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Magnet School Choice and Its Impacts on Student Achievement and Racial and Socio-Economic Segregation in Florida

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COLLEGE OF SOCIAL SCIENCES AND PUBLIC POLICY

MAGNET SCHOOL CHOICE AND ITS IMPACTS ON STUDENT ACHIEVEMENT AND
RACIAL AND SOCIO-ECONOMIC SEGREGATION IN FLORIDA

By

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ABSTRACT

The rapid growth of magnet schools in the 1980s introduced the first widely adopted form of public school choice in the United States. Magnet-based choice was supported as a way to expand school choice options for parents, to bring innovation through specialty schools and programs, and to promote racial integration voluntarily.

Prior to studying the impact of magnet school choice, I examined the role of racial and economic segregation issues in Florida public school systems to understand the background of magnet school policy adoption, to recognize how the impact of magnet school policy has changed, and to discern what role magnet school policy has played in the public school system. Thus, this dissertation examines the impact of magnet schools on the K-12 public school system in Florida as well as the impact that magnet schools have on two important goals in public education reform--higher student academic performance and racial desegregation--using the lens of school choice theory on a market competition approach to public policy. In order to investigate policy impacts more precisely, this study measures school choice policy impact in three ways 1) by policy adoption, 2) by degree of school choice availability, and 3) by degree of policy involvement. Specifically, to assess racial desegregation, this study uses several measurements such as the dissimilarity index (DI), standard deviation and the interracial exposure index (EI) to examine magnet school impact on racial desegregation at the level of both school and school district. To study student academic performance, this study uses Florida Comprehensive Assessment Test (FCAT) scores to examine magnet school impact on student achievement. In addition to studying magnet schools by themselves, this study also examines the combined impact of charter and magnet school policy adoption on these two outcomes in Florida public school districts.

I use four data sets for this study. The Common Core Data (CCD) is from the U.S. Department of Education's National Center for Education Statistics (NCES). The last three datasets-- the Florida Comprehensive Assessment Test (FCAT) data; the Florida School/District Indicators Report Data (FSID/FDID); and the Master School Identification (MSID) Data—are all from the Florida Department of Education (FLDoE). The study covers the years 2005-2011, and examines elementary, middle and high school levels.

First of all, this study shows demographic trends in magnet, charter and TPSs, by school levels. In Florida, the numbers of students enrolled in magnet schools are increasing steadily, but student enrollment in TPSs is decreasing at all school levels. Generally White students decreased in all districts at all school levels, but Hispanic students increased in all districts at all school levels. The percentage of White students shows the highest percentages in districts without any school choice policies, while the percentages of Black and Hispanic students show the highest percentages in districts with both school choice policies.

Student test scores in reading are the highest in districts with magnet school choice policy at all school levels, and student test scores in reading are the lowest in districts without school choice policy at all school levels. Student test scores in mathematics show the same results as the reading test results. However, after controlling for student characteristics, school and teacher characteristics, and district characteristics, the adoption of school choice policy has a negative influence on student performance at all school levels and in both of the subject fields of reading and mathematics, except for the reading score at the elementary level.

This study shows the impacts from both magnet and charter school choice policies by utilizing a greater number of measures than prior research. Overall, school choice policy does not have a positive impact on either student performance or racial segregation. Rather, school choice policy has a negative impact on student performance, and charter school policy exacerbates racial segregation in school districts. This study also found that charter school policy exacerbates racial segregation in school districts, and magnet school policy has a significant positive impact on school segregation after controlling for district income inequality, economic status, demographic characteristics and district size. When considering that the use of magnet school policy has the purpose of racial desegregation, however, the impacts from magnet school policy are slight and marginal in Florida school districts.

CHAPTER ONE

INTRODUCTION

1.1 Innovation of Public Education and Magnet School Choice

What is public education? It is a mirror reflecting the knowledge and values of society and contributing to its future. Therefore education has been a top priority of industrialized and modern societies. Widespread concern about the quality of public education leads to frequent calls for education reform. However, reforming public education is not performed simply and easily, and policy changes may not achieve expected outcomes. Why? One reason is that good education is not defined only in one way; in other words, there are various purposes for education and these multiple goals are not all achieved by one type of education reform. This complexity makes education reformation difficult. A second reason is that education does not work through a free market mechanism that quickly adjusts to consumer demands. Since education through age eighteen is compulsory, there is also a state interest in what is taught so the tension in providing a common core curriculum with options for diverse career interests means that education curriculum does not always meet parental and student demands.

In the last few decades school districts and public policy have been changed to allow for more diversity in school choice policy and curriculum offerings through charter schools, magnet schools, vouchers, and other market-oriented options. In the 1980s, school choice policy was welcomed by political conservatives interested in subjecting schools to competitive market forces (Levin, 1991). The emphasis was on higher public education performance through market-based reform. In addition, people in the middle of the political spectrum have supported allowing parents to leave their neighborhood school for another public school (Fuller et al., 1996). Liberals then began to view school choice as a mean to empower poor and working-class families by allowing them to challenge paternalistic bureaucracies (Diem, 2010). In the South, school choice was originally advocated during the days of desegregation so that parents could avoid sending their children to integrated schools (Fuller, Elmore, & Orfield, 1996).

Today, there are many studies on the impact of school choice policy that question whether it actually contributes to better academic performance and a greater range of options for all. But the answer is still unclear due to conflicting research results. Some studies demonstrate that school choice policy has contributed to the achievement of better academic performance but

others point out the concern that such innovations may not meet the needs of racial minorities and low-income families, rather that it exacerbates segregation in public school systems.

So the goal of this study is to investigate policy innovation in public education, and assess the impact of magnet schools--solo magnet schools and also those combined with charter school use--on the quality of education for racial and socio-economic groups in American society. First, what are the shortcomings of public education in K-12 grades and what has recent public policy done to improve or to revive public education? How have racial segregation and low academic performance been represented in the public education system and what are its effects on the quality of public education?

Some reformers push for higher standards of student achievement such as higher academic outcomes and educational attainment such as lower dropout rate, higher graduation rate and college attendance. Others pursue market-type reforms to produce more options for students and to create incentives for schools to compete with each other (Belfield & Levin, 2002). They assume that competition leads to improvement of educational quality as a whole. The idea that competition will lead to a better education system is connected to offering more options which produces competition between schools. In the United States, parents and students may choose among a number of options for their children's schooling, such as: (1) between public and private education, (2) among public school districts, and (3) among public schools within a given district (Teske and Schneider, 2001). Market-type reforms try to expand the attractiveness of private schools by providing options such as education vouchers and tuition tax credits, and also they try increase awareness of public educational alternatives such as charter schools and magnet schools. Magnet schools, typically established in urban school districts, were initially created in the 1970s as an alternative to mandatory reassignment by providing a choice for parents among many different school options, each offering subject-specific courses or distinct instructional formats (Smrekar & Goldring, 1999). In the public K-12 education system, magnet school choice is a policy approach that has been used to promote intentional racial desegregation, and today, it is a regulated school choice policy being utilized in integration plans based on voluntary choice and socio-economic status.

Steel and Levine (1994) show how magnet schools have grown in the American education system historically and lay out the distinguishing characteristics of magnet schools today. According to these scholars, magnet schools today have three primary features: "1) to

provide a distinctive curriculum or instructional approach; 2) to attract students from outside an assigned neighborhood attendance zone; and 3) to promote desegregation as an explicit purpose.” Magnet school policy, in an era where school choice is more abundant than ever--including charter, private, and alternative schools--appears to stand out as the only form of school choice established for the purpose of racially and socioeconomically integrating schools (Frankenberg & Siegel-Hawley, 2008).

Thus, magnet school adoption and its impact over a period of time is a perfect policy area for the exploration of public school innovation that promotes better student achievement and racial or socio-economic desegregation.

1.2 Purpose of Study

The main objective of this study is to examine the impact of magnet school policy on the K-12 public school system in Florida. Specifically, this study examines how magnet school choice influences public education on two indicators: (1) racial and socio-economic segregation, and (2) student performance. Before examining the impact of magnet school choice, I will examine the role racial and economic segregation plays in the public school system to understand the background in the adoption of magnet school policy by Florida school districts. I will also study to what extent magnet school adoption leads to two outcomes: (1) desegregation of schools, and (2) higher student performance at schools. In addition to studying magnet schools by themselves, I will also examine the combined impact of charter and magnet school adoption on these two outcomes at elementary, middle and high school levels. Charter school policy emerged as a solution for reforming the U.S. public education system in the 1990s. Its advocates argue that creating charter schools based on market-type reformation promotes competition and allows more parental choice in the public education system, and as a result, brings efficiency and better performance to the public school system. However, the opponents of school choice policy argue that school choice policy, especially charter school adoption, would exacerbate the racial segregation problem. Thus, charter school policy could have positive or negative impacts on racial segregation problems, and there could be an interactive effect from using both charter and magnet schools in some districts in Florida. Also, the other districts that adopt either magnet or charter schools could show different policy outcomes from each other. This will contribute to

understanding more deeply and precisely the impact of magnet school choice on racial and socio-economic segregation and student performance in the Florida public school system.

A secondary purpose of this study is to describe the extent and types of magnet schools currently in place in Florida school districts. This study examines the racial and economic segregation characteristics of school districts in Florida as of 2005, which is the first year of data availability, and tracks how these characteristics have changed over a five-year period--2005 until 2010. Along with examining the changes, I will investigate how the magnet school policy has been used and what roles it has played at the elementary, middle, and high school levels. This study will present data on the number of students in magnet schools--elementary, middle and high school--and will look at the social and racial characteristics of students whose parents chose magnet schools rather than traditional public schools (TPSs).

Third, this study will answer the question, "What are the Florida district factors associated with the use of magnet schools from 2005 to 2010." Although some case studies of individual school districts have provided detailed information on how and why families from different economic backgrounds select schools in districts with magnet programs and have suggested ways in which these processes may or may not have influenced segregation between poor and non-poor students within the districts, no one has written a comprehensive descriptive study of the characteristics of school districts and schools in Florida that adopt magnet schools.

Magnet school choice seeks both to enhance the quality of education and to promote desegregation in schools (Steel and Levine, 1994). It is employed as means to desegregate schools and to provide incentives for parents to remain in the public school system (p.6). In other words, the creation of magnet schools is related to two other goals: better school and student performance by competition, and social equity through racial or socio-economic desegregation. I will locate factors that are associated with the use of magnet schools and I expect that this study will more specifically answer the question: "Does racial and socio-economic segregation play an important role in the use of market-based choices, specifically in the adoption of magnet school choice?"

1.3 Research Questions

This study will try to answer two meta-questions: what role do magnet schools perform academically, and how well do magnet schools achieve the goal of desegregating schools to

include students of various ethnic backgrounds. These two meta-questions have several sub-questions, which are presented in Chapter 3 specifically. Since the 1950s, providing education in desegregated school settings has been stressed, and magnet school policy was introduced to increase academic achievement in racially desegregated schools (Steel and Levine, 1994). The desegregation issue dominated the early discussion on reform in U.S. public education. School desegregation has changed from court-ordered mandatory desegregation plans to voluntary desegregation plans through court decisions, historically from the Brown case (1954) to the Parents Involved ruling (2007). Along with this change, politicians and the public are more likely to emphasize academic standards, achievement, and accountability, but the desegregation issue has still remained popular in public education reform. The greater controversy has been the impact of magnet schools on school performance and racial desegregation, but part of the reason stems from the methods to determine magnet school impacts. Studies on magnet school impacts show different results depending on the research settings, such as level of analysis or research scope, which use national or local data or specific school or district cases, thus increasing controversy. It is possible that the controversy about the research results originates from ignorance of local characteristics, especially demographic status, which is closely related to the student racial composition in schools. Traditionally, many studies use the Black/White dichotomy for desegregation measurement, but there is greater diversity today and the level of diversity varies depending on local demographic characteristics. Therefore, in an effort to reduce the controversy in the methodological problem, I will answer the meta-questions by looking at the desegregation impacts of black, white, Latinos, and Asians by improving the index of interracial exposure measurement.

1.4 Significance of the Study

There are many studies that examine the different types of public school reforms and their consequences. Several good studies have dealt with racial or socio-economic segregation in the public education system. For example Choi (2012) and Renzulli (2005) study the impact of charter schools on racial segregation in the school districts. But few studies have examined the impact of magnet schools on racial and socio-economic segregation. This study uses data from the sixty-seven school districts that administer the public education system in Florida to look at magnet school choice through the theoretical lens of school choice theory built upon market-

based competition. Numerous studies on school choice policy have been published (Greene, Peterson, and Du, 1997; Goldhaber 1999; Howell and Peterson, 2002; Krueger and Zhu, 2004; Lauen, 2007; Levin 1998; Levin 1999; Rouse 1998; Witte, 2000), and one of the most controversial issues investigated is whether school choice options impact race and class segregation among students (Saporito, 2003). The segregation impact of school choice policy is not clear, and studies actually shows mixed results on racial or socio-economic segregation. Scholars advocating school choice policies argue that increasing the educational options will create greater educational equity (Peterson 1998; Brandl 1998; Chubb and Moe 1997; Coleman 1992; Coleman, Hoffer, and Kilgore 1982; Coleman, Schiller, and Schneider 1993; Greene 1998; Greene, Howell, and Peterson 1998; Hoxby 1998; Wolf, Howell, and Peterson 2000), but some scholars argue that more choice means greater mobility, and it results in the exacerbation of segregation in public schools.

First of all, this study is significant in that tries to explain magnet school policy by looking at the impact on racial segregation and academic performances together. No other studies have been conducted to comprehensively explain magnet school policy impacts, and this study will show its circumambient impacts. Also, this study has considered charter school policy together with magnet school policy because it is one of the most influential school choice policies and could interact with magnet school policy as another important option. This will help to demonstrate magnet school policy impacts more precisely than examining magnet school policy alone.

Second, most studies on magnet school policy are conducted with the samples of urban school districts because magnet schools were originally created to improve the educational quality of minorities. In the past, examining urban school districts was a meaningful good choice in that urban school districts have high poverty concentrations with socio-economic minorities. Therefore, limiting the investigations of magnet schools to urban school districts has been good foundation. But magnet school policy has flourished through a long history, and today it is focused more on offering a distinctive curriculum. Therefore, there are many case studies that support the fact that magnet schools are chosen by higher academic performers and their parents who are more informed and are not socio-economic minorities. Therefore, examining all school districts in Florida can explain the significant changes that have occurred in implementing magnet school choice. There has been great interest in charter schools, so this study will

contribute to understanding the role it plays in the public education system by describing its various features.

In addition, this study is conducted at the district level mainly to explain magnet school policy impacts more precisely. When a district decides to adopt a policy, it is to improve a certain status of the district. However, few studies compare the policy impact by controlling district characteristics, because most of the studies only dealt with school cases or were conducted in urban school districts. Also, studies controlling district characteristics considered demographic factors by looking at the percentage of whites and blacks generally, but demographic statistics show a significant increase in Hispanic and Asian populations. Thus, I have generated an exposure index (EI) that includes all of these minority groups, and this will contribute to uncovering the extent of magnet school policy impact.

1.5 Plan of Dissertation

This dissertation will be composed of 5 chapters: Chapter One is the Introduction, Chapter Two is the Literature Review, Chapter Three is Methodology and Research Design, Chapter Four contains the Analyses, and Chapter Five is the Discussion.

In Chapter 2, I discuss how the racial segregation issue has played its role in the U.S. education system. It covers how the issue has developed through history until the creation of magnet school policy by looking at related legal and administrative backgrounds. Then I discuss the relationship between the lower resources of racially or socio-economically segregated schools and their lower academic performance, and how the role of magnet school policy has been changed both by racial desegregation and higher academic performance. At the end of this chapter, I review a theoretical lens of school choice theory built on market-based competition, which is the basis for the hypothesis of this study.

In Chapter 3, I suggest research questions, and supply the sources of data used in this study. And I build the analytic stage and prepare the research design to answer the research questions.

In Chapter 4, I show the analytic results of this study about the impacts of magnet school policy on academic performance and racial or socio-economic segregation, and discuss the implications of the results. Then I discuss the limitations of my study and present suggestions for further study in Chapter 5.

CHAPTER TWO

LITERATURE REVIEW OF THE EVOLUTION OF MAGNET SCHOOL POLICY AND ITS ROLE IN RACIAL DESEGREGATION AND STUDENT PERFORMANCE

2.1 The Role of Racial Segregation in Education Policy and Magnet School Choice

The racial segregation issue in the field of U.S. education started in the 1950s after the Supreme Court decision based on legal equal rights and it has been politicized and controversial issue ever since, but the segregation issue is not just confined to educational equity concerns, and has started to be considered as an important factor for achieving better academic performance or even a better society. Straus (2004) demonstrates that although magnet schools were originally discussed as part of the desegregation program, they are now discussed through newspaper article analyses as providers of academic excellence. However, the discussion of racial segregation in schools is still ongoing in various aspects, especially in the Court. Along with the discussion of desegregation in the public education field, concerns that segregated schools were not always as strong academically as more integrated schools have resulted in efforts to develop an administrative framework for considering race within the legal limitations of the U.S. education system.

2.1.1 Legal and Administrative Background of Racial Desegregation in Education Policy

The efforts to desegregate schools has been critical to achieve better education for all since it allows an equal educational opportunity that is fundamental to achieving the American Dream (Mickelson, 2001). After the landmark *Brown v. Board of Education of Topeka* (1954) decision outlawing state-mandated separate schools for Black and White children, there has been extensive discussion on equity of opportunity and resources for all students, affirmative action, and multiculturalism (Pitre, 2009; Valverde, 2004). The features that characterized magnet schools and appeared in magnet school policies ultimately were discussed after the Brown case (1954), and the Court began to be involved school desegregation after the *Brown* case (1954; *Brown v. Board of Education II*, 1955; *Alexander v. Holmes County Board of Education*, 1969; *Green v. County School Board of New Kent County*, 1968; *Swann v. Charlotte-Mecklenberg*

Board of Education, 1971; *Keyes v. Denver School District No. 1*, 1973)¹. But there is a case, *Milliken v. Bradley* (1974), that blocked efforts to desegregate because of local population composition status. At the same time, additional cases were being argued with regards to the use of race for promoting equal educational opportunity and more diversity in the higher education arena (Diem, 2010). However, those cases were extremely controversial because there was no single majority opinion. For example, the Supreme Court ruled in *Regents of the University of California v. Bakke* (1978) that affirmative action is constitutional but racial quota systems cannot be used, and in *Grutter v. Bollinger* (2003) the Court rejected racial quotas but upheld the use of race as one of factors used in college admissions. In fact, issues on educational equity and

¹ There are several features of magnet schools. First of all, a magnet school has programs which have been successful in creating diverse student compositions. Particularly the programs that were created as a result of the initial (mandatory) desegregation plans included specific features that attracted students of all racial and ethnic backgrounds (Blank et al., 1996; Frankenberg & Siegel-Hawley, 2008). In addition to the explicit desegregation goals in the initially developed educational structures in magnet schools, magnet schools have several unique features that expand access to all students. They include certain admissions criteria, free transportation, public outreach, curricular emphases, smaller class size, and more selective teacher assignment processes (Blank et al., 1996; Frankenberg & Siegel-Hawley, 2008; Smrekar & Goldring, 1999).

However, there is a study that reports that magnet schools have been struggling recently to maintain racial diversity because they have abandoned race-conscious desegregation goals. They experience higher teacher turnover, or are unable to provide free transportation based on a survey disseminated to administrators, teachers, and school officials in the magnet school community (Frankenberg & Siegel-Hawley, 2008). Through literature reviews for this study, I found that magnet schools have gradually experienced changes in goals from racial desegregation to higher academic performance. This change is reflected in recent administrative guidelines and legal advice.

In case of magnet programs that are distinguished from magnet schools, there is a higher probability that they are utilized as white flight or self-isolation schools based on race or socio-economic status. Magnet programs can be found within traditionally zoned schools where some students apply to attend a program with a special theme, while other students attend the non-themed school. These school-within-school magnets have been shown to be less likely to meet desegregation objectives compared to whole-school magnets (Steele & Eaton, 1996). Moreover, the school-within-school magnets can further perpetuate inequities as minority students may be prevented from enrolling in high-quality magnet options located within their own schools, while white students not residing in the neighborhood are allowed to attend (Frankenberg & Siegel-Hawley, 2008). Consequently, school-within-school magnets can produce racially isolated classrooms even if the school itself is considered diverse at the building level (Orfield & Eaton, 1996).

diversity have been highly politicized from their inception, and have faced many social and legal challenges (Brown, 1994).

Most recently the U.S. Supreme Court handed down its decision on school desegregation in *Parents Involved in Community Schools v. Seattle School District No. 1* (2007), and they ruled together with *Meredith v. Jefferson County Board of Education* (2007). The Court found that the districts violated the rights of nonminority students by attempting greater diversity in their schools by implementing voluntary student assignments and a desegregation policy. It resulted in the idea that it is unconstitutional to take the race of a students into account in order to stop segregation, which is exactly the reverse of the rulings of the civil rights era that race must be taken into consideration to the extent necessary to end racial segregation (Orfield & Lee, 2007). As a consequence, some school districts have started to implement racially neutral policies; however, other school districts still plan and implement policies for racially diverse student assignments despite the new legal limitations. Even with the *Parents Involved* (2007) ruling, some districts have implemented structured and regulated school desegregation policies that enable parents to have more options, such as magnet schools or programs and inter-district choice plans, so that students can choose schools outside of their districts (Wells & Frankenberg, 2007). Many magnet schools are still built and managed with a goal of racial desegregation.

In fact, although the Supreme Court struck down uses of individualized racial classifications in assigning students to schools in the *Parents Involved* ruling, Justice Kennedy disagreed with the Chief Justice's plurality opinion and his opinion is reflected in the judgment and constitutes the final opinion of the Court. Therefore, the Court affirmed that "when the government distributes burdens or benefits on the basis of individual racial classifications that action is reviewed under strict scrutiny," and a school district that considers race in student assignment decisions must show that the use of race is narrowly tailored (*Parents Involved*, 551 U.S. at 720). Thus, this enables school districts to adopt voluntarily measures to pursue goals of achieving diversity and avoiding racial isolation. Justice Kennedy provided some examples, such as strategic site selection of new schools; drawing attendance zones; allocating resources for special programs; recruiting students and faculty in a targeted fashion; and tracking enrollments, performance, and other statistics by race (Id. at 789.). Thus, a majority of Supreme Court Justices support the flexibility of schools and school districts in designing policies to achieve diversity or determining how to avoid racial isolation voluntarily.

Under the *Parents Involved* ruling, the United States Department of Education (ED) and the United States Department of Justice (DoJ) issued guidance on the voluntary use of race to achieve diversity and avoid racial isolation in order to explain how schools can consider race consistent with existing law. The 2011 ruling describes the legal framework for considering race in K-12 schools, sets forth considerations for school districts in their voluntary use of race, and provides a summary of key steps and examples of ways that school districts may select for achieving their interests (U.S. Dept. of Ed & DoJ, 2011). According to this guidance, a district should first consider race-neutral approaches such as students' socioeconomic status; parental education; students' household status; neighborhood socioeconomic status; geography; and composition of area housing. And when the race-neutral approaches are unworkable, school districts may consider generalized race-based approaches that consider the overall racial composition of neighborhoods but are not involved in the race of individual students. Finally, if both of the approaches are not workable, a school district may consider the race of individual students if the consideration is narrowly tailored to meet a compelling interest.

Alexander and Alexander (2009) point out that the initial approaches to desegregation in the early days were heavily focused on racially balancing or homogenizing schools by transportation (busing), school zone adjustments, school site selection, and student reassignment plans. However, more recently the courts have allowed additional options for desegregation plans such as magnet school choice to enrich the learning experiences of minority students (p.1055). This change of focus is closely related to a change of view in the legal aspect, in which the remedies for racial desegregation can be used in a narrowly tailored manner. This limitation leads to a change of focus from developing a racial balance to an emphasis on the student learning experience and higher achievement.

2.1.2 Lower Resources and Achievements in Racially and Economically Segregated Schools

The continuing efforts to develop a legal framework for desegregation from the 1950s to the present can be understood as concerns about the re-segregation of U.S. public schools. Some scholars think one reason for the re-segregation has occurred due to the restricted tools available to the courts to address segregation challenges, although the causes of segregation and poverty in public schools still exist.

The role that racial and economic segregation play in education is associated with not only lower resources and lower achievement for individual students, but also social and economic disadvantages. In fact, many studies show that the impact of racial or socio-economic segregation is not confined to academic achievement, but is also related to various kinds of social problems such as higher rates of crime, unemployment, and teenage childbearing (Lauen 2007).

