THE IMPACT OF CHARTER SCHOOLS IN TEXAS

A Dissertation

by

TOBY KEVIN BOOKER

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2006

Major Subject: Economics

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Approved by:

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ABSTRACT

The Impact of Charter Schools in Texas. (August 2006)

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Chair of Advisory Committee: Dr. Timothy J. Gronberg

This dissertation examines the effects of charter schools in Texas, using data from the Texas Education Agency for 190 charter schools and over 60,000 charter students. In Chapter II we examine charter effect test score gains for charter students. After controlling for individual student characteristics, we find that students in their first year in a charter school have large negative test score gains compared to when they were in traditional public school, and that charter schools that have been in operation for more than one year have higher average test score gains than new charter schools. Charter schools appear to have the most positive effects on African-American students. We find that the overall effect of being in a charter school for multiple years is that students have slightly lower average test score growth than when they were in a traditional public school.

In Chapter III we examine the effect of charters on test score gains for students attending nearby traditional public schools. After controlling for campus and student characteristics, we find traditional public school districts and campuses that face greater competition from charter schools have higher average test score gains than other traditional public schools. This positive effect of charter competition is strongest for African-American and Hispanic students, and is focused entirely on students attending traditional public campuses in the bottom 50% of the initial campus average achievement distribution.

In Chapter IV we examine the charter effect on the distribution of students by ability and race/ethnicity, as well as examining what factors are associated with a student choosing to move to a charter school. We find that students who move to charter schools tend to move to schools with a higher percentage of students of their same race/ethnicity, and that this gap is largest for African-American students. We also find that average math and reading test scores are lower than the statewide average at the traditional public schools that charter students leave, and that charter schools are attracting, on average, the lower-performing students from these low-performing schools.

DEDICATION

To my parents

Thank you

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I would like to thank my committee chair, Dr. Timothy Gronberg, and my committee members, Dr. Dennis Jansen, Dr. Lori Taylor, and Dr. Hae-shin Hwang, for their guidance and support throughout the course of this research. I have learned a great deal from working with them, and my future research will be much-improved because of their insights.

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Finally, I would like to thank my parents, Leroy and Wanda Booker, for their encouragement and support. This wouldn't have been possible without them.

NOMENCLATURE

FRL	Free or reduced price lunch
LEP	Limited English proficient
NAEP	National Assessment of Educational Progress
NCLB	No Child Left Behind Act
OLS	Ordinary Least Squares
SAT-9	Stanford Achievement Test Series, 9th edition
TAAS	Texas Assessment of Academic Skills
TAKS	Texas Assessment of Knowledge and Skills

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CHAPTER I

INTRODUCTION

Over the past decade, charter schools have emerged as one of the primary school choice options in the United States. By 2004, 40 states and the District of Columbia had passed legislation authorizing charter schools, and over 3,000 charter schools served over 650,000 students. Because the charter sector is such an important and fast-growing provider of school choice, the opportunity is ripe to examine the impact of charter schools.

Charter school laws vary substantially from state to state, but typically charter schools receive most or all of the state per-pupil maintenance and operation funding that a traditional public schools would receive. They are also typically exempt from many state regulations concerning curriculum requirements and teacher hiring and compensation. Many charter schools also focus on a specific type of student, such as students that are poor-performing in traditional public schools, are in danger of dropping out, or are gifted and talented.

There are many interesting policy questions to be addressed regarding the effect of charter schools. Do charter schools have a positive or negative effect on student achievement for the students that attend them? Are charter schools having any effect on the achievement of students who remain in traditional public schools? Which students are choosing to go to charter schools, and what are the schools that they leave like? Do any of these charter school effects vary by student ability or demographic characteristics? To what extent are the effects of charter schools a function of the laws governing charter formation and operation?

This dissertation follows the style of *The American Economic Review.*

In this dissertation we will attempt to address the issues raised above, using data on public school students in Texas. In doing so, we hope to shed some light on one of the most important school choice experiments of the last decade.

CHARTER SCHOOLS IN TEXAS

Charter schools in Texas have experienced a rapid expansion since the passage of authorizing legislation in 1995. This growth is due in part to Texas having a relatively supportive charter law environment. In Texas, the primary chartering agency is the State Board of Education, which is generally considered to be a more a charter-friendly institutional framework than in states where the individual district is the chartering agency. When a student transfers to a charter school in Texas, the charter school receives the full state and local funding that the student would have received in the traditional public school, conditioned on their student characteristics. This contrasts with states like Michigan, where only a portion of the state and local funding follows the student to a charter school. Additionally, charter schools have more flexibility than traditional public schools in terms of curriculum requirements, hiring and compensating teachers, and in targeting specific groups of students.

Table 1.1 shows the pattern of charter school growth between 1996-97 and 2003-04. There were 16 charter schools in Texas in 1996-97, the first year of charter operation. This grew to 61 charters in 1998-99, 142 in 1999-00, and by 2003-04 there were 190 charter schools operating in Texas, with a total enrollment of 60,748 students. By 2003-04, 1.41 percent of Texas public school students were attending charter schools.

Table 1.1—Number and Enrollment of Charter Schools in Texas

Year	Number of Charters in Operation	Total Enrollment in Charters	Annual Charter Enrollment Growth	Percent of Public Students in Charters
2003-04	190	60,748	14%	1.41
2002-03	185	53,156	13%	1.25
2001-02	180	46,979	24%	1.13
2000-01	159	37,978	44%	0.94
1999-00	142	25,687	110%	0.64
1998-99	61	12,226	217%	0.31
1997-98	19	3,856	60%	0.10
1996-97	16	2,412	-	0.06

Table 1.2—Charter Industry Growth

Year	Increase in Number of Charter Students from Previous Year	Number of New Charter Schools	Number of Students Attending New Charter Schools	Percent Growth in Charters Due to Entry of New Charter Schools	Number of Exiting Charter Schools
2003-04	7,592	9	1,165	15.3%	4
2002-03	6,177	10	1,121	18.1%	5
2001-02	9,983	23	2,926	32.5%	2
2000-01	12,269	21	2,686	21.9%	4
1999-00	13,461	83	11,770	87.4%	2
1998-99	8,370	42	6,705	80.1%	0
1997-98	1,444	3	364	25.2%	0
1996-97	2,412	16	2,412	100%	-

Table 1.2 shows the path of charter industry growth in Texas, with the most new charter schools opening for the 1998-99 school year (42) and the 1999-00 school year (83). Although the number of students enrolled in charter schools has continued to grow through 2003-04, starting in 2000-01 most of the growth was due to expansion of existing charter schools, rather than the entry of new charters. Note that we see 17 charter schools closed during this time period.

One interesting characteristic of Texas charter school legislation is that from 1998 through 2000 there was a cap on the total number of open enrollment charters granted, but charter schools that committed to serve at least 75% At-risk[1] students were exempted from this cap. This incentive structure had an effect, as over half the new charter schools that opened during this time period were of the At-risk type. This may also contribute to the fact that students we observe in charter schools tend to have substantially lower test scores on average than the statewide student population, with the difference being larger than is typically seen in other states with charter schools.

[1] A student may be classified as At-risk for a variety of reasons, including failure to advance from one grade level to the next, failure of two or more classes, and failure of a section of the TAAS or TAKS exam, as well as reasons having to do with personal circumstances such as being pregnant.

Table 1.3—Student Demographics in Charters and Traditional Publics, 2003-04

Student Characteristic	Charter Students	Traditional Public Students	Traditional Public Students in Districts with Charter Schools
Percent White	18.4	39.0	26.4
Percent African-American	39.0	13.9	17.7
Percent Hispanic	40.9	43.8	52.9
Percent Asian	1.4	3.0	2.7
Percent Native American	0.3	0.3	0.3
Percent FRL eligible	63.1	52.7	61.5
Percent limited English proficient	9.1	15.4	20.1
Percent in special education	11.3	11.6	11.2
Percent in career and technology	15.8	20.2	19.6
Percent gifted and talented	1.0	7.9	8.5
Percent Classified as At-risk	51.7	37.7	41.1

Table 1.3 compares the average demographics in 2003-04 for students in charter schools, in traditional public schools, and in traditional public school districts that contain at least one charter school within their geographic boundaries. Comparing charter school students to students in traditional public schools, charter school students are more likely to be African-American, eligible for free or reduced price lunch, and classified as At-risk, while students in traditional public schools are more likely to be white, limited English proficient, gifted and talented, and in career and technology programs. If we instead compare charter school students to students in public school districts that contain at least one charter school, these public districts also have a higher percentage of Hispanic students than charter schools, and almost as high a percentage of FRL eligible students as charter schools.

Charter schools in Texas are concentrated primarily in a few large urban school districts. Over 60% of the states' charter schools are located in the five largest metropolitan areas: Houston, Dallas and Fort Worth, El Paso, San Antonio, and Austin, which in total contain about half the population of Texas.

LITERATURE REVIEW

There is a relatively large literature on the effects of attending a charter school on student achievement. Unfortunately, much of the existing literature lacks adequate controls for the differences in student characteristics between charter students and students in traditional public schools. However, there have been some recent papers that use longitudinally-matched student-level data to evaluate the achievement effects of charter schools.

Solmon, Paark, and Garcia (2001) look at the achievement of charter students and traditional public school students in Arizona between 1998 and 2000, using SAT-9 test scores. Their sample includes 8,000 students observed in a charter school during their three years of data, as well as 32,000 students in traditional public schools. They include student fixed effects in their model to control for differences in time-invariant student characteristics between charter schools and traditional public schools. They find that students who attend charter schools for more than one year have significantly higher achievement on both reading and math than students in traditional public schools. However, they do not include a measure of how long the charter school has been in operation, so this is solely the effect of student experience in a charter, without controlling for charter tenure.

Hanushek, Kain, and Rivkin (2002) look at student achievement for students in grades 4 through 7 in Texas, between 1996 and 2001. Their sample includes 6,600 charter students and over 800,000 traditional public school students. They evaluate the effect of charter schools student test score gains on the TAAS state assessment test, and include individual student fixed effects, as well as controls for student mobility. They include separate effects for charter schools depending on how long the charter has been in operation.

Hanushek, Kain, and Rivkin find that student test score gains are lower in both reading and math at charter schools that are in their first year of operation, compared to student test score gains in traditional public schools. They find that as the charters mature the negative effects go away, so that charter schools in their third year or more of operation have student test score gains comparable to those in traditional public schools. They do not include a separate effect for a student being in their first year in a charter, so it is difficult to tell how much of the difference in charter effects for charters with different tenures is due to the different average student years spent in a charter for the different categories.

Booker et al. (2004a) look at the effect of charter schools on student test scores in Texas, using a similar methodology to Hanushek, Kain, and Rivkin, but with student data on students through 2001-02. Their sample contains over 10,000 charter students, and over 1.4 million traditional public school students. They add separate controls for a student being in their first year in a charter school, as well as for a student being in their first year back in a traditional public school after attending a charter. They find that the effect of being a first-year charter student is large and negative, and that once this is controlled for first-year charter schools are not significantly different on test score gains relative to traditional public schools. They also find that as charters increase in tenure their performance improves, with charters in operation for more than one year having higher math and reading gains than traditional public schools.

