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PUBLIC SCHOOL RESPONSES TO CHARTER SCHOOL PRESENCE

A Dissertation
Presented to
The Academic Faculty

By

Nevbahar Ertas

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy in Public Policy

Georgia Institute of Technology and Georgia State University
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PUBLIC SCHOOL RESPONSES TO CHARTER SCHOOLS

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SUMMARY

Charter schools are one of the most recent education reform movements designed to increase innovation, accountability and competition. Since the adoption of the first charter law in 1991, the number of charter schools grew rapidly across United States. As charter schools continue to proliferate, their impact on the public education system is becoming an increasingly important public policy question. Charter school proponents argue that combined pressures of consumer choice and market competition will induce traditional public schools to respond by providing higher quality education and by promoting innovation and equity. Skeptics worry that charter schools pose risks of segregating students by race and economic level, and reducing per-pupil resources available to traditional public schools. This dissertation provides a systematic and comprehensive evaluation of the effects of charter schools on regular public schools by addressing the following questions: 1) How do the charter schools affect the racial and socio-economic distribution, student-teacher ratios and achievement of traditional public schools? 2) How do the size and scope of competitive effects vary according to different measures of competition?

This study uses two-period panel data from the National Center of Education Statistics' (NCES) Common Core Data (CCD) for traditional public schools in Florida, New Jersey, Texas and Ohio for the 1995-96 and 2001-02 school years. The rapid expansion of charter schools in these states in the last six to eight years resembles a quasi-experiment, and this study uses a variation of the difference-in-differences (DD) estimation strategy to compare changes in racial and ethnic distribution, student-teacher

ratios and achievement between the pre and post-charter legislation in public schools that do and do not face competition. Three competition specifications are used: having at least one charter schools in the same county as the public school, having at least one charter school within the 5-mile radius of the public school, and being located in counties where charter schools enroll more than the median percentage of public school students.

The findings from the study suggest that introduction of charter schools in the educational landscape has affected student distributions, and at least in some cases, student-teacher ratios and the performance of traditional public schools. Regression results suggest that charter schools contribute to declines in the share of non-Hispanic white students in traditional public schools in all four states. The results also show that charter schools contribute to the reduction of the share of free-lunch eligible students in traditional public schools in Texas, but increase the share of free-lunch eligible students in Ohio. In Florida, the models show a significant increase in the share of free-lunch eligible students only if the traditional public school has charter schools within its close proximity. Results for New Jersey are not significant. The analyses show mixed effects on student-teacher ratios in traditional public schools. Charter schools also seem to affect test scores in opposite directions across Texas and Ohio. The analyses show that the charter schools contribute to improvements in traditional public schools' pass rates in Texas, but public schools in Ohio experience overall negative effects. The findings highlight the importance of monitoring what will happen to non-choosers in traditional schools as well as the role of considering state context and empirical measures while generalizing from charter school studies

CHAPTER 1

INTRODUCTION

Policymakers seeking to enhance educational outcomes have adopted numerous choice policies designed to increase competition in public education. Charter schools are one of the most recent structural reform tools in the school choice movement designed to increase innovation, accountability and competition. They have quickly become popular and have rapidly increased in number. The earliest law was passed in 1991 in Minnesota, and currently more than 3,000 charter schools operate in 37 states and the District of Columbia, serving over 900,000 students ("The US Charter Schools", 2006, web source). As charter schools proliferate across the country, concern about their effects on the regular public schools grows. Despite this growing interest, most research on the effectiveness of charter schools focuses on how well charter schools educate their own students. The results are an inconclusive mix of positive, negative and mixed effects in both statewide and national studies (Bifulco & Ladd, 2004; Hanushek, 2002; Hoxby, 2001, 2004; Miron & Nelson, 2001; Nathan, 1996; H. Nelson, Rosenberg, & Van Meter, 2004; Zimmer & Gill, 2004). This dissertation focuses on the equally important, but relatively overlooked, systemic effects of charter schools on traditional public schools. Focusing on Texas, Florida, New Jersey and Ohio, I examine the pre- and post-charter legislation levels of racial and ethnic distribution, free-lunch eligible students, pupil-teacher ratio, and achievement in public schools, comparing changes in those schools that do and do not face competition. In order to investigate changes in these outcome measures, I build a number of charter competition measures to assign public schools into treatment and control groups. Then I estimate the difference between outcome measures before and after the adoption of charter legislation in each state for both groups of schools.

Statement of the Problem

Scholars on both sides of the school choice debate recognize that charter schools will not only affect their own students, but will also create systemic changes in the larger system of primary and secondary education, because public schools will respond to competitive pressures. The studies on the role of competition in education rely mostly on institutional theories of social change. Institutionalism is a very broad concept that encompasses many alternative perspectives; however, Peters (2000, p. 4) emphasizes that the most important argument binding various approaches is that structures do matter to outcomes (March & Olsen, 1984; North, 1990; Wood & Waterman, 1991). Public schools, as any other organizations, operate according to a set of rules and structures prevailing in their environments. According to the institutional framework, we need to change the institutions (rules and structures) to change educational outcomes. Traditionally, the education system in the United States is a governmental system and the school choice programs proposed and established in the United States are institutional reforms aiming to change the structure of public education by introducing market-like features in the system. The debate about the role of markets as a method of providing education is not new. In 1962, Milton Friedman advocated vouchers for parents to enable them to send ther children to schools of their choice in his classic book 'Capitalism and Freedom'. He argued that democratic control of schools creates government monopolies that do not allow benefits from competition.

Chubb and Moe (1990) reignited interest in market-based solutions to education problems by using a neo-institutional approach to frame their discussion about the problems of public schools. The authors compare public and private schools, and argue

that the problems of public education in the United States are caused by democratic institutions of governance. Democratic control under a governmental system requires many rules and regulations and this political process leads to excessive bureaucracy. The bureaucratic nature of schools prevents them from addressing parental demands and makes the schools inefficient. This line of reasoning is reminiscent of larger literature on public organization responsiveness. Savas (1987), for example, argues that public sector organizations are less likely to respond to their environments than private sector organizations, because private organizations must compete to produce higher quality and lower cost goods and services to stay in the market against their competitors. In contrast, public organizations do not need to compete to survive and thus are less responsive or even indifferent to their environments (Bast & Walberg, 2003). According to this perspective, in order to achieve more favorable outcomes, we need different systems of institutional control.

On the other hand, other researchers argue that public organizations can and do respond to their environments (Wood & Waterman, 1993). In the school choice context, Smith and Meier (1995) argue that public schools are capable of responding to their environments and they do respond by creating more bureaucracy. They see bureaucracy not as a cause of problems in public schools but rather as a response to parental demands of increased performance. The authors also question the benefits of creating competition to address parental demands. According to this alternative perspective, competition may promote further stratification, especially if parents value factors other academic performance (Smith & Meier, 1995).

Most of the literature on competition in education looks at the effect of private school competition on public school outcomes. Studies focused on private school competition have found varying results in different contexts. Henry and Gordon (2003, p. 5) summarize the general conclusion that can be drawn from the private school competition literature: 'The primary hypothesis of pro-market theorists, that is, greater competition for students leads to better student outcomes, remains open, with the evidence to date indicating that the differences, when found, run slightly in favor of competition.'

While the majority of the research focuses on private school competition, public schools may actually be more responsive to competition from charter schools. Private schools are still an alternative for a very limited number of public school students. The proportion of students in private elementary and secondary schools has changed little over the past 10 years (Wirt et al., 2005). The proportion of students served by the charter schools, on the other hand, has increased rapidly in the last 10 years. While there were no charter schools before 1991, in the 2001-02 school year, 2,348 charter schools provided instruction to 1.2 percent of all public school students ("The US Charter Schools", 2006; WestEd). The number of charter schools continues to accelerate. According to the Center for Education Reform (CER), the number of charter schools across the country increased by 11 percent from 2005 to 2006. Although they still serve a small proportion of students, charter schools have quickly become a center of attention in the education reform movement with their unique characteristics that differentiate them from the rest of public schools. Four points are especially worth mentioning (Anderson et al., 2000; CER, 2005).

First, unlike traditional schools, charter schools are independent public schools established under a charter contract with a designated charter school authorizer such as the local board of education or a specific charter authorization institution. Groups such as teachers, parents, or for-profit or non-profit foundations can operate them. Second, they are exempt from many regulations and restrictions that affect public schools, which make them much more flexible. Charter schools can design and implement their own curricula and use innovative teaching techniques or management practices. Third, charter schools have entirely different accountability standards. They operate under limited-term and performance-based contracts. The schools are accountable to achieve the performance goals listed in their charter at the end of the contract period to get a renewal of their contract (P. Hill et al., 2001). Finally, despite these distinctive qualities, charter schools are public schools, funded with public money on a per-pupil basis. When a student leaves a traditional public school to attend a charter school, public funding follows the student from one type of school to the other. Private schools may take students from public schools, but they do not directly influence public school budgets. Charter schools on the other hand directly influence district budgets. With the ongoing expansion of charter schools and given that they are funded by public money, they may be considered as more direct competition for public schools. Some charter advocates even argue that charter schools are specifically designed to extend the successful application of market-oriented practices in the public sector to the education arena. While charter schools are still public schools, the policy allows them to be free of bureaucratic constraints that affect other public schools and to develop creative, innovative curriculum or to use new teaching methods in hopes of attracting parents and students and becoming "public education's

R&D arm."[1] Charter schools are presented as laboratories that can test and find new and better approaches to education that may help transform the larger public education system (DOE, 2004).

Proponents of charter schools make several claims about the effects of increased competition. Bulkley and Fisler (2003) summarized different components of the charter school reform in the following figure, which provides an outline of the chartering process and the expected positive outcomes. Charter schools are designed to be accountable through both government and the markets. They must meet performance goals set by the government agencies that authorize them (Hill & Lake, 2002). However, as public funding comes with the student, and families choose to enroll their children in charter schools, a charter school is also accountable to parents. If a charter school fails to satisfy parents, it risks losing students and funding. Charter schools also have substantial freedom of action especially over curricular, staffing, and financial decisions (Hill et al. , 2001). Combination of freedom and accountability provide incentives and opportunities for charter school leaders to use innovations to increase quality (DOE, 2004). Bulkley and Fisler (2003, p. 319) summarize the anticipated desirable outcomes as improved student achievement in charter schools, higher parental and student satisfaction, higher teacher satisfaction through empowerment, positive effects on the broader system of public education and positive or neutral effects on educational equity. This study focuses on the last two outcomes regarding the systemic impacts on the broader system of public education.

1 The phrase is taken directly from U.S. Secretary of Education's Foreword to Innovations in Education: Successful Charter Schools report (in Foreword by Rod Paige, U.S. Secretary of Education).

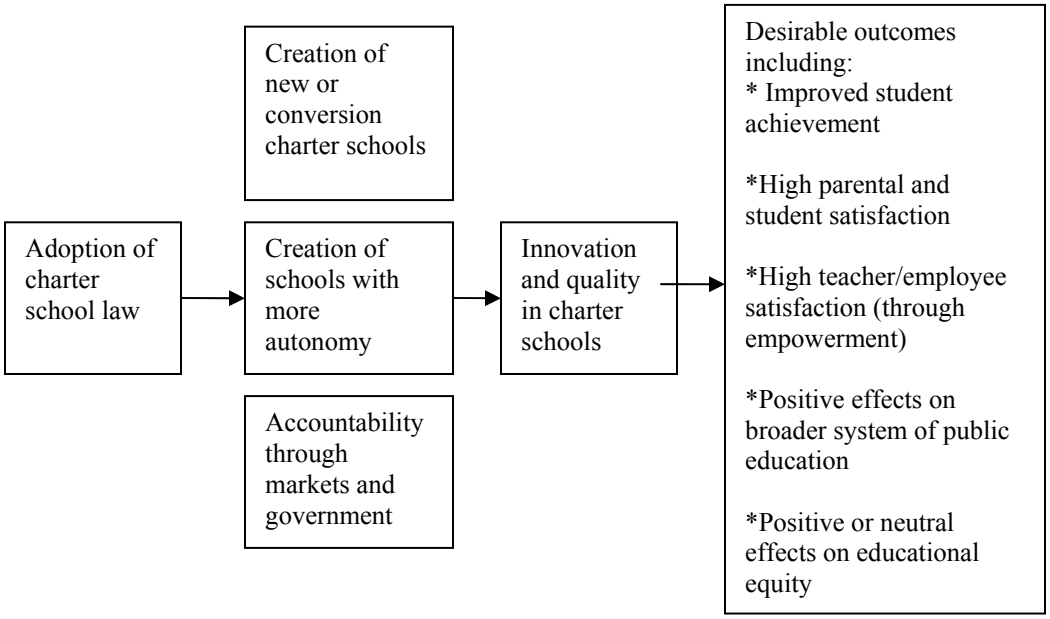


Figure 1.1. Common Elements of Charter School Theory, adopted from Bulkley and Fisler (2003).

Competition and market-based theories, however, are not the only reasons underlying support for charter school movement and systemic effects argument. Some advocates of the choice approach envision choice schools as a means of improving educational opportunities for disadvantaged groups and eliminating existing segregation in the public school system (Coons & Sugarman, 1978; Jencks, 1970). Unlike regular neighborhood schools, charters are generally open to all students, including those residing outside their district. Therefore, charter schools allow students in poor neighborhoods to switch to schools with more affluent peers. In this context, charter schools have the potential to reduce the prevailing racial and class inequalities by detaching where students go to school from where they live (Greene, 2000; Hassel, 1999; Viteritti, 1999).

Others see school choice as a means of individual growth. According to this approach, individual differences in needs, interests and learning styles require diverse, creative and innovative alternatives for education, and flexible charter schools may cater to different needs of families and students (Bulman & Kirp, 1999; Goldhaber, Guin, Henig, Hess, & Weiss, 2005; Henig & Sugarman, 1999).

Opponents of school choice argue that the economic theory is not completely relevant to education markets, because of the public good characteristics of education and the problems associated with creating a competitive market for schooling (Betts, 2005). According to economic theory, in a competitive market, producers compete to produce better products and services at lower costs, and this gives consumers greater selection of products at lower prices. Consumers can shop around to compare price and quality to make optimal decisions, and individual decisions by producers and consumers in a free market create efficiency without government intervention. However, perfectly competitive market model assumes a market for a homogeneous commodity and no externalities in production or consumption. An externality occurs when a decision causes costs or benefits to third parties. Some argue that education is different from other material goods that are privately purchased or consumed, because consumption of education affects the broader community by increasing the quality of the workforce, national human capital and civic leadership, or by decreasing crime and poverty (Henig, 1994; Labaree, 2000). For private good with positive externalities, economic theory predicts market failures in the form of underprovision and underconsumption (Goldhaber, Guin, Henig, Hess, & Weiss, 2005).

Other scholars argue that adopting market-based school choice can have unintended consequences. First, charter schools drain resources from traditional public schools. Operating a school requires some fixed costs regardless of the number of students served. The funds transferred to charter schools may exceed the marginal costs of providing schooling and the lost resources may reduce the funding allocated to the classroom instruction. Additionally, if student and teacher turnover increase with extended choice, this may also create additional educational inefficiencies (Goldhaber, Guin, Henig, Hess, & Weiss, 2005). Second, charter schools may lead to increased segregation of students by ability, race or class. If better students leave traditional public schools, non-choosers may be deprived of positive peer effects. To the extent that parents rely on racial and socio-economic composition of schools, rather than academic outcomes, to make enrollment decisions for their children, we may observe further balkanization in public schools.(Cobb & Glass, 1999; B. Fuller, 2000; Wells, 2002; Wells, Holme, Lopez, & Cooper, 2000).

Finally, some scholars also voice concerns regarding the role of public schools in civic education. Public schools act as critical components of civic democracy in United States by offering common educational and cultural experiences to students and preparing them as future citizens. Fuller (2000, p. 4), for example, argues that by decentralizing authority through charter schools from the state to groups of parents and charter school leaders with private interests, the strength of the public authority and the common values maintained by that authority erode. Similarly, Abernathy (2005) states that choice schools create a disconnected school system by allowing the most involved parents to leave public schools for charter schools. The author argues that the drain of

civic engagement hurts traditional schools and will have critical implications for the future of citizenship and American democracy.

In sum, charter competition can induce change in public schools in three primary ways. First, flexible and innovative charter schools may act as incubators of new ideas and approaches, and regular public schools can adopt these changes (Nathan, 1996). Second, because losing students has direct financial effects, public schools have an extra incentive to adopt better programs and increase performance (Hoxby, 2003). Third, public schools may change if charter schools influence the student composition of public schools by absorbing more disadvantaged or problematic students (Vanourek, Manno, Finn, & Bierlein, 2000) or by attracting the best and brightest students (Wells, Holme, Lopez, & Cooper, 2000).

This research provides an empirical account of changes in outcomes in traditional public schools in four states that experienced competition from charter schools in 1995 to 2001. I use a difference-in-differences design to compare the pre-charter legislation and post-charter legislation trends in public schools, focusing on the following questions. 1) How do charter schools affect the racial, ethnic and socio-economic distribution of the traditional public schools? 2) How do charter schools affect the resource levels of traditional public schools? 3) How do charter schools affect the performance of traditional public schools? 4) How do the size and scope of competitive effects vary according to different formulations of competition?

Contributions of the Dissertation

Policy-makers need empirical data on which to base their decisions on charter school reform. Charter schools' effects are not limited to students who attend them. Understanding the full-range of impacts created by charter schools is crucial to produce sound and effective policies. Teske and Schneider (2001, p. 626) conclude their article What Research Can Tell Policymakers about School Choice, where they review more than a hundred papers on school choice, by pointing to the need for studies that link stratification to specific forms of choice:

> "…Better empirical data on the effects of choice on non-choosers and those left behind are needed. This means that one of the most critical elements of choice involves the degree to which choice stimulates competitive improvements in the non-choice schools and the degree to which these gains are accompanied by more or less stratification along race, SES, or other lines… (626)"

Previous research examining the systemic effects of charter schools is scarce, mostly confined to a single outcome and a single measure of competition. This study builds on the previous research, but uses a quasi-experimental approach based on panel estimates and addresses multiple areas of potential impact using multiple measures of competition. The two important advantages of panel data analyses are the ability to study dynamic relationships and the ability to control for some omitted variables.

Empirical evaluation of competition has many methodological complications due to selection problems (Goldhaber & Eide, 2003). In analysis with non-experimental data, participation in the policy, program or treatment is not random. For example, at the individual level, unobserved differences such as parental support may affect a student's

choice to attend a charter school as well as his performance. At the school level, a charter school may specifically target a low-performing area to locate. The literature on the systemic effects of charters on regular public schools has produced inconsistent findings. Many factors such as the type of data, definition of the variables and the statistical methods may affect findings about the charter schools' effects. In order to deal with these methodological problems, I use two strategies. First, I use multiple measures of charter presence based on both enrollment and spatial position (via geocoding). I discuss these measures in detail in the next chapter. Using multiple distance-based and enrollment based measures allowed me to test the sensitivity of the changes in specifications. Second, I use data from four different states, which allows me to observe different contextual effects. Both difference-in-differences approach and the geo-coding of schools are useful in teasing out the effects of the policy and providing a better understanding of the size and scope of competitive effects.

Briefly, this dissertation provides a systematic and comprehensive evaluation of the effects of charter schools on regular public schools. As the charter movement grows and matures, the questions about changes in the racial and socioeconomic distribution of students, pupil-teacher ratios and academic performance become increasingly critical. The empirical evidence is not adequate to confirm the theoretical claims about the potential segregation and resource draining effects of charter schools. The findings from the current study investigate whether some of the concerns raised by critics of charter schools have been realized.

Overview of the Chapters

The rapid expansion of charter schools in Florida, New Jersey, Texas and Ohio in the last six to eight years resembles a quasi-experiment that provides a valuable opportunity to test the effects of charter school reform and to explore the research questions posed in this study empirically. This dissertation is structured as follows.

In the next chapter, I will discuss my research methodology, data sources and empirical measures. The variations in state laws also have direct implications for the charter schools' impact on the public education system. The laws have different regulations concerning the number of charter school authorizers, caps on the number of schools, and variety of applicants (CER, 2004). Such constraints may limit the potential competitive pressures created by charter schools. I will briefly review some of the variations in the charter laws and educational histories of the four states in the study before the discussion of empirical results in the following chapters.

In chapters 3, 4 and 5, I present my results on the racial and ethnic distribution and socio-economic segregation, student-teacher ratio, and academic outcomes respectively. Each chapter will begin with a review of the relevant literature, and followed by the empirical results. I will end the dissertation with a conclusion chapter, which includes a summary of the primary findings and a discussion of the limitations, conclusions, and possible extensions to the research.

CHAPTER 2

METHODOLOGY

I use a variation of the difference-in-differences (DD) estimation strategy to study the effect of charter schools on my outcome measures. The difference-in-differences estimator models a treatment effect by estimating the difference between outcome measures at two time points for both the treated and the control observations and then comparing the difference between the groups (Buckley & Shang, 2003; Card & Krueger, 1994).

The expansion of charter schools in Texas, Florida, New Jersey and Ohio in the last six to eight years resembles a quasi-experiment that provides a valuable opportunity to employ the research design. The study uses two-period school-level panel data for these four states, which were selected from states that adopted charter school legislation before 1998, that had no charter schools in 1995, and had more than 50 operational charter schools in 2001.[2]

Endogeneity is a common problem in this type of educational policy and program evaluations that use observational data. The main problem stems from the fact that the units of observation may not be randomly assigned to participate in the policy or program in question. In the context of this study, changes in the proportion of white and free-lunch eligible students, student-teacher ratios or test scores in nearby public schools may actually represent pre-existing trends that are also driving the location of charter schools.