Scholars emphasizing school desegregation argue that racial and economic isolation undermines the achievements of minority and low-income students, whereas efforts promoting school integration tend to improve the educational outcomes of disadvantaged groups (Bifulco, Cobb & Bell, 2009; Orfield, Frankenberg & Garces, 2008). Moreover,, there are many studies that show that segregation in schools is closely linked to poverty and poor academic achievement.

Pitre (2009) said that schools with high-minority and low-income student populations endure inequities in the quality of school instruction, facilities, and overall educational experiences, and those inequities are closely related to lower student academic achievements. Rothstein (2004) reviews studies on the linkage between individual poverty, school poverty, race and educational inequality. Throughout his review, we can see how closely poverty is related to many social and individual problems. Poverty is not just related to student performance; it has a strong relationship to a child's physical development and a family's ability to stay in a neighborhood long enough so that a school might have an effect on the student.

A report from the University of North Carolina published in 2005 shows a strong relationship between concentrated school poverty and low achievement. The study found that low-income students attending middle-income schools gained the largest achievement test scores. These students scored 10 points on the test compared to 4 points for low income students in high poverty schools. The high poverty schools were performing worse than schools in nearby Wake County that used socio-economic desegregation to end poverty concentrations (Orfield & Lee, 2005).

Lee (2004) shows a strong relationship between segregation by race and several factors such as poverty, teacher quality, dropout rates, and test scores with a case in the metro Boston region. She found that 97 percent of the schools with less than a tenth percent of white students faced concentrated poverty compared to 1 percent of the schools with less than a tenth percent of minority students, and these gaps were associated with MCAS state examination results. Dropout

rates gained national attention, and Balfanz and Legters (2004) found that the dropout problem is concentrated in segregated high poverty schools. The authors said “almost a third of the high schools that were more than 50 percent minority graduated less than half of their class in the high school class of 2002. Among the schools that were 90 percent or more white, only one school in five had this kind of record”(p.63). Swanson (2004) reports that the difference in graduation rates between districts with high and low proportions of low-income students was 18.4 percent in 2001 nationally, and the difference between majority-white and majority-minority districts is even higher. In addition, racially and socio-economically isolated schools with high poverty levels tend to have less qualified teaching staff, and this tendency has a strong negative relationship to student academic performance. A report published by the U.S. Department of Education in 2004 showed that in schools where “at least 75 percent of the students were low-income, there were three times as many uncertified or out-of-field teachers in both English and science...” Also, Boger (2005) studied turnover of teaching staff, and reported that almost a third of the teachers left each year in Charlotte, North Carolina’s highest poverty schools.

Florida is one of the states that achieved the greatest increase in desegregation in the 1970s and has been losing those gains ever since (Orfield & Lee, 2005). Borman et al. (2004) investigated the relationship between segregation and success of students in passing the state’s high-stakes tests. This study shows a strong negative relationship between segregation and test passing rates. In this study, black students in racially isolated schools had lower pass rates, and black students in integrated schools did as well as the rare black students in overwhelmingly white schools. They conclude that “segregated schools can be viewed as institutions of concentrated disadvantage” and emphasize solving the segregation issue first to resolve the achievement difference. They point out that policies for resolving the achievement gap by funding equity or changes in classroom size would fail if the segregation issue were not solved first (p.605). There are several studies that demonstrate the strong relationship between segregation and lower resources and achievement, and there are also studies that show that desegregated settings have positive influences on student achievement.

However, there are studies that raise doubts about the benefits of desegregation, arguing that the evidence is inconclusive regarding the relationship between desegregated schools and academic achievement (Armor, 1995; Armor, Thernstrom & Thernstrom, 2006). Bifulco et al. (2009) show that attendance at an inter-district magnet school has positive effects on the math

and reading achievement of central city students, but they warn that it is difficult to determine whether magnet schools improve student achievement because they offer schools that are less isolated racially and economically or because of other aspects such as educational programs.

2.2 The Evolution of Magnet School Choice

In the first part of this study, I reviewed how magnet school policy was created as a means for integrating schools under an interpretation from a legal point of view, and how its role has been expanded from promoting desegregation to promoting academic excellence. In this part, I will review how magnet school policy actually has evolved within the school system, and will show how segregation issues and lower academic excellence are associated. Throughout this review, I would like to emphasize how magnet school policy has been used to integrate schools and to achieve higher student academic excellence.

2.2.1 Magnet School Choice as a Method to Desegregate or Improve Student Achievement

There are examples of integrating schools voluntarily such as examples of McCarver Elementary School in Tacoma, Washington in 1968 and William Monroe Trotter School in Boston in 1969. McCarver Elementary in Tacoma, Washington in 1968 was the first magnet school to be created for the purposes of desegregation by breaking the tie between school assignments and residential location (Rossell, 2005). Until the early 1970s, most efforts for desegregating schools were undertaken by federal district mandatory court orders.

In Detroit, the courts approved “special” enrichment programs using a “multiple districts” strategy to overcome “past discrimination” in 1973, and the court orders had a voluntary component for school desegregation after the approval. This voluntary component became known as magnet schools. The term “magnet school” was coined in Houston, Texas, to describe how the district attracted students from beyond a mandatory attendance zone (Kafer, 2005). In response to the court orders to desegregate, school systems used magnet school policy as a form of voluntary school choice through the use of market-based incentives to desegregate schools.

There is one court case in which the court ordered the use of magnet schools; *Missouri v. Jenkins* (1995) mandated the establishment of magnet schools to recapture white students. The

Kansas City, Missouri School District proposed that every high, middle, and half of the elementary schools in the Kansas City, Missouri School District become magnet schools by 1991-1992, and the district court approved a \$142 million expenditure to fund the proposal (Prothro, 2012). Also, there are other instances of magnet schools or program implementations as part of the desegregation efforts (*United St. v. Yonkers, 1986; People who Care v. Rockford, 1992; Edgeron v Clinton, 1996; Dekalb v. Schrenko, 1997; Belk v. Charlotte-Mecklenberg, 2001; Friery v. LA Unified Sch. Dist. 2002; Plans, Inc.v. Sacramento City, 2003; Cavalier v. Caddo Parish Sch. Bd. 2005*).

During the 1980s, the creation of magnet schools, as a voluntary desegregation strategy, spread rapidly. Between 1983 and 1992, the number of students enrolled in magnet schools or programs increased more than three times (Steel and Eaton, 1996). There were 2,433 magnet schools nationwide, offering 3,171 magnet programs in 1991-92 (Steel and Levine, 1994). In the 2007–08 school year, there were approximately 2,400 magnet schools nationwide enrolling 1.2 million students and an additional 3,300 schools with magnet programs enrolling 3.1 million students (U.S. Dept. of Ed, NCES, 2010). The numbers do not show a big increase or decrease compared with the numbers in the 1990s. This might indicate that magnet school policy had flourished through 1980s to the 1990s, but then it entered a stable stage as an option of public school choice policy.

With the wide spread creation of magnet schools in the early 1980s, the federal government initiated the Magnet Schools Assistance Program (MSAP) to support the 1984 magnet school voluntary or court-ordered mandatory desegregation plan.. MSAP funds were provided to foster the elimination, reduction, or prevention of minority isolation in elementary and secondary schools. The MSAP was reauthorized in 1984 and in 1994. With the passage of MSAP, grants were authorized to support the implementation of magnet programs to desegregate public schools, and the grants provided financial support to local education agencies that created magnet schools or programs.

Steel and Eaton (1996) examined the school districts that received MSAP grants to assess the desegregation impact of the grants and MSAP-supported magnets on the targeted schools. They compared the minority enrollment compositions for the year prior to the award of the MSAP grant to that for the end of the grant period. They found that 47 percent of the 615 targeted schools with the objectives of reducing, eliminating, or preventing minority isolation

had met their goals, and another 17 percent of the targeted schools showed progress. Schools in voluntary-plan districts met objectives more successfully (51 %) than schools in mandatory-plan districts (44%), and the most successful case in meeting objectives (73%) was non-isolated schools seeking to prevent becoming minority-isolated.

Although magnet school policy seemed to have an impact on the school desegregation issue, the statistics show that the number of magnet schools did reach a plateau. The current data on the numbers of magnet schools or programs does not show a big increase or decrease compared with the numbers in 1990s, as I mentioned above. According to the National Center for Educational Statistics (NCES), the number of magnet schools rapidly grew up in the 1970s and 1980s as a mechanism designed for racial and ethnic desegregation in school districts or for an academic or social focus on a particular theme. But today, while magnet school policy still has a desegregation purpose that has to be achieved voluntarily, magnet schools themselves are more focused on academic excellence, which I will discuss in more detail below.

2.2.2 Changes in Public Education Policy and Shifting Views on Magnet School

Choice

For more than 40 years, magnet schools have been used as a tool to desegregate public schools with the federal government's financial support and administrative guidance. However, as I mentioned above, the issue of racial segregation has undergone many legal and administrative changes. Along with these changes, magnet schools have been evaluated more recently for their effectiveness as a tool of school desegregation and as well as academic excellence.

On the other hand, studies on the effectiveness of magnet schools have produced conflicting results. Therefore, some studies argue that magnet school choice plays a critical role in restoring public confidence in public schools, while some studies claim that it has two other impacts—racial integration and enhanced academic performance (Prothro, 2012). While some studies show that magnet schools have had positive effects on desegregation or higher academic performance, some studies claim that the impacts of magnet school choice cannot be demonstrated with confidence. As a result, many scholars argue that the absence of clear evidence on magnet school effects leads to a shift in perspective about the way magnet school policy is viewed (Steele & Eaton, 1996; Hadderman, 2002; Rossell, 2003; Christenson et al.,

2003; Woodson, 2004). Rossell (2003) describes the change in the way magnet schools are perceived by demonstrating that magnet schools have a minimal impact on desegregation, and that magnet school choice within a voluntary desegregation plan increases White Flight and thus reduces the gain in interracial exposure. Also, magnet school choice implementation under court order (i.e. mandatory desegregation plan) does not consider the efficiency issue; consequently, magnet school choice is used as a “means of education choice and curricular diversity rather than as a desegregation tool” (p.23).

In addition to the controversial discussions on the impacts of magnet school choice, the national trend of moving away from court-ordered busing to race-neutral student assignment policies also brought about the shifting roles and purposes of magnet schools. Although magnet school choice started to serve as an instrument of racial integration and diversity in the school systems as well as more recently as an instrument of academic excellence, magnet school choice also plays an important role in the persistent debates about race, segregation, student assignments, and parental choice (Goldring, 2009). Magnet schools still have the mission of voluntary desegregation and racial diversity based on the idea that diversity produces both short and long term advantages in terms of intellectual and social development, where academic excellence is pursued through a thematic curriculum (e.g., arts, technology) or a unique method of instruction (e.g. Montessori). Therefore, investigating how magnet schools utilize their roles and purposes in this changing policy context is interesting area of study.

Table 2.1 Changes in Numbers of Magnet Programs and Magnet Schools by Magnet Purpose, Eight Year Trend 2005-06 to 2012-13 in 67 School Districts, Florida

Magnet Status	Magnet Purpose	2005	2006	2007	2008	2009	2010	2011	2012	Δ 8 Years
	Designed to Eliminate Racial Segregation	83	99	94	72	70	106	114	115	32 (38.55)
Magnet Program	NOT Designed to Eliminate Racial Segregation	57	61	86	108	112	156	171	179	122 (214.35)
Magnet School	Designed to Eliminate Racial Segregation	71	77	73	79	81	89	89	89	18 (25.35)

Table 2.1- Continued

Magnet Status	Magnet Purpose	2005 -06	2006 -07	2007 -08	2008 -09	2009 -10	2010 -11	2011 -12	2012 -13	Δ 8 Years
	NOT Designed to Eliminate Racial Segregation	54	56	75	98	100	115	113	111	57 (105.56)
Total		265	293	328	357	363	466	487	494	229 (86.41)

*Data source: Master School Identification Files 2005-06 to 2012-13, Florida Department of Education

**Numbers in parentheses are an increased percentage of magnet programs and schools by purpose for 8 years and rounded to hundredths.

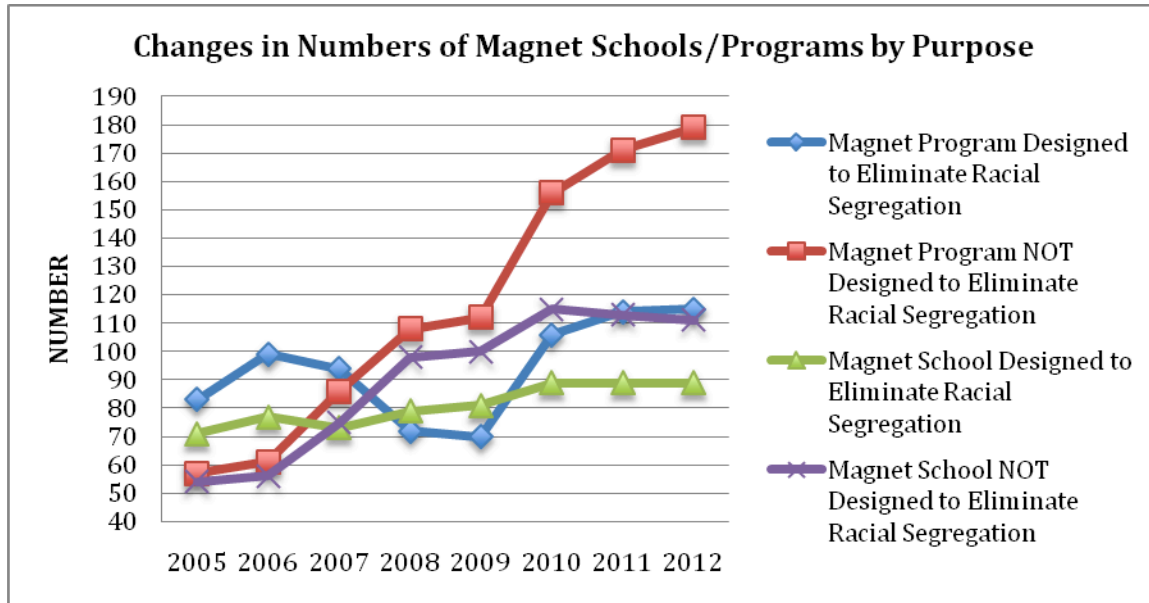


Figure 2.1 Changes in Numbers of Magnet Programs and Magnet Schools by Magnet Purpose, Eight Year Trend 2005-06 to 2012-13 in 67 School Districts, Florida

*Data source: Master School Identification Files 2005-06 to 2012-13, Florida Department of Education

Table 2.1 shows the eight years of trend data for the changing numbers of magnet schools and programs by magnet purpose that are especially related to racial integration in the Florida public education system. Noticeably, the numbers of magnet programs and schools have increased about 86 percent from the 2005 (the first year that data on magnet schools was available) to 2012 that is for eight years. It shows that both magnet programs and schools

increased no matter how they were formed or with what magnet purposes they were formed, but both magnet programs and schools that were not designed to eliminate racial segregation largely increased across time compared to the others which were designed to eliminate racial segregation.

Table 2.2 Changes in the Numbers of Magnet Programs and Magnet Schools by Magnet Purpose and School Levels, Eight Year Trend 2005-06 to 2012-13 in 67 School Districts, Florida

Magnet Purpose	School Level	Year								Δ 8 Years
		2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	
Designed to Eliminate racial segregation	Elementary	73	81	75	77	77	88	93	92	19 (26.03)
	Middle	36	42	39	29	29	50	55	55	19 (52.78)
	High	44	49	49	39	38	50	49	50	6 (13.64)
	Total	153	172	163	145	144	188	197	197	44 (28.76)
NOT Designed to eliminate racial segregation	Elementary	41	44	60	73	74	87	82	80	39 (95.12)
	Middle	23	24	31	47	48	60	70	73	50 (217.39)
	High	45	48	61	75	84	109	117	120	75 (166.67)
	Total	109	116	152	195	206	256	269	273	164 (150.46)

*Data source: Master School Identification Files 2005-06 to 2012-13, Florida Department of Education

**Numbers in parentheses are an increased percentage of magnet programs and schools for 8 years, and rounded to hundredths.

***The numbers of schools in Table 2.1 and 2.2 are different, because the numbers in Table 2.2 are calculated by excluding schools which have not fallen into the categories of elementary, middle, and high school levels such as combination schools.

Table 2.2 shows eight years of trend data for the changes in numbers of magnet schools by magnet purpose especially related to racial integration based on school levels in the Florida public education system. Magnet schools show an overall increase in numbers no matter whether they were designed to eliminate racial segregation or not, but magnet schools without a racial desegregation purpose increased at all school levels across time. In addition, the numbers of magnet schools designed to eliminate racial segregation increased mainly at the elementary and middle school levels, but the numbers of magnet schools which were not designed to eliminate racial segregation increased mainly at the middle and high school levels. This trend could be explained by the fact that the magnet purpose of racial integration was more focused at the lower-grade levels, but another purpose (assumed to be academic performance) was more focused at the higher-grade levels of magnet school creation. Also, the large increase in numbers of magnet schools that were not designed to eliminate racial segregation might reflect the increased demand for academic excellence that resulted from a shifting view of the role of magnet schools, although both purposes of racial integration and higher academic performance have been critical in magnet school creation.

2.3. Theoretical Perspective on Magnet School Policy

Magnet school policy was created to solve the issues of racial or socio-economic segregation and lower academic achievement in the public school system. However, the impact of the policy has been controversial because the results are not merged into one clear answer. Indeed, it is unclear whether or not magnet school policy has contributed to academic performance and racial desegregation.

In this section, I will explore this issue through the lens of a theoretical perspective-- school choice theory. School choice theory was built on the market competition theory and it started to be highlighted during 1980s which opened the discussion about higher performance through competition between schools. This perspective has been popularized since the 1980s with the rapid changing policy context that emphasizes a voluntary and competitive educational environment.

2.3.1 School Choice Theory

A Nation at Risk (National Commission on Excellence in Education 1983), published while Ronald Reagan was in the White House, sounded an alarm regarding the status of public education and opened the door for “competition” through the application of business principles (Resulli & Rocigno; 2005). This shows the widespread concern about the quality of public education, particularly among schools attended by minority and low-income students, and has generated calls for education reform. Intellectual interest in market competition theory was introduced at this time and it has been rapidly expanding since the 1980s. The growth of market-based reform over the past three decades reflects this concern and has been a major new development in public education. Scholars criticized the monopoly-like structures and behaviors of public education that are characterized by bureaucratic rigidity and weak incentives for educational innovation and efficiency (Chubb & Moe, 1990; Kolderie, 1990; Archbald, 2004). Market-type reforms to generate more private and public options for students and to create incentives for schools were emphasized. Therefore, these educational reforms resulted in educational vouchers and tuition tax credits to promote private alternatives and charter schools, magnet schools, and decentralization of larger school districts (Belfield & Levin, 2002) in order to provide more choice for parents and students and to bring competition into the public school system.

The advocates assumed that school choice would reduce economic segregation among children in public schools by creating access for lower-income families to schools outside their neighborhoods, and this effort was supported through public transportation, innovative registration procedures and dissemination of information to parents about school options (Archbald, 2004).

The key assumption of the school choice theory was that poor and minority children are more likely to be trapped in inferior schools than are non-poor and non-minority children (Archbald, 2004). Related to the equity issue, advocates of school choice theory believe that school choice will reduce economic segregation among children in public schools by creating access or improving accessibility for lower-income families to schools outside their neighborhoods. They suggest several reasons for their assumptions and studies fortifying these assumptions find reasons for them from diverse individual, economic, institutional, and cultural perspectives. But the bottom line is that minorities have restricted choice, and advocates of

school choice theory reason that lower academic performance and racial segregation are the results of their restricted choice.

In fact, the generalized way to choose a school is closely related to choosing a place to live. For minorities, there is much evidence from studies that show that they are restricted to choosing schools according to their places of residence. There are many diverse reasons for their restricted choice (Archbald, 2004; Brouillette 1999; Coons, 1981; Farley and Frey 1994; Jargowsky 1996; Kozol 1991; Orfield 1992; Wilson 1997; Yong and Clinchy, 1992). Individually they have limited incomes and a lower amount of information, and institutionally, they are affected by government housing policies that support minorities or lending practices. Also, culturally they are facing societal prejudices and other factors that create racial isolation. Many scholars explain racial isolation as choice based on preferences for cultural similarity and pluralistic forms of socialization (Fuller, et al., 1996). These preferences seem likely to result in self-isolation or white flight and socio-economic stratification in studies based on school choice theory (Choi, 2012; Cobb, et al., 2000; Crew & Anderson, 2003; Frankenberg & Lee, 2003; Garcia, 2008; Renzulli, 2006; Renzulli & Evans, 2005; USDOE, 2004; Weiher & Tedin, 2001).

Also, this perspective has also been applied to the academic performance issue in the same manner, and it has contributed to the growth of magnet schools and charter schools. The advocates of a market-based approach expect that an education system based on market competition will increase productive and innovative behaviors against the traditional bureaucratic political control of public education, and it will attract consumers (i.e. parents and students) as well as generate efficiency. They assume that competition in the public education system could undercut bureaucratic control and provide educators in schools of choice the opportunity and motivation to experiment with new instructional strategies for improving student achievement and new organizational processes that combat inefficiency (Berends & Zottola, 2009). For instance, Friedman (1997) suggests that privatization of the educational system is the only way to save public education by forcing it to improve in order to maintain clientele. Also Chubb and Moe (1990) emphasize the reconstruction of the public education system based on market-like competition to cut bureaucratic inefficiency and inertia. Many scholars argue that allowing market-like competition will provide greater opportunities to parents for home-school interaction and will give greater openness to schools in response to parental demand (Chubb & Moe, 1990; Friedman, 1962; Kearns & Doyle, 1988; Lieberman, 1989,1993). Berends and

Zottola (2009) said that the “Central to the advocates’ argument for choice is that these aspects of reform will produce changes in organizational conditions that promote learning, curriculum, and instruction, which, in turn, will lead to better student outcomes. Moreover, the argument goes, practices and conditions related to autonomy, innovation, and accountability will differ across schools (and school types), thus responding to parental and community preferences and further promoting student achievement.” Based on these assumptions, many scholars argue that school choice policy is the best way to improve educational opportunities for minorities, and that the growth of school choice policy largely depends on the belief that citizen choices can help alleviate lower school performance and racial segregation problems.

On the contrary, some scholars contend that although proponents of market competition theory argue that parents choose schools based primarily on school quality, these scholars believe that school quality is secondary when making a choice. They argue that the primary factors in school choice are the desire for religious infused education, cultural similarity based on race and economic status, and geographic proximity to residence (Tweedie J. et al., 1990; Smith & Meier, 1995). If these critics are correct, the assumptions of market competition theory are invalid, and magnet school choice will not bring any behavioral changes to school choice, because school quality is not a primary factor in choosing a school even though other educational values (such as religious education, homogeneity of students, etc.) may be improved through competition. Second, there are arguments that criticize the effects of school choice because it draws higher performing and non-minority students away and brings about lower student achievement or increased segregation in nearby public schools (i.e. the creaming effect). And there are concerns that school choice will increase class-related educational inequities by exacerbating social class segregation in public schools, or will only shuffle children among schools without a significant change in the distributions of social-class segregation. Finally, there are scholars pointing out that the consequences of competition on educational outcomes are uncertain (Archbald, 2004; Belfield and Levin, 2002). Many scholars believe that market competition improves both technical and allocative efficiency in the use of resources: Suppliers must strive to be efficient, and consumers have more choices. Indeed, a substantial amount of evidence supports this belief (Hanushek et al., 2001; Marlaw 1997, 2000; Borland and Howson 1993; Maranto, Milliman and Stevens, 2000; Hoxby 1994, 2000; Dee 1998; Arum 1996; Grosskopf et al. 1999).

2.4. Summary

The adoption of magnet school choice policy started as a mean for voluntarily integrating schools in the public education system, but magnet school policy has generated controversial issues about its roles and its impacts on the public education system. Initially, magnet school choice was closely related to political issues concerning educational equity that protects the rights of social minorities by giving them educational opportunities. Through a literature review, this study investigated how magnet schools were originally discussed after the landmark *Brown* case (1954), and showed how this discourse developed a consensus on the role of magnet school choice for better public education. Recently, magnet school choice has been emphasized in the context of providing better educational achievement compared to the lower educational achievement due to school segregation. This is closely associated with the education reform emphasized after 1980 that opened a market-like setting for the education system based on competition between schools. The logical basis for national education reform started from the idea that minority children are more likely to be trapped in inferior schools that have; low performance; therefore giving them the ability to choose a school will liberate minority students from the trap, and this will generate competition among schools which will produce positive impacts on nearby schools and better student performance in the educational system.