Sass (2006) applies the student fixed effects methodology to examining student achievement in Florida charter schools. He uses data on Florida public school students in grades 3 through 10 in years 1999 through 2003. His sample contains over 28,000 students that attended a charter school, and over a million traditional public school students. He uses two primary models for estimating student achievement effects, one with student test score gains as the dependent variable, the other with student test score levels as the dependent variable and the lagged test score included in the model. He finds that new charter schools perform more poorly than traditional public schools, but by their fifth year in operation charter schools have caught up to traditional public schools in math scores, and in reading charter schools in operation for five years have slightly higher average test score gains than traditional public schools.

Bifulco and Ladd (2006) use a similar student fixed effects methodology to examine charter school achievement effects in North Carolina. They track students in grades 3 through 8 for the years 1996 through 2002. Their sample includes 8,700 charter students and almost 500,000 traditional public school students. Like Hanushek, Kain, and Rivkin, they do not distinguish between the effect of moving to a charter and the effect of a traditional public district-to-district move. Similarly, they find that new charter schools perform most poorly, and that as charter schools become more experienced they improve their performance. However, they find that even mature charter schools have lower average student achievement gains than traditional public schools.

There are several recent papers looking at the effects of charter schools on the achievement of students in surrounding public schools. Among the papers using cross-sectional data to perform school-level analyses of this issue are Holmes, DeSimone, and Rupp (2003), Eberts and Hollenbeck (2001), Greene and Forster (2002), and Bettinger (1999). These papers generally find mixed results, with some studies finding positive competition effects, while others find no effect or a negative effect of charter competition on traditional public schools. Hoxby (2003) is a good example of this literature. She compares traditional public school achievement in Arizona and Michigan before and after the school districts face charter competition, where facing charter competition is defined as having at least six percent of the students within a geographic district attending charter schools. She finds that greater charter competition is associated with higher average campus fourth grade reading and math achievement levels.

Booker et al. (2004b) use a student panel data set in Texas to look at the effects of charter competition on public school students in grades 4 through 8 from 1996 through 2002. They use a campus-student spell fixed effects model to control for persistent variation in campus and student ability and demographics, with student math or reading test score gains as the outcomes measure. They measure charter competition as either the percent of students in a district attending charter schools, or as the number of charter schools within an N-mile radius of the public campus. They find a positive effect of charter competition on both reading and math scores, and find that this effect is concentrated entirely in the 40% of public campuses with the lowest initial average test score levels.

Holmes (2003) uses cross-sectional student data linked over time for public school students in North Carolina, with controls for student demographic characteristics. He finds that having a charter within 6 miles of the traditional public school has a positive effect on student math scores but not reading scores, and that having a charter within 12 miles has a positive effect on student reading scores but not math scores.

Bifulco and Ladd (2006) employ a student panel data set to look at competitive effects in North Carolina, using student fixed effects to control for differences in student ability and demographics. They find no significant competitive effects of charters on reading or math score gains in traditional public schools, where charter competition is measured by an indicator for whether there is a charter school within a 2.5, 5, or 10-mile radius of the public campus.

Sass (2006) employs a similar methodology to look for competitive effects in Florida public schools, employing campus-student spell fixed effects to control for both campus and student time-invariant characteristics. He measures charter competition by either the number of charter schools within an N-mile radius of the public campus, or an indicator for the existence of a charter school within an N-mile radius. He finds small but significant positive effects of charter competition on both reading and math score gains.

The literature examining the distributional effects of charter schools is relatively small. Two papers that have started to examine this issue using longitudinally-matched student panel data are Bifulco and Ladd (2004), which examines distributional effects of charter schools in North Carolina, and Booker, Zimmer, and Buddin (2005), which examines distributional effects of charters in California and Texas. Bifulco and Ladd find that African-American charter movers in North Carolina tend to move to charter schools with a higher percentage of African-American students than the public schools that they left, and that a similar pattern holds for white students. They also find that the African-American students that move to more segregated charter schools have substantially lower achievement effects from charter attendance than other charter students.

Booker, Zimmer, and Buddin find that students who move to charter schools in both California and Texas tend to move to charter schools that are more like them demographically than the public school they left, and that this difference is most pronounced for African-American charter movers. They also find that in Texas charter schools are attracting students from the lowest-performing public campuses, and that the students from these low-performing campuses that move to charter schools tend to be on average the lowest-performing students at those campuses.

DATA DESCRIPTION

The data set used throughout this dissertation consists of data for the Texas public school system from 1993-94 through 2003-04. All data was obtained from the Texas Education Agency. The data consist of student-level, campus-level, and district-level data sets. The student-level data contain observations for all students in Texas public schools between grades 3 and 8, and years 1993-94 through 2003-04. This includes student demographic and program participation information, such as gender, race/ethnicity, FRL status, LEP status, whether the student is in special education, and the student is classified as At-risk.

For each student we have math and reading scores on the statewide standardized test. For 1993-94 through 2001-02 the test is the TAAS test. Starting in 2002-03 the state switched to the TAKS test. Both the TAAS and TAKS tests are administered in the spring to all Texas public school students in grades 3-8 and 10 (3-11 for the TAKS test), although some limited English proficient and special education students are exempt. Approximately 15% of students in the relevant grades do not take the test because they are either exempt or absent on the testing days. The tests are criterion referenced, with a certain passing standard required to pass the test.

Because we compare student scores across this switch in testing regimes, we must standardize the test scores to make them comparable. We standardize the reading and math scores using rank-based Z-scores, which fit the statewide student score distributions onto a standard normal distribution with a mean of zero and a variance of one, by grade, year, and test, ensuring comparability over time and across different testing regimes.[2]

Each student in the data has a unique student identifier, which can be used to follow individual students over time as they change schools. We also have campus-level and district-level data with enrollments, demographic percentages, and average passing rates for each year.

RESEARCH APPROACH

The research approach in the following three chapters is to divide up the issues related to the effects of charter schools into three different categories. The first category is the effect of attending a charter school on student achievement, which is addressed in Chapter II. The second category is the effect of competition from charter schools on the performance of students in traditional public schools, which is addressed in Chapter III. The third category is the effect of charter schools on the distribution of students by race/ethnicity and ability, as well as analyzing which student characteristics are associated with having a high probability of moving to a charter school, and applying this to extensions of the models from Chapters II and III. This third category is addressed in Chapter IV.

[2] The rank-based Z-scores are calculated by ranking each student in the statewide test distribution for that subject, grade, and year, normalizing this ranking to range from 0 to 1 across students, then calculating the rank-based Z-score as the inverse cumulative density function of this normalized ranking.

CHAPTER II

CHARTER ACHIEVEMENT EFFECTS

One of the primary policy debates in the charter school literature is over whether charter schools are effective at improving the academic performance of students. Studies such as the 2003 National Assessment of Educational Progress have received considerable publicity, and have been used by charter school critics as evidence that charter schools are performing poorly. The NAEP results indicate that average score levels are lower at charter schools than at traditional public schools, for almost every racial, geographic, and income category.

Analyses such as the NAEP study, which compare average test score levels across sectors in a single year, are not useful for evaluating the performance of charter schools. Students who choose to attend charter schools have average characteristics that are quite different from the general student population. Failure to control for these student population differences yields a misleading picture of the quality of schools across the two sectors, which should be the primary policy interest. A valid comparison of student achievement in charter schools and traditional public schools must control for the differences in non-school inputs (student ability, family involvement, peer ability), as well as for the non-random selection of students into charter schools.

Recent papers by Hanushek, Kain, and Rivkin (2002), Bifulco and Ladd (2006), Sass (2006), and Booker et al. (2004a) provide a more careful comparison of student performance in charter schools and traditional public schools. These papers use a longitudinally-matched panel data on student math and reading test scores to estimate models that compare student test score growth in both sectors, using student fixed effects to control for time-invariant student characteristics.

Two other key issues must be addressed when evaluating student performance in charter schools. One is that the charter school sector is still relatively new, and many charter schools have only been in operation for a short time. Startup costs for charters could be significant, and it is likely that charter schools in their first or second year of operation could have different average quality than charter schools that are well-established. Separating the effect of charter school attendance on student achievement by the tenure of the charter is important in order to better evaluate the long-run success of the charter school industry.

The second key issue to be addressed as the charter industry expands is the large percentage of observed charter student observations that are for students in their first year in a charter school. Switching schools in general can have a disruption effect that lowers student performance in the year after the move, and if a charter school is a significantly different environment than a traditional public school then it is likely that a move to a charter school would have an even greater disruption effect.[3] While the mover effect is an important component of the overall picture of student achievement in charter schools, failure to control for first-year charter student effects could mask other interesting aspects of overall student performance in charter schools. In this chapter the goal is to provide a more complete assessment of the effect of attending a charter school on student achievement by looking at the performance path of students as they enter charter schools and either continue in a charter or transfer to back to a traditional public school.

[3] See Hanushek, Kain, and Rivkin (2004) for a more detailed discussion of the disruption effect of switching schools.

CHARTER STUDENTS IN TEXAS

Since the first charter school was established in Texas in 1996, the charter school industry in Texas has expanded rapidly. One important characteristic of the charter laws in Texas is that, from 1998 through 2000, some charter schools were chartered specifically to serve primarily students who were academically At-risk. There was no cap on the number of these At-risk charter schools, as there was for other open enrollment charters. During this time period, over half of the new charter schools that opened were of the At-risk type.

Table 1.3 compares the average characteristics of students in charter schools and in traditional public schools in Texas. Charter students in Texas are more likely than students in traditional public schools to be African-American, eligible for free or reduced price lunch, and At-risk, and less likely to be white or limited English proficient. This holds even when we compare charter students to students in public districts with at least one charter school, which is the last column of the table.

Table 2.1 shows how the Texas charter school industry has expanded over time. The largest growth came in 1998-99, with 42 new charter schools, and in 1999-00, with 83 new charter schools. Even through 2003-04, there is still considerable entry by new charter schools. However, we do not see much evidence that charters school are exiting the market in large numbers. We see relatively few observations on charter schools beyond their sixth year of operation, with only 18 charter-year observations for seventh-year charters, and only 15 charter-year observations for eighth-year charters, which will limit our ability to distinguish the effect of being in operation for those final two years.

Table 2.1—Distribution of Charter Schools by Years of Operation in Each Year

Years in Operation	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
1	16	3	42	83	20	23	10	9
2	-	16	3	40	80	18	23	10
3	-	-	16	3	40	80	18	23
4	-	-	-	16	3	40	77	18
5	-	-	-	-	15	3	39	74
6	-	-	-	-	-	15	3	38
7	-	-	-	-	-	-	15	3
8	-	-	-	-	-	-	-	15

MODEL

We follow the general approach for modeling an educational production function from Todd and Wolpin (2003). Their starting point is a general cumulative model of student achievement:

$$A_{it} = \left[F_i(t), S_i(t), \mu_i, \varepsilon_{it}\right] \tag{1}$$

where A_{it} is the achievement level of student i in year t, F_{it} is a vector of family inputs in year t, S_{it} is a vector of school inputs in year t, μ_i is a student fixed effect representing innate student ability, and ε_{it} is the measurement error term.