[2] There are six states that satisfy these criteria: Florida, Texas, New Jersey, North Carolina, Pennsylvania and Ohio (PPSS, 2004). Four states in the study were selected to maximize diversity with regard to geography, social and political context, and legislative variations. Each state is located in a different Census region. Texas is in west south central division, Florida is in south Atlantic division, New Jersey is in middle Atlantic division and Ohio is in east north central division. The legislation and the history of charter schools in each state are discussed in the last section of this chapter.

The difference-in-differences estimation method provides a simple and powerful technique for estimating treatment effects with observational data (Buckley & Shang, 2003). As the models compare the difference between groups of schools, as well as the difference of pre- and post-charter legislation measures, time-invariant factors that may have affected both the outcome measures and charter school location are differenced out.

Although the DD method circumvents many of the endogeneity problems, the method also has its limitations (Bertrand, Duflo, & Mullainathan, 2001; Meyer, 1995). A main concern regarding validity is the potential endogeneity of the treatment. The model treats the policy change as exogenous. This assumption may not be correct if policy change is correlated with some unobserved determinants. Another maintained assumption of the model is that of similar time effects across treated group and controls. This assumption may not be realistic if other changes such as a change in economic conditions influence groups differently. Aside from concerns regarding treatment, some researchers also point out issues relating to the standard error of the estimate. DD estimates rely on simple OLS regression and if there is severe correlation among outcomes, the estimated standard errors can understate the standard deviations (seeBertrand, Duflo, & Mullainathan, 2001 for a detailed discussion)

Despite its limitations, the difference-in-differences estimation strategy is used in a number of studies that focus on the evaluation of policy impacts (Buckley & Shang, 2003; Card & Krueger, 1994; Dee & Fu, 2004; Hoxby, 2001; Ross, 2005). Bertrand, Duflo and Mullainathan review ninety two papers using DD estimates published in six journals between 1990 and 2000. (Bertrand, Duflo, & Mullainathan, 2001). Other commonly used treatment effects strategies that aim to correct for selection

bias include instrumental variables approach and propensity score matching. The difference-in-differences model provides a straight forward estimation technique to study treatment effects with observational data, especially when identifying appropriate instrumental variables is difficult and matching leads to substantial loses in the number of cases. The model used in this study differs from the traditional difference-in-differences setup in some ways. In this study, I compare the outcome measures in public schools facing charter school competition and other public schools, before and after the adoption of charter school legislation in the state. The definition of the treatment condition is a key concern in difference-in-differences estimates. Previous research utilizing variants of the estimator generally use observations from some other control state (Card & Krueger, 1994; Dee & Fu, 2004). The selection of the control state is very important, as the model assumes that the contemporaneous changes in the control state reflect the similar unobserved and time-varying determinants of the treatment state. As there are many variations in the charter laws and educational histories, as well as regional demographic trends in different states, I employ a number of competition criteria within the same state to assign schools to treatment and control groups. This ensures that both the treatment and the control schools are affected similarly by unmeasured factors such as other statewide policies. Because the states have very different contextual dynamics, analyses are run separately for each state.

In some other respects, the design in the current study follows the traditional difference-in-differences set-up. I use county level, spatial and enrollment-based measures of charter exposure to group public schools and examine the changes between pre- and post-charter legislation. While these measures cover several ways to measure the

charter school effect, they are dichotomous measures. I considered using continuous measures of competition in the model to allow a different effect by the number of charter school or to observe the marginal effects of increased enrollment; however, such a modification would mean assuming a state effect for having any charter school and concentrating on incremental changes. My main interest in this study is to examine the aggregate effect over this period, not the incremental effects. In addition, the use of multiple measures allows me to observe variation in the charter effect measured in different ways. Therefore, I decide not to assume such a general state charter effect and use the traditional two-way assignment. In the next section, I discuss these measures in detail.

I begin the analysis by investigating the basic means estimates for groups of schools during this period. In order to control for county level factors, I use a school and year fixed effects regression model[3]. The model takes on the following form:

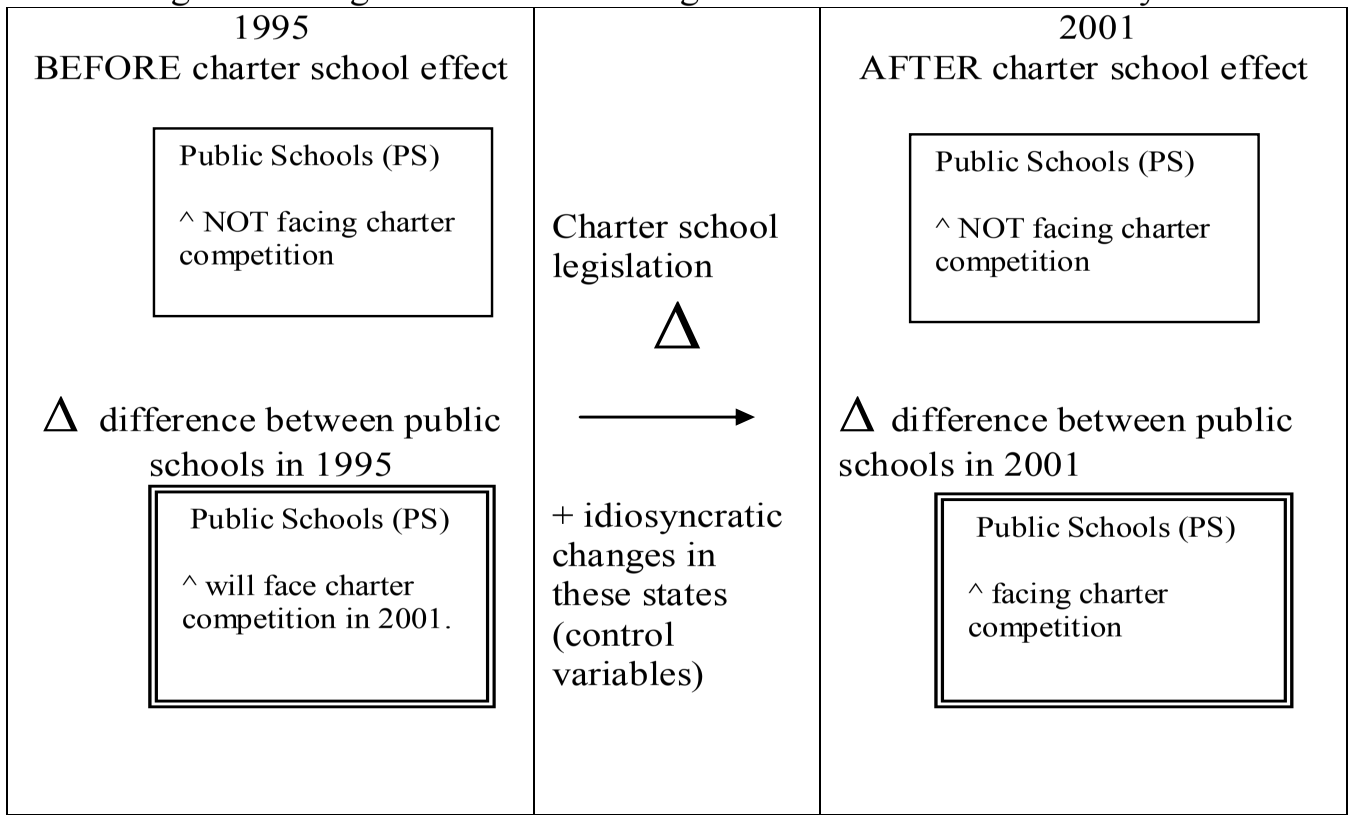
$$Y_{it} = \beta_0 + \beta_1 X + \beta_2 T + \beta_3 (T * C) + \varepsilon_{it}$$

where Y_{it} is the dependent variable for school i in year t, T is a year dummy coded 1 for observations in 2001-02 school year, X is a vector of control variables and C is the competition measure. The parameter of interest is on the interaction term (T*C). The

[3] The dependent variables are changes in outcome measures between 1995 and 2001. The fixed effects regressions in the dissertation were estimated using the 'areg, absorb' command in Stata on data in the long format. This is equivalent to adding a dummy for each school, but the value of each school coefficient is not shown.

coefficient β_3 measures the changes unique to schools that face competition after the introduction of charter schools. Figure 2.1 illustrates the general research design.

Figure 2.1. Figural Model Outlining the Framework for the Study



Charter specific effect $(\gamma) = (PS_{2001,\ CS} - PS_{2001,\ not}) - (PS_{1995,\ CS} - PS_{1995,\ not})$

Data Sources

The data come from multiple sources. The primary data is school-level two-period panel data on public schools in Texas, Florida, New Jersey and Ohio, drawn from the Common Core Data (CCD) for the 1995-96 and 2001-02 school years (DOE, 2002). The CCD is the Department of Education's primary database on public elementary and secondary education in the United States. Five annual surveys are sent to state education departments. State education agencies compile the requested data from their administrative records and send the records to the National Center of Education Statistics (NCES). The five surveys cover public school universe, local education agency (school district) universe, state aggregate fiscal and non-fiscal data and school district fiscal data. The school-level data include information on school location and type, enrollment, grades served, student characteristics and the number of classroom teachers.

Table 1 summarizes the information on the number of public and charter schools and charter school legislation in these states, and the number of schools included in the study. The first data period represents the last year before any charter schools were established and the second data period is the data from the recent post-treatment environment that can be matched with current county-level data. After I extracted all the schools from each state for pre- and post-legislation periods, I eliminated charter, special, vocational, and other alternative schools. I also reviewed the names of the schools and highest grade served. The schools whose name contained the following character strings are also eliminated from the analyses: juvenile, detention, det., evening, program, center, office, hospital, homebound, teleteaching, special, headstart, deaf, blind, kindergarten and early childhood. Then, I deleted the schools that were not operational for both years, as

they cannot be used for panel estimates. This reduced the sample size slightly to 5775 regular schools that were operational in both periods in Texas, 2248 schools in Florida, 2086 schools in New Jersey and 3457 schools in Ohio.[4] See table 1 for number of all schools and number of schools included in the study.

Table 2.1 Summary Information for the States: School Year 2001-02

State	**Number of public elementary and secondary schools**	**Number of charter schools**	**Percentage of Students in Charter Schools**	**Number of schools in the study**	**Year Law Passed**
United States	84,919	2,348	1.2		
Florida	2,992	192	1.6	2,248	1996
Ohio	3,700	85	1.2	3,457	1997
New Jersey	2,271	51	0.9	2,086	1996
Texas	6,715	243	1.1	5,775	1995

SOURCE: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 2001–02.

Outcome Measures

The outcome measures for this analysis cover three areas: racial, ethnic and socio-economic composition of public school students, the student-teacher ratio in the public schools and academic performance of public schools.

The first dependent variable is the percentage of students who are non-Hispanic white. I used percentage of non-Hispanic White students as the outcome variable to track the changes in the concentration of minority and non-Hispanic white students. This is a commonly used and reported education indicator, also featured in the Department of

[4] Most schools excluded from the analyses include non-traditional schools like kindergartens, juvenile facilities and facilities for special populations like the deaf or the blind. As such, they were more likely to serve non-traditional grade levels.

Education's publications as an important indicator of the condition of education in the United States (Wirt et al., 2005).

The second dependent variable is the percentage of students who are eligible for free lunch[5]. Eligibility for the free lunch program provides a proxy measure of low-income family status. It is a commonly used and reported education indicator. Previous research found an association between higher percentages of students who are eligible for free or reduced-price lunch and lower average academic scores in schools (NAEP, 2004).

The third dependent variable is the student-teacher ratio. Student-teacher ratio is used to measure the level of human resources input in terms of number of teachers in relation to the size of the student population and thus student-teacher ratio is both an indicator of class size and resource levels of schools (NCES, 2005). These three outcome measures are available in the Common Core Data.

In chapter 5, I discuss academic outcomes. I used publicly available school-level average test scores in Texas, Ohio and Florida to replicate the models used to analyze student compositions and student-teacher ratio in the earlier chapters. Although test scores are one of many aspects of quality, many researchers have used test scores as an indicator of school quality and academic achievement. I have used several outcome measures using the available data. The data for this section comes from state Departments of Education of Texas, Ohio and Florida. For Texas, the dependent variables are overall passrate and math pass rate for each school on the Texas Assessment of Academic Skills (TAAS) test. For Ohio, four dependent variables used in the analyses are the percentage that passed standardized statewide tests in math and reading at grade 4 and grade 10. The

[5] Students who are eligible for reduced price-lunch are not included to make the outcome measure more stringent.

only publicly available school level data that covers 1995 to 2001 in Florida is the Florida Writing Assessment program (FWAP), which is scored on a scale of 1 to 6. The dependent variables for these models are the percentages of students who scored 4 or above at grade 4 and 10 in the FWAP.

Control Variables

Many social and demographic characteristics are likely to influence the outcome measures, such as the racial composition of the local population and levels of poverty. To control for other county level factors that may cause changes in the dependent variables in this period, the models include county-level economic and demographic indicators based on theory and literature. Most demographic indicators are chosen to reflect the changes in the school aged population. I have used data from Small Area Income and Poverty Estimates of the U.S. Census Bureau (2006) and merged these variables into the Common Core Data files. The school-level CCD files do not include county identifiers, but I generate county identifiers by using the district-level CCD files that include county identifiers. These controls are the log of real median household income, the percentage of 5–17 year olds who are in poverty, the percentage of the 5–19 year old county population who are white non-Hispanics and the logarithmic transformation of total county population.

Charter schools are alternatives to private schools as well as to other traditional public schools. Changes in the size of the private school population may also be affect outcome measures; therefore, I have also included the proportion of private school enrollment per county as a control. In order to calculate what percentage of students attend private schools within a county, I use the Private School Survey (PSS) data from

1995-96 and 2001-02 school years. PSS data is collected by NCES and includes total number of private schools, teachers, and students.

Measures of Competition

The geographic location of the charter schools is critical to understanding their full effects on public schools. In the United States, most students attend schools that they are assigned to on the basis of where they live (Henig & Sugarman, 1999). Although many households choose their residence by considering school quality, location and convenience are important factors in school choice (Henig & MacDonald, 2002). Kleitz (2000) found that location is an important determinant of charter school selection by parents, especially for minority and low-income households (Henig & MacDonald, 2002; Kleitz, Weiher, K., & R., 2000). Buckley and Schneider (2002) study how parents search for information on a website about charter schools in Washington DC and found that most parents look at a map of the school, but very few actually examine information on quality of teachers or academic achievement scores (Schneider & Buckley, 2002). Although charter schools are open to students from outside the school district, the transportation cost of switching to distant schools would be higher (Henig & MacDonald, 2002). Studies focusing on charter school competition use different enrollment-based and spatial measures to characterize charter school effect. Some studies focusing on states with considerable charter enrollment use percent of students enrolled in charter schools to characterize charter presence (Booker, Gilpatric, Gronberg, & Jansen, 2004; Hoxby, 2001; Ross, 2005; Sass, 2006). Many recent studies focus on spatial measures either with simple dummy variables indicating charter presence in the district, county or vicinity of the public school or with a count measure (Bettinger, 2005; Bifulco & Ladd, 2006;

Bohte, 2004; Eberts & Hollenbeck, 2002). Dee and Fu (2004) use an innovative difference in differences design, comparing New Mexico and Arizona public schools. As New Mexico did not have any charters during the study period, these observations acted as controls and Arizona schools in post-charter legislation period acted as a measure of competition. Table 2.2 provides summary information on the several measures used in the previous studies that focus on the impact of charter schools on traditional public schools.

Table 2.2. Charter Competition measures used in the literature

State	Authors	Competition measure
Studies focused on achievement outcomes		
MI AZ	Hoxby (2001, 2003)	- dichotomous variable for 6 percent or more charter school enrollment in the district
MI	Eberts & Hollenbeck (2002)	- dichotomous variable for presence of a charter school in the district
MI	Bettinger (1999, 2005)	- number of schools within 5-mile radius of a public school
NC	Bifulco & Ladd (2004)	- 3 dichotomous variables based on distance (the school attended by the student is within 2.5 miles of a charter school, between 2.5 and 5 miles of the nearest charter school, and between 5 and 10 miles of the nearest charter school) - 3 dichotomous variables based on number of schools (the school had one, two, or more than two charter schools located within 5 miles)
NC	Holmes, DeSimone & Rupp (2003, 2006)	- the distance between the public school and the closest charter school
TX	Bohte (2004)	- dichotomous variable for presence of a charter school in the district - number of charter schools in the district
TX	Booker, Gilpatric, Gronberg and Jansen (2004)	- the percent of public school students in a district that attend a charter school - the sum of net flow of students in the current year and all previous years.
FL	Sass (2006)	- presence of nearby charter schools - the number of competing charter schools - enrollment share of charter schools
Studies focused on racial and ethnic distribution		
AR	Dee and Fu (2004)	-comparison of New Mexico schools to Arizona schools (As New Mexico did not have any charters during the study period, these observations acted as controls and Arizona schools in post-charter legislation period acted as a measure of competition)
MI	Ross (2005)	- dichotomous variable for presence of single or multiple charter school in the district -dichotomous variables indicating that the charter schools account for below or above 7 percent of district enrollment

Following the literature that points out the importance of location in school choice, and the previous studies focusing on competition effects, I mostly rely on spatial measures to evaluate whether schools face competition from charter schools. I experimented with different criteria to assign schools to groups. In three specifications, I count a school as facing competition if at least one, five or nine charter schools operated in the same county and compare them with other schools. These specifications produced similar results.

Because counties vary widely in size, the number of schools per county may not reflect the actual competitive pressure some schools face. I add geographic variables to group schools based on spatial proximity. Latitude and longitude of each school were added to the CCD data starting with 2000-01 school years. The missing latitude and longitude values in Texas are extracted from the geospatial school data from Texas Education Agency (TEA, 2005). For missing values in other states, the geographic coordinates are imputed by directly contacting the schools, confirming their geographic location and geo-coding from the addresses.[6] I use a spatial equation to convert latitude and longitude differences between public and charter schools into actual distances in miles on the surface of the earth.[7] I use these distances to count the number of charter schools within 5 and within 10 miles of each traditional public school. These two spatial specifications produce similar results.

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[6] *Tele Atlas'* Eagle Geocoding Technology is used, For more information on this software, see http://www.geocode.com.

[7] The equation is used is as follows:
Distance = 180/p * (ACOS ((SIN(p/180*lat_1) * SIN(p/180*lat_2)) + (COS(p/180*lat_1) * COS(p/180*lat_2) * COS(p/180*ABS(long_1 - long_2))))) * 69.11
;where lat_1, long_1 and lat_2, long_2 are the latitude and longitudes of two points. It is multiplied by 69.11, which is the approximate number of miles per degree on the earth.

Although enrollments in charter schools still represent a minor portion of the total county enrollment in these states, I also use the share of public school population enrolled in charter schools as an alternative measure. I categorize the counties as high enrollment and low/ no enrollment, based on the percentage of public school students that are enrolled in charter schools in 2001. I used the median value enrollment share of counties that at least had one charter school in 2001 to compare schools located in those counties to others.[8]

I report results from three competition specifications. The first treatment group includes traditional public schools that have one or more charter schools in the same county (3370 schools in Texas, 1982 schools in Florida, 1651 schools in New Jersey and 1729 schools in Ohio). The second treatment group includes traditional public schools that have at least one charter school within their 5-mile radius (2687 schools in Texas, 1414 schools in Florida, 1154 schools in New Jersey and 1293 schools in Ohio). The third treatment group includes traditional public schools that are located in counties where charter schools enroll more than the median percentage of public students (1586 schools in Texas, 1110 schools in Florida, 783 schools in New Jersey and 976 schools in Ohio). Table 2.3 provides a list of all variables used in the models and their descriptions.

Table 2.3 List and Description of All Variables used in Regression Models

[8] Some studies of charter school competition use charter enrollment share as a measure of competition (Sass, 2006; Ross, 2005; Booker et al. 2004; Hoxby, 2001). I dichotomize the enrollment share to be able to assign schools to treatment and control schools. One possibility was to use the 6 percent measure in Hoxby's (2001) paper; however, at the county level proportions attending charter schools are quite small. So, I relied on the above/below median enrollment measure that is used in Ross (2003).

Some of the previous studies focusing on private school competition also use Herfindahl Index alongside private school enrollment to measure competition effects on educational outcomes of private schools (Belfield & Levin, 2002; Borland & Howson, 1993; Henry & Gordon, 2003). The Herfindahl index is the sum of the squares of per-unit enrollments over total enrollments, where the units are typically schools within a market (e.g. district or county) (Borland and Howson 1993). The index has not been used in the charter school context In this research, I use median charter school enrollment in the county to classify schools into groups based on enrollment shares, following current charter school competition literature.