Therefore, there are extensive studies on the competitive impacts generated by magnet school policy or more generally school choice policy. However, the literature reviews have produced mixed results, so it is still unclear whether or not school choice policy brings about better student performance. Belfield and Levin (2002) point out the difficulty of estimating the school choice effect because of unclear study results. They describe two empirical challenges, an endogeneity problem and the self-selection issue. When assuming that students choose their schools based on quality, parental choice would be activated by leaving low performing traditional public schools. Also, when better performing students choose their schools through school choice options; it will result in lower performance in nearby traditional public schools. In this context, the impact of school choice on a traditional school system tends to be biased downward. Therefore, to solve these empirical problems, it is critical to decide how to measure the school choice effect. In other words, the mixed results on the school choice effects are due to the methodological problem that there is no unanimous rule by which to measure it.

Second, the mixed results may be caused by different contextual conditions. This means that even though identical policy features are adopted by school districts, the policy impacts would be different according to each policy environment. In this case, it is important to separate out contextual factors that influence policy outcomes in addition to focusing on policy adoption itself. In this study, the focus is on school choice policy adoption. Therefore, understanding district characteristics and both school and student characteristics in the district are other important issues that will help uncover the impacts of school choice policy. To control influences from students, school, and district characteristics, this study includes various control variables associated with students, school, and district characteristics.

To reduce the limitations of previous research, this study focuses on the two limitations mentioned above. Therefore, considering how to measure the effects of school choice policy more precisely is a critical issue to this study. In addition, delineating the contextual factors may become a key to understanding the major influence on student performance or desegregation.

CHAPTER THREE

METHODOLOGY AND RESEARCH DESIGN

3.1 Research Questions

In this section, I will list specific research questions for testing the impact of school choice policy on educational performance and racial segregation based on the theoretical framework of school choice theory built on the market competition approach.

3.1.1 Magnet School Impact on Academic Performance

Student or school performance can be evaluated through various perspectives from diverse disciplines. Economists using a market model as a theoretical tool to understand educational performance emphasize costs and benefits, or input and output analyses, such as comparing test scores and per pupil expenditures, or the ratio of instructional and administrative inputs and educational outputs. Psychologists emphasize the importance of pedagogies and instructional techniques, and sociologists focus on organizational aspects such as organizational atmosphere, culture, and leadership. The purpose of this study is limited to assess the impact of school choice policy on educational performance at the level of districts as measured by achievement on test scores (FCAT scores). Milton Friedman (1955) opened a discussion about school choice policy by stating, “education would be more efficient if it operated through a market system in which parents had broad discretion to select schools.” There are many studies showing how school choice contributes to school effectiveness through more autonomous accountability and more innovative curriculum, and through more effort expended on meeting parental and student needs (Choi, 2012; Chubb & Moe, 1990; Clark, 2005). I will test whether magnet school choice is associated with students in magnet schools performing better than students in TPSs. Magnet schools are expected to perform better than TPSs and create an atmosphere that fosters student retention in the public school system by enhancing the quality of education and providing creative curriculum that meets various educational needs.

Therefore, I will answer the following questions regarding the academic performance of schools in this study:

School level impact

- 1-a. Are student test scores (FCAT) in magnet schools in 2005 higher than those in TPSs in 2005 (the first year that the magnet school data are available)?
- 1-b. How are the annual growth rates of student achievement in magnet schools different from those in TPSs and charter schools (2005~2010)?
- 1-c. Are the student test scores in magnet schools higher or lower than TPSs when student, school, and district characteristics are considered?
- 1-d. Do magnet schools vary in student achievement according to the levels of education (elementary, middle, high)?

District level impact

When a school district adopts magnet schools as a school choice policy, theoretically, the degree of school choice options may be affected by how plentiful magnet schools are and how accessible they are in the district. (Archbald, 2004). To promote accessibility, providing transportation and parental information have been considered important factors. This assumes that higher accessibility and more options to choose will generate competition in the public school system, and it will result in higher academic achievement. So, in addition to using adoption of magnet school choice as a dummy variable, I will also use two variables: (1) the percentage of schools in the district that are magnet or charter schools, which is used as a proxy of degree of choice availability and (2) the percentage of students enrolled in magnet or charter schools, which is used as a proxy for degree of choice accessibility.

Therefore, I will answer the following questions regarding magnet school policy impact on district academic performance:

- 1-e. Does the competitive pressure on TPSs from magnet schools, measured by adoption of magnet school choice, affect student achievement scores in TPSs in Florida districts?

1-f. Does the competitive pressure on TPSs from magnet schools, measured by the percentage of magnet schools and the percentage of students enrolled in magnet schools in a district, affect the student achievement scores in TPSs in Florida?

1-g. Are the competition effects from magnet school choice, if any, robust when student, school, and district characteristics are considered?

I will examine magnet school impact at the school district level more deeply by looking at the degree of school choice options by including charter school data together with magnet school data.

1-h. Does the competitive pressure on TPSs from the degree of choice availability, measured by how many school choice options are available (adoption of charter and/or magnet schools), affect student achievement in TPSs?

1-i. Does the competitive pressure on TPSs from the degree of choice availability, measured by how extensively school choice options are available (the percentage of schools that are charters or magnets in a district), affect student achievement in TPSs?

1-j. Does the combined enrollment in charter schools and magnet schools (the percentage of student enrollment in magnet schools and charter schools) in a district affect student achievement?

1-k. Are school districts with more charter schools likely to have more magnet schools or do the two seem to serve as substitutes for each other? Put another way: Are charter and magnet schools more likely to be adopted together or as substitutes for each other?

3.1.2 School Choice Impact on Racial Desegregation

All school choice options have similar procedures for student recruiting and school registration, but choices in magnet school systems differ from others in that they are limited in

order to prevent increases in racial segregation and are created originally to promote racial desegregation. This study will examine whether school choice policy implemented through magnet schools affects desegregation in Florida public schools. To answer this question, I will explore the specific research questions below:

School Level Impacts

- 2-a. Do magnet schools serve more students (i.e. a higher percentage of students) from a certain racial/ethnic group or a certain socio-economic stratum than charter schools and TPSs?
- 2-b. Did the school level data for schools that adopted a magnet school choice change over the 2005 to 2010 period with regard to racial, ethnic and SES variables?
- 2-c. Do magnet schools affect the demographic composition of students in nearby TPSs?

District Level Impacts

- 2-d. Are TPSs in districts that adopted the magnet school policy more (or less) similar racially than TPSs in districts without magnet schools?
- 2-e. Does the degree of choice availability, measured by how many school choice options are available (charter and/or magnet), affect racial segregation in TPSs?
- 2-f. Does the degree of choice availability, measured by how many school choice options are available (the percentage of schools that are charters and/or magnets in a district), affect racial segregation in TPSs?
- 2-g. Does the degree of school choice policy involvement, measured by the percentage of student enrollments in magnet schools and/or charter schools in a district, affect racial segregation in TPSs?

2-h. Is the size of the segregation effects by districts with and without school choice policy the same across racial/ethnic groups--black, white, Asian and Hispanic students?

2-i. Are these effects, if any, robust when school and district characteristics are controlled?

3.2 Unit of Analysis

On the research questions of whether school choice options impact race or socio-economic segregation and achievement, scholars can answer the question by focusing on specific levels, ranging from student level, school level, and district level. Each level can be assessed in this study and provides different kinds of information on the research questions I am studying. Studies adopting the individual level unit of analysis give information about individual changes caused by policy adoption and implementation. It also helps to deepen our understanding of the link between individual choice and its impact on racial and socio-economic segregation. It shows what factors explain individual choice or preferences, in other words, how parental choice actually occurs and what the consequences are from the choices. However, this study has a purpose to show how policy adoption and implementation bring about systematic changes in a larger setting, and how they impact schools and districts. This study is not focusing on explaining who chooses magnet schools; rather this study is focusing on explaining how magnet school choice impacts racial and socio-economic composition and student achievement in TPSs. This will show systematic organizational changes caused by policy adoption and implementation, and thus provide information on collective consequences from magnet school choice. School level and district level studies contribute to the analysis of policy impacts in that schools devise specific strategies to achieve policy goals and schools are the actual places in which behavioral changes occur due to the policies. School districts (coterminous with districts in Florida) are the main actors in deciding what policy will be created or adopted for specific needs, and school districts set general goals implemented from the policy. Thus, both the school level and the district level unit of analysis give helpful insight into the policy impacts. To analyze the impact of school choice policy adoption on academic performance (research

question 1), the unit of analysis focused in the model is the district level, and to analyze the impact of school choice policy adoption on racial segregation (research question 2), school level unit of analysis is used in the model.

3.3 Data Collections and Analytic Samples

I use three data sets for this study: Common Core of Data (CCD) from the U.S. Department of Education's National Center for Education Statistics (NCES), and Florida Comprehensive Assessment Test (FCAT) data and the Florida School/District Indicators Report Data (FSID/FDID) from the Florida Department of Education (FLDoE).

The CCD is a school level data set, which is categorized into four school types (regular school, special education school, vocational education school, and alternative/other school), operational status, school levels (primary, middle, and high), number of students eligible for the free and reduced price lunch programs, racial composition by grades, and the charter and magnet school status. This study analyzes the regular school data only because magnet school policy is a school choice option in the regular public school system.

The original common core data used for research question 1 investigating school choice impact on academic performance contains 22,432 schools from 2005-06 through 2010-11. The analytic data, however, contains 18,094 schools over the six years. Based on my research interest of school choice effects on the academic performance of traditional public schools, special education schools such as adult programs, vocational schools and schools categorized as other or alternative schools are dropped, and schools not falling within primary, middle, and high school categories are excluded in the analytic data. The original data contains prekindergarten and kindergarten levels at the primary school level. Thus, the grade offered by schools is also considered and if a school provides prekindergarten or kindergarten level as the highest grade offered, it is excluded in the analytic data. However, if a kindergarten provides kindergarten level education as the lowest grade, it is included in the analytic data. In addition, schools with missing data on dependent variables are excluded. Therefore, the analytic data contains regular schools serving all K-12 grade levels.

The analytic data has 18,094 schools finally, and all the data in this dataset are aggregated to the district level by using elementary, middle, and high school data for research question 1. Therefore, the final dataset is generated to investigate variations in academic

performance from three school levels of policy impacts of magnet and charter school adoption in the 67 school districts in Florida from 2005-06 to 2010-11.

Table 3.1 Analytic Samples Used for Research Question 1

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	Mean	Δ 6 years
Elementary School	N=1910 (66.32%)	N=1941 (67.73%)	N=1964 (66.17%)	N=2006 (66.07%)	N=2041 (66.33%)	N=2042 (62.50%)	N=1984 (65.85%)	N=132 (-0.47%)
Middle School	N=548 (19.03%)	N=599 (19.50%)	N=569 (19.17%)	N=582 (19.17%)	N=580 (18.85%)	N=604 (18.49%)	N=580 (19.01%)	N=56 (-0.54%)
High School	N=422 (14.65%)	N=366 (12.77%)	N=435 (14.66%)	N=448 (14.76%)	N=456 (14.82%)	N=621 (19.01%)	N=458 (15.11%)	N=199 (4.36%)
Total	2880 (100%)	2866 (100%)	2968 (100%)	3036 (100%)	3077 (100%)	3267 (100%)	3016 (100%)	136 (100%)
Magnet School*	N=257 (8.92%)	N=278 (9.70%)	N=316 (10.65%)	N=339 (11.17%)	N=348 (11.31%)	N=400 (12.24%)	N=323 (10.67%)	143 (3.32%)
Charter School	N=268 (9.31%)	N=283 (9.87%)	N=294 (9.91%)	N=318 (10.47%)	N=330 (10.72%)	N=421 (12.89%)	N=319 (10.53%)	153 (3.58%)

*The number of magnet schools include schools providing magnet programs and magnet schools.

The FCAT data and the FSID are collected in two levels, both school and district. The FCAT data set contains information about FCAT scores in math, reading and science from 4th, 5th, 8th, and 10th graders, and this study used math and reading scores from 5th, 8th, and 10th graders as a measure for academic performance of elementary, middle, and high schools respectively. FCAT data is reported in two forms: state report of (1) school level results and (2) district level results. The district level data set is used to define whether adoption of magnet school policy influences academic performance at the district level (i.e. to show differences in academic performance between districts according to adoption of magnet school policy).

FSID is reported in two forms similar to the FCAT data: (1) district-level data and (2) school-level data. This data set includes the same educational data as the CCD contains, but this data set has the following additional information: percentage of teachers with advanced degrees, average class size, teachers average years of experience, dropout rate, graduation rate, and percentage of gifted students. However, this data is no longer produced and publicly available after 2009. Thus I used data from the annual report (2005-2011) published by FDoE, and these reports include all the educational data that the FSID has with the additional years of 2010-11. In the same manner, school level data is aggregated to generate district averages according to the three levels of schools.

Additionally, I used data from the *Florida Statistical Abstract*, to provide information on economic and demographic data at the district level, such as household median income, teacher pupil ratio, and the percentage of minorities.

The original common core data used for research question 2 investigating school choice impact on racial desegregation contains 22,432 schools in FL from 2005-06 through 2010-11. The analytic data, however, contains 16,337 schools over the six years. Based on my research interest of school choice effects on racial desegregation of traditional public schools, special education schools such as adult programs, vocational schools and schools categorized as other or alternative schools are dropped. Also, a stratified sampling procedure is used to avoid confounding effects from demographic and economic differences among districts. Magnet school policy or other types of policy for desegregation are generally prevalent in larger urban districts and fairly common in mid-size districts. So, schools which have students under 100 are excluded to consider school size, then, school districts which do not have at least two schools at each school level are dropped for three reason. The first reason is that they do not have the potential to adopt school choice policy because they are likely to have just one middle or high school. The second reason is that districts with a small number of schools may be skewed by extreme values and may then cause the larger sample to be skewed. Finally, school choice policy is rare in small districts.

Finally, analytic data from 16,337 schools are used to compute the dissimilarity index and exposure index of thirty-seven districts in FL, and all the data used as control variables in this dataset are aggregated to the district level for research question 2. Therefore, the final dataset

is generated to investigate variations of racial desegregation from the policy impacts of magnet and charter school adoptions in the 37 school districts in Florida from 2005-06 to 2010-11.

Table 3.2 Analytic Samples Used for Research Question 2

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	Mean	Δ 6 years
Total	2565 (100%)	2581 (100%)	2781 (100%)	2728 (100%)	2776 (100%)	2906 (100%)	2723 (100%)	158 (13.29%)
Magnet School*	N=256 (9.98%)	N=277 (10.73%)	N=315 (11.33%)	N=337 (12.35 %)	N=341 (12.28%)	N=395 (13.59%)	N=320 (11.71%)	139 (3.61%)
Charter School	N=177 (6.9%)	N=197 (7.63%)	N=283 (10.17%)	N=223 (8.17%)	N=252 (9.08%)	N=334 (11.49%)	N=244 (8.91%)	157 (4.59%)

*The number of magnet schools include schools providing magnet programs and magnet schools.

3.4 Measurement

The purpose of this study is to discover the effects of competition from the levels of school choice policy adoption on student performance and racial desegregation in the traditional public education system. To discover the impact of school choice policy on educational performance and segregation, two types of research can be considered. One type is to investigate the differences in educational performance and segregation before and after the policy implementation longitudinally. The other type is to compare and contrast large samples of districts with different types of school choice policy. This study is conducted by comparing and contrasting districts in Florida from 2005-06, which is the first year that magnet school choice data was available, to 2010-11 by categorizing districts into four types: 1) no school choice option, 2) magnet school option, 3) charter school option, and 4) both magnet and charter school choice option.

3.4.1 Research Question 1: The Effects of School Choice on Student Performance

Dependent Variable: Academic Performance

This study will use the FCAT scores as proxies for academic performance. Although test scores cannot reflect students' academic achievement perfectly, the test score is the most preferred measurement and is used for assessing educational achievement because the FCAT score is standardized and normalized as a numeric format and it allows us to compare year-to-year progress. The FCAT measures student performance in reading, mathematics, writing, and science that are defined by the Florida Sunshine State Standards (SSS), and it shows a developmental scale score that ranges from 0 to about 3000. All students are tested at each grade level, so the scores reflect students' year-to-year progress. Based on a student's developmental scale score, the student is assigned one of five achievement level classifications ranging from 1 to 5, with level 1 being the lowest and level 5 being the highest. Level 3 is the state standard of meeting grade achievement. Therefore, the test scores are used for both comparing yearly progress, and monitoring changes in the percentages of students in each achievement level in schools, districts, and the state (Florida Department of Education, 2006). This study will use the percentage of students meeting standards in reading or math in the district (i.e. the percentage of student level 3 or above) calculated based on the standardized and normalized math and reading FCAT scores of schools for the 5th, 8th, and 10th graders to examine the magnet school competition impact. The distribution of many of dependent variables is highly skewed to the right, so the measures are transformed to meet the regression assumption of normal distribution. Student performance measures of 5th, and 8th grades in Mathematics, and that of the 5th grade in reading are squared. Student performance measure of the 10th grade in Mathematics is cubed. After the transformation, all measures closely resemble a normal distribution.

Explanatory Variables: Degree of School Choice Adoption

To examine the effects, I employed several measurements to capture the levels of school choice policy adoption in school districts. Buddin and Zimmer (2005) indicated that a variety of measures could be used to capture degree of choice adoption (i.e. degree of competition) because no one can know clearly what the level of threat from competition to public schools is. However, Booker et al. (2008) argue that measuring competition at the district level is desirable in that

districts have played a role as a main actor in responding to competition threats by creating a policy or making a decision on policy adoption or resource allocation. To compare and contrast the impacts of levels of choice option availability on Performance in TPSs, I categorized school districts into 4 levels: 1) No Choice Option District (TPSs only district), 2) TPSs and Magnet School Choice Option District, 3) TPSs and Charter School Choice Option District, and 4) TPSs and both Charter and Magnet School Choice Option District. The first model of this study used the measurement as dummy variables to discover the relationship between competition from levels of choice availability and student performance. So, I assume that more choice options would be related to higher academic performance based on the market competition effects. However, no one knows what impact magnet schools and charter schools have when both of the school types are adopted in a district. They could be complementary or they could serve as substitutes for each other. So I included a district type with charter school choice option with TPSs, and a district type with both charter school and magnet school choice options with TPSs to understand how academic performance differs depending on whether a school district has one or both of magnet and charter schools in a district.

The second model used the percentage of combined numbers of charter schools and magnet schools in school districts, and the third model used the percentage of student attendance in magnet schools or charter schools.

I expect these three measurements to give different information, which will help to understand school choice policy impacts more precisely. Specifically, the first independent variable is measured as dummies: Type 1 (no school choice district), Type 2 (TPSs with magnet school choice district), Type 3 (TPSs with charter school choice district), and Type 4 (TPSs with both school choice policies) and I expect to capture policy impacts on the dependent variable from the district decisions about school choice policy. The second independent variable measured as the percentage of numbers of magnet and charter schools expects to capture degree of choice availability by considering levels of choice options in a district. Practically, even though a district adopted a magnet school or charter school choice option, if there are few magnet or charter schools, it is not likely to lead to much impact from school choice. If a school district adopts magnet school policy but only opens a few schools, adoption of the school choice policy would have little influence on the overall public school system in the district. The third independent variable measured as the percentage of students enrolled in magnet or charter

schools expects to capture the difference in degree of policy implementation. In other words, this measurement considers how many students or education consumers use school choice policy to choose their school. Although the decision on adoption of school choice policy is controlled by a school district in large part, I expect to capture the difference from the role of educational consumers who are the actual decision makers in choosing schools.

3.4.2 Research Question 2: The Effects of School Choice on Racial Desegregation

Dependent Variable: Racial or Socio-economic Segregation

Currently, there are several methodologies for measuring racial desegregation. When analyzing school racial balance, the commonly used one is the index of dissimilarity.² This index ranges from 0 to 100 and captures the deviation of each school from the district racial composition. In other words, it examines how much the racial composition of any given school matches that of the surrounding district (Rossell, 1990; Straus, 2010; Welch & Light, 1987). So, it gives information on the percentage of white students (or black students) who would have to be redistributed to have the same percentage of white students (or black students) in each school as in the district as a whole. However, this index does not allow us to compare schools from different districts. Also, it does not consider the number of students in the near school districts that have the possibility of choosing to attend a school outside of their district. It means that this index cannot capture adequately the cost of desegregation in terms of white flight.

The second measure for racial desegregation is the index of interracial exposure. This index is more useful for comparing districts. The EI reflects “the percentage of white students in the average minority child’s school” in a district (Rossell, 1990). This index is calculated as follows:

$$EI = \frac{1}{B} \sum B_i PW_i$$

² The formula is

$$Db = \frac{1}{2 \sum \left| \frac{W_i}{W} - \frac{B_i}{B} \right|},$$

where W_i is the number of whites (or any other reference group) in a school, W is the number of whites in the school district, B_i is the number of blacks (or any other racial group) in a school, and B is the number of blacks in the school district.

where i stands for each individual school, and thus B_i is the number of minority students in a particular school (i), PW_i is the proportion of whites in that school (i), and B is the total number of minority students in the district. Hence, the number of minority students in each school is multiplied by the proportion of white students in the same school. This is summed for all schools and divided by the number of blacks in the district.

Interracial exposure is a district-level measure of the effectiveness of desegregation techniques in actually achieving desegregation in a school district. Since the average proportion of whites in a black child's school in a district increases by student reassignments or transfers, it decreases as the white enrollment decreases. This means that interracial exposure reflects white flight and that would yield the net benefits generated by student reassignments as a school choice policy outcome. For this reason, most desegregation researchers consider interracial exposure to be the preferred outcome when analyzing the effectiveness of different desegregation techniques (Rossell, 2003).

I will use both of the measures introduced above. Each of the measures is appropriate for the district level model constructed in this study.

In order to detect whether magnet schools affect the demographic composition in nearby TPSs and charter schools, I will analyze the demographic compositions of magnet schools, charter schools and TPSs, and project the changes in demographic composition trends.

In addition, this study compares the scores of standard deviation by district types to examine differences between schools in a district. The standard deviation is useful because it is a well-understood measure of the dispersion of a distribution (Archbald, 2004) and enables us to compare how far a school in a given district is away from the mean of the percentage of a certain racial group of public schools in a district. This study's purpose is to show how far the racial value of a school is away from the mean of the racial value of the district; so all the values will be analyzed as absolute values for convenience. Thus, the possible range of this value is from 0% to 99.99%. This means that districts will have small standard deviation scores if schools in the district have a similar percentage of a certain ethnic group compared to the mean of the given district, whereas the standard deviation scores will be large if schools in the district have big differences in the percentage of a certain racial group compared to the mean percentage of a certain racial group in the district.

Explanatory Variables

As a main explanatory variable for research question two, degree of school choice policy adoption is measured as the percentage of students using charter and/or magnet school choice policy in a district. In other words, I separately calculated three independent variables: (1) the ratio of students who attend magnet schools, (2) the ratio of students who attend charter schools, and (3) the combined ratio of students who attend charter or magnet schools to the total public enrollment at the district.

3.4.3 Contextual Factors Used in Models

Studies on school choice impacts on academic performance and racial or socio-economic segregation have delivered mixed results, and this fact makes studies on school choice impacts unclear. One of the reasons for the mixed findings may be resolved by considering the contextual factors of the policy environment, and delineating the way to control the important factors associated with the dependent variables, academic performance and racial or socio-economic segregation. In this study, I included several control variables based on three levels of policy actors related to school choice policy and its outcomes: student or parental choice, school and teacher characteristics, and school district characteristics. For the research question of how school choice policy influences academic performance, I consider all three levels of characteristics. But for the research question of school choice impact on racial or socio-economic levels, I focused only on district characteristics to examine the question. The selection of variables presented below is made based on the study outcome by Fowler & Walberg (1991). Although the authors focused on school size effects on academic performance, their study encompassed most of variables in the data related to educational factors used in studies demonstrating factors influencing academic performance.

Student or Parental Choice Characteristics

First of all, I considered students' demographic characteristics and economic status. Numerous studies have examined the relationship between SES and academic performance, and these studies are closely related to choice of residence, educational expenditures, and educational minorities issues. I include demographic variables such as the percentage of White, Black, Hispanic and Asian, and the percentage of students eligible for free or reduced lunch to

reflect their economic status. All variables were collected from Common Core Data. I also included the percentage of disabled students and the percentage of gifted students. These variables were drawn from the Florida School Indicators Report and the annual reports published by the Florida Department of Education.