If we assume that A_{it} does not vary over time and is additively separable, we can rewrite the education production function as:

$$\begin{aligned} A_{it} &= \alpha_1 F_{it} + \alpha_2 F_{it-1} + \ldots + \alpha_t F_{i1} \\ &+ \beta_1 S_{it} + \beta_2 S_{it-1} + \ldots + \beta_t S_{i1} + \gamma_t \mu_i + \varepsilon_{it} \end{aligned} \tag{2}$$

where α_i and β_i represent the weights given to year i's inputs.

Equation 2 is impossible to estimate with our data, as it requires data on all prior family and school inputs. We can assume that family inputs are time-invariant and captured by the student fixed effect μ_i. This implies the assumption that family inputs are uncorrelated with school inputs. Additionally, we can assume that school inputs have an immediate effect on achievement that does not decay over time. This yields the following equation:

$$A_{it} - A_{it-1} = \Delta A_{it} = \beta_1 S_{it} + \mu_i + \varepsilon_{it} \tag{3}$$

This is the baseline equation used in our estimation, where the students test score gains ΔA_{it} are a function of current school inputs and a student fixed effect that controls for time-invariant student and family characteristics.[4] This is the same specification used in Hanushek, Kain, and

[4] See Todd and Wolpin (2003) for additional details and alternative specifications of the education production function.

Rivkin (2002), Bifulco and Ladd (2006), Sass (2006), and Booker et al. (2004a), so the results will be comparable to other findings in the literature.

An alternative specification, which is also included in Sass (2006), is to use the student's current score as the dependent variable, include the lagged score as an explanatory variable and instrumenting for the lagged score with the twice-lagged score. This alternative functional form assumes that school inputs decay at a constant rate over time, instead of not decaying at all. We choose to use the specification with test scores gains as the dependent variable for three reasons. First, it allows us to include an additional grade of students in our estimation sample, as we only need one lagged score per student rather than also using a twice-lagged score. Second, the gains model is easily interpretable as the effect of treatment on the students test score gains, whereas the alternative model is a hybrid of the effect on levels and on gains, which makes interpreting the resulting treatment effects more difficult. Third, the gains model is more widely used in the literature, so using it makes our results more widely comparable with the findings of other researchers.

As our measure of A_{it}, we use the student's standardized test score in reading or math.[5] In the models that include a student fixed effect we also include as time-varying characteristics the student's mover status (separately for different types of student moves), whether the student is in special education, and the campus percent African-American and percent Hispanic, as well as grade-by-year indicators.

We use this model to look at the effect of attending a charter school on student performance. Because of the inclusion of a student fixed effect, any treatment that is time-invariant over the time that we observe the student is captured by the student fixed effect. This means that the only students that are contributing to our estimated charter school effect are those

[5] The standardized scores are rank-based Z-scores constructed from the full student data, as described in Chapter I.

that we observe in both a charter school and a traditional public school in our data set (between grades 3 and 8, years 1994-95 through 2003-04)). In Chapter IV we perform a more detailed analysis of exactly which students are observed transferring, and it ends up being a little over half of the total observed charter students in these grades. We also check to see if the students that we observe transferring are observationally similar to those that we never observe in public schools, and the two groups are similar in composition. Still, care must be taken in generalizing these results to the entire charter school population, as they are based solely off of students who move to or from charter schools in grades 3 through 8.

Because the treatment effects we observe occur at the campus level, the standard errors in all of our regressions are adjusted for clustering of students by campus.

DATA DESCRIPTION

The data set used in this chapter is a subset of the full student data set described in Chapter I, with data on Texas students in grades 3-8 from 1993-94 through 2003-04. All the data was obtained from the Texas Education Agency. The data include student math and reading test scores for every tested student in the state of Texas on either the TAAS test (through 2001-02) or the TAKS test (2002-03 and 2003-04), both statewide standardized achievement tests.[6] The data also include student demographic indicators, including race/ethnicity, gender, free or reduced price lunch eligibility, limited English proficiency, special education status, and whether the student is classified as At-risk. The data include a unique student identifier which can be used to track individual students over time as they move between charter schools and traditional public schools. Also included are campus-level and district-level data sets with campus and district demographic data.

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[6] Due to confidentiality concerns, the data on student characteristics such as ethnicity are masked if there are fewer than five students in a cell in a single grade at a campus.

Because the full sample of students in Texas over this time period is too large to make estimation using the full sample computationally tractable, we randomly sampled a smaller group of students for our estimation sample. Fortunately, the only students who contribute directly to the charter achievement effect are students that are observed in charter schools in our data, which is a small fraction of the total student population. We kept every student who is observed in a charter school between 1996-97 and 2003-04 in grades 3-8, then took a random 10% sample of all remaining students.[7] All of the regressions are weighted to account for this differential sampling probability.[8]

Because we are comparing test scores across different testing regimes with differently-shaped student test score distributions, it is important to standardize the scores so that they are comparable over time. We use rank-based Z-score to standardize the scores, which fit the statewide student score distributions onto a normal distribution by grade, year, and test, ensuring comparability over time and across different testing regimes.

Table 2.2 has the summary statistics for the student sample used in the regressions looking at the effect of charter school attendance on student achievement gains. The first column has the means for the entire estimation sample, the second column for students that we observe in a charter school, and the third column for students that we never observe in a charter school.

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[7] The sampling was done at the student level, so when a student is kept we keep every student-year observation for that student.

[8] The weight is the inverse of the probability that the student was chosen for our sample.

Table 2.2—Summary Statistics for Chapter II Estimation Sample

Variable	Overall Sample Mean	Mean for Students Observed in a Charter School	Mean for Students Not Observed in a Charter School
Number of student-year observations	1,256,983	81,254	1,175,729
Number of unique students	514,632	38,668	475,964
In a 1st year charter	.003	.047	-
In a 2nd or 3rd year charter	.010	.150	-
In a 4th through 8th year charter	.010	.158	-
Female	.505	.504	.505
African-American	.156	.372	.141
Hispanic	.371	.400	.369
FRL Eligible	.459	.609	.449
Limited English proficient	.055	.058	.055
Special education	.056	.037	.057
Public district mover	.068	.059	.068
Public campus mover	.282	.160	.290
Public-to-charter mover	.010	.158	-
Charter-to-public mover	.006	.092	-
Charter-to-charter mover	.001	.012	-
Standardized Math score	-.016	-.448	.014
	(.981)	(1.01)	(.972)
Standardized Reading score	-.006	-.347	.018
	(.969)	(.988)	(.964)
Change in Math score	-.004	-.012	-.004
	(.678)	(.768)	(.671)
Change in Reading score	.001	-.002	.001
	(.707)	(.763)	(.703)
Campus percent African-American	.152	.311	.142
Campus percent Hispanic	.386	.433	.383

Notes: Standard deviations for non-binary variables shown in parenthesis.

Comparing the last two columns, we can see that students we observe in a charter school are more likely to be African-American and FRL eligible than students we don't observe in a charter school, are slightly more likely to be Hispanic, and slightly less likely to be in special education. Also, students that we observe in charter schools have much lower average standardized math and reading scores than other students, and slightly lower average math and reading score gains. Charter students also tend to be in campuses that have a higher percent African-American and percent Hispanic than students who are not observed in charter schools.

RESULTS

Table 2.3 presents the baseline results for the effect of charter attendance on math and reading test score gains. The first column for each subject shows the results for the OLS specification with no fixed effects, the second column shows the results with campus fixed effects included in the model, and the third column shows the results with student fixed effects included in the model, which is the baseline specification used for the rest of this chapter. The effect of attending a charter school is split up depending on how many years the charter has been in operation, with separate effects for attending a charter in its first year of operation, second or third year of operation, or fourth year of operation and higher.

Table 2.3—Estimated Effect of Charter Attendance on Math and Reading Gains

Variable	Math: No Fixed Effects	Math: Campus Fixed Effects	Math: Student Fixed Effects	Reading: No Fixed Effects	Reading: Campus Fixed Effects	Reading: Student Fixed Effects
1st year charter	-.011	-.011	-.041	.015	.028	.006
	(.036)	(.124)	(.045)	(.031)	(.108)	(.031)
2nd or 3rd year charter	.070	.013	.067	.044	.064	.045
	(.025)	(.116)	(.034)	(.019)	(.106)	(.025)
4th through 8th year charter	.029	.078	.024	.041	.075	.040
	(.019)	(.122)	(.035)	(.013)	(.107)	(.026)
District mover	-.042	-.027	-.038	-.028	-.018	-.024
	(.004)	(.003)	(.005)	(.003)	(.003)	(.005)
Campus mover	-.131	-.082	-.148	-.095	-.060	-.105
	(.004)	(.004)	(.005)	(.003)	(.003)	(.004)
Moved to charter from public	-.256	-.226	-.236	-.191	-.170	-.184
	(.014)	(.036)	(.041)	(.021)	(.025)	(.029)
Moved to public from charter	.236	.256	.239	.157	.167	.171
	(.014)	(.014)	(.020)	(.012)	(.012)	(.017)
Moved from one charter to another	-.016	-.016	-.032	-.008	.031	-.007
	(.037)	(.045)	(.042)	(.038)	(.036)	(.038)
Student in special education	-.009	-.008	.022	-.001	.000	.020
	(.003)	(.003)	(.008)	(.003)	(.003)	(.008)
Student is African-American	-.005	-.007	-	-.013	-.015	-
	(.002)	(.002)		(.002)	(.002)	
Student is Hispanic	-.009	-.008	-	-.012	-.012	-
	(.002)	(.002)		(.002)	(.002)	
Student is FRL eligible	-.008	-.007	-	-.012	-.010	-
	(.002)	(.001)		(.002)	(.002)	
Student is limited English proficient	.082	.083	-	.111	.113	-
	(.004)	(.003)		(.004)	(.004)	
Campus percent African-American	-.031	-	.079	.014	-	.098
	(.009)		(.018)	(.007)		(.015)
Campus percent Hispanic	-.017	-	.118	.011	-	.092
	(.005)		(.014)	(.004)		(.012)
Sample size	1,218,376	1,219,923	1,256,983	1,210,829	1,212,363	1,249,135

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects.

The regressions include a full set of student mover indicators, including indicators for public-to-public district and campus moves, public-to-charter moves, charter-to-public moves, and charter-to-charter moves.[9] This means that the estimated effects of attending a charter school are after controlling for the effect of being a first-year charter student. This first-year charter student effect (captured by the public-to-charter mover indicator) is generally negative and larger than the effect of making an public-to-public campus move. The corresponding coefficient on moving from a charter back to a public is typically positive and significant.

The regressions also include as explanatory variables the percent African-American and percent Hispanic at the campus, as well as an indicator for the student being in special education.[10] In the specifications without student fixed effects we include additional student demographic indicators, including indicators for the student being African-American, Hispanic, free or reduced price lunch eligible, or limited English proficient.