Variable	Description
nhw	Proportion of students who are non-Hispanic white
free	Proportion of students who are eligible for free-lunch
puptch	Student-teacher ratio
tagrsum	TAAS (Texas Assessment of Academic Skills) All Tests % Passing Sum of 3-8 & 10
tmgrsum	TAAS Math % Passing Sum of 3-8 & 10
omgr4	Math grade 4 percent passed on standardized statewide test
omgr10	Math grade 10 percent passed on standardized statewide test
orgr4	Reading grade 4 percent passed on standardized statewide test
orgr10	Reading grade 10 percent passed on standardized statewide test
egr44above	Expository test, scored 4 and above, grade 4
ngr44above	Narrative test, scored 4 and above, grade 4
egr104above	Expository test, scored 4 and above, grade 10
ngr104above	Narrative test, scored 4 and above, grade 10
t	=1 if 2001; =0 if 1995
comp1	School has at least one charter school in the same county
comp4	School has at least one charter school within 5 mile radius
comp10	School in county with at or above median charter enrollment
C1	t*comp1= Interaction term showing public schools that have one or more charter schools in their host county
C2	t*comp4= Interaction term showing public schools that have one or more charter schools within their 5-mile radius
C3	t*comp10= Interaction term showing public schools that are in counties with at or above median charter enrollment
per519nhw	% white non-Hispanics in the 5–19 year old population
age517pov	The percent of 5–17 year olds in poverty
ltotalpop	Log of the total county population
lincome	Log of the county real median household income
ppriv	Proportion of private school enrollment in the county

Program Design

The charter laws vary from state to state, reflecting the varying educational histories and the power of different political and civil groups such as teacher unions. Some of the provisions in state laws may have direct implications for the charter schools' impact on the public education system. I will briefly review some of the variations in the charter laws, focusing on the approval process, funding, operations, students, and

teachers and discuss the educational histories of the four states briefly before presenting the empirical results from the study.

Texas

The Texas Legislature passed legislation establishing state charter schools in 1995. According to earlier charter law scores published annually by the Center for Education Reform (CER), charter law in Texas was ranked as the seventh most charter-friendly in the United States (as reported in Booker, Gilpatric, Gronberg, & Jansen, 2004) and the Manhattan Institute for Policy Research ranked Texas ninth in terms of its availability of charter school options as of 2001 (J. Greene, 2002). In the current reports, Texas bumped down to 20th in the CER rankings. Texas has a cap on the number of charter schools permitted (CER, 2007). One of the main requirements for the efficient functioning markets is free entry, thus the cap may limit the market-like nature of the education reform. Texas first allowed the creation of 20 open-enrollment charter schools. By 1997, it increased this number to 100 open-enrollment charter schools and an unlimited number of open-enrollment charter schools serving students at risk of failure or dropping out of school. If a school enrolled 75 percent or more at-risk students, it would qualify as a 75 Percent Rule charter school and not be subject to the cap. This provision was eliminated in 2001, and the State Board of Education increased the cap to 215 schools, also allowing for an unlimited number of specialized charter schools sponsored by public senior colleges and universities (Shapley, Huntsberger, Maloney, & Sheehan, 2003). The at-risk provision provided an incentive for opening schools serving at-risk populations and the majority of the new charter schools which opened in academic years 1996 to 2000 were of the at-risk type (Booker, Gilpatric, Gronberg, & Jansen, 2004).

Overall, the number of schools increased rapidly after the adoption of the law. Table 2.4 shows the number of charter schools opened and students served each year.

Table 2.4 Number of Texas Open-Enrollment Charter Schools and Students Served, 1996-2002

School Year	Number of Charter Schools	Number of 75% Rule Charters	Number of Students	Percent of Public School Students
1995-96	0	0	0	-
1996-97	17	0	2,498	0.06 %
1997-98	19	0	4,135	0.10 %
1998-99	89	45	17,616	0.31 %
1999-00	146	46	25,687	0.64 %
2000-01	160	51	37,696	0.93 %
2001-02	180	0	46,304	1.13 %

Source: *TEA 2002 Snapshot.* Open-enrollment evaluation reports, years one to five (www.tcer.org) and Booker, Gilpatric, Gronberg and Jansen (2004)

Charter schools in Texas are spatially concentrated, 41 of 254 counties have no charter school by 2001. Only the state board of education can authorize start-up charter schools in Texas. The variation in funding and fiscal autonomy is also very critical to the competition argument. Booker et al. (2004, p. 4) indicates that prior to 2001, according to the Texas school financing rules, the cost of losing a student to a charter were larger in Texas than other charter friendly states like Michigan or Arizona.

After interviewing a group of public school district officials for their 6th year evaluation, evaluators of the Texas charter school program reported that 63 percent of respondents reported having lost students to charter schools and more than half reported that charter schools affected their districts financially (Shapley, Huntsberger, Maloney, & Sheehan, 2003). Respondents estimated losing approximately $1.2 million in average daily attendance (ADA) funding and $108,000 in federal funding due to charter schools. Table 2.4 summarizes selected charter policy characteristics in Texas.

Table 2.5 Selected State Policy Characteristics: Texas

General Statistics	
Number of Schools Allowed	215, not including schools started by public universities
Number of Charters Operating (As of November 2005)	259
Charter Law Ranking (as of 2005 by CER)	20th
Ranking by Availability of Charter School Options (as of 2001 by Greene, 2002)	9th
Approval Process	
Multiple Authorizers	BOTH YES AND NO Local school boards for conversions and state board of education for open-enrollments (new starts)
Eligible Applicants	For conversion charters, parents and teachers at existing public schools; for open-enrollment charters, existing public or private schools, parents, teachers, public or private institutions of higher education, non-profit organizations, governmental entities
Types of Charter Schools	Both converted and new starts
Private school conversion	Allowed
Term of Initial Charter	Specified in charter, usually 5 years
Operations	
Charter School May be Managed or Operated by a For-Profit Organization	Charters may not be granted directly to for-profit organizations, but the schools may contract with them for services.
Transportation for Students	Not required
Funding	
Funding amount	State funds are guaranteed; local revenue is determined based on statewide averages. Estimated portion is about $7,300.
Funding path	Funds pass through districts to charter schools authorized by local school boards; from state to open-enrollment charter schools.
Fiscal autonomy	Limited
Start-up funds	Federal funds available, no state funding
Students	
Restrictions for enrollment	Students in geographic area specified in charter
Enrollment Requirements	None
Teachers	
Collective Bargaining / District Work Rules	Teachers at conversions remain part of district; teachers at open-enrollments work independently
Certification	Not required

SOURCES: adopted from The Center for Education Reform, State by state charter law profiles <http://www.edreform.com>, National Center for Education Statistics' State Education Reforms (SER) web site <http://nces.ed.gov/programs/statereform/sssco_tab.asp>, US Charter Schools Web site <http://www.uscharterschools.org> and Texas State Department of Education.

Florida

The first five charter schools in Florida opened during the 1996-97 school year. Florida was ranked as 9th strongest of the nation's 41 charter laws by the Center of Education Reform and 4th by the availability of charter school options by the Manhattan Institute index. Because of this supportive charter law environment, Florida had the third highest number of charter schools in the nation, with 333 charter schools by 2005 (FDOE, 2005). Table 2.5 shows the increase in the number of charter schools and students served since the adoption of the charter law.

Table 2.6 Number of Florida Open-Enrollment Charter Schools and Students Served, 1996-2002

School Year	Number of Charter Schools	Number of Students	Percent of Public School Students
1995-96	0	0	-
1996-97	5	400	0.02%
1997-98	31	3,500	0.15%
1998-99	78	10,000	0.43%
1999-00	113	17,200	0.72%
2000-01	148	27,200	1.12%
2001-02	190	39,900	1.60%

Source: adopted from Sass (2006)

Charter schools are spatially concentrated in Florida. In 2000, charter schools operated in 33 of Florida's 67 school districts (Allendorff, Brand, & Frederick, 2000). By 2005, still nearly half of the charter schools and about half of the state's charter school students were located in the state's five largest school districts (B. Hassel, Terrell, & Kowal, 2006).

In Florida, local school boards authorize charters and any non-profit can apply for a charter. Although charters may not be granted directly to for-profit organizations, they

can manage the schools (CER, 2004). In Florida, for-profit groups (educational management organizations) manage more than a quarter of charter schools (B. Hassel, Terrell, & Kowal, 2006). Alongside charters managed by independent boards and EMOs, Florida also has municipality-run charter schools and charter schools in the workplace. Most state charter laws prevent charter schools to employ selective enrollment. Florida is the first state to pass legislation allowing businesses to open charter schools in their facility that target employee's children.

Initially, there were varying caps on the number of charter schools by district enrollment, but the caps were increased gradually and totally eliminated in 2003 (B. Hassel, Terrell, & Kowal, 2006). The Florida charter legislation also states that the racial/ethnic balance of charter school may not differ from the district or community. Transportation for students is encouraged but not required, however, the law also states that transportation must not be a barrier to equal access (CER, 2005). The law does not provide guidelines on enforcement of this rule.

Charter schools are exempt from all statutes of the Florida School Code, but are bound by the rules in their charter and some other laws. They are also under the oversight of the district (Allendorff, Brand, & Frederick, 2000). Most charter school administrators interviewed for the Florida Office of Program and Policy Analysis report were not aware of the possibility of requesting additional flexibility by asking the district school board to apply to the Commissioner of Education to get waivers for certain rules and codes (Allendorff, Brand, & Frederick, 2000, p. 13).

Funds pass from district to school and the district may hold up to 5% of the funding for administrative services. Florida legislation also has alternative means for

Table 2.7 Selected State Policy Characteristics: Florida

General Statistics	
Number of Schools Allowed	Unlimited
Number of Charters Operating (As of November 2005)	326
Charter Law Ranking (as of 2005 by CER)	9th
Ranking by Availability of Charter School Options (as of 2001 by Greene, 2002)	4th
Approval Process	
Multiple Authorizers	YES (Local school boards; a district school board may sponsor a charter school in the county over which the board has jurisdiction)
Eligible Applicants	Any non-profit entity
Types of Charter Schools	Both converted and new starts
Private school conversion	Allowed
Term of Initial Charter	3,4, or 5 years with renewal every 5 years. Non-profits are eligible for up to a 10 year charter, and charters operating for 3 years that have demonstrated success can renew for a 15-year term to facilitate financing.
Operations	
Charter School May be Managed or Operated by a For-Profit Organization	Yes
Transportation for Student	Not required
Funding	
Funding amount	100% of state and district operations funding follows students, based on average district per-pupil revenue fees for administrative services may not exceed 5% of total funding. Estimated portion is about $6,936.
Funding path	Funds pass through district to school
Fiscal autonomy	Yes
Start-up funds	Federal and state funds available
Students	
Restrictions for enrollment	School can limit enrollment to students at-risk of dropping out or academic failure and to students within certain boundaries.
Enrollment Requirements	Students enrolled prior, siblings, and the children of employees. Charter schools may give preference for enrollment to at-risk students. Also, racial/ethnic balance of charter school may not differ from district or community
Teachers	
Collective Bargaining / District Work Rules	Teachers may remain covered by district bargaining agreement, negotiate as a separate unit with the governing body, or work independently
Certification	Required, with waivers in specific but narrow circumstances

SOURCES: adopted from The Center for Education Reform, State by state charter law profiles <http://www.edreform.com>, National Center for Education Statistics' State Education Reforms (SER) web site <http://nces.ed.gov/programs/statereform/sssco_tab.asp>, US Charter Schools Web site <http://www.uscharterschools.org> and Florida State Department of Education.

providing additional support for charter schools including capital outlay funding or tax exemptions for charter facilities. Table 2.6 summarizes selected charter policy characteristics in Florida.

New Jersey

New Jersey legislature signed the nation's twentieth charter law in 1995, first allowing 135 charter schools to be established in four years. The cap is eliminated in 2000. Following the New Jersey Charter School Program Act of 1995, the first 13 charter schools opened their doors for the 1997-1998 school years. By the 2001-2002 school year, 54 charter schools were serving over 10,000 students in the State of New Jersey (CER, 2005). Table 2.7 provide information on the number of charter schools and students.

Table 2.8 Number of New Jersey Open-Enrollment Charter Schools and Students Served, 1996-2002

School Year	Number of Charter Schools	Number of Students	Percent of Public School Students
1995-96	0	0	-
1996-97	0	0	-
1997-98	13	-	-
1998-99	34	-	-
1999-00	47	-	-
2000-01	53	~13,000	0.8
2001-02	51	~14,000	0.9

Source: U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey" .
- Data is missing. 1998-99 was the first school year in which states were asked to "flag" charter schools in their reports to CCD.

Similar to Florida, charters cannot be granted directly to for-profit organizations by law, but they can manage the schools. By 2001, only seven schools were managed by for-profit organizations in New Jersey. New Jersey charter schools differ from charter schools in other states in two other ways. Unlike other states in the study, districts

provide transportation for students and none of New Jersey's charter schools are converted from other public schools; they are all start-ups (NJDOE, 2005).

Charter schools in New Jersey created controversy, especially at the beginning. Some local school boards filed appeals with the state board of education to overturn the charters and some even appealed the the constitutionality of the charter law ("NJ Charter School Resource Center: History of NJ Charter Schools", 2006). One of the main issues was financing. The evaluators of New Jersey charter school program have interviewed a group of district officials that host charters in their districts (KPMG, 2001). The majority stated that the most prevalent impact of the charters was on their budgets. More than half believed charter schools had stimulated competition among schools, but only a couple reported making program changes to compete with charter schools.

While district officials complain about the resource drain, National Alliance for Public Charter Schools argues that charter schools in New Jersey suffer from inequities in funding. The school districts provide 90% of the lesser of the state and district operations funding to charters and charters do not have access to state revenue payments or local capital revenue that are available to other schools through New Jersey's Public School Construction Act (NACS, 2006). Selected characteristics of charter school policy in New Jersey is listed under table 2.8.

Table 2.9 Selected State Policy Characteristics: New Jersey

General Statistics	
Number of Schools Allowed	Unlimited
Number of Charters Operating (As of November 2005)	52
Charter Law Ranking (as of 2005 by CER)	20th
Ranking by Availability of Charter School Options (as of 2001 by Greene, 2002)	14th
Approval Process	
Multiple Authorizers	No, only State commissioner of education
Eligible Applicants	Teachers and/or parents in district; college/university or private entity in conjunction with teachers/parents
Types of Charter Schools	New starts
Private school conversion	Allowed
Term of Initial Charter	4 years
Operations	
Charter School May be Managed or Operated by a For-Profit Organization	Charters may not be granted directly to for-profit organizations, but the schools may be managed by them
Transportation for Students	Provided by district
Funding	
Funding amount	90% of the lesser a) state and district operations funding based on average district per-pupil revenue or b) state mandated minimum per-pupil spending. District also pays categorical aid. Estimated portion is about $8,953.
Funding path	Funds pass through district to school
Fiscal autonomy	Yes
Start-up funds	Federal funds available; no state funding
Students	
Restrictions for enrollment	Charter school may not base enrollment on academic achievement or ability
Enrollment Requirements	All students in state
Teachers	
Collective Bargaining / District Work Rules	Teachers in conversions remain covered by district collective bargaining agreement; teachers in new starts may negotiate as a separate unit with the governing body, or work independently
Certification	Required

SOURCES: adopted from The Center for Education Reform, State by state charter law profiles <http://www.edreform.com>, National Center for Education Statistics' State Education Reforms (SER) web site <http://nces.ed.gov/programs/statereform/sssco_tab.asp>, US Charter Schools Web site <http://www.uscharterschools.org> and New Jersey State Department of Education.

Ohio

Charter schools are known as community schools in Ohio. The pilot community school program started in June of 1997, expanded to 85 schools in 2001 and 277 schools in 2005. The number of students attending charter schools has also steadily increased every year since their inception. Table 2.9 illustrates the growth in the number of Ohio community schools and students. The ongoing growth accelerated in the recent years. By 2005, charter school student enrollment represent about 2.5 percent of total public school enrollment in Ohio, more than a hundred percent increase from the 2001 figure. According to Legislative Office of Education Oversight report, the number of charter schools in Ohio has grown 800% since 1998 (Panizo, Cherry, DeJacimo, & Rowland, 2003, p. 1).

Table 2.10 Number of Ohio Open-Enrollment Charter Schools and Students Served, 1996-2002

School Year	Number of Charter Schools	Number of Students	Percent of Public School Students
1995-96	0	0	-
1996-97	0	0	-
1997-98	0	0	-
1998-99	15	2,245	0.1
1999-00	48	9,032	0.5
2000-01	68	16,717	0.8
2001-02	93	22,850	1.2

Source: adopted from Russo (2005) and Ohio Department of Education; U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey"

Any individual or group can start a charter school in Ohio (CER, 2005). As a result, non and for-profit educational management organizations are very active in the Ohio charter school market (CER, 2005). The legislation initially put a cap of 225 on start-up charter schools located in the biggest eight districts and no limit on conversion

schools. Like other states, charter enrollment is spatially concentrated in the eight urban school districts. Akron, Canton, Cincinnati, Cleveland, Columbus, Dayton, Toledo and Youngstown , account for more than two-thirds of the state's charter school enrollment. (Jewell, 2005).

Ohio's charter school movement has created much controversy and has come under heavy criticism in the media. From the beginning, there was a strong opposition to charter schools by teacher unions, some local districts and legislators. To date, two lawsuits by the Ohio Federation of Teachers and one federal lawsuit by the Ohio Education Association have attempted to stop charter schools in the state (Russo, 2005). Despite their small enrollment share, charter schools have large financial effects on school districts. Jewell (2004) shows that funding levels have grown from $11 million to $290 million from 1998 to 2003. Panizo, Cherry, DeJacimo and Rowland (2003, p. 94) estimate that Dayton, Cincinnati, and Youngstown school districts have lost between 13% and 21% of their state funding to charter schools in 2002. There is a disagreement over the funding formula of charter schools. The Center for education reform asserts that 100% of the funds are passed from state to the school. Some like Jewel (2004, p.8-9) argue that state's funding formula also effect local funds and even if it does not, state funding for charter school students is higher than comparable traditional school funding. Others like Russo (2005, p.24) argues that charter school funding is significantly less than what traditional public schools receive and they don't have access to local funds. Table 2.11 presents selected Ohio Charter policy characteristics.

Table 2.11 Selected State Policy Characteristics: Ohio

General Statistics	
Number of Schools Allowed	Cap of 225 for start-ups located in Big Eight Districts, Unlimited for conversions
Number of Charters Operating (As of November 2005)	277
Charter Law Ranking (as of 2005 by CER)	18th
Ranking by Availability of Charter School Options (as of 2001 by Greene, 2002)	12th
Approval Process	
Multiple Authorizers	YES (local school boards; boards of joint vocational school districts; boards of educational service centers; state universities, as approved by the state department of education; federally tax-exempt entities, as approved by the state department of education; or, when another authorizer fails to comply with its obligation as a sponsor, the state department of education..)
Eligible Applicants	Any individual or group
Types of Charter Schools	Converted and new
Private school conversion	No information
Term of Initial Charter	Up to 5 years
Operations	
Charter School May be Managed or Operated by a For-Profit Organization	Charters may not be granted directly to for-profit organizations, but the schools may be managed by them
Transportation for Students	The district in which community school students are eligible to attend, school must provide transportation to and from a community school located within the district or within another district, but districts are not required to provide transportation if student lives more than 30 minutes away from school.
Funding	
Funding amount	100% of the funds equal to the community school's base formula amount, as adjusted by the cost-of-doing business factor of the school district in which the student is entitled to attend school. Estimated portion is about $5,629.
Funding path	Funds pass from state to school
Fiscal autonomy	Yes
Start-up funds	Federal funds available; no state funding
Students	
Restrictions for enrollment	School may choose to limit enrollment to students in a particular geographic area or to at-risk students; school must enroll at least 25 students
Enrollment Requirements	All students in state
Teachers	
Collective Bargaining / District Work Rules	Teachers in conversions remain part of district collective bargaining agreement, unless a majority of them petition to organize as a separate unit, or work independently; charter school teachers in new starts may work independently or form a separate bargaining unit
Certification	Required, but law allows for alternative certification; uncertified employees may teach up to 12 hours/week

SOURCES: adopted from The Center for Education Reform, State by state charter law profiles <http://www.edreform.com>, US Charter Schools Web site <http://www.uscharterschools.org> and Florida State Department of Education.

Summary Discussion

The review of the above-mentioned information is important to understand the context in which the charter legislation is adopted and the schools are operating. The provisions in state charter school laws affect the flexibility and autonomy of the schools. The legislation alongside other historical factors in the state also reflect the amount of support for charter schools. Shober, Manna and Witte (2006) analyzed the content of charter school laws in all states to investigate how different laws affect the formation of charter schools. The authors argue that different laws reflect different values that affect charter openings. Flexibility and accountability, two inherent characteristics of charter schools, may sometimes function against each other. The laws and regulations in each state reflect the need for balance between accountability to public agencies and flexibility required for responding to parental demand.

Despite variations, all state laws include elements of accountability and flexibility. For this research, some of these elements are especially important, because the legislation directly affects the structure of the educational market in the state. For example, Texas and Ohio have caps on the number of charter schools allowed, as opposed to Florida and New Jersey, which allow for unlimited number of schools. In New Jersey only the state board and in Florida only local school boards authorize charters, while in Ohio state universities, the state board, and the local boards may authorize charter schools. Such exogenous constraints limit the degree to which charter reform can foster market-like environments that induce competition. Previous research has shown that states with multiple charter authorizers that do not have caps on the number of schools create more charter-friendly environments.

It is also very important to consider unique provisions in some state laws. The 75 Percent Rule in Texas provides an illustrative example. It could be misleading to reach conclusions about changes in student distributions in public schools without considering the incentives created by this rule on new charter schools to target at risk students. Shober, Manna and Witte (2006) also argue that local political context is critical in explaining charter openings. The educational histories discussed in the preceding section show that the charter schools in Ohio were strongly opposed by local institutions such as teacher unions, local districts, legislators and media from the beginning. This opposition most likely affects the education market in the state and it may also be an indication of stronger impacts of charter schools on traditional public schools. Other factors like inclusion of non-profits as eligible applicants may change the participants of the charter industry in the state. The collective bargaining, district work arrangements, and certification rules may affect the ability of charters to attract high quality teachers. The transportation requirements and enrollment restrictions have direct implications for the student body served by the charter schools. Therefore, these contextual differences may provide us with valuable insights to better understand some of the changes in the outcome measures.