Schools and Teachers Characteristics

I considered school factors and teachers' influence in the organizational aspect. Several measures of school and teacher characteristics are included. For school factors, I included student-teacher ratio as a proxy of average class size, the percentage of administrative staff is included as a proxy of organizational bureaucracy. Anderson et al. (1991) investigated the effects of educational bureaucracy on educational achievement, and they suggest having relatively large educational bureaucracies is negatively related to graduation from high school and standardized achievement tests. Regarding teacher characteristics, I included the percentage of teachers with advanced degrees, the number of years teaching experience, and teacher salary. The composition of teacher degrees is the sum of bachelor's, master's, doctoral and specialist degrees. Therefore, when assuming that acquiring a higher level of degree means a higher quality of teachers, a lower percentage of bachelor's degrees would likely be related to higher student performance. But in reality, over 95% of the composition of teacher degrees are based on bachelor's and master's degrees. In this study, I used the percentage of teachers with master's degrees, and expect that higher percentage of master's degrees would be related to higher student performance. All the measurements are collected from the Florida School Indicators Report and annual reports published by the Florida Department of Education, but student teacher ratio is collected from Common Core Data.

District Characteristics

This study compares academic performance and racial segregation between school districts, so it is necessary to control various district characteristics to find out the impact of school choice policy. Specifically, income distribution in a district is directly linked to a district's educational resources which appear as expenditures on public education. Fernandez and Rogerson (1996) point out that a substantial proportion of public education expenditures is financed at the local level, and they show how policies interact with the educational quality

across communities, residence choices, and income levels. Therefore, an index on the economic status of a district should be considered. Recently, resource allocation has increased at the district level depending on the degree of progress to reward low performing schools that work better, and support from the federal level is in the same context under the No Child Left Behind (NCLB) policy initiation. In this study, I included funding from local, state, and federal government for public schools, and actual expenditures per full-time equivalent student are included, because total expenditure is closely associated with district size or population. Mean house income and the percentage of private school membership are also included. Archbald (2004) shows a strong relationship between parental income and private school choice, and says it affects social-class segregation within public school districts. So the percentage of private school membership reflects a district's economic status, and the economic status influences the academic performance in TPSs by drawing higher performance students from the public schools. Racial or socio-economic segregation, when considering choice of private school enrollment, is closely related to higher parental income.

Also, the percentage of English Language Learner (ELL) is included. According to the CCD statistical results, from the 1997-98 school year to the 2008-09 school year, the number of ELL enrolled in public schools increased by 51%; meanwhile, the general student population grew by only 7.2% in the same period. The number of English learners has a strong relationship to the number of immigrants; as a consequence, the percentage of ELL reflects the percentage of racial minorities along with the traditional index for size of minority such as the percentage of the total district enrollment that is African American and Hispanic.

In addition, in order to control the size effect of districts, school year population is used. The school year population, the percentage of private school membership, and median house income variables are collected from the *Florida Statistical Abstracts*. The percentage of ELL is drawn from Florida District Indicators Report and annual reports published by the Florida Department of Education.

Table 3.3 Descriptions of Variables and Data Sources

Variable		Variable Description	Data Source
Model 1	Dependent Variable District academic performance	Elementary (5 th grade), middle (8 th grade), and high (10 th grade) school students percentage in achievement levels 3(standard) & above in Math/Reading	Florida Comprehensive Assessment Test Data
	Independent Variable Level of school choice	<p>1) Choice option availability in district Measured as dummy: Type 1: If a district has TPSs only, coded 1 otherwise 0 Type 2: If a district has TPSs and Magnet school choice, coded 1 otherwise 0 Type 3: If a district has TPSs, and Charter school choice, coded 1 otherwise 0 Type 4: If a district has TPSs and both Charter and Magnet school choice, coded 1, otherwise 0</p> <p>2) Choice option availability in district % of Charter and Magnet schools in a district % of student enrollment in Magnet schools and Charter schools</p>	*School level data is aggregated as a district level by dividing into elementary, middle, and high schools. * % of charter/magnet school in districts and % of students enrollment in magnet/charter schools are calculated based on the CCD files publicly provided by the National Center for Educational Statistics.
	Control Variable Influences from students Ethnicity Students eligible for free or reduced lunch Minority students	<p>% of White, Black, Hispanic, Asian student (elementary, middle, high)</p> <p>% of students eligible for free or reduced lunch (elementary, middle, high)</p> <p>% of students categorized as learning disabled</p> <p>% of students categorized as gifted</p>	<p>National center for educational statistics, common core data</p> <p>National center for educational statistics, common core data</p> <p>Florida school indicators report (2005-2008) Membership in programs for exceptional students: annual report (2009-2010)</p> <p>Florida school indicators report (2005-2008) Membership in programs for exceptional students: annual report (2009-2010)</p>

Table 3.3 – Continued

Variable	Variable Description	Data Source
Influences from school/teacher		
Pupil per teacher	Calculated pupil/teacher ratio: number of students divided by full time equivalent classroom teachers (elementary, middle, high)	National center for educational statistics, common core data
Teacher degree	% of teachers with advanced degree, Master’s or higher	Florida school indicators report (2005-2008) Teacher salary, experience, and degree level: annual report (2009-2010)
Teacher experience	The average years of teacher experience	Florida school indicators report (2005-2008) Teacher salary, experience, and degree level: annual report (2009-2010)
Teacher salary	The average salary of teacher	Florida school indicators report (2005-2008) Teacher salary, experience, and degree level: annual report (2009-2010)
Organizational bureaucracy	% of administrative staff in a school	Florida school indicators report (2005-2008) Staff in Florida’s public schools: annual report (2009-2010)
Influences from district		
Private school enrollment	% of private school enrollment to total student enrollment	Florida statistical abstract
English language learner	% of English language learners to total student enrollment	Florida district indicators reports (2005-2008) English language learners: annual report (2009-2010)
District size	School year population (elementary, middle, high)	Florida statistical abstract
Economic status	Mean house income	Florida statistical abstract

Table 3.3 - Continued

Variable	Variable Description	Data Source
Model 2	<p><i>Dependent Variable</i></p> <p>The deviation of each school from the district racial composition</p> <p>A Black child's exposure to White students</p>	<p>Calculated based on the Common Core Data (2005-2010)</p> <p>Calculated based on the Common Core Data (2005-2010)</p>
	<p><i>Independent Variable</i></p> <p>Level of school choice</p> <p>1) Choice option availability in district Measured as dummy: Type 1: If a district has TPSs only, coded 1 otherwise 0 Type 2: If a district has TPSs and Magnet or charter school choice, coded 1 otherwise 0 Type 3: If a district has TPSs and both Charter and Magnet school choice, coded 1 otherwise 0**</p> <p>2) Degree of choice in district</p> <p>% of Charter and Magnet schools in a district</p> <p>3) Degree of policy involvement in district</p> <p>% of students enrollment in Magnet schools and Charter schools</p>	<p>* % of charter/magnet school in districts and % of students enrollment in magnet/charter schools are calculated based on the CCD files publicly provided by the National Center for Educational Statistics.</p>
	<p><i>Control Variable</i></p> <p>Income stratification</p> <p>District economic status</p> <p>District demographic characteristics</p>	<p>GINI index of income inequality</p> <p>Median house income</p> <p>% of students eligible for free or reduced lunch</p> <p>% of private school enrollment</p> <p>Florida statistical abstract</p> <p>Florida statistical abstract</p> <p>National center for educational statistic, Common core data</p> <p>Florida statistical abstract</p>

Table 3.3 - Continued

Variable		Variable Description	Data Source
District size		% of Black, Hispanic, Asian	National center for educational statistic, Common core data
		% of English language learner	National center for educational statistic, Common core data
		School year population (log)	Florida statistical abstract
		Total numbers of school (log)	National center for educational statistic, Common core data

* See Section 3.4., Measurement, for detail.

** Model 2 is analyzed with stratified sample districts in Florida, and only one district, St. Lucie, from 2005 to 2008, was founded as a district with TPSs and magnet school choice policy. So St. Lucie is categorized into Type 2 districts which are the same as districts with TPSs and charter school choice policies, which indicates that they are some choice options available districts.

3.5 Models

The first part of this study intends to discover the relationship between academic performance and the level of school choice availability at the district level. In other words, this study examines the effects of competition from school choice policies of magnet or charter schools, and both magnets and charters, compared to districts in which only traditional public schools exist. Additionally, this study examines the relationship between charter school creation and magnet school creation to discover whether these policies are used together or as substitutes. Therefore, this study employs two different analytic approaches based on the dependent variables used in this study.

Using panel data that combines cross-sectional and time-series data, a panel analysis that enables the examination of variations repeated at a different time and a space (Baltagi, 2008; Cameron & Trivedi, 2010) is possible. Panel analysis can examine individual-specific and/or time effects; consequently it can use a fixed or random effects model depending on the effects. This study uses a district fixed effects model to estimate the relationship between academic performance and school choice option availability. A fixed effects model secures the biased

estimation from unobservable factors that might influence dependent variables when the pooled OLS regression is utilized. The fixed effects model allows estimating the relationship between predictors and the outcome variable by controlling for unobserved (omitted) time-invariant variable bias (Wooldridge, 2006). A fixed effect model has a constant slope but a different intercept for the individual entity, so it assumes that intercepts vary by each entity and time (Yaffee, 2003). By including time dummies in the analytic models, this model allows controlling unobserved factors affecting the academic performance that vary over time but that also affect districts homogeneously. In this study, for example, time effects can be detected if the academic performance of TPSs improved over the years because of changes in test difficulty, or levels of maturity of a policy or a program implemented for achieving higher student or school performance. Therefore, I expect that average differences across districts in observable and unobservable factors and time effects are controlled, and only differences within districts remain by applying the fixed effect model with time dummies. Additionally, Hierarchical Linear Modeling (HLM) is particularly common in education research in examining academic performance issue, because it is one of the alternatives to adjust estimated standard errors appropriately by using both the between and within variations to estimate the slope estimates of levels of data. Some scholars say that HLM could control nested characteristics in education data. However, strictly speaking, a standard HLM model does not hold this issue. “HLM is estimated in one stage and the standard HLM (without group mean centering) uses both the between and within school variation to estimate the slope estimates” (Chaplin, 2003), and the only difference between the fixed effects model and the standard HLM model is their assumptions on covariance. Also, omitted variables in the second level can bias the slope estimates. In addition, although a HLM model with group mean centering demonstrates that “the result is unbiased slope estimates for the within group variables even in the presence of unobserved group level variables that are correlated with the within group variables” (Chaplin, 2003), it is also a strength of the fixed effects models.

3.5.1 Research Question 1: Competition Effects of School Choice Availability

In estimating the impact of the level of school choice policy on the academic performance of public schools in each district, I expect higher school choice availability will be associated with higher student academic performance based on the competition effects of school

choice theory. This theory assumes that competition between public schools engendered by magnet or charter school choice adoption will lead to improvement of student academic performance and achievement. The unit of analysis in this model is the district level. So all the measures of student and school characteristics are aggregated and calculated at the district level. Although student and school characteristics are aggregated, I specified and used the aggregated data based on elementary level and secondary level according to the outcome variables which are measured as the percentage of students in achievement level 3 and above in 5th, 8th, and 10th grade math and reading. Therefore, I used elementary school levels of aggregated data to measure the impact of school choice on academic performance in the 5th grade, and I used secondary school levels of aggregated data to measure the impact of school choice achievement in the 8th and 10th grades.

Model

$$Y_{git} = \beta_1 * SC_{it} + \beta_2 * SI_{git} + \beta_3 * STI_{git} + \beta_4 * DI_{it} + \delta T_t + \gamma_{gi} + e_{git}$$

Where

Y_{git} = in district i and year t (the percentage of student achieving standard of 3 and above in reading/math);

SC_{it} = The level of school choice availability in district i and year t (measures used are: a) the percentage of charter and/or magnet schools in a district, b) the percentage of student participation in charter and/or magnet schools in a district, and c) dummies of school choice adoption types specified into 4 categories of no choice district (TPSs only district), magnet school choice district (TPSs and magnet school only district), charter school choice district (TPSs and charter school only district), and both magnet and charter school choice district;

SI_{git} = a vector of student characteristics in grade g in district i in year t (the percentage of students of Black/ Hispanic/Asian, of free and reduced lunch, of disabled, of gifted);

STI_{git} = a vector of school or teacher characteristics in grade g in district i in year t (student teacher ratio, combined percentage of administrative and supportive staff, and teacher quality measurements such as teacher's experience, level of degree, and salary);

DI_{it} = a vector of district characteristics in district i in year t (the percentage of private school membership, the percentage of ELL to reflect differences from levels of immigrants, school year population);

δT_t = a set of year dummies that capture the common influence on academic performance of each school grade of 5th, 8th, and 10th

γ_{gi} = a variable that represents unobserved time-invariant characteristics of school grade or district such as curriculum or culture;

e_{git} = an idiosyncratic error term that changes across time for each school grade of 5th, 8th, and 10th in district i .

3.5.2 Research Question 2: The Effects of School Choice Policy on Student Racial Segregation

In estimating the impact of the level of school choice policy on the racial segregation of public schools in each district, I expect higher school choice availability will be associated with higher racial desegregation based on the school choice theory. Minorities are restricted to choose schools according to their residences, and this theory assumes that school choice policy will reduce economic and racial segregation among students in public schools by creating choice availability and improving accessibility to schools outside their neighborhoods.

Model

$$Y_{git} = \beta_1 * SC_{it} + \beta_2 * SI_{git} + \beta_3 * STI_{git} + \beta_4 * DI_{it} + \delta T_t + \gamma_{gi} + e_{git}$$

Where

Y_{git} = in district i and year t , the degree of racial segregation (measures used are: a) the percentage of dissimilarity index, and b) exposure index);

SC_{it} = The level of school choice availability in district i and year t (measures used are: a) the percentage of charter and/or magnet schools in a district, b) the percentage of student participation in charter and/or magnet schools in a district, and c) dummies of school choice adoption types specified into 3 categories of no choice district (TPSs only district), magnet or charter school choice district (TPSs and one of the schools only district), and both magnet and charter school choice districts;

IE_{it} = a vector of income inequality in district i in year t (GINI index of income inequality);

DD_{it} = a vector of district demographic characteristics in district i in year t (the percentage of Black/ Hispanic/Asian, the percentage of ELL to reflect differences from levels of immigrants);

DE_{it} = a vector of district economic characteristics in district i in year t (the percentage of private school membership, the percentage of students eligible for free or reduced lunch, median house income);

DS_{it} = a vector of district size in district i in year t (school year population, total numbers of schools);

δT_t = a set of year dummies that capture the common influence on racial segregation;

γ_{gi} = a variable that represents unobserved time-invariant characteristics of district such as culture;

e_{git} = an idiosyncratic error term that changes across time for racial compositions in district i .

CHAPTER FOUR

RESULT

This study examines the policy impacts of magnet and charter school choice adoption on academic performance and racial integration in the Florida public school system. This chapter provides the results from the descriptive analysis of the data, and the statistical results for research questions 1 and 2 through pooled fixed effects model approaches.

4.1 Descriptive Analysis for Research Question 1

Descriptive analyses were conducted to project overall trends of school choice policy in the public education system in Florida. The analytic data used in this study contains 67 school districts over the six years 2005-2011, but Table shows the eight years of trend data for the numbers of charter, magnet and TPS schools in Florida. Also it separates magnet programs and magnet schools, although analytic data referenced in Common Core Data from NCES includes magnet programs in the magnet school category.

Table 4.1 Changes in Numbers of Public Schools, 2005-2006 to 2012-2013

Year		2005	2006	2007	2008	2009	2010	2011	2012-	Δ g
		-2006	-2007	-2008	-2009	-2010	-2011	-2012	2013	Years
Elementary School	Magnet Program	45	50	56	45	45	56	65	68	+23
	Magnet School	68	74	78	104	105	115	108	103	+35
	Charter School	133	144	141	140	134	145	158	177	+44
	TPS	1599	1595	1612	1614	1608	1593	1581	1590	-9
	Total	1845	1863	1887	1903	1892	1909	1912	1938	+93
Middle School	Magnet Program	22	28	30	37	38	68	79	81	+59
	Magnet School	37	38	40	39	39	42	46	47	+10
	Charter School	54	59	61	66	64	73	79	86	+32

Table 4.1 - Continued

Year		2005	2006	2007	2008	2009	2010	2011	2012-	Δ 8
		-2006	-2007	-2008	-2009	-2010	-2011	-2012	2013	Years
High School	TPS	440	444	447	444	440	410	390	389	-51
	Total	553	569	578	586	581	593	594	603	+50
	Magnet Program	71	77	86	88	94	126	132	136	+65
	Magnet School	17	18	22	23	25	30	31	31	+14
	Charter School	48	53	56	62	70	74	80	90	+42
	TPS	382	374	338	293	337	322	340	335	-47
	Total	518	522	502	466	526	552	583	592	+74

*Data source: Master School Identification Files 2005-06 to 2012-13, Florida Department of Education

Table 4.1 shows eight years of trend data for the changes in numbers of public schools in Florida by school levels. This table shows that total numbers of schools increased across time for all school levels, but the numbers of TPSs decreased across time at all school levels. At the elementary school level, magnet schools were created more than magnet programs, but magnet programs were created more than magnet schools at the middle and high school levels. In addition, the numbers of magnet programs had a much greater increase at middle and high school levels than at the elementary level but all three levels saw increases in magnet programs.

Table 4.2 Percentage Changes of Public Schools, 2005-2006 to 2012-2013

Year		2005	2006	2007	2008	2009	2010	2011	2012-	Δ 8
		-2006	-2007	-2008	-2009	-2010	-2011	-2012	2013	Years
Elementary School	Magnet Program	2.44	2.68	2.97	2.36	2.38	2.93	3.40	3.51	0.96
	Magnet School	3.69	3.97	4.13	5.47	5.55	6.02	5.65	5.31	1.96
	Charter School	7.21	7.73	7.47	7.36	7.08	7.60	8.26	9.13	1.05

Table 4.2 - Continued

	Year	2005	2006	2007	2008	2009	2010	2011	2012-	Δ 8
		-2006	-2007	-2008	-2009	-2010	-2011	-2012	2013	Years
	TPS	86.67	85.61	85.43	84.81	84.99	83.45	82.69	82.04	-3.98
	Total	100	100	100	100	100	100	100	100	0
Middle School	Magnet Program	3.98	4.92	5.19	6.31	6.54	11.47	13.30	13.43	9.32
	Magnet School	6.69	6.68	6.92	6.66	6.71	7.08	7.74	7.79	1.05
	Charter School	9.76	10.37	10.55	11.26	11.02	12.31	13.30	14.26	3.53
	TPS	79.57	78.03	77.34	75.77	75.73	69.14	65.66	64.51	-13.91
	Total	100	100	100	100	100	100	100	100	0
High School	Magnet Program	13.71	14.75	17.13	18.88	17.87	22.83	22.64	22.97	8.93
	Magnet School	3.28	3.45	4.38	4.94	4.75	5.43	5.32	5.24	2.04
	Charter School	9.27	10.15	11.16	13.30	13.31	13.41	13.72	15.20	4.46
	TPS	73.75	71.65	67.33	62.88	64.07	58.33	58.32	56.59	-15.43
	Total	100	100	100	100	100	100	100	100	0

*Data source: Master School Identification Files 2005-06 to 2012-13, Florida Department of Education

Table 4.3 Changes in Numbers of Students in Public Schools, 2005-2010

	Year	2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
Elementary School	Magnet	66413	50071	71982	75854	76509	82902	16489
	Charter	31969	31228	29314	32147	34945	40269	8300
	TPS	1007948	1010206	978942	960698	954645	941846	-66102
	Total	1106330	1091505	1080238	1068699	1066099	1065017	-41313
Middle School	Magnet	65759	24585	32968	55718	68112	68261	2502
	Charter	75934	92450	31387	36231	25420	27147	-48787
	TPS	123667	110511	153535	129170	130840	97553	-26114
	Total	265360	227546	217890	221119	224372	192961	-72399

Table 4.3 - Continued

Year		2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
High School	Magnet	163418	169379	197510	193959	184292	231865	68447
	Charter	13041	14365	16064	17053	19511	30735	17694
	TPS	528475	461086	486145	474174	453800	424790	-103685
	Total	704934	644830	699719	685186	657603	687390	-17544

*Data source: Common Core Data, National Center for Educational Statistics

Table 4.3 shows six years of trend data for changes in numbers of students in public schools in Florida. This table shows that the numbers of students decreased for six years at all school levels. However, the numbers of students enrolled in magnet schools and charter schools increased over the six years at all school levels except the numbers of charter school students at the middle school level. Furthermore, the numbers of students enrolled in TPS decrease over the six years.

Table 4.4 Percentage Change in Numbers of Students in Public Schools, 2005-2010

Year		2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
Elementary School	Magnet	6.00	4.59	6.66	7.10	7.18	7.79	1.19
	Charter	2.89	2.86	2.71	3.00	3.28	3.78	0.89
	TPS	91.11	92.55	90.62	89.89	89.54	88.43	-2.67
	Total	100	100	100	100	100	100	
Middle School	Magnet	24.78	10.80	15.13	25.20	30.36	35.38	10.59
	Charter	28.62	40.63	14.40	16.39	11.33	14.07	-14.55
	TPS	46.60	48.57	70.46	58.42	58.31	50.56	3.95
	Total	100.00	100.00	100.00	100.00	100.00	100.00	
High School	Magnet	23.18	26.27	28.23	28.31	28.02	33.73	10.55
	Charter	1.85	2.23	2.30	2.49	2.97	4.47	2.62
	TPS	74.97	71.51	29.48	29.20	29.01	61.80	-13.17
	Total	100	100	100	100	100	100	

*Data source: Common Core Data, National Center for Educational Statistics

Table 4.4 shows the percentage change in numbers of students in public schools in Florida over the six years. This table shows that the percentage of students enrolled in TPS decreased over the six years at elementary and high school levels, but it increased at the middle school level. In addition, the percentage of students enrolled in charters increased over the six years at elementary and high school levels, but it decreased at the middle school level. The percent increase in students enrolled in magnet schools is the largest at all school levels.

Table 4.5 Racial Composition of Elementary School Students by District School Choice Adoption, Six-Year Average and 2005-2006 to 2010-2011

School choice adoption	Year	Average	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Δ 6 Years
District with TPS and Magnet choice	White	56.38	64.23	62.68	48.66	58.69	53.04	50.95	-13.28
	Black	18.69	17.57	17.82	20.23	18.73	18.74	19.06	1.49
	Hispanic	20.18	15.98	17.71	21.62	19.82	21.59	24.33	8.35
	Asian	2.01	1.91	1.49	2.71	2.49	1.75	1.69	-0.22
	Total	97.24	99.68	99.69	93.21	99.72	95.11	96.03	
District with TPS and Charter choice	White	53.37	58.86	59.25	53.42	52.16	44.35	52.17	-6.69
	Black	24.99	18.7	19.64	20.86	30.69	34.93	25.1	6.4
	Hispanic	17.04	20.5	18.95	18.8	15.01	11.94	17.05	-3.45
	Asian	1.64	1.59	1.86	1.79	1.76	1.62	1.23	-0.36
	Total	97.04	99.65	99.7	94.86	99.63	92.84	95.55	
District with TPS only	White	65.83	68.41	68.17	67.05	66.96	61.25	63.12	-5.29
	Black	17.13	19.93	19.27	15.76	16.1	16.04	15.7	-4.23
	Hispanic	13.59	10.33	11.25	12.29	14.98	16.81	15.88	5.56
	Asian	1.09	0.85	0.88	1.07	1.16	1.4	1.17	0.32
	Total	97.63	99.5	99.57	96.16	99.2	95.49	95.87	
District with TPS, Charter choice, and Magnet choice	White	47.81	52.75	51.79	47.65	48.07	44.58	42.04	-10.71
	Black	26.19	26.56	24.15	25.04	27.49	26.57	27.31	0.75
	Hispanic	21.17	18.46	21.38	20.06	21.83	21.35	23.93	5.47
	Asian	2.23	1.9	2.13	2.12	2.4	2.54	2.29	0.39
	Total	97.40	99.67	99.45	94.88	99.79	95.05	95.57	

Table 4.5 - Continued

School choice adoption	Year	Average	2005	2006	2007	2008	2009	2010	Δ 6
			-2006	-2007	-2008	-2009	-2010	-2011	Years
67 District Average	White	55.85	61.06	60.47	54.19	56.47	50.81	52.07	-8.99
	Black	21.75	20.69	20.22	20.47	23.25	24.07	21.79	1.1
	Hispanic	17.99	16.32	17.32	18.19	17.91	17.92	20.3	3.98
	Asian	1.74	1.56	1.59	1.92	1.95	1.83	1.6	0.03
	Total	97.33	99.63	99.6	94.78	99.58	94.62	95.75	

*Data source: Common Core Data from NCES

*The student racial compositions in districts are calculated by the regular public schools only that excluded vocational schools, special education schools, and alternative schools.