The estimates effect of charter attendance is fairly stable across the different specifications, and across both math and reading. The first-year charter effect is insignificant throughout, with a small negative coefficient for math and a small positive coefficient for reading. The second or third-year charter effect and the fourth-year and higher effect are consistently positive. For the student fixed effects specification, the coefficient on the second or third-year charter indicator is .067 in math (significant at the 5% level) and .045 in reading (significant at the 10% level), indicating that students who are not in their first year in a charter that attend charter schools that are in their second or third year of operation have annual math score gains that are .067 higher than they would have had in a traditional public school, where

[9] A public-to-public district mover is defined as a student who moved from one traditional public district to another. A public-to-public campus mover is defined as a student who moved from one traditional public campus to another but did not change districts. This includes both structural movers, students who switch from elementary to middle school, and non-structural movers, with the vast majority of the public-to-public campus movers being structural movers.

[10] Other student characteristics do not vary significantly over time, and are omitted due to the inclusion of student fixed effects.

the effect is measured in standard deviations of the score level. Similarly, reading score gains are .045 higher at second or third-year charters than for traditional public school students.

The estimated effect on student score gains of attending a charter school in its fourth year or more of operation is .020 in math and .040 in reading for the student fixed effects specification, with neither coefficient significant at the 10% level. Although there is a large estimated effect associated with even public-to-public campus moves[11], -.148 in math and -.105 in reading, the negative effect associated with moving from a public to a charter is substantially larger, -.236 in math and -.184 in reading. When interpreting the overall effect of charter attendance, this negative first-year charter student effect must be included as well. Because almost every student at a first-year charter school is a first-year charter student, the overall effect of being a first-year student at a first-year charter is negative, even though the coefficient on the first-year charter indicator is small, because of the predominance of the negative public-to-charter mover effect.

Correspondingly, there is a significant positive effect associated with moving from a charter to a traditional public school. In the student fixed effects specification this effect is .239 in math and .171 in reading, indicating that former charter students have substantially larger test score gains during their first year after moving back to a traditional public school. This positive charter-to-public mover effect is almost equal in magnitude to the negative public-to-charter effect, and is likely due in part to a rebound effect from students who found charter schools to be a poor match.

[11] Almost all of these public-to-public campus movers are structural movers switching between elementary and middle school, so this negative campus mover effect could be partially explained as a negative effect of a student's first year in a middle school.

Table 2.4—Charter Attendance Effects, Alternate Specifications

Variable	Separate Effects for Each Year of Charter Tenure: Math	Separate Effects for Each Year of Charter Tenure: Reading	Without Separate Effects for Moving to or from a Charter: Math	Without Separate Effects for Moving to or from a Charter: Reading
1st year charter	-.045	-.005	-.296	-.194
	(.046)	(.031)	(.047)	(.038)
2nd or 3rd year charter	-	-	-.116	-.097
			(.034)	(.023)
4th through 8th year charter	-	-	-.129	-.079
			(.029)	(.020)
2nd year charter	.049	-.001	-	-
	(.033)	(.026)		
3rd year charter	.080	.076	-	-
	(.045)	(.034)		
4th year charter	.028	.034	-	-
	(.046)	(.032)		
5th year charter	-.018	.019	-	-
	(.053)	(.036)		
6th year charter	.098	.096	-	-
	(.078)	(.052)		
7th year charter	-.068	.099	-	-
	(.094)	(.085)		
8th year charter	.292	.131	-	-
	(.131)	(.083)		
District mover	-.038	-.024	-.037	-.024
	(.005)	(.005)	(.005)	(.005)
Campus mover	-.148	-.105	-.148	-.105
	(.005)	(.004)	(.005)	(.004)
Moved to charter from public	-.234	-.178	-	-
	(.040)	(.029)		
Moved to public from charter	.238	.169	-	-
	(.020)	(.017)		
Moved from one charter to another	-.036	-.008	-	-
	(.042)	(.038)		
Sample size	1,256,983	1,249,135	1,256,983	1,249,135

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

Table 2.4 shows results for two alternate specifications. The first alternate specification allows the charter effect to be different in every year of charter tenure. Here again we see that after their first year of operation the charter school effect seems to be generally positive, although the coefficients are rarely significant. There also appears to be weak evidence of an upward trend, with the effect on student gains improving with charter tenure, particularly in reading, which is consistent with the findings of other researchers looking at achievement in charter schools.

The second alternate specification in Table 2.4 treats moves to and from a charter school as normal district moves, rather than having a separate indicator for each type of charter move. Because the negative effect of a public-to-public district move is much smaller than the negative public-to-charter move effect, treating the two as equivalent shifts most of the negative first year charter student effect onto the first-year, second or third-year, and fourth-year and higher charter effects. In this specification first-year charters, which have almost entirely first-year charter students, have large negative effects on student test score gains, -.296 in math and -.194 in reading. Even for more experienced charters there is still a significant negative effect, -.129 in math and -.079 in reading for charters with four or more years of experience.

The difference between the charter effects in these two different specifications highlights the importance of how the negative first-year charter student effect is handled. Even in well-established charter schools, a substantial portion of their students in any given year are first-year charter students, and their negative test score gains cause all of the charter effects to be lower if unaccounted for. However, the inclusion of a separate indicator for public-to-charter movers in the baseline specification does not mean that those students' performance should be ignored when evaluating charter performance as a whole. Students tend to have negative test score gains in their first year in a charter, whether because it is a more disruptive move than a traditional public-to-public mover, or because charter schools don't do as well with first-year students, and in an expanding industry a large portion of our charter observations are of first-year students. We have chosen generally to separate the first-year charter student effect from the overall effect of charter attendance, but the effect is certainly an important component of the overall effect of charter schools on student performance.

One possible explanation for the negative public-to-charter mover effect, and the positive charter-to-public mover effect, is that some students try out charter schools and quickly realize that they are a poor match, and these students then recover quickly once they return to traditional public schools. Table 2.5 takes the baseline specification and allows the effect of moving to and from a charter to vary depending on how long we observe the student remaining in a charter in our data. Not only is the effect of moving to a charter significantly negative for all students, the math effect is actually slightly larger for students who ended up remaining in charter schools at least three years (-.278) than for students who remained in charter school only one year (-.182). In reading the effect is negative and of approximately the same magnitude for each student group. This would indicate that the negative first-year charter student effect is not attributable mainly to students who stay in a charter for only one year.

Table 2.5—Charter Attendance Effects, With Separate Charter Mover Effects by Total Years the Student Spends in a Charter

Variable	Math	Reading
1st year charter	-.073	-.011
	(.045)	(.032)
2nd or 3rd year charter	.033	.029
	(.033)	(.024)
4th through 8th year charter	-.015	.024
	(.033)	(.025)
District mover	-.038	-.024
	(.005)	(.005)
Campus mover	-.148	-.105
	(.005)	(.004)
Moved to charter (and remained one year)	-.182	-.170
	(.035)	(.028)
Moved to charter (and remained two years)	-.216	-.159
	(.049)	(.034)
Moved to charter (and remained at least three years)	-.278	-.187
	(.060)	(.040)
Moved from charter after one year	.285	.203
	(.022)	(.020)
Moved from charter after two years	.197	.157
	(.032)	(.029)
Moved from charter after at least three years	.055	.015
	(.042)	(.038)
Moved from one charter to another	-.033	-.007
	(.042)	(.038)
Sample size	1,256,983	1,249,135

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

The effect of moving from charter back to a traditional public school does vary significantly with the length of time that the student was observed in a charter school. For math, the charter-to-public mover effect decreases from .285 for students who were in a charter for only one year to .055 for students who were in a charter for three or more years, and in reading the effect falls from .203 to .015. One possible explanation for this is that there is a disruption in the first year in a charter school from which the students recover in the following years, whether they stay in a charter or move back to a traditional public school, so that by the time the student has been in a charter school for three years they have already rebounded from the first-year charter student drop, and thus show little effect from moving back to public, whereas students who move back to a public school after just one year in a charter experience the recovery in that year, leading to a positive effect on test score gains from a charter-to-public move.

In order to more fully explore the relationship between the number of years the student spends in a charter and the number of years the charter has been in operation, in Table 2.6 we interact the effect of charter tenure with student years of experience in charters. We use a three-by-four matrix, with student experience classified as one year, two years, or three years or more, and charter tenure classified as one year, two years, three years, or four years or more.[12]

[12] All of the math effects in Table 2.6 are from the same regression, as are all of the reading effects.

Table 2.6—Charter Attendance Effects, Interacting Charter Tenure With Student Years in a Charter

		Student in 1st year in a charter	Student in 2nd year in a charter	Student in 3rd or higher year at a charter
Math	Charter in 1st year of operation	-.270 (.048)	-	-
1,256,983 obs.	Charter in 2nd year of operation	-.183 (.044)	.072 (.043)	-
	Charter in 3rd year of operation	-.204 (.049)	.107 (.063)	.128 (.069)
	Charter in 4th or higher year of operation	-.197 (.039)	-.006 (.039)	.028 (.049)
Reading	Charter in 1st year of operation	-.188 (.038)	-	-
1,249,135 obs.	Charter in 2nd year of operation	-.174 (.031)	.009 (.037)	-
	Charter in 3rd year of operation	-.134 (.036)	.087 (.044)	.122 (.041)
	Charter in 4th or higher year of operation	-.121 (.025)	.013 (.028)	.040 (.039)

Notes: The math and reading results presented here are each from one regression. Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

The results in Table 2.6 highlight the importance of the stability of the negative first-year charter student effect. Although this negative first-year student effect is largest for students in first-year charters (-.270 in math, -.188 in reading), it is still negative and significant even for students in charters that have been in operation for four years or more (-.197 for math, -.121 for reading). Across all levels of charter school tenure, students have significantly lower test scores in their first year in a charter. However, the negative effect is smallest for the first-year students in charter schools that have been in operation for at least four years.

For students in their second year of charter school and beyond, the charter school effect is typically positive. Although there doesn't appear to be a clear trend, the largest positive effects for both second-year charter students and for third-year and higher charter students are for charter schools in their third year of operation.

One way to interpret these results is to follow a student who enters a new charter school and stays at that school for three years. Their overall effect across their three years in the charter would be the sum of the first-year school/first-year student effect, the second-year school/second-year student effect, and the third-year school/third-year student effect. For math, these three effects sum to -.070, and in reading they sum to -.057, indicating that the overall test score gains across the three years were slightly lower for these charter school students than they would have been in a traditional public school. The same comparison for students moving into a second-year charter school yield similar results, with slightly negative overall gains across their first three years in the charter.