CHAPTER 3

EFFECTS ON RACIAL AND ETHNIC DISTRIBUTION AND SOCIO-ECONOMIC SEGREGATION

In the last decade, most states have adopted charter school legislation, with the familiar hopes of increasing the efficiency of schools and creating competition in public education. Charter school authorizers in the recent US Department of Education report on charter schools cited creating competition in the public school system as the primary reason they awarded charters (PPSS, 2004). The question of whether school choice will help reduce or reinforce existing segregation in the public school system has been long debated. Some scholars argue that charter schools might actually reduce existing stratification, particularly in locations where conventional public schools are highly segregated, by either reducing middle class parents' willingness to move to the suburbs or to send their children to private schools or by empowering disadvantaged parents to choose schools without residential limitations (Greene, 2000; Hassel, 1999). However, the concerns regarding potential segregation by race and class remains (Bulkley & Fisler, 2003; Fuller, 2000; Wamba & Ascher, 2003).

Because of the ongoing growth of charter schools, concerns about segregation and stratification will become increasingly important. Has the introduction of charter schools affected the racial and socio-economic composition of public schools in the United States? This chapter explores the systemic effects of charter schools on the racial and socio-economic composition of public schools by addressing the following questions: 1) How does the presence of charter schools affect the racial and socio-economic distribution of students in traditional public schools? 2) How do the size and scope of

effects vary according to different measures of exposure? I summarize the related literature in the next section, before presenting the empirical results.

Previous Research

Most public schools in the United States are already highly segregated by race and socioeconomic status (Clotfelter, 1999; Frankenberg, Lee, & Orfield, 2003). The effect of choice policies on segregation and stratification is a critical issue. Schools in other countries that have experienced wide-ranging school choice reforms have become significantly more polarized along ethnic and socioeconomic lines (Ladd & Fiske, 2001; Schneider, Elacqua, & Buckley, 2006).

Charter schools may increase segregation in a variety of ways (Fiske & Ladd, 2000; Schneider, Elacqua, & Buckley, 2006; Smith & Meier, 1995; Wells, Holme, Lopez, & Cooper, 2000). First, parents choose schools for a variety of reasons, including peer group preferences and geographical proximity. If parents value certain peer group characteristics and sort their children into schools along racial and class lines, existing stratification may deepen (Smith & Meier, 1995). Although most surveys of parents show that all parents value academic quality and that few refer to the composition of the student body in schools, studies based on actual behavior of parents found that parental decisions do appear to be influenced by other factors such as demographics or values (Henig, 1990; Schneider & Buckley, 2002; Schneider, Elacqua, & Buckley, 2006; Schneider, Marschall, Teske, & Roch, 1998; Weiher & Tedin, 2002). Another aspect regarding parental demand is the ability of parents to make well-informed decisions. Parents differ in their ability to obtain and process information about schools. Research on other forms of public school choice has clearly demonstrated that there are significant

information disparities between different groups of parents and that the average parent does not have very accurate information about the conditions in schools (Schneider, Teske, & Marschall, 2000; Schneider, Teske, Marschall, & Roch, 1998). Low-income and less-educated parents are more likely to lack the necessary resources to make informed decisions and to be in lower quality and isolated education networks (Schneider, Teske, Roch, & Marschall, 1997).

Second, even in states set racial/ethnic balance enrollment guidelines for their charter schools, schools can influence their student distributions through a variety of mechanisms (Wamba & Ascher, 2003). The viability of charter schools depends on their capacity to attract students, who increase their financial resources more then their costs. Critics worry that the financial and academic pressures may give them an incentive to avoid high-cost students (Miron & Nelson, 2002). Charter schools can shape their recruitment and admission policies to affect the profile of applicants (Wamba & Ascher, 2003). They can target certain types of parents through advertisements, flyers, mailers and presentations (Wells, 2002). They can also focus their curricula to attract students from particular backgrounds. Even the "first come, first served" rule can create disadvantages for students with less information (Wells, 2002). Requiring parents to provide transportation may seriously affect the pool of applicants (Wells, Holme, Lopez, & Cooper, 2000). Keeping these concerns in mind, critics warn that existing stratification and segregation may deepen as choice increases, if the necessary institutional arrangements and regulations are not created (Cobb & Glass, 1999; Schneider, Elacqua, & Buckley, 2006; Smith & Meier, 1995; Wells, Holme, Lopez, & Cooper, 2000)

In this section, I will briefly review the empirical studies that focus on the effects of charter schools on student compositions. Much of the existing research on student compositions in charter schools is cross-sectional comparisons of whom the schools are serving (see e.g. C. Finn, Manno, & Vanourek, 2000; Frankenberg & Lee, 2003a; Nelson et al., 2000). In the National Study of Charter Schools sponsored by the U.S. Department of Education, Nelson et al. (2000) conclude that the proportion of white students in charter and public schools are about the same, providing no evidence of increased segregation. On the other hand, in the Charter Schools and Race study sponsored by the Harvard Civil Rights Project, Frankenberg and Lee (2003b) compare racial composition and segregation of charter schools by state and conclude that charter schools are largely more segregated than public schools in the same state.

Other studies, primarily focusing on the academic performance, examined whether charter schools absorb more advantaged students from public schools and worsen school systems for troubled students, which is sometimes referred to as an academic skimming problem. Hoxby (2003) finds that the students with lower grades and minority students transferred to charter schools in Chicago, suggesting no skimming on an academic or racial basis. Hanushek, Rivkin and Kain (2002) in Texas and Bifulco and Ladd (2004; 2006) in North Carolina use student level data that enabled them to track the moves of students from a regular public school to a charter school or back over time. Both studies find that the charters cause additional racial and ethnic concentration, primarily because black charter school students select into more racially isolated schools.

Three studies used variations of the difference-in-differences estimates, which is also utilized in this paper, to study the effect of charter schools on student composition of

public schools. As discussed in the methodology chapter, the basic idea behind the difference-in-differences estimator is to model the treatment effect by estimating the difference between outcome measures at two time points for both the treated and the control observations and then comparing the difference between the groups (Buckley & Shang, 2003; Card & Krueger, 1994). The definition of the treatment condition is a key concern in difference-in-differences estimates. Hoxby (2001) in her study of the effects of charter schools on the achievement of public school students in Arizona and Michigan, defines "treatment" school districts as those where charter schools account for over 6 percent of district enrollment, based on average annual enrollment change in a Michigan school (which was 5.1 percents prior to 1994). She found that both the Michigan and Arizona public schools raised achievement in the face of competition from charter schools and the increased achievement was not a result of cream-skimming of students. Dee and Fu (2004) compare changes in the student-teacher ratio and share of white students in Arizona, which introduced charter schools, and New Mexico, which did not. They found that charter schools drew white non-Hispanic students from regular public schools and caused a reduction of resources in Arizona. The underlying assumption is that the average district in Arizona faced a non-zero charter school presence. Even though some counties and school districts in Arizona host multiple charter schools, some do not host any. As the competitive impact of charter schools should be stronger in their host school districts or counties, the potential competitive effect of charter schools may differ between these two types of districts and the actual charter school effects may even be larger. In a district level analysis, Ross (2005) estimates the effect of charter school presence on the segregation of traditional public schools within districts in Michigan. She

measures charter presence with three dichotomous variables indicating existence of a single charter school within the district, existence of multiple charter schools within the district, and indicating the charter schools account for below or above 7 percent of district enrollment (median enrollment rate in Michigan in 1999). Her results show that quantity of charter schools do not affect segregation, but several forms of public school segregation (black and Latino exposure to white students) have been exacerbated in Michigan districts with high levels of charter school enrollment.

Empirical Results

While the average changes in the composition of students served by public schools can not capture the full extent of segregation or integration in schools, this chapter focuses on the composition of student bodies as a first step in beginning to understand whether the charter school movement contributes to how student groups are sorted across schools. The two dependent variables for this analysis are the percentage of students who are non-Hispanic white and the percentage of students who are eligible for free lunches. In this section, I present the empirical findings from all four states for these two outcome variables. In tables 3.1 to3.4, I report the means of the share of non-Hispanic white students and free-lunch eligible students in these four states for groups of schools. The first treatment group (C1) includes traditional public schools that have one or more charter schools in the same county. The second treatment group (C2) includes traditional public schools, which have at least one charter school within their 5-mile radius. The third treatment group (C3) includes traditional public schools, which are located in counties where charter schools enroll more than the median percentage of public students.

Table 3.1 Mean Differences in the Share of non-Hispanic White Students and Free-lunch eligible students for Traditional Public Schools in Texas*

% non-Hispanic white students		C1	C2	C3
Treatment	1995-96	42.1	36.1	36.6
	2001-02	34.9	28.7	28.0
	Difference	**-7.2**	**-7.4**	**-8.6**
Control	1995-96	62.9	63.5	56.1
	2001-02	58.6	58.7	51.1
	Difference	**-4.3**	**-4.8**	**-5.0**
Difference-in-Differences		**-2.9**	**-2.6**	**-3.6**
% Free-lunch eligible students		C1	C2	C3
Treatment	1995-96	44.2	47.3	46.8
	2001-02	42.8	45.5	45.9
	Difference	**-1.4**	**-1.8**	**-0.9**
Control	1995-96	37.6	36.3	39.4
	2001-02	38.2	36.9	39.1
	Difference	**0.6**	**0.6**	**-0.3**
Difference-in-Differences		**-2.0**	**-2.4**	**-0.6**

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

Table 3.2 Mean Differences in the Share of non-Hispanic White Students and Free-lunch eligible students for Traditional Public Schools in Florida*

% non-Hispanic white students		C1	C2	C3
Treatment	1995-96	56.9	50.9	50.5
	2001-02	50.5	44.4	44.0
	Difference	**-6.4**	**-6.5**	**-6.5**
Control	1995-96	73.7	72.4	67.0
	2001-02	71.1	67.5	61.7
	Difference	**-2.6**	**-4.9**	**-5.3**
Difference-in-Differences		**-3.8**	**-1.6**	**-1.2**
% Free-lunch eligible students		C1	C2	C3
Treatment	1995-96	41.0	43.5	43.7
	2001-02	42.4	45.5	45.2
	Difference	**1.4**	**2.0**	**1.5**
Control	1995-96	40.2	36.5	38.2
	2001-02	41.4	36.7	39.3
	Difference	**1.2**	**0.2**	**1.1**
Difference-in-Differences		**0.2**	**1.8**	**0.4**

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

Table 3.3 Mean Differences in the Share of non-Hispanic White Students and Free-lunch eligible students for Traditional Public Schools in New Jersey*

% non-Hispanic white students		C1	C2	C3
Treatment	1995-96	62.3	55.0	51.5
	2001-02	57.7	50.2	47.0
	Difference	**-4.6**	**-4.8**	**-4.5**
Control	1995-96	80.7	80.0	74.9
	2001-02	77.8	76.4	70.8
	Difference	**-.2.9**	**-3.6**	**-4.1**
Difference-in-Differences		**-1.7**	**-1.2**	**0.4**
% Free-lunch eligible students		C1	C2	C3
Treatment	1995-96	24.3	29.4	35.4
	2001-02	22.9	27.9	34.2
	Difference	**-1.4**	**-1.5**	**-1.2**
Control	1995-96	18.4	15.3	15.6
	2001-02	16.8	14.0	14.2
	Difference	**-1.6**	**-1.3**	**-1.4**
Difference-in-Differences		**0.2**	**-0.2**	**0.2**

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

Table 3.4 Mean Differences in the Share of non-Hispanic White Students and Free-lunch eligible students for Traditional Public Schools in Ohio*

% non-Hispanic white students		C1	C2	C3
Treatment	1995-96	72.6	67.0	66.5
	2001-02	68.6	62.8	62.4
	Difference	**-4.0**	**-4.2**	**-4.1**
Control	1995-96	96.1	94.7	91.3
	2001-02	95.7	93.7	89.9
	Difference	**-.0.4**	**-1.0**	**-1.4**
Difference-in-Differences		**-3.6**	**-3.2**	**-2.7**
% Free-lunch eligible students		C1	C2	C3
Treatment	1995-96	14.8	17.4	14.8
	2001-02	33.0	40.0	35.9
	Difference	**18.2**	**22.6**	**21.1**
Control	1995-96	16.3	14.5	15.9
	2001-02	21.7	19.8	24.1
	Difference	**5.4**	**5.3**	**8.2**
Difference-in-Differences		**12.8**	**17.3**	**12.9**

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

The estimates show that the average share of non-Hispanic white students fell more in traditional public schools that faced competition from charter schools in all four states 1995-96 school year to 2001-02. The results show that there is also a decrease in the share of non-Hispanic white students in other control schools, although the size of the change is significantly smaller. This implies that the introduction of charter schools affect this reduction, however charter schools may be located in counties with different racial compositions in the first place. The difference-in-differences estimates control the differences between the two groups before the implementation of the policy (Purdon, Lessof & Bryson, 2001). Difference-in-differences column in the table shows the difference of the differences between the two groups of schools. For example, proportion of non-Hispanic white students in traditional public schools that are located in counties with at least one charter school fell by .072 from 1995 to 2001. Proportion of non-Hispanic white students in other traditional public schools also fell by .043 in the same period. The difference between these differences shows that the introduction of charter schools suggests a 2.9 percentage point decrease (-0.072 –(-0.043)) in the share of non-Hispanic white students in Texas traditional schools, which face charter competition in their county. The estimates show a 3.8 percentage point decrease in Florida, 1.8 percentage point decrease in New Jersey and a 3.6 percentage point decrease in Ohio. The enrollment measure produces very similar results. The spatial measure produces similar, but slightly smaller results. The enrollment based measure shows a larger negative effect in Texas, and similar but smaller effects in other states.

The differences in means for free-price lunch students show effects in different directions across states. The difference between the differences from 1995 to 2001 show

a drop of 2.0 percentage points with the county level measure, 2.4 percentage points with the spatial measure, and 0.6 points with the enrollment based measure in Texas. In other states, the differences of differences are almost all positive with the exception of New Jersey public schools which have charter schools within their 5-mile radius. The differences in differences are very small in New Jersey schools. In Florida and Ohio schools, the means estimates shows that the share of free-lunch eligible students increased in this period for both the treatment and control schools, but more for treatment schools, suggesting that charter schools contribute to the rise in the share of free lunch eligible students public schools. The differences in means are considerably larger in Ohio.

Regression Results

The means estimates suggest some statistically distinguishable effects that may occur due to charter presence, but they are only average changes across the groups of schools in those states in this period. In this section, I present the results from the school and year fixed effects regression models that allow me to introduce control variables. Tables 3.5 to 3.8 present the results from the regression models that estimate the share of non-Hispanic white students for the four states. Tables 3.9 and 3.12 present the results from the models that estimate the share of free-lunch eligible students. Tables are organized in a similar way. Models with the county level competition measure (C1), the spatial competition measure (C2), and enrollment based competition measure (C3) is presented in the first, second and third columns respectively. Table 3.13 is a summary table that tracks the competition variable across all models in the previous tables,

presenting the results from the basic models and the models with control side by side. In this table, the coefficient of interest is the interaction term between the post treatment year and the competition variable. The first row shows the results from the base model and the second row shows how the coefficient is affected, when the control variables are included. Similar to previous tables, C1, C2 and C3 are three charter school exposure measures used throughout the dissertation.

The effects on racial and ethnic distribution

The regression results suggest that the existence of charter schools contributed to the reduction of the share of non-Hispanic white students in traditional public schools that face charter competition in all four states. The size of the effect and the sensitivity to the competition measure varies a bit across states, but the overall negative effect remains significant across models. The initial regression model for Texas schools shows a 2.9 percentage points decrease in the share of non-Hispanic white students in the treatment group. With the addition of county level controls to the first specification, the size of the effect is reduced to 1.1 percentage points but remains significant. For the schools that experience direct competition within their 5-mile radius, the share of non-Hispanic white students is reduced by 2.7 percentage points. With the additional controls, the size of the coefficient is reduced to 1.4, but remains highly significant. In the models with enrollment-based models, the basic model shows the largest change in share of non-Hispanic whites in public schools with a decline of almost 4 percentage points. The change reduces to 1.4 percentage points and remains highly significant.

In Florida, schools that have charter schools in their county saw the non-Hispanic white percentage of their students drop by a statistically significant 3.8 percentage points

more than schools in other counties. Introducing the county level controls reduces the size of the coefficient by almost half to 1.7 percentage points, but the coefficient remains significant. Schools with charter schools within five miles saw the non-Hispanic white percentage drop 1.7 percentage points more than schools without competition that close. With control variables, we still observe a statistically significant 1 percentage point reduction. Relative to schools in counties with below median charter school enrollment, schools in high enrollment counties experienced a 1-point drop in their non-Hispanic white student population.

The results from New Jersey models also suggest that the introduction of charter schools reduced the share of white non-Hispanic white students in traditional public schools by 1.8 percentage points using the county level measure, and by 1.4 percentage points with both spatially more precise measure and the enrollment measure. In all three models, the coefficients remain negative and highly significant.

The effect size in Ohio is quite large. Schools in counties with multiple charters experienced 3.6 percentage point drop in the share of non-Hispanic white student population. The spatial specification also shows a 3.2 percentage point reduction and the enrollment specification shows a 2.8 percentage point reduction. With additional controls, the effect size reduces to 1.3 percentage points in models with county control, and to 1.4 in models with spatial control and remain significant. In the enrollment based specification, the coefficient loses significance. To sum, for racial composition outcome, all specifications show significant and negative effects, except for the schools in counties with above median charter school enrollment in Ohio.

Aside from the impacts of charter schools, there are some additional findings with respect to characteristics of counties. As expected, increases in the percent of white non-Hispanics in the 5–19 year old county population led to significant increases in the share of white students in public schools. In Florida, increases in the proportion of private school enrollment in the county seemed to influence the share of white students in public schools positively. In Ohio, increases in the proportion of private school enrollment in the county are associated with declines in the share of white students in the public schools. Changes in the county population seemed to influence the share of white students negatively in Florida and Texas public schools.

Table 3.5 Estimated Effect of Charter Schools on Public Schools in TEXAS: Percent non-Hispanic Whites

	NHW	*NHW*	*NHW*
	(I)	(II)	(III)
C1	-0.011** (0.002)	-	-
C2	-	-0.014** (0.002)	-
C3		-	-0.014** (0.003)
T	-0.018** (0.003)	-0.020** (0.003)	-0.022** (0.003)
Proportion of white non-Hispanics in the 5–19 year old population	0.573** (0.026)	0.569** (0.026)	0.547** (0.029)
Proportion of 5–17 year olds in poverty	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Log of the total population	-0.032** (0.010)	-0.028** (0.010)	-0.040** (0.010)
Proportion of private school enrollment	-0.085 (0.083)	-0.071 (0.083)	-0.076 (0.083)
Constant	0.600*** (0.125)	0.560** (0.125)	0.714** (0.128)
Adjusted R^2	.9741	.9742	.9741

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 3.6 Estimated Effect of Charter Schools on Public Schools in FLORIDA: Percent non-Hispanic Whites

	NHW	*NHW*	*NHW*
	(II)	(II)	(III)
C1	-0.017** (0.006)	-	-
C2	-	-0.010** (0.003)	-
C3	-	-	-0.010** (0.003)
T	-0.005 (0.006)	-0.013** (0.004)	-0.014** (0.004)
Proportion of white non-Hispanics in the 5–19 year old population	0.579** (0.039)	0.585** (0.038)	0.587** (0.038)
Proportion of 5–17 year olds in poverty	-0.048* (0.023)	-0.032 (0.024)	-0.020 (0.024)
Log of the total population	-0.095** (0.027)	-0.085** (0.027)	-0.088** (0.027)
Proportion of private school enrollment	0.338** (0.101)	0.352** (0.101)	0.369** (0.100)
Constant	1.336** (0.355)	1.293** (0.355)	1.323** (0.356)
Adjusted R^2	.9685	.9685	.9685

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 3.7 Estimated Effect of Charter Schools on Public Schools in NEW JERSEY: Percent non-Hispanic Whites

	NHW	*NHW*	*NHW*
	(I)	(II)	(III)
C1	-0.018** (0.004)	-	-
C2	-	-0.014** (0.003)	-
C3	-	-	-0.014** (0.005)
T	-0.013* (0.005)	-0.020** (0.003)	-0.026** (0.005)
Proportion of white non-Hispanics in the 5–19 year old population	0.265** (0.045)	0.251** (0.045)	0.242** (0.045)
Proportion of 5–17 year olds in poverty	-0.063 (0.056)	-0.090 (0.058)	-0.197* (0.082)
Log of the total population	-0.062 (0.056)	-0.074 (0.056)	-0.069 (0.057)
Proportion of private school enrollment	-0.002 (0.086)	0.077 (0.081)	0.102 (0.081)
Constant	1.297 (0.727)	1.462 (0.722)	1.416 (0.736)
Adjusted R^2	.9795	.9795	.9794

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 3.8 Estimated Effect of Charter Schools on Public Schools in OHIO: Percent non-Hispanic Whites

	NHW	*NHW*	*NHW*
	(I)	(II)	(III)
C1	-0.013** (0.003)	-	-
C2	-	-0.014** (0.002)	-
C3	-	-	-0.005 (0.003)
T	0.017** (0.002)	0.017** (0.002)	0.017** (0.002)
Proportion of white non-Hispanics in the 5–19 year old population	0.998** (0.088)	1.067** (0.078)	1.188** (0.077)
Proportion of 5–17 year olds in poverty	0.078 (0.058)	0.101 (0.056)	0.113 (0.061)
Log of the total population	-0.003 (0.021)	0.012 (0.020)	0.013 (0.021)
Proportion of private school enrollment	-0.124 (0.073)	-0.152* (0.072)	-0.155* (0.073)
Constant	0.028 (0.287)	-0.211 (0.266)	-0.333 (0.286)
Adjusted R^2	.9769	.9770	.9769

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

The effects on the share of free lunch eligible students

The results suggest that charter presence in these states affects the share of free-lunch eligible students in traditional public schools in three of these four states. The size and direction of the effect varies across states. The regression results were not statistically significant in New Jersey for all three measures. The results from Texas show a reduction. Relative to schools without charter schools in their county, schools with one or more charters in their county experienced approximately a 2-point drop in the share of free-lunch eligible students. With the addition of county level controls, the size of the effect actually increases to 4.2 percentage points and remains significant at .05 level. In the models with the spatial measure, charter school presence again contributes to the reduction in the share of free- lunch eligible students by a statistically significant 2.5 percentage points and with the additional controls the effect size again increases, but modestly compared to the first specification. For public schools located in counties with above median charter enrollment, the initial model shows no significant difference, but with the addition of controls, we observe a significant 2-point drop in the share of free-lunch eligible students similar to other models.