Table 4.5 shows six years of trend data for the racial composition of elementary school students by degree of choice availability. This table shows that the percentage of White students decreased across time for every type of district school choice availability. The percentage of Black, Hispanic, and Asian students, however, increased overall across time. The table also shows differences in increase and decrease depending on district school choice availability. In districts that adopted magnet and charter school choice policies, all ethnicities except Whites increased across time. When comparing the six years of average student racial composition, districts with TPSs only had the highest percentage of White and the lowest percentage of all other ethnicities. On the contrary, districts with magnet and charter school choice policy with TPSs had the lowest percentage of White and the highest percentage of all other ethnicities.

Table 4.6 Racial Composition of Middle School Students by District School Choice Adoption, Six-Year Average and 2005-2006 to 2010-2011

School choice adoption	Year	Average	2005	2006	2007	2008	2009	2010	Δ 6
			-2006	-2007	-2008	-2009	-2010	-2011	Years
District with TPS and Magnet choice	White	59.05	62.58	62.99	62.61	58.04	56.02	53.81	-8.77
	Black	18.66	16.91	17.56	16.46	22.62	19.46	19.28	2.37
	Hispanic	16.67	16.34	16.48	13.56	16.73	16.73	19.41	3.07
	Asian	2.33	2.06	2.60	2.33	2.15	2.59	2.42	0.36
	Total	96.71	97.89	99.63	94.96	99.54	94.8	94.92	-2.97

Table 4.6 - Continued

School choice adoption	Year	Average	2005	2006	2007	2008	2009	2010	Δ 6
			-2006	-2007	-2008	-2009	-2010	-2011	Years
District with TPS and Charter choice	White	65.49	62.66	67.14	68.22	69.78	59.58	62.00	-0.66
	Black	17.96	19.10	16.53	16.29	17.40	21.36	19.23	0.13
	Hispanic	13.45	16.32	14.52	10.52	10.83	14.22	14.74	-1.58
	Asian	1.55	1.53	1.53	1.49	1.75	1.62	1.40	-0.13
	Total	98.45	99.61	99.72	96.52	99.76	96.78	97.37	-2.24
District with TPS only	White	67.69	72.03	68.30	66.86	67.42	66.45	65.34	-6.69
	Black	17.62	17.95	19.71	17.94	18.16	16.26	16.18	-1.77
	Hispanic	11.41	8.55	10.57	10.92	12.80	12.09	13.34	4.79
	Asian	1.27	1.15	1.11	1.31	1.27	1.47	1.28	0.13
	Total	97.99	99.68	99.69	97.03	99.65	96.27	96.14	-3.54
District with TPS, Charter choice, and Magnet choice	White	49.01	52.12	54.08	44.63	51.59	47.23	44.34	-7.78
	Black	26.72	29.01	25.72	28.19	25.49	26.05	26.55	-2.46
	Hispanic	19.85	16.69	17.76	21.00	19.97	20.09	23.07	6.38
	Asian	2.31	1.91	2.12	2.21	2.57	2.62	2.35	0.44
	Total	97.89	99.73	99.68	96.03	99.62	95.99	96.31	-3.42
67 District Average	White	62.74	66.01	64.49	62.38	63.51	60.88	59.18	-6.83
	Black	19.72	20.06	20.31	19.67	20.03	19.09	19.19	-0.87
	Hispanic	13.88	12.01	13.34	13.02	14.42	14.37	16.13	4.12
	Asian	1.61	1.43	1.50	1.57	1.69	1.81	1.63	0.2
	Total	97.95	99.51	99.64	96.64	99.65	96.15	96.13	-3.38

*Data source: Common Core Data from NCES

*The student racial compositions in districts are calculated by the regular public schools only that excluded vocational schools, special education schools, and alternative schools.

Table 4.6 shows the six years of trend data for racial composition of middle school students by degree of choice availability. This table shows that the percentage of middle school students decreased across time regardless of ethnicities in general. The percentage of White largely decreased in all district types except in districts with no school choice policy. Therefore, the percentage of White is the highest in the district with only TPSs, and it is the lowest in the district with both charter and magnet school choice policy with TPSs. The percentage of Black and Hispanic is the highest in the district with both magnet and charter school choice policy;

however, the percentage of Asian is a little higher in the district with only magnet school choice policy.

Table 4.7 Racial Composition of High School Students by District School Choice Adoption, Six-Year Average and 2005-2006 to 2010-2011

School choice adoption	Year	Average	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Δ 6 Years
District with TPS and Magnet choice	White	56.38	64.23	62.68	48.66	58.69	53.04	50.95	-13.28
	Black	18.69	17.57	17.82	20.23	18.73	18.74	19.06	1.49
	Hispanic	20.18	15.98	17.71	21.62	19.82	21.59	24.33	8.35
	Asian	2.01	1.91	1.49	2.71	2.49	1.75	1.69	-0.22
	Total	97.24	99.68	99.69	93.21	99.72	95.11	96.03	
District with TPS and Charter choice	White	53.37	58.86	59.25	53.42	52.16	44.35	52.17	-6.69
	Black	24.99	18.7	19.64	20.86	30.69	34.93	25.1	6.4
	Hispanic	17.04	20.5	18.95	18.8	15.01	11.94	17.05	-3.45
	Asian	1.64	1.59	1.86	1.79	1.76	1.62	1.23	-0.36
	Total	97.04	99.65	99.7	94.86	99.63	92.84	95.55	
District with TPS only	White	65.83	68.41	68.17	67.05	66.96	61.25	63.12	-5.29
	Black	17.13	19.93	19.27	15.76	16.1	16.04	15.7	-4.23
	Hispanic	13.59	10.33	11.25	12.29	14.98	16.81	15.88	5.56
	Asian	1.09	0.85	0.88	1.07	1.16	1.4	1.17	0.32
	Total	97.63	99.5	99.57	96.16	99.2	95.49	95.87	
District with TPS, Charter choice, and Magnet choice	White	47.81	52.75	51.79	47.65	48.07	44.58	42.04	-10.71
	Black	26.19	26.56	24.15	25.04	27.49	26.57	27.31	0.75
	Hispanic	21.17	18.46	21.38	20.06	21.83	21.35	23.93	5.47
	Asian	2.23	1.9	2.13	2.12	2.4	2.54	2.29	0.39
	Total	97.40	99.67	99.45	94.88	99.79	95.05	95.57	
67 District Average	White	55.85	61.06	60.47	54.19	56.47	50.81	52.07	-8.99
	Black	21.75	20.69	20.22	20.47	23.25	24.07	21.79	1.1
	Hispanic	17.99	16.32	17.32	18.19	17.91	17.92	20.3	3.98
	Asian	1.74	1.56	1.59	1.92	1.95	1.83	1.6	0.03
	Total	97.33	99.63	99.6	94.78	99.58	94.62	95.75	

*Data source: Common Core Data from NCES

*The student racial compositions in districts are calculated by the regular public schools only that excluded vocational schools, special education schools, and alternative schools.

Table 4.7 shows the six years of trend data for the racial composition of high school students by degree of choice availability. This table shows that the percentage of White decreased across time for every type of district school choice availability, and the percentage of Black students in districts with only TPSs decreased across time. The percentage of Hispanic, and Asian, however, increased across time overall, but those racial percentages decreased in districts with TPSs and charter school choice. The percentage of Black students increased highly when compared to the trends of increases of Black student percentages in all kinds of districts. A district with all school choice policies had the lowest percentage of White students, and a district with only TPSs had the highest percentage of White students. Also, all ethnicities except White had the lowest percentage in the TPS only districts. When comparing each of ethnicity ratios to their ratio in each of the four district types, the percentage of Hispanic and Asian show the highest percentage in the districts with magnet school choice, and the percentage of Black shows the highest percentage in the district with both magnet and charter school choices, and the percentage of White shows the highest percentage in the district with only TPSs.

Table 4.8 Mean Differences in Percentage of the 5th, 8th, and 10th Grade Students Meeting State Standard Level 3 or Above in Reading by District Degree of Choice Availability, 2005-2006 to 2010-2011

		Grade	Average	Year						Δ 6
				2005	2006	2007	2008	2009	2010	Years
				-2006	-2007	-2008	-2009	-2010	-2011	
School choice adoption										
District with TPS and Magnet choice	5th	73.75	69.00	69.00	80.50	73.00	82.00	69.00	0.00	
	8th	56.50	46.00	46.00	59.00	62.00	61.00	65.00	19.00	
	10th	44.25	34.00	34.00	44.50	53.00	51.00	49.00	15.00	
District with TPS and Charter choice	5th	70.71	66.67	69.16	74.58	69.25	73.81	70.76	4.09	
	8th	51.40	44.48	47.84	52.47	53.45	54.81	55.35	10.87	
	10th	36.06	32.10	34.32	35.63	39.65	36.71	37.94	5.84	
District with TPS only	5th	64.55	61.62	60.92	68.54	64.33	66.74	65.13	3.51	
	8th	45.90	40.50	39.60	44.54	48.25	51.78	50.75	10.25	
	10th	29.26	26.42	25.68	28.08	33.67	29.65	32.08	5.66	

Table 4.8 - Continued

	Grade	Average	Year						Δ 6
School choice adoption			2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Years
District with TPS, Charter choice, and Magnet choice	5 th	68.18	67.17	65.43	70.41	67.14	70.00	68.92	1.75
	8 th	49.16	45.00	42.76	47.23	52.45	52.95	54.55	9.55
	10 th	34.60	32.78	31.29	31.95	37.23	35.73	38.64	5.86
67 District Average	5 th	69.30	66.12	66.13	73.51	68.43	73.14	68.45	2.34
	8 th	50.74	44.00	44.05	50.81	54.04	55.14	56.41	12.42
	10 th	36.04	31.33	31.32	35.04	40.89	38.27	39.42	8.09

Table 4.8 provides the mean differences in percentage of the 5th, 8th, and 10th grade students who achieved state standard level 3 or above in reading. The districts that adopted magnet school choice show the highest increase in the percentage of the 8th and 10th students meeting state reading standards or above for six years. And districts that adopted charter school choice show the highest increase in percentage of the 5th grade students meeting state reading standards or above for six years. Districts with magnet school choice show the highest average in all grades, and districts with no school choice policy show the lowest average in all grades, and their average is far below the average scores of all districts in Florida.

Table 4.9 Mean Differences in Percentage of the 5th, 8th, and 10th Grade Students Meeting State Standard Level 3 or Above in Mathematics by District Degree of Choice Availability, 2005-2006 to 2010-2011

	Grade	Average	Year						Δ 6
School choice adoption			2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Years
District with TPS and Magnet choice	5 th	64.67	58.00	58.00	68.00	65.00	70.00	69.00	11.00
	8 th	70.42	59.50	59.50	75.50	76.00	70.00	82.00	22.50
	10 th	76.25	66.00	66.00	77.50	81.00	88.00	79.00	13.00
District with TPS and Charter choice	5 th	59.43	55.90	57.74	57.16	60.70	62.05	63.00	7.10
	8 th	65.38	59.52	62.63	66.26	66.65	67.57	69.65	10.13
	10 th	68.35	64.29	66.37	68.21	69.80	69.10	72.35	8.06

Table 4.9 - Continued

	Grade	Average	Year						
School choice adoption			2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Δ 6 Years
District with TPS only	5 th	52.60	47.38	46.72	51.00	56.25	55.74	58.50	11.12
	8 th	59.99	55.42	54.64	59.29	63.58	62.74	64.29	8.87
	10 th	63.23	59.69	59.00	61.71	65.29	64.74	68.96	9.27
District with TPS, Charter choice, and Magnet choice	5 th	58.81	57.22	55.76	56.41	60.59	60.91	61.96	4.74
	8 th	62.71	59.28	57.24	61.50	66.14	64.77	67.32	8.04
	10 th	66.05	63.78	62.57	62.73	67.14	67.68	72.40	8.62
67 District Average	5 th	58.87	54.63	54.56	58.14	60.64	62.18	63.12	8.49
	8 th	64.62	58.43	58.50	65.64	68.09	66.27	70.82	12.39
	10 th	68.47	63.44	63.49	67.54	70.81	72.38	73.18	9.74

Table 4.9 provides the mean differences in percentage of the 5th, 8th, and 10th grade students who achieved state standard level 3 or above in mathematics. Districts that adopted magnet school choice show the highest increase in percentage of the 8th and 10th grade students meeting state math standards or above for six years. And districts with no school choice show the highest increase in percentage of the 5th grade students meeting state math standards or above for six years. Districts with magnet school choice show the highest average in all grades. Districts with no school choice policy show the lowest average in all grades, and their average is far below the average scores of all districts in Florida. Districts with both magnet and charter school choice, however, show the smallest percentage increase over six years.

Table 4.10 Descriptive Statistics for All Districts, Six-Year Average and 2005-06 to 2010-11

Variables	Average	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Δ 6 Years
Private school enrollment (%)	5.83	6.50	7.20	7.04	6.96	6.62	6.50	0
Pupil per teacher (#)	14.76	15.37	14.92	14.25	14.87	14.72	14.43	-0.94
Median house income	42034.5	37152	42001	44182	44460	42078	42334	5182
Free/ reduced lunch (%)	58.26	55.12	55.07	55.36	58.18	62.36	63.49	8.37
Teacher experience (#)	12.96	12.90	12.71	12.47	12.57	13.66	13.46	0.56

Table 4.10 - Continued

Variables	Average	2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
English language learner (%)	4.73	3.53	3.69	6.00	5.89	4.54	4.75	1.22
School staff (%)	41.37	34.27	33.97	44.10	45.41	44.86	45.63	11.36
Learning-disabled student (%)	16.00	16.17	15.93	16.36	16.28	15.93	15.31	-0.86
Gifted student (%)	3.69	3.77	3.86	3.64	3.66	3.64	3.55	-0.22
Teacher salary (2005\$)	43656	40763	43020	44502	44801	44590	44259	3496
Total government revenue (\$1,000)	414203	380375	437468	450840	406804	401827	407905	27530
Expenditures per student (\$1)	8577	7314	8604	9013	8751	8754	9028	1714
Teachers with advanced degree (%)	30.73	30.32	29.82	28.04	28.27	34.31	33.60	3.28
School year population (#)	47500	45498	46419	47085	46900	46244	52852	7354
Graduation rate (%)	69.89	73.44	75.25	77.40	80.50	31.32	81.44	8.00
District grade (1-5)	4.37	3.82	4.17	3.91	4.32	5	5	1.18

* Average teacher salary, in constant 2005 dollars computed by the Bureau of Economic and Business Research. The term, constant dollars, refers to a metric for valuing the price of something over time, without that metric changing due to inflation or deflation. Constant dollars are used to compare the “real value” of an income or price to put the “nominal value” in perspective.

* Total government revenue is the total dollar amount received from local, state, and federal government taxes and programs to fund public elementary and secondary schools.

* Expenditure per full time equivalent student is the amount of dollars expended by district for everyday operation and maintenance of the schools including food and community service expenditures.

* School year population is the number of children between the ages 5-19 who are within the typical age for attending school. This number is an estimate of the number of children that could attend school, not the actual number of students in school.

Table 4.11 Descriptive Statistics for Districts (No School Choice, TPSs only district), Six-Year Average and 2005-06 to 2010-11

Variables	Average	2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
Private school enrollment (%)	4.71	3.89	5.20	5.37	4.77	4.68	4.37	0.48
Pupil per teacher (#)	15.00	15.12	14.83	14.56	15.90	15.12	14.48	-0.64
Median house income	40537	33689	39808	42863	43512	41572	41776	8087
Free/ reduced lunch (%)	59.44	56.30	56.80	57.75	59.22	62.16	64.43	8.13
Teacher experience (#)	12.93	13.12	12.86	12.86	12.68	13.16	12.90	-0.22
English language learner (%)	3.20	1.98	1.99	3.92	4.33	3.56	3.43	1.45
School staff (%)	42.12	35.30	34.88	44.87	45.91	45.39	46.39	11.09
Learning-disabled student (%)	16.61	17.21	16.85	17.27	16.95	15.99	15.37	-1.84
Gifted student (%)	3.13	3.09	3.07	2.85	3.02	3.37	3.39	0.3
Teacher salary (2005\$)	42645	39871	41753	43347	43716	43895	43285	3414
Total government revenue (\$1,000)	134412	88634	109051	160797	148350	148818	150822	62188
Expenditures per student (\$1)	8539	7101	8751	9045	8645	8767	8924	1823
Teachers with advanced degree (%)	29.15	28.38	28.66	26.48	26.32	33.14	31.92	3.54
School year population (#)	15210	11427	10882	16096	16588	16982	19286	7859
Graduation rate (%)	78.95	73.20	74.58	78.15	81.74	82.95	83.06	9.86
District grade (1-5)	4.32	3.71	4.00	3.90	4.29	5	5	1.29

Table 4.12 Descriptive Statistics for Districts (Magnet, Charter School Choice with TPSs), Six-Year Average and 2005-06 to 2010-11

Variables	Average	2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
Private school enrollment (%)	10.92	11.28	10.61	10.93	11.24	10.74	10.74	-0.54
Pupil per teacher (#)	14.31	15.27	14.70	14.20	14.04	14.52	13.15	-2.12
Median house income	44925	41490	45095	46497	46943	44758	44765	3275
Free/ reduced lunch (%)	57.47	54.83	51.54	54.73	58.27	61.83	63.59	8.76
Teacher experience (#)	12.80	12.42	12.52	11.48	12.04	14.21	14.14	1.72
English language learner (%)	7.40	5.65	5.90	9.21	9.45	6.67	7.51	1.86
School staff (%)	38.91	32.85	32.11	41.82	42.62	41.75	42.33	9.48
Learning-disabled student (%)	14.59	14.55	14.13	14.82	14.77	15.12	14.17	-0.38
Gifted student (%)	5.20	5.80	5.90	5.50	5.81	4.18	4.0	-1.8
Teacher salary (2005\$)	45332	42136	45174	46032	46561	46459	45629	3493
Total government revenue (\$1,000)	1089649	985856	1059012	1155277	1104167	1095234	1138345	152489
Expenditures per student (\$1)	8506	7748	8386	8802	8713	8629	8760	1012
Teachers with advanced degree (%)	34.59	35.18	33.39	31.52	32.83	37.25	37.34	2.16
School year population (#)	126413	117634	113366	122634	128559	125294	150990	33356
Graduation rate (%)	77.12	72.28	74.61	75.35	78.41	80.72	81.37	9.09
District grade (1-5)	4.46	3.92	4.43	3.94	4.47	5	5	1.08

Table 4.10 provides descriptive statistics on all variables for the 67 school districts in Florida. Table 4.11 provides descriptive statistics for the no school choice with TPS district, and Table 4.12 shows descriptive statistics for districts that have adopted both magnet and charter

school choice with TPSs. For six years, all variables show a similar pattern of increase or decrease between no choice districts and all choice available districts. The percentage of private enrollment increased in the no school choice districts; on the contrary, it decreased in magnet and charter school choice available districts. The average of the percentage of private enrollment is, however, much higher (more than double) in districts with magnet and charter school choice than in no school choice available districts.

When comparing total government revenue, districts with both school choices have a much larger amount of government funding than no choice districts, and no choice districts show lower average revenues than that of all districts in Florida. So, presumably, districts with no school choice policy are small districts with smaller numbers of schools, and school choice policy would be adopted more frequently in larger districts with larger numbers of schools and students. The percentage of English learner is twice as high in all school choice available policy districts (7.40 %) than in no school choice districts (3.20 %). When considering that the percentage of ELL is usually related to higher numbers of immigrants, the estimates also show a higher probability of school choice policy adoption in larger school districts.

Teacher salaries and the percentage of teachers with advanced degrees are higher in districts with both school choice policies. The average years of teacher experience increases in school districts with both school choices.

Table 4.13 Changes in Number and Percentage of Schools by District School Choice Adoption, Seven-Year Average and 2005-2006 to 2011-2012

District Type	School Type	Average	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	Δ 6 Years
TPS, magnet or charter school	TPSs (#)	38	55.07	53.71	46.61	30.7	32	24.24	23.67	-31.4
	TPSs (%)	85.91	86.49	86.20	85.98	86.36	87.05	84.96	84.35	-2.14
	M or C (#)	6.16	8.6	8.6	7.6	4.85	4.76	4.29	4.39	-4.21
	M or C (%)	14.09	13.51	13.80	14.02	13.64	12.95	15.04	15.65	2.14
TPS, magnet and charter school	TPSs (#)	75.82	77.83	73.10	75.55	77.5	78.23	73.92	74.64	-3.19
	TPSs (%)	75.04	75.21	76.75	76.29	76.03	75.68	72.92	72.40	-2.81
	Magnet (#)	16.12	14.28	13.57	14.36	15.95	16.23	19.24	19.24	4.96
	Magnet (%)	13.99	14.15	12.44	12.55	13.39	13.60	16.12	15.67	1.52
	Charter (#)	12.65	10.5	10.71	12	12.36	13.14	13.96	15.88	5.38
	Charter (%)	10.97	10.64	10.81	11.15	10.58	10.72	10.95	11.93	1.29

*Data source: Master School Identification Files 2005-06 to 2012-13, Florida Department of Education

In order to discern the relationship of charter school adoption to magnet school adoption, this table is produced with data from districts that have at least one school choice policy. To answer research question 1-1, if charter school choice and magnet school choice are more likely to be adopted together or as substitutes for each other in districts, the first magnet or charter schools in a district should be identified and one would need to track whether magnet and charter schools were adopted as substitutes or together throughout the entire time period of their existence to fully determine the causal relationships between the two school choice policies. Under the limitation of our seven-year data, this study includes Table 4.13 which describes the changes in numbers and percentages of each school type within districts that demonstrates how they covary in this restricted time period. The first column shows the district types. This study divides district type into two categories; 1) districts with either charter or magnet school choice policy, and 2) districts with both charter and magnet school choice policies. Therefore, the first four rows show the numbers of TPSs and numbers of magnet or charter schools, and the percentages of TPSs and magnet or charter schools in district type 1, meaning districts that adopted one of the school choice policies with TPSs. Similarly, the next six rows show the numbers of TPSs, magnet and charter, and the percentages of each of the school types in districts that adopted both school choice policies with TPSs. The reason this study divided the district types into only two categories is that there is only one school district having magnet school choice without also having charter school choice in the sample data. Therefore, the district having TPSs with magnet schools are included into the first category of districts with one of the school choices.

The first district type shows the changes in numbers of each school type--TPSs and magnet or charter--and their percent changes for seven years from 2005 to 2012. Although the difference in numbers of TPSs between the districts with one school choice and the districts with both school choice policies was approximately 20, but the numbers of TPSs in the districts with one school choice dramatically decreased over the seven years from 55.07 to 23.27. On the contrary, the numbers of TPSs in districts with both school choices slightly decreased from 77.83 to 74.64.

In addition, the numbers of magnet or charter schools in districts with one school choice also decreased by almost half, but the number of TPSs dramatically decreased, so the percentage of magnet or charter schools in the districts increases although their number decreased.

Therefore, this trend of overall decrease in both school types in districts with one school choice policies resulted in small percentage changes of each school types in the districts, but big changes in numbers of schools in the district.

On the contrary, the numbers of TPSs in the district with both school choice policies decreased to approximately only 3, but the numbers of magnet schools and those of charter schools increased over the seven years. Therefore, the overall numbers of schools in the district with both school choice policies increased because the increases in numbers of magnet and charter schools was relatively larger than the decrease in numbers of TPSs in the district with both school choice policies. Also, the decrease in numbers of TPSs was slight.

Thus, this table shows the differences of overall changes in numbers of each school types in the two district types: 1) districts with only one school choice policy, and 2) districts with both school choice policies. And this table indicates that districts with one school choice policy had experienced a dramatic decrease in the number of all school types for seven years; however, both charter and magnet schools increased gradually in the district with both school choice policies, and the number of TPSs was almost the same for the same period of time. In other words, if a district adopts both school choice policies, this table seems to show that they do not substitute for each other. And if this is correct, it means they are not replacing each other, and thus play complementary roles with respect to school choices.