Table 2.7—Charter Attendance Effects, Average Effect Across Entire Span of Charter Attendance

Variable	Number of Students Observed in Category	Math	Reading
Student attends charter last year in sample	8,831	-.117 (.029)	-.082 (.025)
Student attends charter last two years in sample	3,370	-.104 (.025)	-.042 (.019)
Student attends charter last three years in sample	1,751	-.093 (.030)	-.036 (.021)
Student attends charter last four years in sample	673	.109 (.055)	.035 (.050)
Student attends charter exactly one year, then returns to public	4,571	-.059 (.033)	-.049 (.028)
Student attends charter exactly two years, then returns to public	1,454	-.105 (.035)	-.053 (.031)
Student attends charter exactly three years, then returns to public	385	-.074 (.069)	.095 (.068)
District mover		-.038 (.005)	-.024 (.005)
Campus mover		-.147 (.005)	-.105 (.004)
Sample size		1,237,284	1,237,284

Notes: For the students that we observe returning to public school (rows 5-7), the charter effect is turned on in their first year back in public. Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

Table 2.7 takes a different approach to estimating the overall effect of the full span of charter attendance on student achievement. We divide up the students we observe in charter schools into groups, depending on how many years we observe them in a charter school and whether we observe them move back to a traditional public school during our data. We can then estimate the average effect of charter attendance across all the years the student was in a charter for each of these different categories.[13] We end up with four different categories of student that stay in charter school through the end of our sample, and three different categories of student that we observe move to a charter and then back to a traditional public school.

We do not include separate public-to-charter or charter-to-public mover effects in this specification, so the overall average effects capture both the effect of the transition to a charter and the effect of moving back to a public. Additionally, we include the first year back in public as part of the effect (for those students that we observe moving back to a public), which allows us to see the overall impact of the move to a charter, the years in the charter, and the move back to a public school.

For students that remain in a charter school through the end of our data, the largest negative effect is for students who were in charter school for only the final year we observe them (-.117 for math, -.082 for reading). This is not surprising, as this includes their negative effect from making a public-to-charter move. The average effect is still negative for students that we observe in a charter for either their last two or their last three years in the data, but the magnitude is smaller, as the negative first-year charter student effect is being averaged over more years. For the 673 students that we observe in charter school for the final four years of our data, the average charter effect over the four years is positive but insignificant.

[13] We omit students that are in charter school already in the first year we observe them, as we have no way of knowing how long they were in charter school before we observed them.

The next three lines in Table 2.7 show the average effects for students who we observe moving back to a public school. The only category that has a positive average charter effect is in reading for students who attended a charter school for three years before returning to a public school. For students who stayed in the charter school for one or two years the average charter effect is negative and significant at the 10% level for both reading and math. For instance, the -.105 average effect for students that stayed in a charter school for two years then returned to a traditional public school indicates that those students' test score gains were on average .105 lower during the years they were in charter school and their first year back in a traditional public than the test score gains for those students in traditional public schools. Overall, it appears that students who move to charter schools during our data have lower average test score gains than they would have had in traditional public schools.

Because many charter schools in Texas focus primarily on serving students with low test scores prior to entering charter schools, it is interesting to look at how students at different initial performance levels do once they enter charter schools. In Tables 2.8A and 2.8B we run our baseline specification separately by initial student achievement quartile, dividing the students up by their quartile in the overall state performance distribution, using the student's test score in that subject in the first year the student is observed.

Table 2.8A—Math Charter Attendance Effects, Separately by Student Initial Math Quartile

Variable	Lowest Quartile	Second Quartile	Third Quartile	Highest Quartile
1st year charter	-.134	-.078	-.003	.029
	(.060)	(.064)	(.065)	(.066)
2nd or 3rd year	.063	.007	.096	.071
charter	(.035)	(.048)	(.041)	(.044)
4th through 8th year	.000	.038	.051	.107
charter	(.041)	(.049)	(.054)	(.044)
District mover	-.037	-.044	-.043	-.033
	(.009)	(.008)	(.009)	(.010)
Campus mover	-.169	-.161	-.142	-.120
	(.007)	(.007)	(.007)	(.007)
Moved to charter	-.199	-.216	-.250	-.249
from public	(.045)	(.051)	(.055)	(.052)
Moved to public	.213	.222	.285	.322
from charter	(.028)	(.029)	(.036)	(.040)
Moved from one	.022	-.094	.121	-.124
charter to another	(.064)	(.069)	(.091)	(.100)
Sample size	308,617	324,503	311,838	304,979

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

Table 2.8A shows the separate student quartile results for math. The most positive charter effects are found for the students in the top two achievement quartiles, with the highest quartile students in well-established charter schools having the most positive effect, .107. The new charter school effect also changes dramatically with student initial achievement quartile, increasing from -.134 for students in the lowest quartile to .029 for students in the highest quartile. This difference is offset somewhat by the effect of making a public-to-charter move, which is negative for all categories of student, but largest in magnitude for the students in the highest achievement quartile (-.249, compared to -.199 for students in the lowest quartile). However, these high-performing students also have the largest positive effect of moving back to public school, .322, compared to .213 for the lowest quartile students.

Table 2.8B shows the same specifications for reading scores. Here the results are much more mixed. The first-year and second or third-year charter effects are slightly more positive for the lower quartile students, but the effects are all insignificant, whereas the well-established charter school effect is positive throughout and highest for the top quartile students (.092, compared to .031 for the lowest quartile students). There is no clear trend in either the public-to-charter or charter-to-public mover effects, as they are of approximately the same magnitude for students in each initial quartile.

Table 2.8B—Reading Charter Attendance Effects, Separately by Student Initial Reading Quartile

Variable	Lowest Quartile	Second Quartile	Third Quartile	Highest Quartile
1st year charter	.028	-.011	-.031	-.026
	(.051)	(.046)	(.060)	(.059)
2nd or 3rd year	.043	.044	.033	.024
charter	(.032)	(.032)	(.042)	(.043)
4th through 8th year	.031	.051	.070	.092
charter	(.043)	(.034)	(.050)	(.041)
District mover	-.023	-.024	-.021	-.031
	(.009)	(.008)	(.009)	(.009)
Campus mover	-.134	-.114	-.098	-.075
	(.006)	(.006)	(.006)	(.006)
Moved to charter	-.188	-.183	-.177	-.154
from public	(.039)	(.036)	(.045)	(.042)
Moved to public	.176	.157	.210	.147
from charter	(.027)	(.026)	(.035)	(.039)
Moved from one	-.073	-.018	.190	.006
charter to another	(.069)	(.060)	(.075)	(.088)
Sample size	307,529	320,367	295,975	315,937

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

Table 2.9—Charter Attendance Effects, Separate Effects for African-American, Hispanic, and Other Students

Variable	Math	Reading
1st year charter, student is African-American	-.058	-.029
	(.063)	(.064)
2nd or 3rd year charter, student is African-American	.149	.075
	(.050)	(.038)
4th through 8th year charter, student is African-American	.128	.113
	(.045)	(.036)
1st year charter, student is Hispanic	.018	.094
	(.071)	(.042)
2nd or 3rd year charter, student is Hispanic	.052	.038
	(.043)	(.029)
4th through 8th year charter, student is Hispanic	-.037	.011
	(.044)	(.032)
1st year charter, other students	-.110	-.091
	(.064)	(.047)
2nd or 3rd year charter, other students	-.037	.022
	(.052)	(.046)
4th through 8th year charter, other students	-.004	-.006
	(.042)	(.035)
District mover	-.038	-.024
	(.005)	(.005)
Campus mover	-.148	-.105
	(.005)	(.004)
Moved to charter from public	-.242	-.189
	(.039)	(.028)
Moved to public from charter	.243	.173
	(.020)	(.017)
Moved from one charter to another	-.050	-.021
	(.043)	(.036)
Sample size	1,256,983	1,249,135

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

In Table 2.9, the charter effects are allowed to vary depending on whether the student is African-American, Hispanic, or other. At first-year charter schools, the charter effect is most positive for Hispanic students, with effects of .018 in math and .014 in reading, but for the other charter effects the coefficients are most positive for African-American students. For charter schools in operation for two or three years, the effects for African-American students are .149 for math and .079 for reading, and for charter schools in operation for four or more years the effects are .128 for math and .113 for reading, substantially higher than for other student groups. Hispanic students have the next highest effects, and non-African-American, non-Hispanic students show the lowest effects, either negative or positive but insignificant.

Although in some of our specifications we allow the effect of charter attendance to vary depending on how long the student stays in a charter, an additional check to make sure that our results are not being driven primarily by students who remain in a charter for only one or two years is to run our baseline specification excluding students who either stay in a charter for only one year, or who stay in a charter for only two years. These results are shown in Table 2.10. The results here are consistent with those for the full sample, suggesting that there is little difference when these short charter duration students are excluded from the sample.

Table 2.10—Charter Attendance Effects, Limiting Sample to Student Observed in Charters for Multiple Years

	Omitting students we observe in a charter for only one year		Omitting students we observe in a charter for two or fewer years	
Variable	Math	Reading	Math	Reading
1st year charter	-.075	.043	-.100	.030
	(.055)	(.036)	(.065)	(.046)
2nd or 3rd year	.052	.042	.078	.061
charter	(.035)	(.026)	(.044)	(.033)
4th through 8th year	-.015	.021	.011	.041
charter	(.037)	(.026)	(.046)	(.035)
District mover	-.038	-.024	-.038	-.024
	(.005)	(.005)	(.005)	(.005)
Campus mover	-.147	-.105	-.147	-.105
	(.005)	(.004)	(.005)	(.004)
Moved to charter	-.246	-.190	-.270	-.203
from public	(.049)	(.033)	(.061)	(.044)
Moved to public	.155	.115	.082	.035
from charter	(.029)	(.025)	(.046)	(.041)
Moved from one	-.028	-.019	.011	-.006
charter to another	(.042)	(.037)	(.047)	(.045)
Sample size	1,211,392	1,203,777	1,193,151	1,185,620

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

Table 2.11—Charter Attendance Effects, Interacting Effect With Whether the Student Was Ever Classified as Limited English Proficient or At-risk

	Category is Limited English Proficiency		Category is At-risk	
Variable	Math	Reading	Math	Reading
1st year charter, student observed in status	.158	.254	-.024	.023
	(.085)	(.060)	(.050)	(.036)
2nd or 3rd year charter, student observed in status	.102	.088	.082	.049
	(.055)	(.041)	(.035)	(.025)
4th through 8th year charter, student observed in status	-.060	.017	.024	.040
	(.053)	(.046)	(.040)	(.030)
1st year charter, student not observed in status	-.081	-.045	-.098	-.048
	(.044)	(.036)	(.057)	(.043)
2nd or 3rd year charter, student not observed in status	.065	.041	.025	.037
	(.036)	(.026)	(.045)	(.035)
4th through 8th year charter, student not observed in status	.052	.051	.020	.042
	(.032)	(.024)	(.032)	(.025)
District mover	-.038	-.024	-.038	-.024
	(.005)	(.005)	(.005)	(.005)
Campus mover	-.148	-.105	-.148	-.105
	(.005)	(.004)	(.005)	(.004)
Moved to charter from public	-.240	-.188	-.236	-.184
	(.039)	(.027)	(.041)	(.029)
Moved to public from charter	.240	.170	.238	.171
	(.020)	(.017)	(.020)	(.017)
Moved from one charter to another	-.040	-.016	-.032	-.008
	(.043)	(.037)	(.042)	(.038)
Sample size	1,256,983	1,249,135	1,256,983	1,249,135

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

As mentioned before, one of the unique characteristics of the Texas charter school industry is that many Texas charter schools were chartered explicitly to serve primarily At-risk students. Because many students who attend charter schools were classified as At-risk prior to entering charter school, it is interesting to see if students who were ever classified as At-risk do better or worse at charter schools than other students. In Table 2.11 we address this issue, interacting the charter effects with an indicator for whether the student was ever classified as limited English proficient (first two columns) or At-risk (last two columns).