The results from Florida schools are complex. Quantity of charter schools impact the share of free-lunch eligible students in Florida public schools only if the schools have charter schools within their close proximity (within their 5-mile radius). Relative to other public schools, public schools with charter schools nearby experienced approximately a 2-point rise in their share of free-lunch eligible students. Additional county level controls decrease the effect size to a still significant 1.3 percentage points. In other instances, the models do not show significant effects related to charter schools.

Ohio models show that the charter school presence contributes to increases in the share free-lunch eligible students in the traditional Ohio public schools in this period. In Ohio, both the schools that have at least one charter school in their counties and those that are located in counties with above median charter enrollment experience a statistically significant 13.6 percentage points increase in the share free-lunch eligible students. With the additional controls for county level demographic and socio-economic changes, the size of the coefficient drops to 3.0 percentage points for the first specification and 5.0 percentage points for the second specification, but remains highly significant. I observe the largest effect size for this outcome measure for Ohio schools that have charter schools within their 5-mile radius. Relative to other public schools, public schools with charter schools nearby experienced approximately an 18-point rise in their share of free-lunch eligible students. The controls reduce the effect size to 11.9 percentage points, but the coefficient remains highly significant.

Summary Discussion

Consistent with the findings by Dee and Fu (2004) in Arizona and Ross (2005) in Michigan, introduction of charter schools appears to reduce the share of non-Hispanic white students in traditional public schools in all four states. Charter presence, measured both spatially and by enrollment, shows significant negative effects. The basic models overestimate the effect and introduction of the control variables reduces the effect size, but the coefficients remain significant across models for all states. After controlling for other factors, models show consistent effect sizes that range from 1.0 to 1.9 percentage points across models in all states.

If charter presence is systematically associated with declines in the enrollment of non-Hispanic white students from nearby traditional public schools, this may imply that some sorting is taking place in the face of charter competition. This does not necessarily mean that charter schools are attracting more non-Hispanic white students. In fact, in some states like Texas, charter schools are serving predominantly black students. If charter schools choose to locate in areas with already high levels of minority concentration, they may be speeding up the ongoing departure of non-Hispanic white families to other areas or private schools. This study cannot explain the underlying mechanism that causes these observed changes, but findings suggest interesting avenues for further research that may increase our understanding of the charter school effect.

The analyses also show that charter school presence affects the share of free-lunch eligible students in traditional public schools in different ways in these states. The models for free-lunch eligible students did not suggest significant results for New Jersey. Only public schools with charter schools nearby experienced decline in their share of free-lunch eligible students in Florida. The regression results showed that the existence of charter schools contributed to the decline of the share of free-lunch eligible students in traditional public schools in Texas, but increased the share of free-lunch eligible students in Ohio. These dissimilar findings in different states may be reflecting differences in educational histories and operation of charter schools. For example, New Jersey has the fewest number of charter schools (only 51 charter schools by 2001) among the four states, so the insignificant results may not be surprising. Maybe the charter schools are still too few in New Jersey to create any effect on the share of free-lunch students in the public school system. The more interesting finding is the contradictory results in Ohio

and Texas. According to National Center for Education Research reports, larger percentages of black, Hispanic, and American Indian students attend high-poverty schools than white students (Wirt et al., 2005). Why would charter schools contribute to the decline of the share of free-lunch eligible students in traditional Texas public schools, while charter schools in Ohio and Florida contribute to increase of their share in traditional public schools? One possibility is the effect of the 75 percent provision in Texas charter legislation. The Texas Legislature passed legislation initially put a cap on open-enrollment charter schools, but allowed an unlimited number of open-enrollment charter schools serving students at risk of failure or dropping out of school that serve more than 75 percent at-risk students. The negative coefficient on the share of free-lunch eligible students may reflect the transfer of the at-risk students from traditional schools to charters under the 75 percent rule. These results underline the importance of considering contextual factors and multiple ways to measure charter effect.

Table 3.9 Estimated Effect of Charter Schools on Public Schools in TEXAS: Percent Free-Lunch Eligible

	FREE	*FREE*	*FREE*
	(I)	(II)	(III)
C1	-0.042** (0.005)	-	-
C2	-	-0.028** (0.005)	-
C3	-	-	-0.023** (0.006)
T	0.064** (0.009)	0.053** (0.009)	-0.044** (0.009)
Proportion of white non-Hispanics in the 5–19 year old population	-0.750** (0.057)	-0.673** (0.056)	-0.687** (0.062)
Proportion of 5–17 year olds in poverty	0.009** (0.001)	0.010** (0.001)	0.010** (0.001)
Log of the county real median household income	-0.243** (0.038)	-0.208** (0.038)	-0.191** (0.039)
Proportion of private school enrollment	0.239 (0.178)	0.254 (0.178)	0.215 (0.178)
Constant	3.093** (0.396)	2.663** (0.393)	2.499** (0.393)
Adjusted R^2	.8041	.8028	.8028

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 3.10 Estimated Effect of Charter Schools on Public Schools in FLORIDA: Percent Free-Lunch Eligible

	FREE	*FREE*	*FREE*
	(I)	(II)	(III)
C1	-0.007 (0.006)	-	-
C2	-	0.013** (0.004)	-
C3	-	-	-0.003 (0.004)
T	0.011* (0.006)	-0.001 (0.004)	0.007* (0.004)
Proportion of white non-Hispanics in the 5–19 year old population	-0.185** (0.048)	-0.159** (0.048)	-0.178** (0.047)
Proportion of 5–17 year olds in poverty	0.282** (0.087)	0.257** (0.086)	0.284** (0.089)
Log of the county real median household income	0.038 (0.029)	0.033 (0.029)	0.036 (0.029)
Proportion of private school enrollment	-0.063 (0.121)	-0.033 (0.120)	-0.052 (0.120)
Constant	0.086 (0.334)	0.115 (0.331)	0.090 (0.335)
Adjusted R^2	.9264	.9268	.9264

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 3.11 Estimated Effect of Charter Schools on Public Schools in NEW JERSEY: Percent Free-Lunch Eligible

	FREE	*FREE*	*FREE*
	(II)	(IV)	(VI)
C1	0.006 (0.004)	-	-
C2	-	-0.000 (0.003)	-
C3	-	-	-0.000 (0.004)
T	-0.003 (0.010)	-0.003 (0.010)	-0.003 (0.010)
Proportion of white non-Hispanics in the 5–19 year old population	0.036 (0.048)	0.032 (0.048)	0.032 (0.048)
Proportion of 5–17 year olds in poverty	0.009 (0.059)	-0.010 (0.060)	-0.013 (0.079)
Log of the county real median household income	-0.056 (0.051)	-0.038 (0.049)	-0.038 (0.049)
Proportion of private school enrollment	-0.095 (0.079)	-0.122 (0.077)	-0.123 (0.077)
Constant	0.818 (0.535)	0.631 (0.515)	0.634 (0.517)
Adjusted R^2	.9689	.9689	.9689

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 3.12 Estimated Effect of Charter Schools on Public Schools in OHIO: Percent Free-Lunch Eligible

	FREE	*FREE*	*FREE*
	(I)	(II)	(III)
C1	0.030** (0.012)	-	-
C2	-	0.119** (0.009)	-
C3	-	-	0.050** (0.011)
T	-0.078** (0.023)	-0.086** (0.022)	-0.063** (0.022)
Proportion of white non-Hispanics in the 5–19 year old population	-3.952** (0.350)	-3.106** (0.306)	-4.178** (0.301)
Proportion of 5–17 year olds in poverty	-1.053** (0.228)	-0.724** (0.211)	-0.734** (0.245)
Log of the county real median household income	0.157 (0.141)	0.233 (0.135)	0.083 (0.137)
Proportion of private school enrollment	0.041 (0.299)	-0.043 (0.289)	0.037 (0.297)
Constant	2.038 (1.587)	0.480 (1.485)	2.958* (1.505)
Adjusted R^2	.5014	.5254	.5014

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 3.13 Summary Table for the Estimated Effect of Charter Schools on Public Schools in Texas, Florida, New Jersey and Ohio: Percent Non-Hispanic White Students and Percent Free-lunch Eligible Students

Dependent variables	Texas			Florida			New Jersey			Ohio		
Percent Non-Hispanic White Students	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*	*NHW*
	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
Base model	-0.029** (0.002)	-0.026** (0.002)	-0.037** (0.002)	-0.038** (0.005)	-0.017** (0.003)	-0.012** (0.003)	-0.018** (0.004)	-0.012** (0.003)	0.003 (0.003)	-0.036** (0.002)	-0.032** (0.002)	-0.028** (0.002)
W/Controls	-0.011** (0.002)	-0.014** (0.002)	-0.014** (0.003)	-0.017** (0.006)	-0.010** (0.003)	-0.010** (0.003)	-0.018** (0.004)	-0.014** (0.003)	-0.014** (0.005)	-0.013** (0.003)	-0.014** (0.002)	-0.005 (0.003)
Percent Free-lunch Eligible Students	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*	*FREE*
Base model	-0.020** (0.005)	-0.025** (0.004)	-0.006 (0.005)	0.002 (0.006)	0.018** (0.004)	0.005 (0.004)	0.006 (0.004)	0.001 (0.001)	0.002 (0.003)	0.136** (0.008)	0.177** (0.008)	0.136** (0.009)
W/Controls	-0.042** (0.005)	-0.028** (0.005)	-0.023** (0.006)	-0.007 (0.006)	0.013** (0.004)	-0.003 (0.004)	0.006 (0.004)	-0.000 (0.003)	-0.000 (0.004)	0.030** (0.012)	0.119** (0.009)	0.050** (0.011)

Note: (p<.01)= ***, (p>.05)= **, (p<.10)= *, standard errors are in parenthesis. Second row shows coefficients from the models with controls (not reported in the table). C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

CHAPTER 4

EFFECTS ON STUDENT-TEACHER RATIO

Fiscal reasons are the major incentives for public schools to respond to other school choice alternatives, because in most cases, the students who leave for alternative schools take some public funding with them. As charter schools are new entities, most studies have focused on achievement outcomes and few have considered charter school funding and resources (Sugarman, 2002). Even less attention is given to the potential impact of charters on public school resources. In a recent study, Dee and Fu (2004, p. 261) asserted that "no study … has presented empirical evidence on whether the introduction of charter schools actually influenced the resource levels in conventional public schools."

Theoretical and anecdotal arguments about the influence of lost resources, however, provide some evidence on the possible incentives for public schools to change behavior. For example, in Dayton, Ohio, officials report a $19 million loss from their annual budget due to charter enrollment (Gewertz, 2002). The Cincinnati Public School District started a study to find out why hundreds of students are leaving the district for charter schools as the officials are concerned about the district's budget problems due to the loss of students to charter schools (Mrozowski, 2005). In Milwaukee, a think tank estimated a net loss of $22.2 million dollars in state funds to traditional public schools because of students transferring to private and charter schools (Miner, 1999). A school board director in Pittsburgh complains that by year's end, the district will have sent nearly $3.5 million of its $79.38 million budget to charter schools (Tinsley, 2006).

Researchers argue that public schools will react to the budget loss. Hoxby (1998), an avid supporter of competition-based school choice, even argues that when the competition is between similar alternatives like a charter school and a regular public school, rather than private school competition, public schools will reduce costs more. If public schools experience increased achievement despite reduced resources, this may suggest that they have become more efficient providers of schooling.

In this section, I will start by investigating the changes in the student-teacher ratios across different groups of public schools. Student-teacher ratio is used as an indicator of both class size and school-level resources. Introduction of charter schools may decrease the pupil-teacher ratio in regular public schools. On the other hand, many district officials complain about the loss of students to charter schools and its contribution to the district's budget problems (Elliott, 2005; Mrozowski, 2005). These financial losses can lead to reductions in teachers and administrative staff. In Detroit, Michigan, the teacher federation has been worried that the public schools maybe forced to lay off 4000 employees in the face of enrollment declines due to competition from charter and private schools (Gehring, 2004). In Los Angeles, it has been reported that hundreds of teachers and administrators have left the city's school system to take jobs at growing charter schools (Rubin, 2006). If these concerns are valid, introduction of charter schools may increase the pupil teacher ratio in regular public schools. This hypothesis will then test whether charter schools lead to resource reductions in regular public schools.

While the average change in the student-teacher ratio in public schools is far from a perfect measure of school resources, this chapter focuses on the student-teacher ratio as an indicator of class size and school level resources to explore whether the charter school

movement contributes to any changes. In previous work, student-teacher ratio is commonly used to measure the level of human resources input in terms of number of teachers in relation to the size of the student population (Borland, Howsen, & Trawick, 2005; Dee & Fu, 2004; Wirt et al., 2005). Therefore, pupil-teacher ratio is an indicator of both class size and resource levels of schools (Wirt et al., 2005).

In the second part of this section, I will concentrate on the student-teacher ratios in schools located in counties with high poverty rates to investigate whether the competitive effects of charter schools are stronger in certain types of environments. We may expect to observe bigger effects in higher poverty areas for many reasons. If most charter schools are directed to more disadvantaged or problematic students as suggested by some scholars, we would expect to see more charter concentration in high poverty areas. As most of the public school funding comes from real estate values in neighborhoods, real estate values in poor neighborhoods tend to be low and quality of the school systems tend to be poor. Charter schools in such poor areas create more options for low-income parents who have children in poorly performing neighborhood public schools. The student-teacher ratios in public schools may fall because of student transfers to charters. However, we may also expect to observe increases in the student-teacher ratios if the transfers lead to significant financial losses resulting in teachers and administrative staff cutbacks. In sum, this hypothesis will allow me to test the scope and significance of competitive pressures in higher poverty areas.

Previous Research

Student-teacher ratio is a commonly used education indicator. National Center for Education Statistics compiles indicators from a variety of data sources to provide information on the current state of education (NCES, 2001). It is also a part of the youth indicators also published by NCES to provide statistics to describe the circumstances of young people's lives in school (Fox, 2005). Table 1 shows the median public school student-teacher ratio in Texas, Florida, New Jersey, and Ohio.

Table 4.1 Median public school student-teacher ratio, by instructional level for Texas, Florida, New Jersey, and Ohio: School year 1999-2000

	Instructional Level		
State	Primary	Middle	High
Texas	15.2	14.2	12.4
Florida	17.2	19.2	18.9
New Jersey	15.4	13.4	13.0
Ohio	17.8	16.0	17.0
50 States Average	16.2	15.5	14.8

Source: National Center for Education Statistics (NCES, 2001)

The student-teacher ratio is not the same as class size although it has been used as a measure of class size in some previous work. In broad terms, the student-teacher ratio reflects teacher workload and school resources (Hanushek, 1998). In that sense, NCES argues "the student-teacher ratio has implications not only for the cost of education, but also for the quality"(Matheson, Salganik, Phelps, & Perie, 1996). Student-teacher ratio is calculated by comparing the number of students in a school compared to the number of all teaching professionals in the school, which may not only include the full time teachers serving students in the classroom, but also other administrative staff, counselors, or part-time teachers. Because of this discrepancy, the typical class size observed in schools is larger than the reported student-teacher ratios (Achilles, 2000).

The impact of class size reduction on student performance has been studied widely and created controversy among researchers. Reducing the class size for increasing achievement is a traditional intervention policy that targets educational inputs. Coleman (1966) concludes that differences in school resources such as class size are relatively unimportant in explaining student achievement. Others have shown, however, that students from schools with abundant resources such as lower student-teacher ratios grow up to have better job market success and earn more than children from poorer schools (Burtless, 1996). The most extensive information on the effect of school resources in the form of pupil-teacher ratios comes from the STAR (Student-Teacher Achievement Ratio Study) experiment. In the mid 1980s, the Tennessee Department of Education conducted a four-year longitudinal class-size study called Tennessee's Project STAR (Student-teacher Achievement Ratio) (Mosteller, 1995). In this experimental design, researchers assigned students and teachers randomly into small and regular classes and tracked the students from kindergarten to third grade. Studies analyzing STAR data find that class size has a significant effect on test scores. Finn and Achilles (1990) for example concluded that "this research leaves no doubt that small classes have an advantage over larger classes in reading and math in early primary grades."

There is, however, not a consensus on the relationship between resources and student achievement. Some proponents of the school choice approach to educational reform also argue that school resources do not matter much in educational outcomes. Hanushek (1998), for example, reviewed 152 studies of class size and concluded that a minority of them reported significant relationships between class size and student achievement. Hanushek also reviewed the STAR project in his literature review and

argued that the findings from the study showed minor gains for students in earlier grades, but the interpretation of findings go beyond of what is suggested by the available data. Other scholars, however, do not agree with Hanushek's conclusions (Krueger, 2002; Molnar, 1998). Krueger (2002) criticizes Hanushek's selection and review method as he relied on multiple estimates from the same papers and counted each estimate separately to find the insignificant findings. Krueger counted each publication as only one result and concluded that the resources are more influential on achievement than is suggested by Hanushek's review (Mishel & Rothstein, 2002).

Student-teacher ratios in charter schools are often used as controls in studies focusing on performance outcomes (e.g. Bifulco & Ladd, 2006; Eberts & Hollenbeck, 2002), but they have not been studied in particular in the charter school context. The only study that has presented empirical evidence on whether the introduction of charter schools influenced the student-teacher ratios in traditional public schools was conducted by Dee and Fu (Dee & Fu, 2004). The authors tracked changes in the student-teacher ratio in Arizona, which introduced charter schools, and New Mexico, which did not. They found that student-teacher ratios increased in Arizona public schools and interpreted this finding as evidence that charter schools drain resources from traditional schools.

According to the US Department of Education charter school report (Nelson et al., 2000), the student-teacher ratios in charter schools are slightly smaller, on average, than other public schools, especially in the earlier grades. Many charter school developers interviewed in the study reported that they created their schools in part to provide smaller classes and that parents often chose their schools because their class sizes were low.

Table 4.2 is adopted from the US Department of Education report (Nelson et al., 2000) and summarizes the student-teacher ratio for charter and regular public schools.

Table 4.2 Student-teacher ratio for Charter Schools and all Public Schools in the 27 States that have charter schools by 1997

	Type of School	
Instructional Level	Charter Schools	Public Schools
Primary	15.8	17.6
Middle	15.4	16.4
High	16.4	16.5
N	945	51,505

Source: table adopted from *The State of Charter Schools 2000 - Fourth-Year Report, which uses U.S. Department of Education, National Center for Education Statistics, Common Core of Data Survey, 1997-98.*

Empirical Results

The CCD data contains student-teacher ratio variable, which is calculated by dividing the total number of students by the number of full-time equivalent classroom teachers. This chapter focuses on the student-teacher ratios in Texas, Florida, New Jersey and Ohio public schools by using similarly specified models as in the previous chapters.

In table 4.3, 4.4, 4.5 and 4.6, I report the student-teacher ratios in these four states for groups of schools. The first treatment group (C1) includes traditional public schools that have one or more charter schools in the same county. The second treatment group (C2) includes traditional public schools, which have at least one charter school within their 5-mile radius. The third treatment group (C3) includes traditional public schools, which are located in counties where charter schools enroll more than the median percentage of public students. The estimates show that the student-teacher ratios in traditional public schools located in counties with above median charter enrollments or that have charter schools in their county or within their 5-mile radius, fell from 1995-96 school year to 2001-02 school year across all states. The results show that there is also a

decrease in the student-teacher ratios in other control schools, but the size of the change is smaller. There is a decrease of about 1 in student-teacher ratios in Texas and Florida schools across all specifications, and decrease of about 2 in New Jersey and Ohio schools.