4.2 Regression Results of the Effects of School Choice Availability on Student Academic Achievement

The first research question investigates the effects of magnet and charter school choice adoption on student academic performance in the public school system in Florida for six years, 2005-06 to 2010-11. The analyses were conducted with the two estimation approaches of Fixed Effect Panel Data analysis or the Panel Corrected Standard Error (PCSE) analysis for all districts and each school level (Elementary, Middle, and High) and two subjects (Reading and Math). Three different kinds of independent variables were used for measuring school choice policy adoption, choice availability, and choice implementation in separate models. Student academic performance is also measured separately based on the subject fields of Reading and Mathematics. Therefore, a total of 6 separate results were produced at each school level.

4.2.1 Elementary School Level

This study conducts a Hausman test in order to determine whether a fixed effect model or a random effect model is appropriate. The test results of the Hausman indicate that errors are correlated with predictors in all the models presented, which means that a fixed effect model is appropriate for the analyses. For more accurate estimation, three key assumptions in using panel data are tested. The assumption of cross-sectional independence, meaning the error terms are independent across cross-sections, is tested through the Pesaran Cross-sectional Dependence test. The assumption of homoscedasticity is tested through the modified Wald test, and finally the assumption of no first-order autocorrelation is tested by the Lagrangian-Multiplier test. As Table 4.14 shows, all three models estimating the impact of school choice policy on academic performance in the Reading test reject the null hypothesis of homoskedasticity. But the models fail to reject the null hypothesis of no cross-sectional dependence and no auto-correlation. Therefore, this study uses fixed effect estimation with a robust option to control for heteroskedasticity. The model's estimating impact of school choice policy on academic performance in the Mathematics test show autocorrelation problems and heteroskedasticity problems. The PCSE analysis considers the complexity of the error process and provides unbiased results by making the three assumptions relaxed (Cameron & Trivedi, 2010, p.273), so this study uses the Panel Corrected Standard Error (PCSE) analysis to solve those assumption violations.

Table 4.14 Results of Diagnostic Test with P-value

Diagnostic Test	H ₀	Reading		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.301	.294	.298
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.990	.972	.865
Panel estimation		FE, robust	FE, robust	FE, robust

Table 4.14 - Continued

Diagnostic Test	H ₀	Mathematics		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.647	.881	.754
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.000	.000	.000
Panel estimation		PCSE	PCSE	PCSE

*Model 1 indicates the estimation of the impacts of school choice adoption, Model 2 indicates the estimation of the impacts of the degree of choice availability, and Model 3 indicates the estimation of the impacts of the degree of policy implementation on student academic performance.

Table 4.14 reports the relationship between school choice adoption and student academic performance in reading with control variables. School choice adoption in model 1 means district policy decision about school choice adoption measured as dummy variables: Type 1, Type 2, Type 3, and Type 4. So the reference group in Model 1 is the district with no school choice policy (Type 1), and Type 2 is the district with magnet school policy. Types 3 and 4 mean the district with charter school policy and the district with both school choice policies respectively. The second column shows the relationship between the degrees of school choice availability, measured as the percentage of the number of magnet schools and that of charter schools, and student academic performance with control variables. The third column shows the relationship between the degree of school choice policy implementation, measured as the percentage of the number of students actually enrolled in magnet schools and that of the number of students enrolled in charter schools, and student academic performance.

Table 4.15 The Impact of School Choice Policy on Student Academic Performance in Reading through 2005-06 to 2010-11 (Elementary School Level)

Reading			
Fixed Effect Regression			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with magnet choice)	1.466 (1.011)		
-Type3 (TPSs with charter choice)	.933 (.663)		
-Type4 (TPSs with magnet & charter choices)	2.298*** (.879)		

Table 4.15 - Continued

Variables	Model 1	Model 2	Model 3
Degree of choice availability			
- % of magnet school		.004 (.021)	
- % of charter school		.031** (.014)	
Degree of choice implementation			
-% of magnet school student			.003 (.039)
-% of charter school student			.033**(.015)
Controls			
Students Ethnicity			
-% of White	.051***(.015)	.057***(.015)	.058***(.015)
-% of Black	-.009 (.049)	-.030 (.053)	-.028 (.052)
-% of Hispanic	.045 (.086)	.080 (.087)	.082 (.089)
-% of Asian	.047 (.100)	.104 (.101)	.110 (.101)
Students eligible for free/reduced lunch (%)	-.080 (.054)	-.070 (.050)	-.069 (.049)
Students learning disabled (%)	.036 (.118)	.044 (.115)	.032 (.119)
Students gifted (%)	.023 (.113)	.018 (.112)	.025 (.112)
Pupil/teacher ratio (#)	.085 (.074)	.085 (.076)	.081 (.074)
Teacher degree (%)	.038 (.061)	.026 (.059)	.021 (.060)
Teacher experience (#)	.049 (.132)	.036 (.131)	.028 (.134)
Teacher salary (2005\$)	.0002 (.0001)	.0002 (.0002)	.0002 (.0002)
Administrative staff (%)	.182**(.084)	.152* (.090)	.155* (.089)
Private school enrollment (%)	.183 (.167)	.169 (.165)	.162 (.168)
ELL (%)	-.165 (.109)	-.181* (.107)	-.185*(.108)
District size (log of school year population)	.287 (1.857)	.011 (1.71)	-.074 (1.71)
Median house income (\$)	-3.62e-06 (.0001)	-.00001 (.0001)	-.00001(.0001)
Year06	-.386 (.474)	-.391 (.472)	-.349 (.465)
Year07	4.688*** (1.281)	5.044***(1.363)	5.081***(1.37)
Year08	-.137 (1.475)	.119 (1.510)	.137 (1.511)
Year09	3.718*** (1.371)	4.005*** (1.407)	4.053***(1.43)
Year10	1.398 (1.370)	1.680 (1.389)	1.728 (1.409)
Number of Obs	390	390	390
Number of Districts	65	65	65
R² : within	0.558	0.558	0.559
between	0.389	0.415	0.390
overall	0.384	0.376	0.360

*p<.10, **p<.05, ***p.<01. *Note: Numbers in parentheses are robust standard errors.

Table 4.15 provides the estimated results of school choice policy impacts on reading scores for the elementary school level. Through the district fixed effect models examined with aggregated school data, the relationship between school choice policy and student academic performance on the reading test is examined. The test results show that districts that adopt both magnet and charter school choice policy are positively related to higher percentage of students meeting state standards on the reading test, and that increases in the number of charter school and number of students enrolled in charter schools has a positive relationship to higher performance. However, magnet school choice numbers of schools or students is not statistically significant with the elementary reading performance.

Among control variables, only the percentage of White, percentage of administrative staff in schools, and percentage of English language learners are statistically significant, and all variables show the expected relationship to school performance. A higher percentage of White and lower percentage of ELL are associated with higher reading performance for the elementary school level. Based on the school choice theory rationale, magnet or charter schools are expected to be more competitive by introducing new organizational processes against inefficiency from traditional bureaucratic schools. However, in contrast to the expectation, the higher percentage of administrative staff included to measure the degree of organizational bureaucracy shows a positive relationship to student performance.

Table 4.16 The Impact of School Choice Policy on Student Academic Performance in Mathematics through 2005-06 to 2010-11 (Elementary School Level)

Mathematics			
Panel Corrected Standard Error (PCSE) Analysis			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with magnet choice)	-2.47*** (.726)		
-Type3 (TPSs with charter choice)	-.341 (.583)		
-Type4 (TPSs with magnet & charter choices)	-.486 (.558)		
Degree of choice availability			
- % of magnet school		-.088**(.035)	
- % of charter school		-.012 (.022)	

Table 4.16 - Continued

Variables	Model 1	Model 2	Model 3
Degree of choice implementation			
-% of magnet school student			-.065** (.031)
-% of charter school student			.006 (.026)
Controls			
Students Ethnicity			
-% of White	.063**(.031)	.063**(.030)	.066**(.031)
-% of Black	-.088***(.031)	-.082***(.031)	-.083*** (.033)
-% of Hispanic	.091**(.042)	.087** (.038)	.093** (.039)
-% of Asian	.044 (.167)	.034 (.167)	.056 (.160)
Students eligible for free/reduced lunch (%)	-.139***(.019)	-.139*** (.022)	-.129*** (.023)
Students learning disabled (%)	-.109***(.099)	-.111 (.098)	-.096 (.099)
Students gifted (%)	.365***(.081)	.399***(.070)	.396***(.069)
Pupil/teacher ratio (#)	-.028 (.083)	-.041 (.085)	-.030 (.090)
Teacher degree (%)	.232***(.063)	.221*** (.062)	.227*** (.063)
Teacher experience (#)	.217 (.160)	.204 (.157)	.200 (.160)
Teacher salary (2005\$)	.0001* (.00008)	.0002** (.0001)	.0002* (.0000)
Administrative staff (%)	-.144**(.076)	-.164** (.073)	-.163** (.076)
Private school enrollment (%)	-.118* (.065)	-.112* (.065)	-.123* (.169)
ELL (%)	-.346*** (.081)	-.349*** (.074)	-.354***(.076)
District size (log of school year population)	1.13***(.467)	1.32*** (.443)	1.28***(.419)
Median house income (\$)	.0002***(.000)	.0001*** (.000)	.0002***(.000)
Year06	-.829***(.194)	-.782*** (.198)	-.870***(.206)
Year07	3.649***(1.125)	3.878***(1.083)	3.894***(1.14)
Year08	7.877*** (1.164)	8.151***(1.182)	8.073*** (1.25)
Year09	7.647*** (.832)	7.975*** (.857)	7.885***(.922)
Year10	9.335*** (.923)	9.716*** (.971)	9.593*** (1.03)
Number of Obs	390	390	390
Number of Districts	65	65	65
R²	.613	.613	0.611

*p<.10, **p<.05,***p.<01

*Note: Numbers in parentheses are panel-corrected standard errors.

Table 4.16 shows the estimated results of school choice policy impacts on student performance in mathematics tests for the elementary school level. Through the Panel Corrected

Standard Error analysis, magnet school adoption shows a statistically significant negative relationship to student performance in the mathematics test. In other words, districts with a magnet school choice policy lower the percentage of students meeting state standards by 2.47% than districts with no school choice policy. In addition, a higher degree of magnet school choice available in districts and greater participation in magnet schools choice are associated with lower student performance in mathematics tests for the elementary school level, although the impacts are small.

Most of the control variables have statistically significant influences, and show positive or negative relationships to student performance as expected. The percentage of White and Hispanic, gifted students and level of teacher degree, experience, and salary, and district size and median house income have positive relationships to student performance. The percentage of Black, of students eligible for free or reduced lunch, of ELL, of disabled and of private school enrollment show negative relationships to student performance in the public education system. The relationship between the percentage of private school enrollment and student performance in public schools could be interpreted in several ways. A regression model does not explain the direction of causal effects. Therefore, this result could mean higher performing students are more likely to be enrolled in private schools than in public schools, or it could be understood that lower performance in the public school system results in an increase of enrollment in private schools. Contrary to the result of the impact of school choice on the reading test for elementary school level, the percentage of administrative staff has a negative association with student performance in the mathematics test as expected.

4.2.2 Middle School Level

To determine whether a fixed effect model or a random effect model is appropriate, first of all, a Hausman test is conducted. The test results indicate that a fixed effect model is appropriate for all models ($pr.>.000$). For more accurate estimation, three key assumptions in using panel data are tested. Cross-sectional dependency is tested by the Pesaran Cross-sectional Dependence test. Homoscedasticity is tested by the modified Wald test, and first-order autocorrelation is tested by the Lagrange-Multiplier test. As Table 4.17 shows, all six models estimating the impact of school choice policy on academic performance in Reading and Mathematics tests reject the null hypothesis of homoskedasticity. Although the models fail to

reject the null hypothesis of no cross-sectional dependence, all three models testing student performance on the Reading test reject the null hypothesis of no first-order autocorrelation, and all three models in Mathematics show suspicious results on the presence of first-order autocorrelation. Therefore, this study employs the Panel Corrected Standard Error (PCSE) analysis to solve those assumption violations.

Table 4.17 Results of Diagnostic Test with P-value

Diagnostic Test	H ₀	Reading		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.205	.189	.195
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.053	.048	.045
Panel estimation		PCSE	PCSE	PCSE
		Mathematics		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.189	.186	.155
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.101	.119	.099
Panel estimation		PCSE	PCSE	PCSE

*Model 1 indicates the estimation of the impacts of school choice adoption, Model 2 indicates the estimation of the impacts of the degree of choice availability, and Model 3 indicates the estimation of the impacts of the degree of policy implementation on student academic performance.

Table 4.18 The Impact of School Choice Policy on Student Academic Performance in Reading through 2005-06 to 2010-11 (Middle School Level)

Reading			
Panel Corrected Standard Error (PCSE) Analysis			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with magnet choice)	.922 (.617)		
-Type3 (TPSs with charter choice)	-.442 (.383)		
-Type4 (TPSs with magnet & charter choices)	-2.178*** (.743)		

Table 4.18 - Continued

Variables	Model 1	Model 2	Model 3
Degree of choice availability			
- % of magnet school		-.045 (.038)	
- % of charter school		-.033*(.018)	
Degree of choice implementation			
-% of magnet school student			-.044 (.033)
-% of charter school student			-.067 (.056)
Controls			
Students Ethnicity			
-% of White	.217 (.179)	.170 (.182)	.188 (.172)
-% of Black	.112 (.174)	.067 (.173)	.084 (.162)
-% of Hispanic	.122 (.175)	.093 (.173)	.108 (.163)
-% of Asian	.936*** (.312)	.920*** (.341)	.998*** (.366)
Students eligible for free/reduced lunch (%)	-.241*** (.033)	-.255*** (.034)	-.253*** (.036)
Students learning disabled (%)	-.053 (.099)	-.065 (.096)	-.065 (.100)
Students gifted (%)	.035 (.092)	.024 (.088)	.007 (.091)
Pupil/teacher ratio (#)	-.046 (.091)	-.057 (.094)	-.044 (.096)
Teacher degree (%)	.314*** (.041)	.301*** (.038)	.300*** (.040)
Teacher experience (#)	.355*** (.095)	.396*** (.097)	.417*** (.100)
Teacher salary (2005\$)	.0001** (.0000)	.0002** (.0000)	.0002** (.0000)
Administrative staff (%)	-.377** (.104)	-.359*** (.097)	-.352*** (.094)
Private school enrollment (%)	-.139* (.078)	-.129* (.077)	-.139* (.073)
ELL (%)	-.084 (.090)	-.111 (.089)	-.102 (.092)
District size (log of school year population)	.079 (.173)	-.053 (.182)	-.110 (.209)
Median house income (\$)	.0001 (.000)	.0001** (.000)	.0001** (.000)
Year06	.709 (.553)	.536 (.551)	.688 (.624)
Year07	9.994*** (1.339)	9.628*** (1.203)	9.773*** (1.32)
Year08	13.175*** (1.406)	12.95*** (1.341)	12.98*** (1.40)
Year09	16.169*** (1.655)	15.76*** (1.486)	15.86*** (1.56)
Year10	16.833*** (1.645)	16.50*** (1.508)	16.65*** (1.59)
Number of Obs	360	360	360
Number of Districts	60	60	60
R²	.784	.779	0.779

*p<.10, **p<.05, ***p.<01

*Note: Numbers in parentheses are panel-corrected standard errors.

Table 4.18 provides the results of the reading test for middle schools. Contrary to the previous results of the reading test for elementary schools, adoption of charter school policy has a negative influence on student performance. Also, districts that adopt both magnet school policy and charter school policy show a lower percentage of students meeting state standards by 2.18% than districts with no school choice policy. In addition, the creation of more charter schools shows a statistically significant relationship to lower percentages of students meeting state standards in reading tests.

Different from the estimation results for the elementary school level, some variables such as the percentage of White, disabled, gifted, ELL, district size and median house income are statistically insignificant, but other variables such as the percentage of students eligible for free or reduced lunch, teacher degree, experience, and salary, and the percentage of administrative staff and private school enrollment show statistical significance and the same positive or negative influences on student performance as at the elementary school level.

Table 4.19 The Impact of School Choice Policy on Student Academic Performance in Mathematics through 2005-06 to 2010-11 (Middle School Level)

Mathematics			
Panel Corrected Standard Error (PCSE) Analysis			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with magnet choice)	2.093** (.929)		
-Type3 (TPSs with charter choice)	-.831* (.467)		
-Type4 (TPSs with magnet & charter choices)	-2.202*** (.614)		
Degree of choice availability			
- % of magnet school		-.008 (.024)	
- % of charter school		-.055** (.022)	
Degree of choice implementation			
-% of magnet school student			-.015 (.025)
-% of charter school student			-.110* (.061)

Table 4.19 - Continued

Variables	Model 1	Model 2	Model 3
Controls			
Students Ethnicity			
-% of White	.216 (.188)	.143 (.171)	.140 (.169)
-% of Black	.130 (.185)	.056 (.165)	.051 (.163)
-% of Hispanic	.121 (.181)	.063 (.164)	.056 (.160)
-% of Asian	.963*** (.300)	.875*** (.329)	.904*** (.340)
Students eligible for free/reduced lunch (%)	-.263*** (.037)	-.280*** (.041)	-.275*** (.042)
Students learning disabled (%)	-.032 (.090)	-.052 (.088)	-.053 (.094)
Students gifted (%)	-.060 (.094)	-.070 (.089)	-.095 (.092)
Pupil/teacher ratio (#)	.010 (.072)	-.006 (.073)	.007 (.074)
Teacher degree (%)	.246*** (.048)	.231*** (.048)	.226*** (.048)
Teacher experience (#)	.275*** (.087)	.325*** (.086)	.347*** (.087)
Teacher salary (2005\$)	.0003*** (.000)	.0003*** (.000)	.0003*** (.000)
Administrative staff (%)	-.317*** (.066)	-.287*** (.054)	-.282*** (.055)
Private school enrollment (%)	-.289*** (.088)	-.283*** (.085)	-.291*** (.084)
ELL (%)	-.067 (.082)	-.086 (.076)	-.080 (.081)
District size (log of school year population)	.102 (.241)	-.043 (.248)	-.048 (.266)
Median house income (\$)	.00003 (.000)	.00004 (.000)	.000042 (.000)
Year06	.172 (.471)	-.058 (.464)	-.052 (.510)
Year07	7.928*** (1.246)	7.347*** (.990)	7.305*** (1.04)
Year08	11.127*** (1.048)	10.76*** (.933)	10.68*** (.983)
Year09	11.396*** (1.556)	10.71*** (1.23)	10.67*** (1.27)
Year10	13.975*** (1.585)	13.35*** (1.27)	13.38*** (1.32)
Number of Obs	360	360	360
Number of Districts	60	60	60
R²	.768	.759	0.759

*p<.10, **p<.05, ***p.<01

*Note: Numbers in parentheses are panel-corrected standard errors.

The test results in Table 4.19 show that districts with charter school choice and districts with both charter and magnet school choice have lower percentages of students meeting state standards in mathematics tests than do districts with no school choice policy for middle school level. These results are consistent with the test results for student performance in reading tests for

the middle school level. However, for mathematics, districts with magnet school choice policy show a higher student performance of about 2.10% than districts with no school choice policy. Both the percentages of charter schools and students enrollment in charter schools have a negative association with the percentage of students meeting state standards in the mathematics test.

All other statistically significant variables show a positive or negative relationship to student performance as expected, but the percentage of Asian has a statistically positive influence on student performance in both the reading and mathematics tests for the middle school level only.

4.2.3 High School Level

To determine whether a fixed effect model or a random effect model is appropriate, first of all, a Hausman test was conducted. The test results indicate that a fixed effect model is appropriate for all models ($pr.>.000$) for investigating school choice impact on student performance in reading and mathematics tests. Three key assumptions in using panel data are tested. Table 4.20 shows the test results of the three assumptions of cross-sectional dependency, homoscedasticity, and first-order autocorrelation. As Table 4.20 shows, all six models reject the null hypothesis of homoskedasticity. Although the models fail to reject the null hypothesis of no cross-sectional dependency, all six models reject the null hypothesis of no first-order autocorrelation. Also, all three models in Mathematics show suspicious results on the presence of cross-sectional dependence. Therefore, this study employs the Panel Corrected Standard Error (PCSE) analysis to solve those assumption violations.

Table 4.20 Results of Diagnostic Test with P-value

Diagnostic Test	H ₀	Reading		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.179	.185	.216
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.000	.000	.000
Panel estimation		PCSE	PCSE	PCSE

Table 4.20 - Continued

Diagnostic Test	H₀	Mathematics		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.055	.051	.055
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.000	.000	.000
Panel estimation		PCSE	PCSE	PCSE

*Model 1 indicates the estimation of the impacts of school choice adoption, Model 2 indicates the estimation of the impacts of the degree of choice availability, and Model 3 indicates the estimation of the impacts of the degree of policy implementation on student academic performance.

Table 4.21 The Impact of School Choice Policy on Student Academic Performance in Reading through 2005-06 to 2010-11 (High School Level)

Reading			
Panel Corrected Standard Error (PCSE) Analysis			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with magnet choice)	.298 (.478)		
-Type3 (TPSs with charter choice)	1.83*** (.578)		
-Type4 (TPSs with magnet & charter choices)	-1.84** (.975)		
Degree of choice availability			
- % of magnet school		-.015 (.012)	
- % of charter school		.030* (.016)	
Degree of choice implementation			
-% of magnet school student			-.016 (.011)
-% of charter school student			-.032 (.038)
Controls			
Students Ethnicity			
-% of White	.109***(.033)	.114***(.038)	.118***(.037)
-% of Black	-.074** (.035)	-.083** (.039)	-.082** (.038)
-% of Hispanic	.001 (.032)	.003 (.036)	.002 (.037)
-% of Asian	-.003 (.030)	-.013 (.030)	-.013 (.030)
Students eligible for free/reduced lunch (%)	-.066** (.033)	-.074** (.031)	-.075** (.032)
Students learning disabled (%)	.120 (.005)	.120 (.082)	.121 (.086)
Students gifted (%)	.273*** (.096)	.284*** (.120)	.293*** (.121)

Table 4.21 - Continued

Variables	Model 1	Model 2	Model 3
Pupil/teacher ratio (#)	-.012* (.007)	-.010 (.007)	-.010 (.007)
Teacher degree (%)	.242***(.041)	.243***(.044)	.242**(.111)
Teacher experience (#)	.186* (.108)	.242** (.109)	.145 (.173)
Teacher salary (2005\$)	.0002***(.000)	.0001*(.000)	.0001** (.000)
Administrative staff (%)	-.165***(.070)	-.125**(.061)	-.134**(.061)
Private school enrollment (%)	.250*** (.081)	.238*** (.075)	.253*** (.073)
ELL (%)	-.289***(.046)	-.244***(.048)	-.224***(.049)
District size (log of school year population)	.792*** (.217)	.755*** (.205)	.787*** (.212)
Median house income (\$)	.0003*** (.000)	.0003*** (.000)	.0003*** (.000)
Year06	-.844** (.394)	-.684** (.318)	-.654** (.317)
Year07	2.998***(.685)	2.678***(.655)	2.781***(.675)
Year08	6.127***(.896)	5.818***(.899)	5.910***(.906)
Year09	5.766***(.946)	5.325***(.893)	5.481***(.890)
Year10	8.212*** (.926)	7.780*** (.875)	8.023*** (.866)
Number of Obs	366	366	366
Number of Districts	61	61	61
R²	.760	.751	.751

*p<.10, **p<.05, ***p.<01

*Note: Numbers in parentheses are panel-corrected standard errors.

Table 4.21 provides the results of the FCAT reading tests for high schools. Although districts having charter school choice policy have lower percentages of students meeting state standards than the districts with no school choice policy for the middle school level, the test results for high school show a more positive influence on student performance in districts with charter school choice than in districts with no choice options. Therefore, for reading performance, districts with charter school choice policy show a higher performance over time at elementary and high school levels than districts with traditional public schools only. Also a higher degree of charter school choice availability shows a statistically positive relationship to the percentage of students meeting state standards or above. However, districts that adopted both magnet school and charter school choice policies have lower student percentages meeting state standards than districts with traditional public schools only. Although adoption of policy and degree of choice availability have statistically significant influences on student reading

performance, the degree of actual participation in school choice policy does not have a statistically significant influence.

Most of the control variables, except the percentages of Hispanic, Asian, and disabled students, have statistically significant relationships to student performance in the reading test as expected.