For limited English proficient students, we get the striking result that LEP students actually do better in first-year charter schools, with effects of .158 in math and .254 in reading. Combining those effects with the -.240 public-to-charter mover effect, there is a much smaller overall negative first-year effect for LEP students in math, and no negative first-year effect at all in reading, compared to other students. The estimated effects for LEP students decline however in charter schools that have been in operation for more than one year, with LEP students in charters that were in operation at least four years doing worse than non-LEP students (-.060 versus .052 in math, .017 versus .051 in reading).

For At-risk students the differences are smaller, with At-risk students having slightly more positive effects than non-At-risk students in charter schools that are either in their first year or their second or third year of operation, and almost identical effects in well-established schools.

Table 2.12—Charter Attendance Effects, Separate Effects Depending on Charter Schools Serving Predominantly At-risk Students

Variable	Math	Reading
1st year charter, campus serves mainly At-risk students	-.050	.005
	(.049)	(.034)
2nd or 3rd year charter, campus serves mainly At-risk students	.073	.045
	(.037)	(.025)
4th through 8th year charter, campus serves mainly At-risk students	.007	.030
	(.046)	(.032)
1st year charter, campus serves mainly non-At-risk students	-.022	.001
	(.084)	(.062)
2nd or 3rd year charter, campus serves mainly non-At-risk students	.023	.040
	(.062)	(.049)
4th through 8th year charter, campus serves mainly non-At-risk students	.083	.078
	(.082)	(.041)
District mover	-.038	-.024
	(.005)	(.005)
Campus mover	-.148	-.105
	(.005)	(.004)
Moved to charter from public	-.233	-.183
	(.040)	(.029)
Moved to public from charter	.239	.171
	(.020)	(.017)
Moved from one charter to another	-.026	-.005
	(.042)	(.038)
Sample size	1,256,983	1,249,135

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

It is also possible that the difference in performance doesn't depend on whether the student is classified as At-risk or not, but rather whether the charter school is focused on serving primarily At-risk students. One way to check this is to divide charter schools up by whether they have at least 50% students who were ever classified as At-risk. In Table 2.12 we do this, allowing the charter school effect to vary for high-At-risk and low-At-risk charters. The results do not show a substantial difference between the two groups of charter schools, with charters serving primarily At-risk students having a more positive effect for second or third-year charters, and charters that serve primarily non-At-risk students having a more positive effect for charters in their fourth year or higher of operation. Basically, whether the student is At-risk or the school is focused on At-risk students does not appear to have a large impact on the estimated charter achievement effects.

SUMMARY

By carefully controlling for the effect of a student being in their first year in a charter school, we have shown that students tend to experience a decline in test scores in their first year in a charter school, followed by a rapid recovery. This can lead to misleading results when great weight is placed on the transition year, as it naturally is in a growing industry where a large percentage of the charters students are observed in their first year in a charter school. By separately estimating the effect of charter attendance on students who remain in charter school for varying lengths of time we have found evidence that those students who remain in charter schools for multiple years have slightly lower average math and reading test score growth while in charter schools. Briefly experimenting with charter schools and then returning to a traditional public school also appears to have a small negative impact on student performance.

We do find evidence that charter schools that have been in operation longer have higher average student gains than new charter schools, but no matter how long the charter school has been in operation, new charter students continue to do poorly at those schools. We also find evidence that African-American students do better at charter schools than other students, and that charter school attendance has the most negative impact on the performance of non-African-American, non-Hispanic students.

Although the overall story for the effect of charter schools on student achievement is that charters have average test score gains that are the same or slightly lower than traditional public schools, the interesting interactions between student years in a charter and charter years of operation indicate the overall effect of charter schools on student achievement is richer and more complex than simply saying charter schools are “good” or “bad,” in terms of their impact on student performance.

CHAPTER III

CHARTER COMPETITION EFFECTS

Although much of the debate about charter schools has focused on how students who attend the charter schools perform relative to students in traditional public schools, perhaps the more important effect of charters schools is the effect they have on the performance of students in nearby traditional public schools. School choice advocates claim that charter schools could increase educational outcomes for all students by providing incentives for inefficient public schools to improve. There is a significant literature that suggests that public schools are not typically cost efficient, and that lack of competition in the education market may be an important cause of this inefficiency.[14] If choice reforms such as charter schools increase the degree of competition in the education sector, then increasing efficiency could lead to improved outcomes for all students.

The new and expanding charter school industry is an important opportunity to test the systemic effect of competition on the performance of public school students. Because the large majority of public school students remain in traditional public schools, this potential for a positive competitive effect is arguably of greater importance than the direct performance effects of charter school attendance. Although charter schools are public schools and do receive public funding, they have more freedom in choosing their curriculum, hiring and compensating teachers, and in targeting specific types of students. This ability for charters to differentiate their product from traditional public schools makes charter schools potentially strong competitors in the education market.

A key issue in evaluating the competitive effect of charter schools is how to measure charter competition. Conceptually, the passage of the law allowing charter schools could be

[14] See Hoxby (2000), Grosskopf et al. (2004) for examples of this literature.

taken as the key point of increased charter competition, as from that point forward every traditional public school district faced the threat of entry by charter schools. School districts might improve in response to this threat without a single charter school ever forming. Empirically, this type of competitive effect could be tested for with an event-study, evaluating the effect of the passage of the charter law.

An alternative measure of charter competition would be the degree to which charter schools have become well-established locally, at a level that can provide meaningful competition for the traditional public school district or campus. This is the approach we take here, measuring charter competition by the number of charter schools or students within a certain geographic area. We use an education production function approach to evaluate whether this type of charter competition has any effect on student performance.

Public schools in Texas faced some degree of competition even before the passage of charter legislation. Tiebout competition from surrounding public schools provides some competitive pressure, as does the presence of private school options. Charter competition is different in that parents can take advantage of the charter option without paying additional tuition or moving to a new school district. We measure the effect of charter competition, assuming that Tiebout and private competition levels are constant over the time period. If there is substantial substitution by parents between charter schools and private schools, charter competition may not have as large an effect as it would have if all charter students switched over from traditional public schools.

CHARTER PENETRATION IN TEXAS

Since legislation authorizing charter schools was passed in Texas in 1995, the charter school industry in Texas has flourished, both in number of charter schools and in the number of charter students. One reason for this rapid expansion is that Texas has charter laws that are relatively favorable to charter formation. Unlike some states where the school district is the chartering agency, in Texas the State Board of Education is the principal chartering agency for open enrollment charter schools, which should facilitate greater competition between charters and traditional public school districts.[15]

Additionally, the funding of charter schools is Texas is quite favorable to charters, with the charter school receiving the full state and local funding that the student would have received in the traditional public school, conditioned on their student characteristics. This contrasts with states like Michigan, where only a portion of the state and local funding follows the student to a charter school. This allows charter schools in Texas to compete with traditional public schools more effectively.

Charter schools in Texas are concentrated mainly in the large urban areas, such as Houston, Dallas and Fort Worth, San Antonio, and Austin. Charter schools must draw in a minimum number of students in order to be successful, and this is presumably easier in areas with higher student density. Because of this observed charter school concentration, it is likely that the effects of charter competition will be felt most strongly in the urban school districts in Texas.

[15] Texas charter school law allows both open enrollment charter schools, which are independent school districts, and district-chartered charter schools, which are chartered by an existing public school district and function as a part of that school district. In this dissertation we examine the impact of open enrollment charter schools.

Table 3.1—Charter Penetration of Public School Districts

Year	Number of Districts with at least one Charter	Total Enrollment in Districts with at least one Charter	Percent of Public Enrollment in Districts with at least one Charter
2003-04	70	1,829,382	43.0
2002-03	70	1,815,280	43.4
2001-02	67	1,738,360	41.9
2000-01	59	1,587,469	39.1
1999-00	40	963,714	24.2
1998-99	21	940,460	23.9
1997-98	10	632,311	16.3
1996-97	5	158,765	4.2

Notes: District with at least one charter means a traditional public school district with at least one open enrollment charter school within its geographic boundaries.

Table 3.1 shows the extent to which charter schools have penetrated traditional public school districts in Texas. By 2003-04 there were 70 school districts in Texas with at least one charter school within their geographic boundaries, and those 70 districts contained 43 percent of the total public school enrollment in Texas.

MODEL

As in Chapter II, we use a restricted form of the education production function described by Todd and Wolpin (2003). Because charter schools may locate where the surrounding public schools are low-performing, it is especially important to control not only for unmeasured student ability but also for unmeasured school quality. One way to do this is to add a campus fixed effect to our student test score gains model from Chapter II, giving us the following equation:

(1) $$\Delta A_{it} = \beta_1 S_{it} + \phi_c + \mu_i + \varepsilon_{it}$$

where φ_c is the campus fixed effect, A_{it} is the achievement of student i in year t, S_{it} is a vector of school inputs, μ_i is the student fixed effect, and ε_{it} is the error term.

Equation 1 is difficult to estimate directly, at least for the sample size that we are using. In order to make the model computationally tractable, we combine the campus and student fixed effects into a single campus-student spell fixed effect, representing each unique campus-student combination.[16] This yields the following equation:

(2) $$\Delta A_{it} = \beta_1 S_{it} + \theta_{ci} + \varepsilon_{it}$$

where θ_{ci} is the campus-student spell effect for campus c and student i.

This specification controls for time-invariant campus and student characteristics, and for large samples is a close approximation of the model with separate campus and student fixed effects. The spell effects model also has the advantage that the effects resulting from the model

[16] See Sass (2006) and Andrews, Schank, and Upward (2004) for a more in depth discussion of spell fixed effects.

are relatively easy to interpret, as they represent the difference between test score gains for students at the campus while it was in treatment, relative to the test score gains of those same students while they were at that same campus when it was out of treatment, or faced lower levels of treatment.

One major issue in measuring the effect of charter competition is dealing with the endogenous choice by charter schools of where to locate. Because charter schools may tend to locate near public schools of low quality, it is essential to control for unobservable school quality when measuring the competitive effects. By including spell fixed effects we control for this unobservable school quality, which would otherwise bias the resulting effects estimates.

However, if there are time-varying campus characteristics that are associated with being near charter schools, and these time-varying characteristics are also correlated with student test score gains, then these could still cause the bias in the model. For instance, during this time period the No Child Left Behind law was passed, and the penalties associated with failing to meet school accountability targets were increased, which would put added pressure on schools to improve performance, and could arguably have a stronger effect on low performing schools. If this NCLB pressure is correlated with our charter competition measure, some of the NCLB effect could be picked up in the estimated effect of charter competition.

An additional difficulty in interpreting the effect that we call charter competition is that, as low-performing students leave for charter schools, the remaining students may do better for reasons that are not associated with a competitive response from public schools. There may be positive peer effects associated with losing the lowest performing students, or those students may demand a disproportionate share of the school's resources, which can then be allocated to the remaining students. These factors are other possible explanations for what we call the charter competition effect, and it is difficult to distinguish between these different possible interpretations of the effect.