Table 4.3 Mean Differences in the Student-Teacher Ratios for Traditional Public Schools in Texas*

Student-teacher Ratio		C1	C2	C3
Treatment	1995-96	16.16	16.23	16.42
	2001-02	15.11	15.19	15.43
	Difference	**-1.05**	**-1.04**	**-0.99**
Control	1995-96	13.95	14.38	14.73
	2001-02	12.97	13.38	13.76
	Difference	**-0.98**	**-1.0**	**-0.97**
Difference-in-differences		-0.07	-0.04	-0.02

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

Table 4.4 Mean Differences in the Student-Teacher Ratios for Traditional Public Schools in Florida*

Student-teacher Ratio		C1	C2	C3
Treatment	1995-96	18.86	18.88	19.02
	2001-02	17.83	17.68	17.86
	Difference	**-1.03**	**-1.12**	**-1.16**
Control	1995-96	18.93	18.84	18.71
	2001-02	18.29	18.23	17.91
	Difference	**-0.64**	**-0.61**	**-0.8**
Difference-in-differences		-0.39	-0.51	-0.36

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

Table 4.5 Mean Differences in the Student-Teacher Ratios for Traditional Public Schools in New Jersey*

Student-teacher Ratio		C1	C2	C3
Treatment	1995-96	15.70	15.76	15.65
	2001-02	14.10	14.00	13.71
	Difference	**-1.60**	**-1.76**	**-1.94**
Control	1995-96	15.69	15.62	15.73
	2001-02	13.69	14.03	14.19
	Difference	**-2.00**	**-1.59**	**-1.54**
Difference-in-differences		0.4	-0.17	-0.40

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

Table 4.6 Mean Differences in the Student-Teacher Ratios for Traditional Public Schools in Ohio*

Student-teacher Ratio		C1	C2	C3
Treatment	1995-96	18.79	18.80	18.37
	2001-02	16.31	15.97	15.90
	Difference	**-2.48**	**-2.83**	**-2.47**
Control	1995-96	19.88	19.65	19.59
	2001-02	17.64	17.57	17.54
	Difference	**-2.24**	**-2.08**	**-2.05**
Difference-in-differences		-0.24	-0.75	-0.42

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

Table 4.7, 4.8, 4.9 and 4.10 present the results from the regression models that estimate the student-teacher ratio. The coefficient of interest is the interaction term between post year and the competition measure (C1, C2 and C3). Similar to tables in previous chapters, C1, C2 and C3 are three competition measures used throughout the dissertation.

In the Texas models, charter schools seemed to have no effect on student-teacher ratios of traditional public schools. The coefficients on interaction terms are all insignificant. Increase in the ratio of school age non-Hispanic white population in the

county is associated with increases in the student-teacher ratios. In Florida, the charter coefficients are negative and significant across three specifications. Interestingly, with the addition of the controls to the first model, the coefficient on the interaction term loses significance, although it still shows a negative effect for schools with at least one operational charter school in their county. For the schools that experience direct competition within their 5-mile radius, student-teacher ratio is reduced by .6, an average decrease of about 3 percent. With the additional controls, the size of the coefficient is reduced to .5, but remains highly significant. For schools in counties with at or above median charter school enrollment, the regression results show a negative effect. The size of the effect declines with additional controls from .4 to .3, but remains significant.

In New Jersey models, the results are mixed. There are no significant effects in schools with charters within 5-mile radius. Interestingly, for schools in counties with at or above median charter school enrollment, the regression results suggest that introduction of charter schools decreased student-teacher ratios in traditional schools by about .4. The size of the effect declines to .1 in the enrollment based model with additional controls, but the effect is no longer significant. For schools that have charters in their county, the effect size increases to .6 and remains significant.

In Ohio, only schools that have charter schools within their 5-mile radius experience their student-teacher drop by a statistically significant .8 more than schools without competition that close. Introducing the county level controls in this case strengthens the size of the coefficient to .9, and the coefficient remains significant.

Table 4.7 Estimated Effect of Charter Schools on Public Schools in TEXAS: Student-teacher Ratio

	(I)	(II)	(III)
C1	-0.035 (0.086)	-	-
C2	-	-0.064 (0.082)	-
C3	-	-	0.176 (0.102)
T	-1.009** (0.100)	-1.013** (0.100)	-.932** (0.105)
Proportion of white non-Hispanics in the 5–19 year old population	3.724** (1.000)	3.285** (0.970)	5.083** (1.099)
Proportion of 5–17 year olds in poverty	-0.031* (0.013)	-0.037** (0.013)	-0.020 (0.014)
Log of total population	0.009 (0.378)	0.037 (0.013)	0.332 (0.387)
Proportion of private school enrollment	4.592 (3.127)	4.693 (3.128)	5.772 (3.179)
Constant	13.845** (4.756)	13.866** (4.752)	8.844 (4.940)
Adjusted R^2	0.6063	0.6063	0.6053

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 4.8 Estimated Effect of Charter Schools on Public Schools in FLORIDA: Student-teacher Ratio

	(I)	(II)	(III)
C1	-0.041 (0.169)	-	-
C2	-	-0.449** (0.110)	-
C3	-	-	-0.247* (0.110)
T	-1.073** (0.198)	-0.790** (0.150)	-0.947** (0.147)
Proportion of white non-Hispanics in the 5–19 year old population	9.031** (1.309)	8.185** (1.277)	8.681** (1.275)
Proportion of 5–17 year olds in poverty	-0.710 (0.795)	-0.323 (0.797)	-0.205 (0.826)
Log of total population	3.950** (0.902)	3.487** (0.897)	3.652** (0.903)
Proportion of private school enrollment	2.883 (3.406)	2.029 (3.387)	2.910 (3.388)
Constant	-37.967** (12.048)	-31.452** (12.048)	-34.006** (12.044)
Adjusted R^2	0.6699	0.6724	0.6707

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 4.9 Estimated Effect of Charter Schools on Public Schools in NEW JERSEY: Student-teacher Ratio

	(I)	(II)	(III)
C1	0.548** (0.182)	-	-
C2	-	-0.038 (0.145)	-
C3	-	-	-0.118 (0.213)
T	-1.478** (0.247)	-1.202** (0.232)	-1.240** (0.238)
Proportion of white non-Hispanics in the 5–19 year old population	8.018** (2.086)	8.600** (2.082)	8.551** (2.083)
Proportion of 5–17 year olds in poverty	12.458** (2.612)	10.600** (2.702)	9.268* (3.807)
Log of total population	1.653 (2.590)	3.373 (2.576)	3.365 (2.629)
Proportion of private school enrollment	-3.405 (3.966)	-7.994* (3.761)	-8.152* (3.746)
Constant	-12.097 (33.628)	-34.023 (33.447)	-37.204 (34.037)
Adjusted R^2	0.5677	0.5658	0.5659

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 4.10 Estimated Effect of Charter Schools on Public Schools in OHIO: Student-teacher Ratio

	(I)	(II)	(III)
C1	-0.226 (0.206)	-	-
C2	-	-0.901** (0.164)	-
C3	-	-	-0.302 (0.393)
T	-2.275** (0.150)	-2.490** (0.148)	-2.085** (0.279)
Proportion of white non-Hispanics in the 5–19 year old population	-2.244 (6.249)	-8.868 (5.509)	-11.301 (10.087)
Proportion of 5–17 year olds in poverty	-2.675 (4.121)	-4.731 (3.993)	-9.160 (8.027)
Log of total population	4.600** (1.483)	4.194** (1.421)	4.503 (2.802)
Proportion of private school enrollment	0.172 (5.177)	0.543 (5.112)	4.916 (9.591)
Constant	-34.471 (20.380)	-23.603 (18.855)	-44.383 (37.451)
Adjusted R^2	.5368	.5407	.2021

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Results for schools located in high poverty areas

In this section, I will concentrate on the student teacher ratios in schools located in counties with high poverty rates. The purpose of these analyses is to investigate whether competitive effects are larger in higher poverty counties than lower poverty counties. If most charter schools target disadvantaged students concentrated in poor areas, we might observe more charter concentration in high poverty areas and drop in student-teacher ratios of public schools because of student transfers to charters. Similarly, if the schools in high poverty areas are especially hard hit by the decline in school funding and address this change by cutting back in teaching and administrative personnel student-teacher ratios may increase more in these schools.

In order to investigate whether the competitive effects of charter schools are more or less observable in poor areas, I have identified counties with poverty rates for school-aged children higher than the 75th percentile of all counties in the state in 1996 and rerun the models for this subgroup of schools. These sub-samples include fewer schools than the original models. Texas models include traditional public schools in counties with more than 27.8 percent of 5–17 year olds in poverty (1780 schools). Florida models include traditional public schools in counties with more than 22.8 percent of 5–17 year olds in poverty (584 schools). New Jersey models include traditional public schools in counties with more than 18.1 percent of 5–17 year olds in poverty (601 schools). Ohio models include traditional public schools in counties with more than more than 18.6 percent of 5–17 year olds in poverty (893 schools).

Tables 4.11 shows the summary results from these models, alongside the original results for all schools. The coefficient of interest is the interaction term between three charter school specifications and the post legislation year. The first row shows the initial

regression results and the second row shows the coefficient after control variables are included in the model. In the Texas models, charter schools still seemed to have no effect on student-teacher ratios of traditional public schools located in high poverty areas. The coefficients on interaction terms remain insignificant, however, in schools that experience direct competition within their 5-mile radius or located in high charter enrollment counties, the coefficient on the charter competition variable changes sign and shows an increase of pupil/teacher ratios.

In Florida, the charter coefficients are negative and significant across three specifications in models that include all schools. When the models are run for schools located in poor areas, the coefficients loses significance expect for public schools with charter schools close by. In New Jersey models, there are still no significant effects in schools with charters within 5-mile radius. Interestingly, for schools in counties with at or above median charter school enrollment, the size of the effect rises from .548 to 1.504 and remains significant. In Ohio, similarly specified models do not show significant effects on student-teacher ratios of schools in poor counties.

Summary Discussion

In their study on Arizona, Dee and Fu (2004) found that charter schools led to a statistically significant increase of 6 percent in their student-teacher ratios of public schools. The analysis in this chapter shows that the effect of charter schools on student-teacher ratios in public schools are different in Texas, Ohio, Florida and New Jersey. Most models did not show significant coefficients, and the significant coefficients are in general negative.

Unlike race models, the results from the student-teacher ratio models are not consistent across states and measures, so it is difficult to characterize the findings. In Texas, none of the models showed significant coefficients, so the models suggest that charter schools did not cause any change in student-teacher ratios of traditional Texas schools during this period. In Florida, both schools with charter schools within five miles and schools in counties with above median charter school enrollment experience drops in student-teacher ratios. The repeated analysis of the sub-sample of schools located in counties with high poverty rates showed generally insignificant coefficients, with the exception of New Jersey model. Schools in counties with above median charter enrollment experience an increase of 1.5 in student-teacher ratio after the controls are added.

It is not clear whether the slight drops in the student-teacher ratios of Florida public schools are caused by decreases in student enrollment or increases in number of teachers during that period. This question is difficult to answer with existing data, but it would be interesting to study the basis of this observed change. Further work is also needed to understand the rise of student-teacher ratios in schools located in poorer New Jersey counties; however, it is promising to see that charter schools do not lead to overall increases in student-teacher ratios in traditional public schools in these four states.

Table 4.11 Summary Table for the Estimated Effect of Charter Schools on Public Schools in Texas, Florida, New Jersey and Ohio: Student/Teacher Ratio

Dependent variables	Texas			Florida			New Jersey			Ohio		
All schools												
	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
Base model	-0.066 (0.073)	-0.037 (0.072)	-0.022 (0.083)	-0.383* (0.164)	-0.588** (0.108)	-0.354** (0.105)	0.396* (0.165)	-0.160 (0.135)	-0.409** (0.139)	-0.238 (0.138)	-0.746** (0.142)	-0.416 (0.285)
W/Controls	-0.035 (0.086)	-0.064 (0.082)	0176 (0.102)	-0.041 (0.169)	-0.449** (0.110)	-0.247* (0.110)	0.548** (0.182)	-0.038 (0.145)	-0.118 (0.213)	-0.226 (0.206)	-0.901** (0.164)	-0.302 (0.393)
Sub sample of schools in poor counties												
	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
Base model	-0.107 (0.186)	0.185 (0.186)	0.266 (0.241)	-0.311 (0.217)	-0.401* (0.197)	0.051 (0.200)	2.400** (0.586)	0.471 (0.392)	2.400** (0.586)	-0.681 (0.872)	-1.383 (0.868)	-0.681 (0.872)
W/Controls	0.097 (0.238)	0.172 (0.224)	0.404 (0.267)	-0.055 (0.330)	-0.262 (0.216)	-0.206 (0.279)	1.504* (0.763)	-0.680 (0.478)	1.504* (0.763)	1.067 (1.753)	-1.123 (1.065)	1.066 (1.753)

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis. Second row shows coefficients from the models with controls (not reported in the table). C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment).

CHAPTER 5

EFFECTS ON ACADEMIC OUTCOMES

No other question in charter school literature has caused so much passionate discussion as performance. The evidence on the impact of charter schools on the achievement levels of their students, as well as their effect on achievement of non-choosers are mixed and the debate remains contentious, reflecting the diverse opinions on the school choice issue in general. In 2004, the New York Times published a front-page story headlined "Nation's Charter Schools Lagging Behind, U.S. Test Scores Reveal", summarizing the negative findings of the American Federation of Teachers (AFT) report based on the early data from the federally-sponsored National Assessment of Educational Progress (NAEP)(Schemo, 2004). The article attracted widespread national attention and engendered an unusual response in scholarly debates, a full-page rebuttal advertisement by several academicians and charter school supporters. The ad points to the ideological stand of the AFT and discusses the methodological flaws in the AFT report and the standards for methodological quality in charter school research. Other newspaper stories about the reactions to the AFT report followed (Fuller 2004; Howell, Peterson, & West, 2004; Kelly & Szabo, 2004). The U.S. Secretary of Education issued a statement regarding the article (Paige, 2004). In the months following the incident, other research papers and reports on charter school performance were published and publicized. In 2005, Carnoy, Jacobsen, Mishel, and Rothstein (2005) published a book called The Charter School Dust-Up: Examining the Evidence on Enrollment and Achievement, in which they review the controversy, the literature regarding charter school performance

and criticize the overreaction of charter school supporters who placed the ad in the New York Times, by referring them as charter school zealots. The authors even criticize some of the researchers who signed the NY Times ad for not satisfying the standards for methodological quality in their own research. The most recent U.S. Department of Education report using the same National Assessment of Educational Progress (NAEP) data also concluded that charter school students had lower mathematics and reading achievement scores on average when compared with their counterparts in regular public schools (Braun, Jenkins, & Grigg, 2006). The controversy surrounding the publication of the New York Times article on charter school performance and following reactions demonstrate the magnitude of interest and compassion regarding charter school reform.

The controversy illustrates the highly charged atmosphere surrounding the charter school reform and charter school research. In this chapter, I focus again on the impact of charter schools on performance of other traditional public schools. In the following section, first, I will review the previous research findings. Then, I will present the empirical findings on the achievement outcomes from this study.

Previous Research

Reviews of Studies Comparing Charter and Traditional Public School Achievement

Performance of charter school students is at the heart of the controversy surrounding charter schools. Most research focuses on achievement of charter school students and compares achievement between charter and regular school students. Not only do the individual studies find mixed and even conflicting results, but also different reviews of the literature on academic outcomes draw different conclusions on the overall

effectiveness of charter schools based on these studies. Table 5.1 provides a list of recent studies that review research findings on charter school achievement.

Table 5.1. Literature Reviews on Charter School Achievement

Year	Authors	Source
2001	Gill, Timpane, Ross, and Brewer	Chapter 3: Academic Achievement, *Rhetoric versus Reality: What We Know and What We Need To Know About Vouchers and Charter Schools* (Santa Monica, Calif.: RAND).
2001	Miron and Nelson	Student Academic Achievement in Charter Schools: What We Know and Why We Know So Little, Occasional Paper No. 41, National Center for the Study of Privatization in Education Teachers College, Columbia University.
2005	Carnoy, Jacobsen, Mishel, and Rothstein,	Chapter 5: What we know about relative charter and regular public school student achievement in *The Charter School Dust-Up: Examining the Evidence on Enrollment and Achievement* (New York, NY: Teachers Colege Press)
2006	Hassel and Terrell	Charter School Achievement: What We Know. Charter School Leadership Council Report.
2006	Hill, Angel, and Christensen	Charter School Achievement Studies, Education Finance and Policy,1,1, 139-150.
2006	Berends, Watral, Teasley, and Nicotera	Charter school effects on achievement: where we are and where we're going, paper presented in National Center on School Choice conference, Vanderbilt University, Nashville, TN.

Gill, Timpane, Ross and Brewer (2001) summarize the empirical evidence related to academic achievement under charter programs until 2001. Their review is based on the findings of only three statewide studies that focus on Michigan, Arizona, and Texas, which were three of the states with the largest number of charter schools by 2001. Based on the negative results from Michigan, positive results from Arizona and the mixed results from Texas, the authors conclude that the evidence suggests reason for cautious

optimism. Miron and Nelson (2001) review 15 studies that focus on charter schools' impact on student achievement. The authors rate the existing studies and weight the impacts by methodological quality. They conclude that the charter impact on student achievement is mixed or very slightly positive.

In a more recent book, Carnoy, Jacobsen, Mishel, and Rothstein (2005) reviewed NAEP data and 19 studies with a state by state categorization. The authors conclude that based on standardized test scores, the performance of charter schools is not higher and in some states lower than those of their counterparts in regular public schools. Although some of the studies show positive gains for charter students, the authors conclude that the average effect is negative. In one of the author's (Mishel) words (N. Coleman, 2005): "The evidence that charter schools do not outperform regular public schools suggests that while some charters may be a benefit to students, others do great harm… Charter schools were designed to be experimental; it should be no surprise that some experiments lead to failures, experiences that can provide useful lessons."

In a report prepared for the Charter School Leadership Council, Hassel (2006) reviews 58 comparative analyses of charter and district performance. He divides the studies that compare achievement into three groups as individual level panel studies, other change studies that investigate, for example, average school-wide scores, and snapshot studies, which investigate cross-sectional data. Of the 58 studies, 25 look only at a snapshot of performance with mixed results, while other 33 studies look at change over time in student or school performance, with relatively positive results for charter schools. The author concludes that the findings from the panel-based studies suggest encouraging results for charter schools and believes: "Charter schooling represents an experiment

worth continuing – and refining to improve quality further over time"(Hassel & Terrell, 2006, p. 2).

Hill, Angel and Christensen (2006) review 35 studies focusing on charter schools and academic achievement by methodological sophistication. The results are extremely mixed: 15 find positive effects, 10 find negative effects and 10 report neutral or mixed findings. The authors conclude that even the five most sophisticated studies present mixed results, with two reporting positive effects, two reporting mixed results, and one reporting negative effects. The authors conclude that some charter schools have definite positive outcomes, however, "these average out when combined with large numbers of schools that have small or slightly negative outcomes" (Hill, Angel & Christensen, 2006, p. 146).

Berends, Watral, Teasley and Nicotera (Berends, Watral, Teasley, & Nicotera, 2006) review the above-mentioned reviews. The authors argue that these studies, with the exception of Miron and Nelson, do not utilize meta-analytic procedures and may be subject to publication bias as they only include published studies. The authors aspire to use meta-analysis techniques to systematically explore the impacts of charter schools aiming to better understand the mixed results. The authors emphasize the importance of looking into the mixed results to understand the conditions under which researchers observe positive impacts. This paper, however, is just a preamble that describes some of the ongoing research activities.

Table 5.2 is adapted from Hassel (2006) and provides a list of studies that compare achievement in public and charter schools according to the methods they used.

The geographical focus of each study is listed in the parentheses following the authors' names.

Table 5.2. Studies Comparing Charter and Traditional Public School Achievement

Panel studies following individual students over time	**Other change studies**	**Cross-sectional Studies**
Ballou, Teasley, and Zeidner (ID) Bifulco & Ladd (NC)* Booker et al. (TX) Florida Department of Education (FL) Florida Office of Program Policy Analysis and Governmental Accountability (FL) Gronberg & Jansen (TX)*+ Hanushek, Kain, & Rivkin (TX)* Hoxby & Rockoff (Chicago)* Massachusetts Department of Education (MA) Miron (DE) Miron et al (DE) Noblit & Dickson (NC) Sass (FL)* Solmon & Goldschmidt (AZ) * Zimmer et al. (CA)	Bettinger (MI)*+ Carr & Staley (OH) EdSource (CA) Greene, Forster, & Winters (multi) Loveless (multi) Metis Associates (KC, MO) Miron & Horn (CT)* Miron & Nelson (MI)* Miron, Nelson & Risley (PA)* NY Board of Regents (NY) Raymond (CA)* Rogosa (CA)* Shapley et al (TX) Slovacek et al. (CA)* Solmon, Paark and Garcia(AZ) + Zimmer et al. (CA)*	Bates & Guile (OR) Bifulco & Ladd (NC)* Colorado Department of Education (CO)* Chicago Public Schools (Chicago) Eberts & Hollenbeck (MI)* Finnigan et al. (multi) Florida Department of Education (FL) Gronberg and Jansen (TX) Hoxby (national)* Henig et al. (DC)* Legis. Office of Ed. Oversight (OH) Loveless (multi)* Nelson, Rosenberg, & Van Meter (national) Nelson & Miron (IL)* Noblit & Dickson (NC) Plucker et al (GA) Raymond (CA)* Roy & Mishel (national) Stevens, Jean (NY) U.S. Department of Ed. (national) Was & Kristjansson (UT) Witte et al. (WI)* Zimmer et al. (CA)*

Note: * indicates that the study is also reviewed in Carnoy et al. (2005). +indicates studies reviewed in Gill, Timpane, Ross and Brewer (2001).

Impact of Charter Schools on Performance of Traditional Public Schools

The studies and the reviews discussed so far focus on comparing achievement in charter schools and traditional public schools. Supporters of the systemic or competitive effects argument, however, assert that regardless of how well charter schools compare with traditional schools, their existence will benefit the public school system by creating competition for traditional schools. Hoxby (2001, p. 1) explains this position clearly:

> As a rule, the key way in which organizations respond to competition is by becoming more efficient. This tendency is so strong that we often say that an organization has 'become more competitive' when we really mean that it has become more efficient or productive in response to competition. Thus, it is not only possible, but likely, that regular public schools will respond to competition from choice schools by raising their pupils' achievement or raising another pupil outcome valued by parents. Better outcomes are the way in which a regular public school would evince increased efficiency.