Table 4.22 The Impact of School Choice Policy on Student Academic Performance in Mathematics through 2005-06 to 2010-11 (High School Level)

Mathematics			
Panel Corrected Standard Error (PCSE) Analysis			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with magnet choice)	-.617 (.607)		
-Type3 (TPSs with charter choice)	.280 (.620)		
-Type4 (TPSs with magnet & charter choices)	-2.83*** (.875)		
Degree of choice availability			
- % of magnet school		-.027*** (.010)	
- % of charter school		-.003 (.018)	
Degree of choice implementation			
-% of magnet school student			-.027 (.025)
-% of charter school student			-.002* (.061)
Controls			
Students Ethnicity			
-% of White	.115***(.024)	.119***(.028)	.119***(.027)
-% of Black	-.120*** (.033)	-.127*** (.033)	-.127*** (.032)
-% of Hispanic	.0002 (.028)	.005 (.032)	.006 (.032)
-% of Asian	.009 (.038)	-.0002 (.039)	-.0009 (.038)
Students eligible for free/reduced lunch (%)	-.090*** (.033)	-.095*** (.034)	-.095*** (.033)
Students learning disabled (%)	.002 (.077)	.007 (.075)	.014 (.078)
Students gifted (%)	-.036 (.102)	.006 (.114)	.011 (.117)
Pupil/teacher ratio (#)	-.008 (.005)	-.006 (.006)	-.006 (.006)
Teacher degree (%)	.190***(.057)	.191***(.059)	.191***(.059)
Teacher experience (#)	.108 (.170)	.147 (.174)	.145 (.173)
Teacher salary (2005\$)	.0002***(.000)	.0001 (.000)	.0001 (.000)

Table 4.22 - Continued

Variables	Model 1	Model 2	Model 3
Administrative staff (%)	-.153***(.101)	-.119 (.093)	-.120 (.090)
Private school enrollment (%)	.249*** (.092)	.232*** (.084)	.232*** (.080)
ELL (%)	-.147***(.056)	-.127**(.060)	-.128**(.057)
District size (log of school year population)	.504** (.236)	.386 (.254)	.408 (.252)
Median house income (\$)	.0003*** (.000)	.0003*** (.000)	.0003*** (.000)
Year06	-.760 (.480)	-.644 (.422)	-.636 (.423)
Year07	2.369**(1.008)	2.155**(.967)	2.181**(.964)
Year08	2.947**(1.640)	2.851**(1.654)	2.914**(1.665)
Year09	6.996***(1.384)	6.586***(1.301)	6.598***(1.26)
Year10	11.656*** (1.329)	11.216*** (1.24)	11.26*** (1.19)
Number of Obs	366	366	366
Number of Districts	61	61	61
R²	.714	.709	.710

*p<.10, **p<.05,***p.<01

*Note: Numbers in parentheses are panel-corrected standard errors.

Table 4.22 shows the relationship between the adoption of school choice policy, degree of choice availability, and degree of policy involvement and student performance in the high school mathematics test. Contrary to the results on reading performance, magnet school choice policy has a statistically significant influence on mathematics test performance, and a negative impact. Both magnet or charter school choice policies do not have statistically significant influences when they are adopted alone, but districts with both magnet and charter school choice policies show a statistically significant lower percentage of students meeting state standards or above than the districts with no school choice policy. Also, a higher degree of magnet school choice availability lowers the percentage of students meeting state standards. As students participate in charter or magnet school policies, there are lower student percentages meeting state standards for the mathematics test, but only the percentage of charter school enrollment shows a statistically significant result.

All other statistically significant variables show the expected relationship to high school student performance in the mathematics test.

4.3 Descriptive Analysis for Research Question 2

Descriptive analyses were conducted to project the overall trends of racial composition in the public education system in Florida. The analytic data used in this study contains 37 school districts that were chosen by a stratified sampling procedure over the six years--2005-2011. Although the analytic models use the EI calculated with only Black and White students (i.e. the average proportion of white children in the schools attended by black children in a district) as one of dependent variables, multi-ethnic interracial exposures and interracial ratio, which is calculated with the interracial exposures (i.e. each EI value of four ethnic groups of Black, White, Hispanic, and Asian), are included in the descriptive analysis for additional information offering a much more comprehensive view of desegregation.

Table 4.23 Means of Dissimilarity Index, Exposure Index, and Standard Deviation by District School Choice Adoption, Six-Year Average and 2005-2006 to 2010-2011

	Index	Average Year							Δ 6 Years
		2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011		
School choice adoption									
District with TPS only	DI	28.87	30.65	32.29	32.25	27.16	27.14	23.33	-7.32
	EI	50.67	54.21	52.46	50.06	51.67	48.40	47.25	-6.96
	SD	5.93	6.42	6.36	6.18	5.82	5.31	5.30	-1.12
District with TPS and Charter choice	DI	39.07	40.89	39.90	34.62	39.13	40.14	40.66	-0.23
	EI	49.24	48.48	44.75	52.14	49.14	49.36	51.53	3.05
	SD	14.20	16.67	16.36	12.74	14.51	13.02	11.34	-5.33
District with TPS, Charter choice, and Magnet choice	DI	39.69	38.81	39.28	40.82	40.00	39.92	39.88	1.07
	EI	44.79	49.00	48.50	43.21	46.11	42.76	40.43	-8.57
	SD	17.66	17.59	16.91	18.02	17.54	16.94	17.66	0.07
37 District Average	DI	37.88	38.00	38.35	37.55	37.66	37.87	37.85	-0.15
	EI	50.67	54.21	52.46	50.06	51.67	48.40	47.25	-6.96
	SD	14.71	15.40	14.70	14.80	14.75	14.24	14.36	-1.04

* See 3.4. Measurement for DI, EI, and SD computation.

Table 4.23 shows the averages of the Dissimilarity Index (DI), the Exposure Index (EI) and Standard Deviation (SD) and the changes over six years by three types of school districts in Florida. The DI ranges from 0 to 100 percent, and theoretically, 0 percent means no Black

students need to be redistributed to achieve a balanced distribution of Black students among schools, and 100 percent means all Black students need to be redistributed to achieve a balanced distribution of Black students among schools. Therefore, lower DI values mean better racially balanced districts. The table indicates that DI is the lowest in the district with no school choice policy, and although the DI percent is similar between districts with one school choice option available and districts with both school choice options, it shows a higher percentage when more school choice options are available. Also, the value of DI decreases as much as 7.32 percent in districts without school choice policy, but it increases as much as 1.07 percent in districts with both school choice policies for six years.

In addition, this table shows the values of the DI, EI, and SD in the year of 2005, and their changes over the six years by district type. The district with no school choice policy has a value of 30.65 in 2005, but it goes down through the six years, so the value is 23.33 in 2010. However, the district with charter school choice policy has a DI value of 40.66 in 2010, and it shows only 0.23 lower than the value in 2005. The DI value in the district with both school choice policies is 38.81, and it goes up slightly over the six years, and the value is 39.88 in 2010.

However, the DI value reflects the differences in percentages among the schools, so it does not consider how much an ethnic group can be exposed to the other ethnic groups in the district. Therefore, even though one district has 20% of Black, and another district has 80% Black students, these two districts can have the same DI values if the percentage of Black students is fairly distributed among schools in their district.

The EI reflects how much an ethnic group can be exposed to the other ethnic groups. Therefore, if an ethnic group (Black students in this study) is distributed among most schools in the district, this means greater exposure of Black students to White students, and the value of the EI will be higher. On the contrary, if an ethnic group is concentrated in a few schools in the district, the value of the EI will be lower. The table indicates that a typical Black student is in a school with about 51 percent White students in an average no school choice available district, but s/he is with approximately 45 percent White students in a school in the average both school choice policies available districts. The values of the EI, in this table, show lower percentages when the choice availability increases (50.67% in no choice districts, 49.24% in one choice available districts, and 44.79% in both choices available districts).

However, when comparing the EI values of each district type, a district with TPS only and a district with both school choice policies show decreases in EI values compared to the initial value of 2005 for six years, meaning less exposure of Black students to White students over the time period, and the EI value increases in the district with charter school choice policy over the six years, meaning more exposure of Black students to White students from 2005 to 2010.

The standard deviation is included to show the average deviation of schools, calculated with absolute values, in a district from the mean percentage of Black students in the district. Therefore, districts in which schools have a relatively similar percentage of Black students will have small standard deviation scores, and districts in which schools have big differences in the percentage of Black students will have larger scores. The table indicates that the value of SD (5.93) is the lowest in the district with no school choice policy, and the value of SD (14.20) is larger in the district with charter school choice policy. Also, the value of SD (17.66) is much bigger in the district with both school choice policies. This means that although the differences between schools (SD values) by each school district type decrease over the six years, the values in the percentage of Black students between schools vary greatly depending on the district types. And this table shows that districts with school choice policy have larger differences in the percentage of Black students between schools than the districts with no school choice policy.

Overall, the values of DI, EI and SD uniformly show more segregation and more school choice policies at the district level for the six years in Florida.

Traditionally, the exposure index is calculated with two racial groups of White and Black, and either group can be a reference group in the calculation.³ In this study, EI indicates the percentage of White students in the typical Black student's school. However, the EI has a limitation in that the index cannot be used to measure desegregation among multiple groups, for example, Blacks, Whites, Latinos, and Asian, at the same time (Straus, 2009). Therefore, I employ the logic of calculation for the multiethnic interracial exposure index proposed by Straus (2009) to project segregation or desegregation trends among multi-ethnicities in Florida. The logic behind the measure for multiethnic interracial exposure index is the same as the traditional exposure index. For example, interracial exposure replaces the White component of the EI with Hispanics, and the Black group with non-Hispanics (i.e. Whites, Blacks, and Asian) to measure

³ See 3.4., Measurement, for a more detailed calculation.

Hispanic interracial exposure. After repeating this calculation for each of the four groups, the interracial exposures for each group are combined with each group’s overall district enrollment. The interracial ratio is calculated by dividing each group’s interracial exposure by their enrollment percentage. Therefore, the interracial ratio approaches 1 with greater desegregation. And furthermore, “the interracial ratio provides an overall estimate of the amount of desegregation, by group, within the district” (Straus, 2009).

Table 4.24 Interracial Exposure, Enrollment, and Interracial Ratio for 37 School Districts in Florida, Six-Year Average and 2005-2006 to 2010-2011

	2005	2006	2007	2008	2009	2010	Δ 6
	-2006	-2007	-2008	-2009	-2010	-2011	Years
White Interracial Exposure (%)	55.87	54.21	51.65	53.48	50.29	49.33	-6.54
White Enrollment (%)	62.08	60.15	56.73	59.09	55.40	53.77	-8.31
White Interracial Ratio	0.890	0.892	0.902	0.896	0.895	0.911	0.021
Black Interracial Exposure (%)	15.09	15.13	14.81	15.58	14.94	14.94	-0.15
Black Enrollment (%)	19.94	20.26	19.81	20.44	19.59	20.08	0.14
Black Interracial Ratio	0.819	0.807	0.814	0.824	0.815	0.810	-0.009
Hispanic Interracial Exposure (%)	13.50	14.66	14.56	15.47	15.64	17.42	3.92
Hispanic Enrollment (%)	15.71	17.02	16.86	17.91	18.00	19.77	4.06
Hispanic Interracial Ratio	0.913	0.910	0.918	0.910	0.895	0.925	0.012
Asian Interracial Exposure (%)	1.99	2.17	2.16	2.34	2.35	2.14	0.15
Asian Enrollment (%)	1.87	2.05	2.05	2.23	2.27	2.04	0.17
Asian Interracial Ratio	1.071	1.055	1.046	1.040	1.027	1.030	-0.041
Averages	0.923	0.916	0.920	0.917	0.908	0.919	-0.004

*This table includes the total numbers of observations, 222, in the analytic sample.

Table 4.24 shows the changing trends in interracial exposure, enrollment, and interracial ratio for White, Black, Hispanic, and Asian students in Florida. White interracial exposure and White enrollment decreased over time. The percent of enrollment, however, declined faster than interracial exposure, so the white interracial ratio slightly increased from 0.89 to 0.91 over time. Again, White interracial exposure means the percent of White students in the average non-White student’s school.

In the same way, this table shows that although Black students' enrollment increased over time, their interracial exposure decreased. As a result, the Black interracial ratio also decreased slightly, but it does not show big changes in all measures. In addition, White and Black students compose the majority of the student racial composition, but both interracial exposures decreased. On the contrary, although Hispanic and Asian students compose a small portion of student racial composition, their interracial exposure increased over time.

Generally, the average multiethnic interracial exposure decreased slightly, but it was over 0.9 for six years, and it means districts in Florida are almost approaching perfect desegregation.

Table 4.25 Interracial Exposure, Enrollment, and Interracial Ratio for Districts with TPSs only in Florida, Six-Year Average and 2005-2006 to 2010-2011

	2005	2006	2007	2008	2009	2010	Δ 6
	-2006	-2007	-2008	-2009	-2010	-2011	Years
White Interracial Exposure (%)	78.54	81.59	76.26	75.62	70.80	69.50	-9.04
White Enrollment (%)	81.70	84.78	80.47	78.84	73.29	72.81	-8.89
White Interracial Ratio	.961	.962	.947	.959	.965	.954	-0.007
Black Interracial Exposure (%)	8.62	7.16	8.30	9.55	9.25	9.05	0.43
Black Enrollment (%)	9.46	8.20	8.81	10.04	9.87	9.50	0.04
Black Interracial Ratio	.911	.885	.944	.955	.926	.959	0.048
Hispanic Interracial Exposure (%)	6.59	4.59	4.86	8.52	9.58	10.98	4.39
Hispanic Enrollment (%)	7.04	5.00	5.46	9.08	10.52	11.38	4.34
Hispanic Interracial Ratio	.956	0.946	0.927	0.954	0.867	0.980	0.024
Asian Interracial Exposure (%)	1.57	1.79	1.74	1.70	1.81	1.64	0.07
Asian Enrollment (%)	1.47	1.71	1.62	1.63	1.74	1.58	0.11
Asian Interracial Ratio	1.058	1.039	1.059	1.031	1.025	1.027	-0.031
Averages	0.972	0.958	0.969	0.975	0.946	0.98	0.008

*This table includes 33 observations with TPSs only during six years.

Table 4.26 Interracial Exposure, Enrollment, and Interracial Ratio for Districts with TPSs and Charter or Magnet Choice Policy in Florida, Six-Year Average and 2005-2006 to 2010-2011

	2005	2006	2007	2008	2009	2010	Δ 6
	-2006	-2007	-2008	-2009	-2010	-2011	Years
White Interracial Exposure (%)	50.13	46.17	53.00	50.36	50.42	52.41	2.28

Table 4.26 - Continued

	2005	2006	2007	2008	2009	2010	Δ 6
	-2006	-2007	-2008	-2009	-2010	-2011	Years
White Enrollment (%)	58.03	52.86	57.57	56.55	57.70	72.81	14.78
White Interracial Ratio	.852	.863	.906	.875	.880	.890	0.038
Black Interracial Exposure (%)	15.57	16.88	14.04	16.14	13.81	13.33	-2.24
Black Enrollment (%)	20.75	22.60	18.03	20.75	18.17	17.21	-3.54
Black Interracial Ratio	.818	.803	.846	.830	.816	.836	0.018
Hispanic Interracial Exposure (%)	15.66	18.16	15.44	16.89	15.25	15.67	0.01
Hispanic Enrollment (%)	18.77	21.57	17.95	20.15	18.49	18.71	-0.06
Hispanic Interracial Ratio	.880	0.884	0.929	0.883	0.862	0.900	0.02
Asian Interracial Exposure (%)	2.02	2.17	2.01	2.34	2.32	2.05	0.03
Asian Enrollment (%)	1.86	2.04	1.97	2.25	2.27	2.01	0.15
Asian Interracial Ratio	1.096	1.072	1.015	1.029	1.008	0.995	-0.101
Averages	0.912	0.906	0.924	0.904	0.892	0.905	-0.007

*This table includes 71 observations with TPSs and charter school choice policy, and 6 observations (St. Lucie) with TPSs and magnet school choice policy during six years.

Table 4.27 Interracial Exposure, Enrollment, and Interracial Ratio for Districts with TPSs, Charter and Magnet Choice Policy in Florida, Six-Year Average and 2005-2006 to 2010-2011

	2005	2006	2007	2008	2009	2010	Δ 6
	-2006	-2007	-2008	-2009	-2010	-2011	Years
White Interracial Exposure (%)	50.93	50.65	45.47	48.56	45.34	43.34	-7.59
White Enrollment (%)	57.09	56.98	51.12	54.57	50.80	47.65	-9.44
White Interracial Ratio	.890	.888	.890	.888	.885	.911	0.021
Black Interracial Exposure (%)	17.39	16.55	16.75	17.08	16.89	17.01	-0.38
Black Enrollment (%)	23.64	22.59	23.45	23.38	22.65	23.78	0.14
Black Interracial Ratio	.781	.785	.764	.781	.787	.764	-0.017
Hispanic Interracial Exposure (%)	14.70	15.64	15.95	16.78	17.29	19.67	4.97
Hispanic Enrollment (%)	16.94	17.94	18.46	19.33	19.52	22.15	5.21
Hispanic Interracial Ratio	.920	0.916	0.907	0.911	0.918	0.924	0.004
Asian Interracial Exposure (%)	2.16	2.29	2.36	2.53	2.50	2.29	0.13
Asian Enrollment (%)	2.05	2.17	2.20	2.40	2.39	2.15	0.1
Asian Interracial Ratio	1.056	1.050	1.066	1.047	1.037	1.046	-0.01
Averages	0.912	0.910	0.910	0.907	0.907	0.911	-0.001

**This table includes 118 observations with TPSs and both charter and magnet school choice policies during six years.

Tables 4.25, 4.26, and 4.27 show the interracial exposure, enrollment, and interracial ratio by ethnic group in districts with TPSs only, districts with TPSs and either magnet or charter school choice policy, and districts with TPSs and both magnet and charter school choices respectively. The White interracial exposure and interracial ratio are the highest in the district with TPSs only. The White interracial exposure in TPSs only districts is as much as 17.09% and 26.16% higher than that of districts with one of the school choice policies and districts with both school choice policies respectively during 2010-11. However, note that White enrollment decreased over time in all types of districts except in the district type with one of the school choice policies. White enrollment almost decreased about 10 percent in TPSs only districts and districts that adopted both school choices, but almost increased 15 percent in districts that adopted one of the school choice policies. Note that this district type includes one school district with TPSs and magnet school choice policy, so this means the percentage of White enrollment increased only in districts with charter school choice policy.

The Black interracial exposure is highest in the districts with TPSs and both school choice policies, and the percentage of Black students in the average non-Black student school is almost twice as large in districts with both school choice policies than in districts with TPSs only.

The interracial exposures for Hispanic show similar trends in districts with one of the school choice policies and in districts with both school choice policies, but both interracial exposure and enrollment show the highest increases in districts with magnet and charter school choice policies. Asian interracial ratios are over 1 in all district types, but this might be because their numbers are too small compared to the numbers of other racial groups.

When comparing interracial ratio, Black interracial ratio is the lowest in all types of school districts. Especially, the Black interracial ratio is 0.764 in districts with both school choice policies, and it is 0.959 in districts with TPSs only during 2010 to 2011, and it decreased in districts with both school choice policies over the six years. In other words, the percentage of Black students exposed to the other ethnic groups decreased from 2005 to 2010 in the district with both school choice policies.

In general, the tables indicate that the percentage of interracial exposure, the percentage of enrollment and interracial ratio by each ethnic group show differences within the each district type and between district types, but the average interracial ratio is over 0.9 in all districts types

during the last six years. And this means that although there might be an ethnic group which has had relatively low exposure to other ethnic groups, the average of the four ethnic groups' interracial ratio approaches almost perfect desegregation in all types of school districts in Florida. However, when the percentage of interracial exposure, the percentage of enrollment and interracial ratio are examined by each ethnic group, all the groups show the highest interracial ratio in districts with TPSs only, meaning higher desegregation, and they show the lowest interracial ratio in districts with school choice policy, meaning more segregated student composition than that in districts with TPSs only. This reinforces that magnet and charter school choice policy may be adopted to deal with more segregated schools in Florida school districts.

Table 4.28 Descriptive Statistics for 37 Districts, Six-Year Average and 2005-06 to 2010-11

Variables	Average	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Δ 6 Years
GINI index of income* inequality	.450	.448	.448	.449	.450	.452	.455	0.007
Median house income	45917	43026	45769	47879	48299	45367	45141	2115
Free/reduced lunch (%)	50.11	46.06	46.59	46.81	50.65	54.19	56.37	10.31
Private school enrollment (%)	8.90	9.55	9.35	9.02	8.90	8.46	8.13	-1.42
School year population (#)	79652	76525	77793	78909	78558	77478	88691	12166
Total schools (#)	73.59	69.32	69.76	75.16	73.73	75.03	78.54	9.22
English language learner (%)	6.17	4.62	4.90	7.89	7.78	5.87	5.97	1.35

*The GINI index ranges from 0 to 1, and a coefficient of 0 reflects a perfectly equal society in which all income is equally shared, and a coefficient of 1 represents a perfectly unequal society wherein one earns all income theoretically.

*School year population is the mean of the school year population in a district.

*The number of total schools is the mean of the number of schools in a district.

Table 4.29 Descriptive Statistics for Districts (No School Choice, TPSs only district), Six-Year Average and 2005-06 to 2010-11

Variables	Average	2005 -2006	2006 -2007	2007 -2008	2008 -2009	2009 -2010	2010 -2011	Δ 6 Years
GINI index of income inequality	.416	.413	.418	.407	.417	.426	.411	-.002
Median house income	48497	44857	50926	53115	48884	47544	47474	2617

Table 4.29 - Continued

Variables	Average	2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
Free/reduced lunch (%)	42.65	37.96	34.48	37.03	46.59	49.42	52.02	14.06
Private school enrollment (%)	5.31	5.88	5.89	5.12	4.72	5.52	4.74	-1.14
School year population (#)	22351	21128	23054	23714	20872	21667	24589	3461
Total schools (#)	22.18	20.71	22	24	21.83	22.6	23	2.29
English language learner (%)	1.50	1.16	0.81	1.28	2.37	1.73	1.73	0.57

Table 4.30 Descriptive Statistics for Districts (Magnet or Charter School Choice with TPSs), Six-Year Average and 2005-06 to 2010-11

Variables	Average	2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
GINI index of income inequality	.451	.453	.448	.444	.449	.449	.466	.013
Median house income	46532	43109	45562	47519	50378	46582	46479	3370
Free/reduced lunch (%)	49.91	47.87	49.89	47.56	50.19	51.70	53.60	5.73
Private school enrollment (%)	7.80	8.82	8.38	7.52	8.27	7.28	6.24	-2.58
School year population (#)	49112	62724	58855	41509	47934	46456	34588	-28136
Total schools (#)	45.70	57.31	52.58	39.93	45.82	44.36	31.8	-25.51
English language learner (%)	7.50	6.15	6.87	8.77	9.89	7.09	6.05	-1.10

Table 4.31 Descriptive Statistics for Districts (Magnet, Charter School Choice with TPSs), Six-Year Average and 2005-06 to 2010-11

Variables	Average	2005	2006	2007	2008	2009	2010	Δ 6
		-2006	-2007	-2008	-2009	-2010	-2011	Years
GINI index of income inequality	.460	.459	.458	.462	.460	.459	.460	.001
Median house income	44825	42207	44271	47041	46979	44248	44003	1796
Free/reduced lunch (%)	52.32	48.00	48.33	48.32	52.13	56.63	58.61	10.61
Private school enrollment (%)	10.57	11.62	11.05	10.95	10.51	9.83	9.75	-1.87
School year population (#)	114053	109890	107040	118087	112706	106945	127853	17963
Total schools (#)	104.75	98.53	95.68	111.89	104.65	103.57	112.41	13.88
English language learner (%)	6.68	4.88	4.95	8.63	8.25	6.22	6.89	2.01

Table 4.28 provides descriptive statistics on all variables used in analyzing school choice impacts on racial segregation for the 37 school districts in Florida. And Table 4.29 provides descriptive statistics for the no school choice with TPSs district, and Table 4.30 shows descriptive statistics for districts that have adopted either magnet or charter school choice with TPSs. Table 4.31 shows descriptive statistics for districts that have adopted both magnet and charter school choice with TPSs. For six years, all variables show a similar pattern of increase or decrease between districts, but the percentage of private school enrollment, school year population and total numbers of schools decrease in the districts with one of the school choice policies with TPSs, and school year population and total numbers of schools increase in districts without a school choice policy and districts with both school choice policies. Income inequality and median house income are highest in the TPSs only districts, and the percentage of students eligible for free or reduced lunch, the percentage of private school enrollment, school year population, total number of schools and the percentage of ELL show the lowest values in the TPSs only districts.