We use two different methods of measuring charter competition. One measure is at the district level, and is constructed as the percent of students in grades 3-8 within the district's geographic boundaries that attend charter schools in that year.[17] We refer to this measure as the district-level geographic charter competition measure.

The other charter competition measure is at the campus level, and is constructed using the distance between the public campus and surrounding charter campuses.[18] We construct this measure in three different ways. The first method is the number of charter schools that serve grades 3-8 within a five-mile radius, and within a 6-10 mile radius. The second method is an indicator for whether there is a charter school that serves grades 3-8 within a five-mile radius, and within a 6-10 mile radius. The third method is the number of grade 3-8 charter students (divided by 1000) within a five-mile radius, and within a 6-10 mile radius. We use all three campus-level measures, but primarily focus on the results using the first method, the number of charter schools within an N-mile radius.

DATA DESCRIPTION

The data set used in this chapter is a subset of the full student data set described in Chapter I, with data on Texas students in grades 3-8 from 1993-94 through 2003-04. All data came from the Texas Education Agency. The data include student math and reading test scores for every tested student in the state of Texas on the TAAS test (through 2001-02) or the TAKS test (2002-03 and 2003-04), both statewide standardized achievement tests. The data also

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[17] We restrict our competition measures to only students in grades 3-8, or school that serve grades 3-8, as those are the students in our estimation sample.

[18] Thanks to Lori Taylor for supplying the campus latitude/longitude data used to calculate the campus-to-campus distances.

include student demographic indicators, including race/ethnicity, gender, free or reduced price lunch eligibility, limited English proficiency, special education status, and whether the student is classified as At-risk. The data include a unique student identifier, which we use to track individual students over time as they move between charter schools and traditional public schools. We also have campus-level and district-level data sets with campus and district demographic data.

Because the full sample of students in Texas over this time period is too large to make estimation using the full sample computationally tractable, we randomly sampled a smaller group of students for our estimation sample. The students that we are most interested in keeping are students in districts that face charter competition, as they are the ones contributing to the estimated charter competition effect. We keep every student at in a district with fewer than 5000 students that ever had charter schools within their geographic boundaries, 20% of the students in districts with more than 5000 students that ever had charter schools, 10% of students in districts with fewer than 5000 students that never had charter schools, and 5% of students in districts with more than 5000 student that never had charter schools.[19] All of the regressions are weighted to account for this differential sampling probability.[20] In addition, we drop all students that we ever observe in a charter school from our sample.

[19] The sampling was done at the student level, so when a student is kept we keep every student-year observation for that student. For sampling purposes, each student was assigned to the district that they were observed the most frequently in.
[20] The weight is the inverse of the probability that the student was chosen for our sample.

Table 3.2—Summary Statistics for Chapter III Estimation Sample

Variable	Overall Sample Mean	Mean for Students in Districts with Charters	Mean for Students in Districts without Charters
Number of student-year observations	1,316,667	1,029,565	287,102
Number of unique students	428,959	336,921	92,038
District geographic percent charter	.007	.009	-
	(.016)	(.018)	
Number of charters within a 5-mile radius of public campus	.943	1.13	.262
	(2.23)	(2.45)	(.899)
Number of charters within a 6-10 mile radius	1.67	1.84	1.04
	(3.36)	(3.51)	(2.64)
At least one charter within a 5-mile radius of public campus	.313	.362	.136
At least one charter within a 6-10 mile radius of public campus	.143	.138	.159
Number of charter students within a 5-mile radius of public campus (divided by 1000)	.219	.264	.058
	(.663)	(.731)	(.247)
Number of charter students within a 6-10 mile radius of public campus (divided by 1000)	.382	.416	.263
	(.954)	(.999)	(.758)
African-American	.163	.184	.090
Hispanic	.401	.431	.290
FRL Eligible	.480	.513	.366
Limited English proficient	.064	.072	.034
Special education	.056	.056	.054
Standardized Math score	-.013	-.056	.143
	(.978)	(.984)	(.939)
Standardized Reading score	-.004	-.042	.134
	(.969)	(.976)	(.932)
Change in Math score	-.005	-.007	.004
	(.674)	(.677)	(.664)
Change in Reading score	.003	.003	.005
	(.704)	(.705)	(.699)
Campus percent African-American	.162	.180	.100
Campus percent Hispanic	.414	.442	.315
Campus percent FRL eligible	.530	.559	.425
Campus percent limited English proficient	.132	.144	.088
Campus percent special education	.124	.123	.128

Notes: Standard deviations for non-binary variables shown in parenthesis.

Because we are comparing test scores across different testing regimes with differently shaped student test score distributions, it is necessary to standardize the scores so that they are comparable over time. We use rank-based Z-score to standardize the scores, which fit the statewide student score distributions onto a normal distribution scores, which fits the statewide scores onto a normal distribution by grade, year, and test.

Table 3.2 has summary statistics for the student sample used in the charter competition regressions. The first column shows the means for the entire sample, the second column for students in districts that have charter schools in any year, and the third column for students in districts that never have charter schools. Comparing the last two columns, we can see that students in our sample from districts with charter schools are more likely to be African-American, Hispanic, free or reduced price lunch eligible, and limited English proficient, compared to students in our sample from districts without charter schools. Students in our sample from districts with charter schools are also lower performing on average in both math and reading than other students in our sample, although the average math and reading gains are similar across the two groups.

Table 3.3—Estimated Effect of District-level Charter Competition on Math and Reading Gains

	Math			Reading		
Variable	No Fixed Effects	Campus Fixed Effects	Student Fixed Effects	No Fixed Effects	Campus Fixed Effects	Student Fixed Effects
Percent of students in geographic district attending charter schools	.057 (.143)	.688 (.159)	.426 (.325)	.143 (.096)	.322 (.118)	.755 (.239)
District mover	-.042 (.004)	-.027 (.004)	-.037 (.006)	-.031 (.004)	-.019 (.004)	-.027 (.006)
Campus mover	-.131 (.004)	-.079 (.004)	-.138 (.006)	-.093 (.003)	-.055 (.004)	-.098 (.004)
Student in special education	-.004 (.003)	-.007 (.003)	.013 (.009)	-.001 (.003)	-.003 (.003)	.020 (.010)
Student is African-American	-.006 (.003)	-.007 (.003)	-	-.008 (.003)	-.009 (.003)	-
Student is Hispanic	-.006 (.003)	-.007 (.002)	-	-.010 (.002)	-.010 (.002)	-
Student is FRL eligible	-.009 (.002)	-.008 (.002)	-	-.012 (.002)	-.011 (.002)	-
Student is limited English proficient	.068 (.004)	.084 (.004)	-	.112 (.004)	.120 (.004)	-
Campus percent LEP	.089 (.015)	-	.295 (.026)	.024 (.012)	-	.097 (.021)
Campus percent FRL eligible	.019 (.012)	-	.261 (.025)	-.009 (.009)	-	.133 (.021)
Campus percent African-American	-.047 (.012)	-	-.106 (.025)	.008 (.010)	-	-.010 (.021)
Campus percent Hispanic	-.068 (.004)	-	-.290 (.029)	.005 (.008)	-	-.089 (.025)
Campus percent special education	-.229 (.041)	-	-.410 (.059)	-.135 (.031)	-	-.226 (.049)
Sample size	1,271,331	1,272,330	1,315,609	1,264,091	1,265,073	1,308,067

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects.

RESULTS

Table 3.3 shows the first results estimating the effect of district-level charter competition (defined as the percent of the students in grades 3-8 within the geographic boundaries of the public school district attending charter schools). There are three different specifications presented, the first including no fixed effects, the second including campus fixed effects, and the third including student fixed effects. These are primarily included for comparison with the baseline model, which includes campus-student spell fixed effects. The baseline model is presented in Table 3.4.

In Table 3.3, with no fixed effects included, the coefficient on the district-level charter competition variable is .057 for math and .143 for reading. Considering that even the districts with the most charter competition had barely five percent of their geographic students in charter schools in 2003-04[21], even a one percentage point increase in district-level charter competition is a fairly substantial increase, which would mean a .01 increase in the competition variable. These coefficients imply that a one percentage point increase in competition is associated with a .0006 increase in math test score gains, and a .0014 increase in reading test score gains, essentially no effect.

However, when either campus or student fixed effects are added to the model, the competition effect increases dramatically. For math it increases to .688 with campus fixed effects and to .426 with student fixed effects, and similar magnitude increases occur for the reading effects. These correspond to increases in test score gains of .007 and .004 respectively, still small effect sizes, but larger than with no fixed effects.

It is not surprising that adding campus or student fixed effects increases the size of the estimated charter competition effect. As we will show in Chapter IV, students who go to charter

[21] Houston ISD and Dallas ISD, the two districts with the most charter schools, had approximately five percent and four percent charter competition in 2003-04, respectively.

schools tend to leave traditional public schools that are low performing, so adding campus fixed effects controls for these differences in time-invariant campus characteristics, including average score levels, which would otherwise ensure that public schools facing charter competition would appear to be low-performing. Additionally, we can control directly for the differences between student ability in schools that face competition and in schools that don't face competition by including student fixed effects in the model, controlling for any time-invariant student characteristics. Either of these controls is likely to increase the estimated effect of charter competition on student test score gains.

Ideally we could control for both time-invariant campus and student effects by including both campus and student fixed effects directly in the model. However this is computationally intractable with a student sample as large as we have, so we must try alternatives. The specification we use as our baseline specification includes campus-student spell fixed effects, which combines each unique campus-student combination into a single "spell."

Table 3.4 shows the results from our baseline model with spell fixed effects, for both district-level and campus-level charter competition. Controlling for both campus and student time-invariant characteristics with the spell fixed effects causes the district-level competition effect to increase substantially, to 3.80 in math and 3.01 in reading. These effects correspond to a .038 increase in math gains from a one percentage point increase in charter competition, and a .030 increase in reading gains. Considering that the standard deviation in the test score levels is equal to one, increasing average test score gains by .038 is a reasonably large improvement.

Table 3.4—Charter Competition Effect, With Campus-Student Spell Fixed Effects

Variable	District-level competition		Campus-level competition (# of charters within an N-mile radius)	
	Math	Reading	Math	Reading
Percent of students in geographic district attending charter schools	3.80 (1.06)	3.01 (.842)	-	-
# of charters within five miles of public campus	-	-	.021 (.006)	.021 (.005)
# of charters within 6-10 miles of public campus	-	-	.010 (.004)	.008 (.003)
District mover	-.046 (.014)	-.030 (.015)	-.047 (.016)	-.025 (.016)
Campus mover	-.110 (.011)	-.071 (.010)	-.108 (.012)	-.070 (.011)
Student in special education	.018 (.023)	.018 (.024)	.020 (.024)	.019 (.026)
Sample size	1,316,667	1,309,109	1,199,938	1,193,323

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects.