In the context of charter schools, this translates into changes in the behaviors of public school administrators, such as introduction of new techniques and innovations to increase achievement when faced with the possibility of losing students and funding. In addition, potential changes in student composition can affect academic achievement in public schools. If charters absorb the more disadvantaged or problematic students, performance in traditional public schools may increase. Findings from the previous chapters show that in these four states, charter presence lead to declines in the enrollment of non-Hispanic white students from nearby traditional public schools. The regression

results also showed that charter schools contribute to the decline of the share of free-lunch eligible students in traditional public schools in Texas, but increase the share of free-lunch eligible students in Ohio

Although the competition argument is voiced often amongst school choice supporters, papers analyzing the actual performance increase empirically due to competition from charter schools are still a limited fraction of the literature. Not surprisingly, the findings from this literature are also mixed and sometimes contradictory even between studies that focus on the same state. Table 5.3 provides a list of studies that focus on competition effects in public school achievement or studies that may have some findings that are relevant to the competitive effects discussion.

Hoxby (2001; 2003) studies the competitive effects of charter schools in Michigan and Arizona. She concludes that in districts with high charter school enrollment, achievement in public schools has increased over the years. She uses 6 percent or more charter school enrollment as the critical threshold and classifies public schools in such district as facing competition. Based on this criterion, she uses difference-in-differences estimates to compare schools that do and do not face competition over the same time period for 4th graders. The selection of the 6 percent criterion is arbitrary, and she does not explain why the effects start at this cut-off point. The author also does not use any county or district level controls in these analyses.

Table 5.3. Studies on Traditional Public School Achievement due to Charter Competition

State	Authors	Methodological approach	Findings	Competition measure
MI AZ	Hoxby (2001, 2003)	- School level difference-in-differences regression	-positive effect	- 6 percent or more charter school enrollment in the district
MI	Eberts & Hollenbeck (2002)	- School level lagged panel regression	- no effect	- dichotomous variable for presence of a charter school in the district
MI	Bettinger (1999, 2005)	- school level panel regression	- no effect	- number of schools within 5-mile radius of a public school
NC	Bifulco & Ladd (2004)	- Student fixed-effect regressions	- no effect	- 3 dichotomous variables based on distance (the school attended by the student is within 2.5 miles of a charter school, between 2.5 and 5 miles of the nearest charter school, and between 5 and 10 miles of the nearest charter school) - 3 dichotomous variables based on number of schools (the school had one, two, or more than two charter schools located within 5 miles)
NC	Holmes, DeSimone & Rupp (2003, 2006)	- School level lagged panel regression	-positive effect	- the distance between the public school and the closest charter school
TX	Bohte (2004)	- district level pooled time-series regression	-positive effect	- dichotomous variable for presence of a charter school in the district and number of charter schools in the district
TX	Booker, Gilpatric, Gronberg and Jansen (2004)	- Student fixed-effect regressions	-positive effect	- the percent of public school students in a district that attend a charter school - the sum of net flow of students in the current year and all previous years.
FL	Sass (2006)	- Student fixed-effect regressions	-positive effect	- presence of nearby charter schools - the number of competing charters - enrollment share of charter schools

Other studies also focusing on Michigan find different results. As part of a study examining the achievement of charter school students, Eberts and Hollenbeck (2002) also investigate whether there is evidence for indirect effects of charter schools on achievement in public schools in Michigan. They use three years of test score data and achievement in traditional public schools in Michigan, and included a dummy variable for presence of a charter school in the district. In contrast to Hoxby's findings, their results show little achievement gain in writing and science, but gains in math and reading. They conclude that there is little evidence that supports competitive effects on test scores in Michigan schools.

Bettinger (1999; 2005) uses school-level data from Michigan's standardized testing program and analyzes whether charter schools have any effect on test scores in neighboring public schools. The author uses the number of schools within a 5-mile radius of a public school as an indicator of competition and estimates the effect of this measure on public school test scores. As Michigan's charter law allows state universities to approve charter schools and universities use this right extensively, the author also uses the proximity of a public school to one of these state universities as an instrument for the likelihood that charter schools were established nearby as an additional control for possible endogeneity. Bettinger concludes that charter schools have had no significant effects on test scores in neighboring public schools in Michigan. It should be noted however that the study estimates the effects of charter schools on public schools' math scores by comparing the two after just one year and focuses on the effects of newly created schools.

Bifulco and Ladd (2004) use individual level panel data to estimate the impact of charter schools on their own students and on students in nearby traditional public schools in North Carolina. Because they have detailed student level data, they are able to control for student fixed effects and to track the moves of students from a regular public school to a charter school or back over time. They use the number of charter schools within 5-miles and the distance to the nearest charter school and estimate the effects of these two measures on public school students' test scores over time. The authors find that in both math and reading, charter schools have no statistically significant effects on the achievement of the traditional public school students. Analyzing the likelihood of losing students to charter schools as an indicator of intensity of the competition, the authors caution, however, that the generalizability of their results is limited as the amount of competition provided by charter schools in North Carolina is small.

In contrast, Holmes, DeSimone and Rupp (2003; 2006) found test score gains in public schools from charter competition in North Carolina. They used school-level performance data from 1996 to 2000 provided by the North Carolina Department of Public Instruction. The authors use the distance between the public school and the closest charter school as their competition measure, which they refer to as a price variable as it theoretically measures the cost of attending a charter school. The authors found that an approximate one percent increase in achievement when a traditional school faces competition from a charter school.

Bohte (2004) analyzed school districts in Texas, rather than schools. He used pooled time series data from 1996 to 2002 to analyze the overall pass rate of 10th grade for each school district in Texas TAAS test. The study covers the years after competition

is introduced. Charter school competition is incorporated into the models by simply adding a dummy variable to show the existence of a charter school in the district or a variable to show the total number of charter schools in the district. The results show that charter schools contribute to modest overall performance improvements for traditional public school students, and that the performance gain is stronger for low-income students. It should be noted that district level analysis may produce a noisier measure of the impact than a school or student level analyses. Additionally, as the majority of the charter schools serve lower grades, these results may underestimate their impact.

Booker, Gilpatric, Gronberg and Jansen (2004) analyze student-level panel data on test scores for public school students over an eight-year period. They evaluate the impact of charter schools on public school students' achievement in Texas. Because these researchers were able to obtain detailed student-level data, they were able to control for both student and school level fixed effects and even some family background characteristics as well as to investigate individual student gains in test scores. The authors measure charter school competition first as the percent of public school students in a district that attend a charter school and second as the cumulative net flows of students to charters for each school. They find a positive but small effect of charter schools on public school test scores in Texas.

Sass (2006) also utilizes panel data on individual students who attended traditional public schools and took the Florida achievement test in 2000 and 2001. The author uses presence of nearby charter schools, the number of competing charters, and the enrollment share of charter schools as charter competition measures and concludes

that competition from charters has a modest but positive impact on math scores and no impact in reading scores in Florida's traditional public schools.

Overall, the literature on competition effects is still in its infancy as relatively a small number of studies focus on systemic effects in a number of states. So, the mixed results are not surprising. A few trends in these studies are worth noting. First is the growing interest, especially by economists, in the effects of charter school competition on public school achievement as evidenced by the expanding literature. As better quantitative data becomes available, it will become increasingly important to observe the effects of charter schools on the achievement of their students as well as on other students who stay in traditional public schools. Second is the focus on a particular state in most studies. As the states have quite distinct educational histories in terms of both their charter school legislation and other educational policies, it is reasonable to observe varying effects in different states. As more and more studies with different approaches accumulate, we may be in a better position to understand some of the inter-state variations. Third is the use of various competition measures. Some of the variation in the observed effects may be due to different formulations of charter exposure. Studies that use similar measures in different contexts may increase our understanding of the charter impact.

Empirical Results

While the use of test scores to measure performance is contentious, many researchers have used test scores as an indicator of school quality and academic achievement. This chapter focuses on the available school-level average test scores in Texas, Ohio and Florida to replicate the models in the previous chapters. The purpose of

these analyses is to examine whether average test scores rose or fell in response to charter competition. The observed changes in student compositions and student-teacher ratios studied in the earlier chapters may explain some of the changes in the test scores, so the models in this chapter also include controls for the percentage of students who are non-Hispanic white, the percentage of students who are eligible for free-lunch and the student-teacher ratios at the school level.

I gather available data from 1995 and 2001 from the state department of education web sites. For Texas, I use Texas Assessment of Academic Skills (TAAS) test results, which was administered annually by Texas Department o Education (TEA) until 2003. The test measures student achievement in reading, writing and mathematics. Passing rates by grade in reading, writing and mathematics are also available from 1995 to 2001 for Ohio schools through Ohio Department of Education. In Florida, I use the only publicly available school level test scores that span from 1995 to 2000, which is the Florida Writing Assessment Program (FWAP) test results. In New Jersey, Elementary School Proficiency Assessment (ESPA) test results are publicly available only from 1998 to 2001. The dependent variables for these analyses are pass rates for schools in these statewide tests. I discuss the results state by state in the following sections. I again start by reporting the means for groups of schools. The first treatment group (C1) includes traditional public schools that have one or more charter schools in the same county. The second treatment group (C2) includes traditional public schools, which have at least one charter school within their 5-mile radius. The third treatment group (C3) includes traditional public schools, which are located in counties where charter schools enroll more than the median percentage of public students. The general hypothesis regarding

systemic effects of charter schools argues that competition for students would lead to higher student achievement in traditional public schools. In this section, I will test whether charter school competition measured in different ways increase the test scores in public schools.

Texas

The Texas Assessment of Academic Skills (TAAS) is administered annually by Texas Department of Education (TEA). TAAS measures student achievement in reading, writing and mathematics at grades 3 through 8 and 10. The dependent variables used in these analyses are overall pass rate for each school on the TAAS (all tests summed across all grades) and overall pass rate for each school on the TAAS math test (math test summed across all grades). The overall passing rate is calculated by dividing the number of students who passed a subject test in all grades that are served by the school by the total number of students who took the test in the school. These average scores in TAAS and TAKS (after 2001) have been used widely as an overall measure of school quality in Texas (e.g. Bohte, 2004; Enns, 2004).

The pass rates increased for both treatment and control group schools during that period. The change is approximately 20 percentage points across all specifications and quite substantial for a six-year period. Although the TAAS has been considered the most comprehensive of all state testing systems (Greene, 2001) and used in many research papers (e.g. Grissmer, Flanagan, Kawata, & Williamson, 2000), some researchers have argued against the validity of TAAS scores (Klein, Hamilton, McCaffrey, & Stecher, 2000). Some suggested that the results overstate achievement gains in Texas and the passing score is arbitrarily determined by TEA (Haney, 2000). It is especially interesting

that two RAND reports published in 2000 concluded somewhat differently on Texas achievement gains based on the TAAS data (Grissmer, Flanagan, Kawata, & Williamson, 2000; Klein, Hamilton, McCaffrey, & Stecher, 2000).

Grissmer, Flanagan, Kawata, and Williamson (2000) suggests that students in Texas showed large gains in math scores in the 1990s as a result of a series of reforms focusing on standards, assessments, and accountability. Klein, Hamilton, McCaffrey and Stecher (2005) investigate the validity of the gains and conclude that the results from NAEP data and TAAS data does not correlate well and present different accounts of achievement. According to TAAS scores, the gap in Texas is much smaller than suggested by NAEP and decreasing greatly. In the news release about the later report, RAND argues that the Grissmer report is not directly comparable to Klein report and both found at least some gains in Texas NAEP scores (RAND, 2000). The discussion even went further when Hanushek (2001) criticized both reports in his review titled "Deconstructing RAND". The reports' authors responded in "RAND versus Hanushek", published in the Education Next journal (2001). Hanushek (2001) argues that the evidence from the reports does not provide enough evidence to conclude that the additional resources led to student achievement gains in Texas. He also argues that the gap between the TAAS than on NAEP scores is not accurate because TAAS represents Texas' own curriculum and NAEP represents a generic test of national content, so the two tests may be testing different skills. As a comprehensive test that cover a lengthy period, TAAS has been used in many analyses to date. However, it is important to be keep these discussions about reliability in mind when considering the results.

Table 5.4 Mean Differences in the Achievement Scores for Traditional Public Schools in Texas: *All Tests Summed Across All Grades and Math Test Summed Across All Grades*

		TAAS All Tests % Passing Sum of 3-8 & 10			*TAAS Math Test % Passing Sum of 3-8 & 10*		
		C1	C2	C3	C1	C2	C3
Treatment	1995-96	60.82	58.99	59.37	66.38	64.63	64.88
	2001-02	81.04	79.79	79.66	89.32	88.46	88.28
	Difference	**20.22**	**20.80**	**20.29**	**22.94**	**23.83**	**23.40**
Control	1995-96	64.02	64.90	63.21	69.65	70.45	68.83
	2001-02	83.94	84.38	83.22	91.39	91.68	90.90
	Difference	**19.92**	**19.48**	**20.01**	**21.74**	**21.23**	**21.97**
Difference-in-diff.		0.3	1.32	0.28	1.2	2.6	1.43

Tables 5.5 and 5.6 present the results from the regression models that estimate the overall pass rate in all tests and in math test. Similar to tables in previous chapters, the three columns show the three competition measures (C1, C2 and C3) used throughout the dissertation. In achievement models, percentage of the non-Hispanic white students and percentage of free-lunch eligible students in the school and the school level student-teacher ratio is included in the models in addition to the county level controls used in the previous chapters.

Table 5.5 Estimated Effect of Charter Schools on Public Schools in TEXAS: TAAS All Tests Percent Passing, Sum of 3-8 & 10

	(I)	(II)	(III)
C1	.864** (0.406)	-	-
C2	-	2.825** (0.381)	-
C3	-	-	2.192** (0.463)
T	21.537** (0.401)	21.890** (0.467)	22.222*** (0.483)
Proportion of white non-Hispanics in the 5–19 year old population	22.767** (4.851)	24.970** (4.686)	26.378*** (5.184)
Proportion of 5–17 year olds in poverty	-0.405** (0.062)	-0.360** (0.061)	-0.380** (0.064)
Log of total population	-7.741** (1.755)	-8.498** (1.753)	-6.481** (1.772)
Proportion of private school enrollment	9.084 (14.527)	6.276 (14.490)	7.720 (14.534)
Percentage of students who are non-Hispanic white	38.526** (2.512)	39.509** (2.508)	38.493** (2.510)
Percentage of students who are eligible for free-lunch	-1.684 (1.153)	-1.439 (1.146)	-1.874 (1.148)
Student-teacher ratio	0.065 (0.090)	0.071 (0.089)	0.067 (0.090)
Constant	134.902** (22.229)	141.270** (22.116)	117.103** (22.773)
Adjusted R^2	0.7396	0.7412	0.7396

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 5.6 Estimated Effect of Charter Schools on Public Schools in TEXAS: *TAAS Math Tests Percent Passing, Sum of 3-8 & 10*

	(I)	(II)	(III)
C1	2.541** (0.425)	-	-
C2	-	3.978** (0.403)	-
C3	-	-	3.095** (0.490)
T	22.694** (0.495)	23.187** (0.493)	23.657** (0.512)
Proportion of white non-Hispanics in the 5–19 year old population	19.127** (5.140)	22.638** (4.952)	24.668** (5.491)
Proportion of 5–17 year olds in poverty	-0.552** (0.066)	-0.484** (0.065)	-0.512** (0.067)
Log of total population	-8.508** (1.861)	-9.580** (1.854)	-6.727** (1.878)
Proportion of private school enrollment	9.931 (15.398)	5.931 (15.319)	7.709 (15.400)
Percentage of students who are non-Hispanic white	39.674** (2.662)	41.114** (2.651)	39.685** (2.659)
Percentage of students who are eligible for free-lunch	0.061 (1.222)	0.441 (1.211)	-0.169 (1.216)
Student-teacher ratio	0.053 (0.095)	0.061 (0.094)	0.056 (0.095)
Constant	154.284** (23.570)	162.977** (23.390)	128.753** (24.139)
Adjusted R^2	0.6952	0.6986	0.6955

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

The coefficient on time dummy shows that the overall pass rate in all subjects and in math increased from 1995 to 2001, even after controlling for demographic changes and private schools enrollment. The change is approximately 20 percentage points across all specifications. The coefficients of C1, C2 and C3 show the difference-in-differences estimates, the changes unique to schools that face competition after the introduction of charter schools. The regression results suggest that presence of charter schools in a county leads to an additional .864 percentage point increase in traditional public schools' overall pass rates. The coefficient is insignificant before the inclusion of the control variables, however, once the control variables are included, the overall positive effect is significant across other specifications. For the schools that experience direct competition

within their 5-mile radius, the overall pass rate increases by 2.83 percentage points. Relative to schools in counties with below median charter school enrollment, schools in high enrollment counties experienced a 2.19-point rise in their overall pass rates.

In the models for math test pass rates, similar results are observed. The impact in the baseline model is positive and the size of the coefficient increases with the addition of the controls and remains highly significant across all models. Schools that have charter schools in their county or have at or above median charter school enrollment at the county level experience a statistically significant rise of almost 3 percentage points in their math test pass rates. Schools that have charters within their 5-mile radius experience the largest change in math pass rates with an increase of almost 4 percentage points.

Aside from the impacts of charter schools, increases in the percent of white non-Hispanics in the 5 to 19 year old county population and the school are positively related to both the overall and the math pass rates in public schools. Increases in the county's share of school-age population in poverty leads to declines in overall pass rates. Overall, all schools in Texas experienced achievement gains during this period; however, the size of the gain is higher in treatment schools. We observe an overall positive coefficient on the competition variable, and the size of the effect typically increases with the inclusion of the control variables.

Ohio

Ohio tests students at grades 4, 6, 9 and 12 in writing, reading, mathematics, citizenship, and science. All of the tests are based on learning outcomes adopted by the State Board of Education. The percentage passed on standardized statewide tests in citizenship, math, reading, and writing for grades 4, 6, 9 and 10 (only grades 4 and 6 for

science tests) are available through Ohio Department of Education web site. The four dependent variables used in these analyses are the percentage passed on standardized statewide tests in math and reading at grade 4 and grade 10.

Table 5.7 and 5.8 show mean differences in pass rates in math and reading, respectively, across groups of schools. Charter schools are concentrated in certain counties in Ohio, so the county specification and the enrollment specification refer to the same schools in Ohio, and thus the results are identical. The estimates show that the pass rates in math and reading in traditional public schools located in counties with above median charter enrollments or that have charter schools in their county or within their 5-mile radius rise from 1995-96 school year to 2001-02 school year. The results show that there is a bigger increase in the pass rates of the control schools, except in the reading pass rates at grade 10. The size of the difference is slightly larger in math compared to reading.

Table 5.7. Means Differences in the Achievement Scores for Traditional Public Schools in Ohio: Passing rate, *Math Grade4 and Grade10*

		Math Grade 4 % Passed			Math Grade 10 % Passed		
		C1	C2	C3	C1	C2	C3
Treatment	1995-96	41.58	37.45	41.29	78.60	75.19	78.71
	2001-02	57.30	53.04	55.81	82.76	79.83	81.01
	Difference	**15.72**	**15.59**	**14.52**	**4.17**	**4.64**	**2.30**
Control	1995-96	46.60	48.44	45.07	81.87	82.71	81.07
	2001-02	66.63	67.75	64.19	89.57	89.88	88.51
	Difference	**20.03**	**19.31**	**19.12**	**7.70**	**7.17**	**7.44**
Difference-in-differen.		-4.31	-3.72	-4.60	-3.53	-2.53	-5.14

Table 5.8. Means Differences in the Achievement Scores for Traditional Public Schools in Ohio: Passing rate, *Reading Grade4 and Grade10*

		Reading Grade 4 % Passed			Reading Grade 10 % Passed		
		C1	C2	C3	C1	C2	C3
Treatment	1995-96	41.31	38.20	41.92	93.28	91.83	92.49
	2001-02	62.09	57.42	59.91	96.05	95.28	95.51
	Difference	**19.78**	**19.22**	**17.99**	**2.77**	**3.45**	**3.02**
Control	1995-96	46.48	48.50	45.28	94.93	95.26	94.74
	2001-02	71.87	73.20	69.59	97.74	97.83	97.50
	Difference	**25.39**	**24.70**	**24.31**	**2.81**	**2.57**	**2.76**
Difference-in-differen.		-5.61	-5.48	-6.32	-0.04	0.88	0.26

Tables 5.9 and 5.10 present the results from the regression models that estimate the pass rate in math test for grade 4 and grade 10. Three columns show results for three measures after the same set of control variables are included. Unlike Texas, the results in Ohio show overall negative effects. For the schools that experience direct competition within their 5-mile radius, the math pass rate drops by 1.5 at grade 4, but the coefficient is not significant. Relative to schools in counties with below median charter school enrollment, schools in high enrollment counties experienced a3.6-point decline in their math pass rates. At grade 10, relative to schools in counties with below median charter school enrollment, schools in high enrollment counties experienced a 7-point decline in their math pass rates. The spatial specification shows negative results for math pass rates, but the coefficients are not significant.