Interestingly, the numbers of total schools (45.70) and school year population (49112) in districts with one of the school choice policies are approximately twice as large as those (22.18 and 22351, respectively) in districts with no school choice policy, and those (104.75 and 114053, respectively) in districts with both school choice policies are approximately twice as large as those in districts with one of the school choice policies.

4.4 Regression Results of the Effects of School Choice Policy on Racial Segregation

The second research question investigates the effects of magnet and charter school choice adoption on the student racial segregation in the public school system in Florida with 37 school districts for six years, 2005-06 to 2010-11. The analyses were conducted with the estimation approaches of the Panel Corrected Standard Error (PCSE) analysis. Three different kinds of independent variables are used for measuring school choice policy adoption, choice availability (the percentage of charter and magnet schools), and degree of school choice involvement (the percentage students enrolled in magnet and charter schools) in separate models. And racial segregation is considered with the index of dissimilarity and exposure separately. Therefore, a total of 6 separate results were produced.

First of all, Hausman tests are conducted in order to determine whether a fixed effect model or a random effect model is appropriate. The test results of the Hausman indicate that errors are correlated with predictors in all models presented, which means that a fixed effect model is appropriate for the analyses. Next, three key assumptions in using panel data are tested. The assumption of cross-sectional independence is tested through the Pesaran Cross-sectional Dependence test. The assumption of homoscedasticity is tested through the modified Wald test, and finally the assumption of no first-order autocorrelation is tested by the Lagrangian-Multiplier test. As Table 4.32 shows, all six models estimating the impact of school choice policy on racial segregation reject the null hypothesis of homoscedasticity and no autocorrelation. Therefore, this study uses the Panel Corrected Standard Error (PCSE) analysis considering the complexity of the error process and providing unbiased results to solve those assumption violations.

Table 4.32 Results of Diagnostic Test with P-value

Diagnostic Test	H ₀	DI		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.152	.178	.152
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.014	.014	.013
Panel estimation		PCSE	PCSE	PCSE
		EI		
		Model1	Model2	Model3
Cross-sectional dependence test	Residuals are not correlated	.119	.113	.119
Heteroskedasticity test	Homoskedasticity	.000	.000	.000
Autocorrelation test	No autocorrelation	.006	.013	.011
Panel estimation		PCSE	PCSE	PCSE

*Model 1 indicates an estimation of the impacts of school choice adoption. Model 2 indicates an estimation of the impacts of the degree of choice availability, and Model 3 indicates an estimation of the impacts of the degree of policy involvement on student racial segregation.

Table 4.33 The Impact of School Choice Policy on Dissimilarity Index in 37 districts in FL 2005-06 to 2010-11

Dissimilarity Index			
Panel Corrected Standard Error (PCSE) Analysis			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with charter or magnet choice)	-.0015 (.018)		
-Type3 (TPSs with magnet & charter choices)	-.0825*** (.029)		
Degree of choice availability			
- % of magnet school		-.002*** (.000)	
- % of charter school		.0002 (.000)	
Degree of choice implementation			
-% of magnet school student			-.0007 (.000)
-% of charter school student			.0001 (.001)
Controls			
Income stratification			
-GINI index of income inequality	1.058*** (.115)	.895*** (.095)	.911*** (.098)
District economic status			
-Median house income (\$)	2.40e-06*** (7.06e-07)	3.65e-06*** (8.14e-07)	3.50e-06*** (7.97e-07)
- Students eligible for free/reduced lunch (%)	.0002 (.0007)	.0001 (.000)	-.0004 (.000)
- Private school enrollment (%)	-.006***(.002)	-.007***(.001)	-.009***(.002)
District demographic characteristics			
- % of minority			
- % of Blacks	.0023***(.0006)	.004***(.000)	.004***(.000)
- % of Hispanic	.0029***(.0005)	.003***(.000)	.003***(.000)
- % of Asian	.0046 (.0048)	.008 (.006)	.009 (.005)
- ELL (%)	-.0044**(.0018)	-.002 (.001)	-.002 (.001)
District size			
- School year population (log)	.0633*** (.025)	.060** (.025)	.054** (.023)
- Total numbers of school (log)	.0408 (.029)	.012 (.026)	.017 (.025)
Year06	-.005* (.003)	-.015***(.003)	-.015***(.002)
Year07	-.011* (.006)	-.027***(.005)	-.028***(.005)

Table 4.33 - Continued

Variables	Model 1	Model 2	Model 3
Year08	-.016**(.008)	-.034***(.007)	-.036***(.007)
Year09	-.017**(.007)	-.028***(.009)	-.028***(.008)
Year10	-.036***(.009)	-.047*** (.011)	-.046*** (.009)
Number of Obs	222	222	222
Number of Districts	37	37	37
R²	.675	.643	.634

*p<.10, **p<.05, ***p.<01

*Note: Numbers in parentheses are panel-corrected standard errors.

*The reference group is Type 1 meaning school districts with no school choice policy, and Type 2 means districts with a kind of school choice policy. Type 3 means a district with both school choice policies.

Table 4.33 shows the relationship between the adoption of school choice policy, degree of choice availability, and degree of policy involvement and the dissimilarity index. In other words, this table shows the impacts of school choice policy on the value of DI reflecting “the percentage of Black students who would have to be redistributed to have same percentage of Black students in each school as in the district as a whole” (Archbald, 2004). Again, DI means how much schools in a district achieved a balanced distribution reflecting the racial distribution of the district. Therefore, a district having a lower DI than the other districts that have smaller numbers of students would need to be redistributed between schools theoretically.

This table shows that when a district adopts both magnet and charter school choice policy, it has a statistically significant negative influence on DI. Note that although this table shows statistically significant negative impacts on DI, it means a more racially balanced racial composition between schools. In the same manner, a higher degree of magnet school choice availability lowers the DI value, and this also means that an increase of magnet schools in a district has a positive impact on the reflection of students’ racial distributions between schools in the district.

All other statistically significant variables show the expected relationship to DI. The increase in the percentage of minority students and income inequality increases the percentage of students who would need to be redistributed to achieve a balanced distribution reflecting district racial composition. Also, School year population has a statistically significant positive influence on the value of DI.

Table 4.34 The Impact of School Choice Policy on Exposure Index in 37 districts in FL 2005-06 to 2010-11

Exposure Index			
Panel Corrected Standard Error (PCSE) Analysis			
Variables	Model 1	Model 2	Model 3
Choice option availability			
-Type2 (TPSs with charter or magnet choice)	-2.809*** (.878)		
-Type3 (TPSs with magnet & charter choices)	-1.674*** (.648)		
Degree of choice availability			
- % of magnet school		.085** (.039)	
- % of charter school		-.072** (.031)	
Degree of choice implementation			
-% of magnet school student			.024 (.026)
-% of charter school student			-.134*** (.048)
Controls			
Income stratification			
-GINI index of income inequality	-21.36*** (7.67)	-26.76*** (6.53)	-28.59*** (6.81)
District economic status			
-Median house income (\$)	-.000 (.000)	-.000 (.000)	-.000 (.000)
- Students eligible for free/reduced lunch (%)	-.029 (.046)	-.070 (.059)	-.047 (.049)
- Private school enrollment (%)	.111**(.056)	.015 (.078)	.100 (.065)
District demographic characteristics			
- % of minority			
- % of Blacks	-.926***(.030)	-.926***(.040)	-.937***(.037)
- % of Hispanic	-.838***(.040)	-.840***(.039)	-.835***(.042)
- % of Asian	-1.813*** (.325)	-2.112*** (.360)	-2.180*** (.381)
- ELL (%)	-.1657* (.101)	-.1494* (.088)	-.1933** (.098)
District size			
- School year population (log)	.829 (.955)	.210 (1.05)	.365 (1.03)
- Total numbers of school (log)	-3.45***(1.12)	-2.545**(1.15)	-2.541**(1.14)
Year06	.147 (.147)	.252 (.156)	.266* (.137)
Year07	-1.73***(.376)	-1.77***(.320)	-1.74***(.337)
Year08	1.58***(.504)	1.79***(.450)	1.93***(.447)

Table 4.34 - Continued

Variables	Model 1	Model 2	Model 3
Year09	-2.51***(.495)	-2.21***(.544)	-2.14***(.512)
Year10	-1.99***(.553)	-1.54**(.631)	-1.51***(.563)
Number of Obs	222	222	222
Number of Districts	37	37	37
R²	.962	.961	.961

*p<.10, **p<.05,***p.<01

*Note: Numbers in parentheses are panel-corrected standard errors.

*The reference group is Type 1 meaning school districts with no school choice policy, and Type 2 means districts with a kind of school choice policy. Type 3 means districts with both school choice policies.

Table 4.34 shows the relationship between the adoption of school choice policy, degree of choice availability, and degree of policy involvement and the value of EI. Contrary to the meaning of DI, higher EI means higher exposure to other racial groups. Therefore, if Black students are concentrated in some schools, and have a lower chance to be exposed to White students, the value of EI decreases.

This table indicates that a district with school choice policy lowers the EI value more than the district without school choice policy. And Type 2 means districts with one school choice policies lower the value of EI more than the districts with both school choice policies. This might be because, although Type 2 means districts with magnet or charter school policy, the analytic sample has only one school district with magnet school choice only included as Type 2. Therefore, Type 2 means a district with charter school choice, and this helps to understand why a district with both school choice policies has a smaller negative impact on the value of EI than the district with charter school choice.

The result of Model 2 supports the possibility. Model 2 uses the percentage of magnet school and that of charter school to measure degree of choice availability, and the percentage of magnet school has a statistically positive influence on EI value, but the percentage of charter school has a statistically negative influence on EI value. This means that an increase in magnet school percentage in a district increases the percentage of Black students exposed to White students, and an increase in charger school percentage in a district decreases the percentage of Black students exposed to White students. In addition, the result of Model 3 shows that a higher degree of charter school policy involvement lowers the value of EI. And this means that an

increase in the numbers of students enrolled in charter school decreases the percentage of Black students exposed to White students. However, the degree of magnet school policy involvement does not have a statistically significant influence on EI value.

All other statistically significant variables show the expected relationships to the degree of minority student exposure to White students. Higher income inequality and higher percentage of minorities have a relationship to a lower EI value. School year population has a positive relationship to DI value, meaning an increase in school year population increases the numbers of students who would have to be redistributed to have same percentage of Black students in each school. And number of schools has a negative relationship to EI value, and it means that an increase in total number of schools in a district decreases the percentage of Black students exposed to White students.

4.5 Summary of the Study

4.5.1 School Choice Impacts on Student Performance in Public School System

This study investigates how school choice policy based on market competition theory impacts student performance for elementary, middle, and high school levels separately. This study only examined data for 2005-2011, a limited time period, and does not cover the earlier years when the school choice policies were actually adopted. So I am examining what impact these policies have over the starting points of school performance and racial integration. The results of the statistical analysis overall do not support the school choice rationales of a market-based approach. The school choice rationale expects that the education system based on market competition will increase productive and innovative behaviors against traditional bureaucratic public education and generate efficiency. And it expects that this change will produce changes in organizational conditions promoting learning, which in turn, will lead to better student outcomes. However, this study's results indicate that although school choice policy has statistically significant influences on student performance, both magnet and charter school choice adoption, with higher degrees of choice availability and higher degrees of policy involvement, are more likely to have statistically negative relationships to student performance in both reading and mathematics at all school levels, except reading performance for elementary level students.

Overall, this study found that school choice policies are associated with deterioration in student performance in the FL K-12 public school system, contrary to the expectation of school

choice policy adoption. However, these test results could mean that districts with a relatively lower percentage of students meeting state standards tend to adopt school choice policy more in response to demands to improve their education. Nonetheless, this study shows that adoption of school choice as well as an increase of choice availability and policy involvement did not produce better student performance over the time period of 2005-2011 in FL.

Although there are many studies that support the positive effects of school choice policy on student performance, the findings of this study, support the studies demonstrating no significant effects or negative effects. All the variables measuring school choice policy show negative influences on or associations with student performance. Districts with magnet school choice, districts with charter school choice, and districts with both school choice policies generally lower the student scores in both reading and mathematics tests at all school levels except reading scores at the elementary level. Also increases in magnet schools and charter schools are associated with lower student performance at all school levels and in both fields. Higher involvement of charter school choice lowers student performance in mathematics tests at the middle and high school levels, and higher involvement of magnet school choice lowers student performance in mathematics only at the elementary level.

4.5.2 School Choice Impacts on Racial Segregation in Public School System

This study examines how school choice policy impacts student racial segregation in Florida school districts. Some studies argue that school choice policy will contribute to racial integration by improving choice-ability in the education of minorities, while others argue that school choice may increase racial segregation by white-flight or cream skimming effects.

This study shows different results on racial segregation by school choice policy type. The study results on the relationship between school choice policy and the dissimilarity index indicate that magnet school choice policy lowers the value of DI, meaning it contributes to the reflection of a district's racial composition among schools within the district. Also, the study results on the relationship between school choice policy and the exposure index indicate that magnet school choice policy has a positive relationship to the value of the EI, meaning it contributes to an increase in the percentage of Black students exposed to White students.

However, the study results indicates that charter school choice policy has negative impacts on racial desegregation overall. Although districts with both magnet and charter school

choice policies have positive impacts on racial segregation, measured by DI, charter school choice policy does not have statistically significant influences solely. Also, charter school choice policy has negative influences on the value of EI, meaning it exacerbates the isolation of minority ethnic groups. Model 3's analysis of the relationship between school choice involvement and the value of EI supports this result. The higher percentage of involvement in charter school policy has a relationship to the lower percentage of Black students exposed to White students. And magnet school choice involvement does not show any positive or negative influences on the value of EI.

Although the descriptive analyses presented in this study show that districts with more school choice policy adoptions have higher values of DI and lower values of EI, after controlling district income inequality, economic status, demographic characteristics and size, this study shows different policy impacts on racial segregation from the adoption of magnet school choice policy or charter school choice policy.

CHAPTER FIVE

CONCLUSION AND DISCUSSION

5.1 Findings and Discussion

School choice policy has been adopted to improve the quality of public education based on the belief that creating a market-like education setting will foster innovative education and increase efficiency of behaviors in the public school system. However, there have been arguments criticizing the negative effects of school choice policy such as racial and socio-economic segregation, cream-skimming and cropping (Clotfelter, 2001; Lacireno-Paquet, et al., 2002; C. Lubienski, 2005; Renzulli, 2006; Renzulli & Evans, 2005; Choi 2012).

This study examines the policy impacts of school choice on the two outcomes of student performance and racial segregation.

First of all, this study shows demographic trends in magnet, charter and TPSs, by school levels. In Florida, the numbers of students enrolled in magnet schools are increasing steadily, but student enrollment in TPSs is decreasing at all school levels. Generally White students decreased in all districts at all school levels, but Hispanic students increased in all districts at all school levels. The percentage of White students shows the highest value in districts without any school choice policies, and the percentages of Black and Hispanic show the highest values in districts with both school choice policies.

Student test scores in reading are the highest in districts with magnet school choice policy at all school levels, and student test scores in reading are the lowest in districts without school choice policy at all school levels. Student test scores in mathematics show the same results as the reading test results. However, after controlling student characteristics, school and teacher characteristics, and district characteristics, adoption of school choice policy has a negative influence on student performance at all school levels and in both of the subject fields of reading and mathematics, except for the reading score at the elementary level.

Next, this study shows the school choice impact on racial segregation. The results indicate that the value of DI was 30.65 in 2005 and it decreased over the six years to 23.33 in 2010 in districts with no school choice policy. And the value of DI was 40.89 in 2005, but it did not change over the six years in the district with charter school choice policy. However, the value of DI increased from 38.81 in 2005 to 39.99 in 2010 in the district with both school choice

policies. The value of EI decreased from 54.21 to 47.25 in districts with no school choice policy during the six years, and the EI value in districts with both school choice policies decreased from 49 to 40.43 during that same time period. But the EI value of districts with a charter school choice policy increased from 48.48 to 51.53 during the six years. This means that schools in districts without a school choice policy approached a more racially balanced distribution among schools, but the percentage of Black students exposed to White students decreased over the six years. And the percentage of Black students who would have to be redistributed to have the same percentage of Black students in each school as in the district as a whole increased in districts with both school choice policies, and the percentage of Black students exposed to White students also decreased over the years. The results show that districts with more school choice policies have higher values of DI, lower values of EI, and a bigger standard deviation between schools. It means that school choice policies exacerbate racial segregation in school districts in Florida.

Nationwide, the 2000 Census shows that the Latino share of public school enrollment has almost tripled since 1968, compared to an increase of thirty percent in black enrollment approximately and a decrease of seventeen percent in white enrollment during the same time period (Grieco & Cassidy, 2001; Frankenberg & Lee, 2002). So, this study calculates multi-ethnic interracial index, and shows the differences in multi-ethnic interracial exposures and interracial ratios by school district types as follows: 1) TPS only district, 2) magnet or charter school with a TPS district, and 3) magnet and charter schools with a TPS district to more specifically investigate the overall racial desegregation by ethnic groups within the district. The results show that school districts in Florida are almost approaching perfect desegregation when the average of multi-ethnic interracial ratio is calculated, but each ethnic group shows differences in the degree of exposure to other ethnic groups.

In districts without school choice policy, the average interracial ratio shows the highest value, and it has the lowest value when a district adopts charter school or magnet school policies. It means that all ethnic groups are more exposed to the other ethnic groups in the district with no school choice policy, and the degree of exposure between the four ethnic groups is the lowest in the district with the one school choice policy. And the Black interracial ratio is the lowest in all types of school districts. Although the average interracial ratio is the highest in a district with no school choice policy, White interracial exposure and white enrollment increase only in districts with charter school choice policy during six years. This result supports the criticisms on school

choice policy especially related to charter school choice that it might be used for white flight, and will generate negative effects against racial desegregation. Frankenberg & Lee (2002) found decreasing black and Latino exposure to white students and declining white exposure to blacks and Latinos in large school districts nationwide. And they point out that this is because white percentage is small in large districts, and they tend to be concentrated in a few schools. In fact, I found white enrollment increases 14.78 percent in districts with charter school choice policy although white enrollment decreases 8.31 percent on average in Florida school districts for six years. This doesn't mean that white students are concentrated in charter schools exactly, but show that white students are increasing in school districts with charter school choice policy without magnet school choice policy. In large school districts that have both magnet and charter school choice policies generally, white student's interracial exposure to blacks, Hispanic, and Asian students and their enrollment decrease also, but it is not as much as in the districts with charter school choice policy only.

To examine the controlled impacts of school choice policy, this study examines district income inequality, economic status, demographic characteristics and district size by district types. The results indicate that districts with both school choice policies have higher income inequality and lower median house income than the other school district types, and the districts with no school choice policies have the lowest value of income inequality and the highest median house income among the district types. Also, districts with more school choice options have more population and more schools in their districts.

After controlling the characteristics of each district, this study reports the statistically significant negative influences of school choice policy on racial segregation. However, magnet school choice policy makes a slightly positive contribution to a balanced distribution between schools compared to a district's racial composition within the school district. Charter school choice policy does not have negative or positive policy impacts that reflect a balanced racial distribution between schools within districts. However, this result shows that school choice policy adoption deteriorates racial desegregation by lowering the degree of exposure of minority students to major ethnic groups. When magnet school choice policy is adopted with charter school choice policy, Black students in the district have a lower EI value than those in the district without school choice policy. But the EI value is higher than that of a district with a one school choice policy only. When considering that the analytic sample contains 65 charter schools out of

71, this study suspects that charter school choice policy exacerbates racial segregation more in districts with both school choice policies. This is supported by the test result that increases in the percentage of magnet schools have a positive impact, and increases in the percentage of charter schools have a negative impact on racial desegregation. Also, increases in student enrollment in charter schools also show a negative impact on racial desegregation.

When considering the impacts of magnet schools by school levels, magnet schools have increased more than magnet programs at elementary school level, and mathematics and science schools are the majority type of magnet school specialty areas. However, magnet programs have increased more than magnet schools at secondary school levels, and the international baccalaureate (IB) program is the most frequent type of magnet specialty programs. This might demonstrate that the magnet purpose of racial integration was more focused at the lower-grade levels, but academic performance was more focused at the higher-grade levels of magnet school. Also, the large increase in numbers of magnet programs that were not designed to eliminate racial segregation at high school level might reflect the increased demand for academic excellence.

Overall, school choice policy does not have a positive impact on either student performance or racial segregation. Rather, school choice policy has a negative impact on student performance, and charter school policy exacerbates racial segregation in school districts. Although magnet school choice policy shows a statistically significant positive impact on racial segregation, it does not show a big influence. Rather, considering that many of the magnet schools still have the purpose of racial desegregation in the community, the impacts from magnet school choice adoption are small and marginal.

5.2 Contributions and Limitations of This Study

First of all, while there are many studies that examine charter school choice impact on student performance or racial segregation, there are few studies that examine magnet school choice impact in Florida because the Florida Department of Education has collected magnet school data only since 2005. This study uses the latest data on magnet school choice policy, and reports recent policy impacts from magnet school choice policy by also considering the policy impacts from charter school policy. However, the data used for this study covers only a six year period of time, so the results of this study contribute to the examination of more associational

rather than causal relationships between school choice policies, student performance and racial segregation. Therefore, the study results show that districts with school choice policies have negative relationships to student performance and racial segregation problems, but it might be understood that districts could adopt school choice policies because they need to address student performance and desegregated school problems. Also, the six years examined in this study is a short period of time to transform school performance problems.

By considering the combined effects of charter and magnet school choice policy on the two policy goals, however, this study contributes to the reduction of the complexity and mixed results in the established studies on school choice policy impacts. The segregation impact of school choice policy is not clear because of contradictory research results. Actually, the results of this study show that each school choice policy influences racial segregation in different ways.

In addition, this study includes several measures to reduce the uncertainty of policy impacts on student performance and racial segregation. This study measures school choice policy impact in three ways 1) by policy adoption, 2) by degree of school choice availability, and 3) by degree of policy involvement. By measuring the school choice impact in several ways, this study adds more information on the school choice impacts of two different policy goals. Each measure shows different or congruous impacts on student performance or racial segregation. Therefore, this study shows the overall impacts from both magnet and charter school choice policies by utilizing a greater number of measures; school choice policies are generally associated with lower student performance no matter how they are measured. Higher involvement in magnet schools and a higher degree of magnet school choice-ability are associated with less racial segregation, but higher involvement in charter schools and a higher degree of charter school choice ability are associated with more segregation. Consequently, this study shows, in a more comprehensive way, how magnet and charter school choice policy impacts the public education system in Florida.

Also, this study includes multi-ethnic interracial exposure in addition to the traditional measure of racial segregation. This measure shows the changes in racial segregation by district types more specifically by enabling the examination of most of the population covering over 95% of the student population at the same time. However, these results cannot provide information about the relationship between school choice policy adoption and the racial segregation of multi-ethnicities.

Related to the understanding of this study, this study has another limitation. Although the average of the interracial ratio of 37 districts in Florida shows almost perfect desegregation from 2005 to 2010, this estimation only means the overall amount of desegregation within the district. In other words, the results shown in this study indicate the differences in the degree of racial segregation within the district by adoption of school choice policies or not. Therefore, there might be big differences between schools within the district, but the differences could trade off while calculating the district average. To reflect the differences between schools within a district, the average value of a district's standard deviation is included. This value, however, is also compared with the average values of each district type, so this gives information about overall differences between districts, but it does not show the differences between schools within districts.

Also, this study assumes that the competition effects from school choice policies are equal for all schools within the district. Although this study included the percentage of magnet or charter schools and the percentage of students enrolled in magnet and charter schools to reflect the differences in competition effects from school choice policy adoption in each district, the competition effects can be more or less based on the distance between schools. Therefore, if specific geographic information from each school is considered when measuring the competition effects, it will report a more accurate competition effect of the policy impacts of school choice policy on student performance.

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BIOGRAPHICAL SKETCH

Nayong Ryoo earned her Bachelor degree in Public Administration from Seoul Women's University in 2003, and she received her Master degree in Public Administration from Korea University in 2006. She joined the doctoral program in Public Administration and Policy at Florida State University in 2006, and worked for four years as a research assistant for Dr. Lance-de-Haven Smith, Dr. Robert Eger, and Dr. Guen-Hyung Lee.

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During her study at Florida State University, she was interested in policy analysis and policy evaluation, and public management. She paid attention to analyze policy outcome and performance with a case of Medicaid program and school choice policies, especially magnet school program and charter school program.