Table 5.9 Estimated Effect of Charter Schools on Public Schools in Ohio: Passing rate, *Math Grade4*

	(I)	(II)	(III)
C1	-2.614* (1.234)	-	-
C2	-	-1.531 (0.998)	-
C3	-	-	-3.605* (1.225)
T	18.483** (0.994)	18.648** (0.989)	18.446** (0.990)
Proportion of white non-Hispanics in the 5–19 year old population	26.342 (37.285)	53.653 (33.268)	44.591 (33.043)
Proportion of 5–17 year olds in poverty	-65.952* (26.032)	-56.590* (25.278)	-80.702* (26.985)
Log of total population	19.922* (9.099)	24.237** (8.808)	14.966 (9.407)
Proportion of private school enrollment	-46.504 (31.113)	-52.348 (30.972)	-42.381 (31.132)
Percentage of students who are non-Hispanic white	33.115** (6.482)	33.776** (6.471)	33.115** (6.482)
Percentage of students who are eligible for free-lunch	0.489 (1.729)	1.067 (1.761)	0.728 (1.728)
Student-teacher ratio	-0.213 (0.124)	-0.221 (0.124)	-0.212 (0.123)
Constant	-231.670 (125.778)	-309.110** (117.824)	-185.183 (126.729)
Adjusted R^2	0.7149	0.7158	0.7168

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 5.10 Estimated Effect of Charter Schools on Public Schools in Ohio: Passing rate, *Math Grade10*

	(I)	(II)	(III)
C1	-3.179** (1.071)	-	-
C2	-	-0.488 (0.931)	-
C3	-	-	-7.038** (1.207)
T	8.624** (0.824)	8.966** (0.821)	8.258** (0.809)
Proportion of white non-Hispanics in the 5–19 year old population	2.857 (36.355)	53.441 (32.571)	-0.829 (32.289)
Proportion of 5–17 year olds in poverty	-66.297** (20.311)	-53.666** (20.045)	-94.123** (20.653)
Log of total population	-3.694 (7.666)	2.786 (7.401)	-10.087 (7.514)
Proportion of private school enrollment	-4.836 (27.225)	-16.458 (27.161)	-5.560 (26.648)
Percentage of students who are non-Hispanic white	24.615* (10.404)	24.840* (10.532)	17.083 (10.294)
Percentage of students who are eligible for free-lunch	4.037 (3.232)	3.995 (3.257)	2.460 (3.178)
Student-teacher ratio	-0.044 (0.126)	-0.054 (0.127)	-0.032 (0.124)
Constant	109.373 (104. 064)	-12.851 (96.529)	198.412 (99. 730)
Adjusted R^2	0.7487	0.7458	0.7863

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 5.11 and 5.12 summarize the regression results from models with reading pass rate at grade 4 and grade 10 respectively. At grade 4, models predict negative effects across specifications. Public schools that have charter schools in their county experience a statistically significant drop of 3.3 percentage points in their reading test pass rates. The reading pass rates drop by 2.5 percentage points in schools that have charters within their 5-mile radius. The reading pass rates decline by 5.5 percentage points for schools that are located in counties with above median charter school enrollment. None of the coefficients are significant at grade 10.

Overall, Ohio models are more likely to show significant effect in earlier grades. All schools in Ohio experience achievement gains during this period; however, the size of the gain is smaller for schools with charter schools nearby. We observe an overall negative coefficient on the competition variable, especially in grade 4 in both math and reading pass rates of public schools experiencing a certain degree of charter competition.

Table 5.11. Estimated Effect of Charter Schools on Public Schools in Ohio: Passing rate, *Reading Grade4*

	(I)	(II)	(III)
C1	-3.292** (1.068)	-	-
C2	-	-2.464** (0.864)	-
C3	-	-	-5.542** (1.055)
T	25.246** (0.860)	25.429** (0.856)	25.126** (0.854)
Proportion of white non-Hispanics in the 5–19 year old population	46.377 (32.271)	76.505** (28.787)	63.502* (28.482)
Proportion of 5–17 year olds in poverty	-46.621* (22.526)	-37.460 (21.870)	-73.866* (23.248)
Log of total population	4.862 (7.875)	10.074 (7.621)	-4.186 (8.111)
Proportion of private school enrollment	-9.074 (26.922)	-16.118 (26.792)	-0.673 (26.837)
Percentage of students who are non-Hispanic white	18.461** (5.608)	18.994** (5.597)	19.745** (5.547)
Percentage of students who are eligible for free-lunch	-4.376** (1.483)	-3.472* (1.512)	-3.987** (1.477)
Student-teacher ratio	-0.101 (0.107)	-0.118 (0.108)	-0.103 (0.106)
Constant	-59.074 (108.882)	-149.546 (101.961)	40.113 (109.292)
Adjusted R^2	0.7732	.7731	0.7755

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Table 5.12. Estimated Effect of Charter Schools on Public Schools in Ohio: Passing rate, *Reading Grade10*

	(I)	(II)	(III)
C1	-0.856 (0.696)	-	-
C2	-	1.154 (0.589)	-
C3	-	-	-0.412 (0.793)
T	1.764** (0.533)	2.637** (0.489)	1.813** (0.535)
Proportion of white non-Hispanics in the 5–19 year old population	-34.636 (23.531)	-10.627 (20.911)	-23.380 (21.362)
Proportion of 5–17 year olds in poverty	-38.001** (13.172)	-31.615* (12.890)	-36.742** (13.699)
Log of total population	0.286 (4.981)	3.042 (4.770)	1.365 (4.984)
Proportion of private school enrollment	-31.219 (17.595)	-36.827* (17.407)	-33.389 (17.554)
Percentage of students who are non-Hispanic white	23.493** (6.572)	24.690** (6.589)	23.257** (6.629)
Percentage of students who are eligible for free-lunch	9.273** (2.010)	9.027** (2.011)	9.178** (2.014)
Student-teacher ratio	-0.138 (0.081)	-0.125 (0.082)	-0.138 (0.082)
Constant	109.962 (67.590)	93.963 (62.775)	87.502 (66.134)
Adjusted R^2	0.5368	0.5379	0.5359

Note: (p<.01)= ***, (p>.05)=**, (p<.10)=*, standard errors are in parenthesis

Florida

The only publicly available school level data that covers 1995 to 2001 is the Florida Writing Assessment Program (FWAP), which was implemented in grades 4, 8, and 10. The assessment is designed to measure students' proficiency in writing responses to assigned topics within a designated testing period. For the Florida Writing Assessment, students are given 45 minutes to read their assigned topic, plan what to write, and then write their responses. They are scored on a scale of 1 to 6 for narrative and expository. These scores are inherently less objective because of the nature of the test and the writing test is by no means a complete or even a good indicator of achievement. Nevertheless, I

report some results from similarly specified models below. The dependent variables for these models are percent of students who scored 4 or above at grade 4 and 10. Table 5.13 provides the summary results for the estimated effect of charter schools on public schools' writing scores at grade 4 and grade 10.

At grade four, the results are mixed. There are no significant effects in schools with charters within 5-mile radius or the county. Interestingly, for schools in counties with at or above median charter school enrollment, the regression results show a positive effect for both expository and narrative writing scores. The size of the effect declines with additional controls. None of models shows significant results at grade 10.

Table 5.13 Summary Table for the Estimated Effect of Charter Schools on Public Schools in Florida: Percent scored 4 or above, Writing Grade4 and Grade 10

percent of students who scored 4 or above	*Grade 4 Expository*			*Grade 4 Narrative*		
	C1	C2	C3	C1	C2	C3
Base model	0.902 (1.327)	-1.017 (0.816)	3.605** (0.786)	-1.148 (1.453)	0.664 (0.893)	1.862* (0.866)
W/Controls	0.048 (1.365)	-1.438 (0.835)	2.892** (0.825)	-0.962 (1.517)	0.662 (0.929)	1.876* (0.919)
percent of students who scored 4 or above	*Grade 10 Expository*			*Grade 10 Narrative*		
	C1	C2	C3	C1	C2	C3
Base model	-3.450 (2.050)	-1.398 (1.582)	-2.279 (1.520)	0.762 (2.337)	-0.776 (1.798)	-1.370 (1.729)
W/Controls	-2.649 (2.489)	-1.833 (1.612)	-1.982 (1.591)	1.744 (2.849)	-0.930 (1.845)	-1.265 (1.822)

Summary Discussion

Performance of charter schools is already under close scrutiny. As the charter movement matures, it will also become critical to understand whether charter schools affect achievement in traditional public schools. The review of the studies focusing on this question so far exhibit mixed results in different states. The results from this study are no exception.

The regression models for Texas schools suggest that charter schools contribute to increases in the overall pass rates and math pass rates. Once the control variables are included, the positive effect remains significant across all specifications and the size of the effect typically increases. Although these results are encouraging, the findings from the earlier chapters showed that charter schools also contributed to declines in the share of free-lunch eligible students in Texas traditional public schools. Therefore, part of the positive effect may be due to the changes in the composition of the student groups. In Florida, the regression results only show a positive effect for both expository and narrative writing scores in schools in counties with at or above median charter school enrollment at grade 4. However, this data is limited because it only includes writing test scores at the school level. Earlier research report some positive effects for math test scores as well. Sass (2006) had access to student level data in Florida and found that competition from charters have a modest but positive impact on math scores, and interestingly no impact on writing scores of traditional school students.

In contrast to Texas, public schools that face charter competition measured in all three ways experience declines in their math pass rates in Ohio in both grade 4 and grade 10 and declines in reading pass rates at grade 4. The results raise interesting questions on the possible causes of the contradictory findings in different states. Earlier results showed that in Ohio, charter schools contributed to declines in the share of non-Hispanic white students and increases in the share of free-lunch eligible students in public schools. So, it is possible that some of the decline in public school test scores to be associated with changes in the student composition of public schools. When the controls for school level changes in the student composition is added to the models, the negative effect actually

shrinks, however it does not completely disappear. Other differences in charter legislation and operations may also contribute to the negative effects. Further work is definitely required to explain why these observed changes are taking place. In sum, the results imply that in spite of the fact that charters serve still a small proportion of students, they have effects on the aggregate performance of traditional public schools, at least in some cases, as expected by the theory.

CHAPTER 6

CONCLUSION

As charter schools continue to proliferate, their impact on the public education system is becoming an increasingly important public policy question. Many discussions of such system-wide effects revolve around the academic achievement issues; however, this study focuses on changes in the composition of the student body and student-teacher ratios as well as academic performance as other important dimensions of system-wide effects created by the introduction of charter schools in the public education system. This analysis provides additional empirical evidence from four states that have experienced a certain degree of charter competition in the last decade by relying on a panel design and school level data. In this chapter, first I will summarize the primary findings. Then, I will discuss the limitations and policy implications of the study and possible extensions for future research.

Primary Findings

Table 6.1 presents a summary of the findings across comparable models from four states. The results based on these data consistently suggest that the introduction of charter schools reduces the share of non-Hispanic white students from traditional public schools in all four states. The estimates from the race models are negative and robust to county level, spatial and enrollment based specification. Charter presence measured in all three ways show significant effects, but the effect size generally reduces in the models with spatially more precise measures. The additional controls also reduce the effect size, but all coefficients remain significant. The effect size ranges from 1.0 to 1.9 percentage

points. These results from Texas, Florida, Ohio and New Jersey are consistent with the findings by Dee and Fu (2004) in Arizona and Ross (2005) in Michigan.

The analyses also show that charter school presence in these states affects the share of free-lunch eligible students in traditional public schools in three of these four states. The size and direction of the effects vary across states. The regression models for free-lunch eligible students did not suggest significant results for New Jersey, which has very few charter schools compared to the other states (only 51 charter schools by 2001), so this may simply suggest that charter schools are still too few to adequately pressure the public school system. The regression results showed that the existence of charter schools contributed to the reduction of the share of free-lunch eligible students in traditional public schools in Texas, but increased the share of free-lunch eligible students in Ohio. In Florida, the models show a significant increase in the share of free-lunch eligible students only if the traditional public school has charter schools within its close proximity.

The analyses show mixed effects on student-teacher ratios in traditional public schools. In Texas, charter schools seemed to have no effect on student-teacher ratios of traditional public schools. In Florida and Ohio, the models show significant drops in the student-teacher ratios of traditional public schools. In Florida schools, all three specifications showed significant negative impacts, although the size of the effect becomes smaller with the inclusion of controls. In Ohio, schools that have charter schools within their 5-mile radius experience experienced the biggest drop and the inclusion of the controls makes the effect stronger in this case. For New Jersey schools, schools located in counties with one or more charter schools experienced an increase in the student-teacher ratios, but other specifications did not show significant effects. Previous

research found that student-teacher ratios increased in Arizona public schools due to charter competition (Dee & Fu, 2004). I also ran the same models for schools located in counties with high poverty rates to investigate whether competitive effects become more significant or larger in higher poverty districts compared to lower poverty districts. Overall, the similarly specified models do not show significant differences in student-teacher ratios of schools in poor counties compared with the original results for all schools, except some models in New Jersey.

Table 6.1 Summary of Findings: Effects of Charter Competition on Regular Public Schools

		Percent non-Hispanic white students	Percent free-lunch eligible students	Student-teacher ratio	Performance
Texas	C1	Negative effect	Negative effect	No effect	Positive effect
	C2	Negative effect	Negative effect	No effect	Positive effect
	C3	Negative effect	Negative effect	No effect	Positive effect
Florida	C1	Negative effect	No effect	No effect	No Effect
	C2	Negative effect	Positive effect	Negative effect	No effect
	C3	Negative effect	No effect	Negative effect	Positive effects
New Jersey	C1	Negative effect	No effect	Positive effect	-
	C2	Negative effect	No effect	No effect	-
	C3	Negative effect	No effect	No effect	-
Ohio	C1	Negative effect	Positive effect	No effect	Negative effect
	C2	Negative effect	Positive effect	Negative effect	Negative effect
	C3	No effect	Positive effect	No effect	Negative effect

* C1 refers to the county level measure (Public schools that have one or more charter schools in their host county); C2 refers to the spatial measure (Public schools that have one or more charter schools within their 5-mils radius); C3 refers to the enrollment measure (Public schools that are in counties with above median charter enrollment). * The reported finding shows the effects from the full regression models with controls.

In chapter 4, I have used publicly available school-level performance data. The summary table sows the overall results from multiple outcome measures. The analyses show that the charter schools contribute to improvements in traditional public schools' overall and math pass rates in Texas. The positive impact is consistent across all models and consistent with the findings by Booker, Gilpatric, Gronberg and Jansen (2004),

Gronberg and Jansen (2005), and Bohte (2005). In Ohio, I analyzed the changes in pass rates in math and reading at grade 4 and 10. Unlike Texas public schools, Ohio public schools experience overall negative effects. Public schools that have charter schools in their county, within their 5-mile radius or have at or above median charter school enrollment at their host county experience a statistically significant drop in both their math and reading test pass rates at grade 4. The schools also experience drops in math pass rates at grade 4, but no effect on the reading pass rates at grade 10. There are no comparable studies that focus on competitive effects in Ohio. In Florida, I was only able to examine test scores on writing. Overall, the results were not significant at both grade 4 and 10. Only for schools in counties with at or above median charter school enrollment, the regression results show a positive effect for both expository and narrative writing scores at grade 4. One previous study finds no impact of charter schools in reading scores in Florida's traditional public schools (Sass, 2006).

In less than two decades, charter schools spread across the United States and established themselves as one of the most significant and most debated educational and political reform movements. The charter school movement is supported by a broad range of advocates from different sides on the political spectrum. On the one hand, the movement endorses ideas like competition, decentralization, organizational change, and flexibility. On the other hand, the movement is in tune with many core values of public education as charter schools are public, tuition-free, non-selective in their admission, non-religious, and accountable. Both sides unite in the ultimate purpose of improving student learning. The supporters of the reform also believe that the charter schools will lead to positive or neutral effects on educational equity. In sum, evaluations of the effects

of charter schools need to address both their impact on academic achievement of their students and non-choosers and the impact of charter reform on educational equity.

This study attempts to provide a comprehensive assessment of the charter school impact on traditional public schools. Findings from previous research on systemic effects do not provide conclusive answers. Reasons for this inconsistency include variation in the analysis techniques in different studies, as well as the variation in the programs. The political environment shapes and guides all educational reform movements including charter schools. The findings from this study also emphasize the importance of considering state context and empirical measures. The results clearly show different results in different states for some outcome areas. Although all models show a decline in the share of white non-Hispanic students, charter schools seem to affect share of poor students and test scores in opposite directions across Texas and Ohio. I look into the histories of charter school movement in these two states to seek some clues to better understand this disparity. In the beginning, Texas legislature issued a provision which may have shaped incentives of some charter school entrepreneurs. The Texas Legislature passed legislation establishing state charter schools in 1995. Texas first allowed the creation of 20 open-enrollment charter schools, and then by 1997 increased this number to 100 open-enrollment charter schools and an unlimited number of open-enrollment charter schools serving students at risk of failure or dropping out of school. If a school enrolled 75 percent or more at-risk students, it would qualify as a 75 Percent Rule charter school and not be subject to the cap (TCER, 2002). This provision was eliminated in 2001, but the negative results regarding the share of free-lunch eligible students in the models may reflect the transfer of the at-risk students from traditional schools to charters

under the 75 percent rule. If this is the case, then the observed gains in the pass rates in traditional Texas public schools may also reflect the effects of changing peer composition due to student transfer under the 75 percent rule. Similar to findings from other states like Michigan and North Carolina, this study also finds some neutral and mostly negative effects in Ohio.

The results also show variation due to different measures for some outcome areas. For example, in Florida, the models show a significant increase in the share of free-lunch eligible students only if the traditional public school has charter schools within its close proximity. If the study relied only on the simple county dummy or the enrollment measure, all models from the state would show insignificant results. Considering different contextual dynamics proves to be critical for being able to make meaningful generalizations.

In sum, the findings from the study suggest that introduction of charter schools in the educational landscape has affected student distributions, and at least in some cases, student-teacher ratios and performance of traditional public schools. During the study period, only about 1.2 percent of the students in the United States were served by charter schools. Despite the relatively small number of charter schools in these four states, the results show significant effects in multiple outcome areas. Especially, the results from race models suggest that there may be some consistent sorting of students in public schools on the aggregate level. This may happen unintentionally and regardless of the successes and goals of individual charter schools, but if we fail to consider concerns about systemic effects, we risk exacerbating existing stratification in public education.

Therefore, policymakers need to keep the effect of choice on non-choosers in perspective in designing and amending the charter policy.

Limitations, Discussion and Extensions

The present study has certain limitations that need to be taken into account when considering the results and contributions. However, the results as well as the limitations of this study highlight interesting possible avenues for future research. Charter school reform is a complex phenomenon that has very extensive repercussions on the public education system. Each charter school serves different purposes and reflects diverse ideas of their constituents, and as such, a simple classification of charters and traditional schools is not an easy task. In the future, we definitely need more studies that look into the differences among charter schools to identify the factors that make a difference. Charter reform is also shaped by the particular state legislatures and implemented in multiple ways. Because of this inherent differentiation, no single study can fully characterize the systemic impacts created by charter schools in a conclusive manner. The extremely mixed results from the literature on various aspects of charter schools can attest to that account.

In this study, this extensive and complex phenomenon has been studied from a rather narrow empirical perspective. This section reviews some of the possible caveats that should be considered while interpreting these results. First, this study uses school-level data. While the data demonstrates evidence of charter induced changes in four states across this period, we can only observe the aggregate changes. Charter schools vary a great deal based on flexibility and uniqueness that is inherent in charter school laws. Therefore, it is important to interpret the results as average changes that do not apply to

each individual charter school. It is also important to note that this study merely points out a pattern, it does not explain why these changes are taking place. For example, why is there a decline in the average proportion of white and free lunch eligible students served by public schools in these states in the face of charter presence? Do the charter schools disproportionately serve white and economically advantaged students? Or do charter schools choose to locate in areas with already high levels of minority concentration and turn into a factor in parent's preferences to move to areas with less minority students or to send their children to private schools? These questions are of central importance and definitely require specific attention.

Second, the analysis only deals with four states and cannot be generalized to other states, which may have entirely different experiences with charters. Even among these four states, the results show a great deal of variation in some outcomes. For example, why does the size of the effects, especially in the models investigating the changes in the share of free-lunch eligible students, vary this much across states? Why do we see the largest effects in Ohio schools? Educational Management Organizations (EMOs) are very actively involved in the charter schools in Ohio (Hill & Lake, 2005). Could there be a relationship between the positive and large effect sizes and the possible inclination of some profit oriented educational management organizations to serve less disadvantaged and less costly students? What other policy variables such as racial balance provisions or transportation requirements in the charter school legislation have affected these patterns? Further research should examine these and other characteristics of schools and policies. As the charter school experiment continues, we can observe the effects in other states in

future studies and hopefully discover differences in operation and legislation that will lead to outcomes that are more favorable.

Third, as discussed in the methodology chapter, endogeneity is a common problem in policy and program evaluations that use observational data. If the charter school location is partly determined by pre-existing trends such as public school quality, endogeneity could bias the estimates of the coefficients. In this study, to address this concern, I have used carefully selected control variables and school level fixed effects models utilizing the difference-in-differences estimation. However, school choice in general and charter schools in particular are complex policies involving individual choice and it is difficult to account for all sources of potential endogeneity. More research is definitely needed on the location choice of charter schools to clarify the existence, size and direction of the potential bias. Finally, the size of the observed effects are very small, however this is probably expected because the number of schools are still very few compared to the number of traditional schools.

Many educational professionals and parents embrace charter schools, because they bring choice and potential for innovation and freedom. As a result, number of charter schools and the number of students served by them are growing. As adoption and revision of charter school legislation continues, analysis of the overall cost and benefits of the charter school experience is helpful and necessary for state policy makers as they struggle to ensure fair and effective adoption and implementation of choice programs. Keeping these constraints in mind, this study provides evidence on charter school effects on the student composition of traditional public schools from four states. As the charter school experiment continues to flourish across the country, it is very important to

understand both the intended and the unintended consequences of this new reform to develop better charter school policies.

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