For the campus-level competition effect, there are competition measure consists of two variables, the number of charter schools within a five-mile radius of the public campus, and the number of charter schools within a 6-10 mile radius of the public campus.[22] In our baseline specification the effect of number of charter schools within a 5-mile radius is .021, and within a 6-10 mile radius the effect is .010, so adding an additional charter school within a five-mile radius is associated with a .021 increase in test score gains, and about half that effect for adding a charter school within 6-10 miles. The effects on reading scores are similar, .021 and .008 respectively. With many public campuses in Houston and Dallas having five or more charter schools within a five-mile radius, this can lead to quite significant effect sizes.

Table 3.5 shows the results from the same specification, but with two alternative measures of campus-level charter competition. The first alternative is an indicator for whether there is a charter school within a five-mile radius or a 6-10 mile radius of the public campus. This specification results in small positive but insignificant effects for the five-mile radius on both math and reading scores, and negative effects for both math and reading at the 6-10 mile radius.

[22] Additional radii of charter competition were tested, up to a 30-mile radius, but only the 10-mile a lower radii ever had a significant effect.

Table 3.5—Campus-level Charter Competition Effect, Alternative Specifications

	Campus-level competition (has a charter within an N-mile radius)		Campus-level competition (# of charter students within an N-mile radius, divided by 1000)	
Variable	Math	Reading	Math	Reading
Public campus is within five miles of a charter	.021 (.016)	.006 (.015)	-	-
Public campus is within 6-10 miles of a charter	-.022 (.016)	-.026 (.014)	-	-
# of charter students within five miles of public campus (divided by 1000)	-	-	.060 (.023)	.064 (.020)
# of charter students within 6-10 miles of public campus (divided by 1000)	-	-	.047 (.014)	.030 (.012)
Sample size	1,199,938	1,193,323	1,199,938	1,193,323

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, student mover variables, and an indicator for the student being in special education.

The second alternative measure of campus-level charter competition is the number of charter students within a five-mile or a 6-10 mile radius of the public campus. The results from this specification are very similar to the version with number of charter schools within an N-mile radius, with a .060 effect on math score gains at the five-mile radius and a .047 effect at the 10 mile radius, and similar effects on reading. From this point forward we will use primarily the first definition of campus-level charter competition, the number of charter schools within an N-mile radius of the public campus.

Table 3.6 extends the baseline specification by allowing the charter competition effect to vary depending on whether the public school student is African-American, Hispanic, or other. Interestingly, for both district-level and campus-level competition the competitive effect is most positive on African-American students, then Hispanic students, with very little or no effect on other students. For instance, in the math district-level competition specification the effect for African-American students is 4.75, for Hispanic students it is 4.14, and for other students it is 1.43, so the estimated effect of charter competition on African-American students is over three times as large as on non-African-American, non-Hispanic students.

This pattern, with the largest effects for African-American students and the smallest effects for non-African-American, non-Hispanic students, fits with the idea of public schools responding to potential or realized competition by shifting resources towards the students that are most likely to leave for a charter. As we will show more explicitly in Chapter IV, African-American students are significantly more likely to transfer to a charter school than other students, so it is logical that the schools would focus their efforts to improve the performance of African-American students.

Table 3.6—Charter Competition Effect, With Different Effects for African-American, Hispanic, and Other Students

	District-level competition		Campus-level competition (# of charters within an N-mile radius)	
Variable	Math	Reading	Math	Reading
District geographic charter percent, student is African-American	4.75 (1.65)	4.43 (1.27)	-	-
District geographic charter percent, student is Hispanic	4.14 (1.22)	3.23 (1.06)	-	-
District geographic charter percent, other students	1.43 (1.03)	-.005 (.996)	-	-
# of charters within five miles of public campus, student is African-American	-	-	.023 (.009)	.030 (.008)
# of charters within five miles of public campus, student is Hispanic	-	-	.017 (.007)	.017 (.007)
# of charters within five miles of public campus, other students	-	-	.012 (.005)	.003 (.009)
# of charters within 6-10 miles of public campus, student is African-American	-	-	.022 (.006)	.013 (.006)
# of charters within 6-10 miles of public campus, student is Hispanic	-	-	.013 (.005)	.012 (.004)
# of charters within 6-10 miles of public campus, other students	-	-	-.001 (.005)	.000 (.005)
Sample size	1,316,667	1,309,109	1,199,938	1,193,323

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, student mover variables, and an indicator for the student being in special education.

By the same token, one might expect that schools facing charter competition would divert their resources towards improving the performance of their lowest performing students, as those students are also more likely to leave for a charter school. We investigate this possibility in Table 3.7, which runs the baseline competition specification separately depending on the achievement quartile of the student in the first year that they are observed in our data. The table shows the results of sixteen different regressions: math and reading, four different initial achievement quartiles, district-level and campus-level charter competition.

The results in Table 3.7 show little evidence that charter competition effects vary significantly for students with different initial achievement levels. The only measure that seems to have any systematic variation is the effect of campus-level charter competition on student math gains, where the coefficient on number of charter schools within a five-mile radius goes from .021 for the lowest quartile students to .038 for the highest quartile students, with almost twice as large an effect for the highest quartile students as for the lowest. However, none of the other charter competition measures show a similar pattern, so this is weak evidence of any relationship between student initial achievement levels and the effect of charter competition.

Table 3.7—Charter Competition Effect, Separately by Student Initial Achievement Quartile

Variable	Lowest Quartile	Second Quartile	Third Quartile	Highest Quartile
Math, District-level geographic charter competition	4.60 (1.53)	5.19 (1.34)	4.95 (1.17)	5.17 (1.23)
Reading, District-level geographic charter competition	4.40 (1.33)	3.59 (1.14)	4.48 (1.18)	3.58 (1.10)
Math, # of charters within five miles of public campus	.021 (.009)	.026 (.008)	.029 (.009)	.038 (.010)
Math, # of charters within 6-10 miles of public campus	.019 (.006)	.014 (.006)	.009 (.006)	.002 (.006)
Reading, # of charters within five miles of public campus	.025 (.008)	.023 (.008)	.036 (.008)	.023 (.009)
Reading, # of charters within 6-10 miles of public campus	.012 (.005)	.008 (.006)	.006 (.006)	.007 (.006)

Notes: The table has the results from sixteen different regressions: math and reading, district-level and campus-level competition, four different student quartiles. Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, student mover variables, and an indicator for the student being in special education.

An alternative hypothesis would be that, rather than the effect of charter competition varying by the initial achievement level of the student, it might instead vary by the initial average achievement level of the campus. If there is any district-level resource reallocation in response to a charter threat it would likely take the form of targeting more resources for those campuses that are most in danger of losing substantial numbers of students to charters, rather than targeting individual students. In Table 3.8 we investigate this possibility, allowing the effect of charter competition to vary depending on the achievement quartile of the public campus in 1994 (calculated using campus average standardized math and reading scores).

The results in Table 3.8 show a dramatic difference between the effect of charter competition on students at public campuses in the bottom half of average student achievement distribution, relative to students at campuses in the top half of the distribution. The district-level competition effect on math scores for students at campuses in the lowest quartile is 6.01, and for reading scores it is 5.46, meaning that an extra percentage point of students in the district attending charters is associated with a .06 increase in math score gains, and a .055 increase in reading score gains, a considerable effect. Meanwhile, the effects for the top two quartile campuses are negative and insignificant. Similar patterns hold for reading and for campus-level competition, with the entire positive effect of charter competition occurring for the campuses with low initial average performance.

Table 3.8—Charter Competition Effect, Effects Vary by Campus Initial Performance Quartile

	District-level competition		Campus-level competition (# of charters within an N-mile radius)	
Variable	Math	Reading	Math	Reading
District geographic charter percent, campus in lowest quartile	6.01 (1.54)	5.46 (1.16)	-	-
District geographic charter percent, campus in second quartile	3.84 (1.80)	3.09 (1.45)	-	-
District geographic charter percent, campus in third quartile	-.370 (2.14)	-.900 (1.32)	-	-
District geographic charter percent, campus in highest quartile	-1.14 (2.56)	-1.07 (1.90)	-	-
# of charters within five miles of public campus, campus in lowest quartile	-	-	.015 (.008)	.020 (.007)
# of charters within five miles of public campus, campus in second quartile	-	-	.028 (.014)	.026 (.013)
# of charters within five miles of public campus, campus in third quartile	-	-	.012 (.016)	.006 (.007)
# of charters within five miles of public campus, campus in highest quartile	-	-	.009 (.011)	.003 (.012)
# of charters within 6-10 miles of public campus, campus in lowest quartile	-	-	.023 (.006)	.020 (.006)
# of charters within 6-10 miles of public campus, campus in second quartile	-	-	.008 (.010)	.006 (.007)
# of charters within 6-10 miles of public campus, campus in third quartile	-	-	.011 (.009)	.000 (.009)
# of charters within 6-10 miles of public campus, campus in highest quartile	-	-	-.002 (.006)	.001 (.006)
Sample size	1,174,861	1,168,114	1,081,216	1,075,314

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, student mover variables, and an indicator for the student being in special education.

SUMMARY

We find that charter competition, as measured by the availability of charter schools at either the district or campus level, has a positive effect on student math and reading test score gains. The estimated effect sizes tend to be fairly small, but even a small increase in the growth rate of student test scores can have a large impact on student achievement over time. We also find that this positive competitive effect is largest for African-American and Hispanic students, and that the competitive effect is focused entirely on students in schools that are in the lowest 50% of the average student achievement distribution.

Although we call this effect a charter competition effect, there are other possible explanations for the improvements in student test score gains in districts and campuses with nearby charter schools, including positive peer effects. However, it seems clear that there is something causing test score growth to increase at public schools that face competitive pressures from charter schools.

CHAPTER IV

CHARTER DISTRIBUTIONAL EFFECTS

Although there have been many studies of the effect of charter schools on student achievement,[23] there have been relatively few studies that examine the issue of which students are choosing to go to charter schools, and what effect charter schools are having on the distribution of students by race/ethnicity and student ability. In this chapter we address both those issues, as well as link the resulting information to the analysis of student achievement from the prior two chapters.

Critics of charter schools argue that evidence of high student performance in charter schools may be due to those charters recruiting the best students from traditional public schools, and that in the process the expansion of the charter school industry may lead to greater racial and ability segregation in the public school system.[24] If charter schools were to take away the best public school students, this could have negative peer effects for students remaining in traditional public schools. On the other hand, charter schools could cause public schools to become more integrated by allowing families to choose schools outside of racially segregated neighborhoods.

Although some information can be gained about the distributional effect of charter schools by comparing overall average demographics in charter schools with student demographics in traditional public schools, the ability to track individual students as they move between charters and traditional public schools allows us to undertake a more detailed analysis of the charter mover effect. We can see definitively whether students transferring into charter schools are moving to charter schools that are more or less homogeneous, by race/ethnicity and ability, than the traditional public schools they left.

[23] See for example Buddin and Zimmer (2005), Booker et al. (2004), Sass (2006), Bifulco and Ladd (2006), and Hanushek, Kain, and Rivkin (2002).
[24] See for example Fiske and Ladd (2000).

Table 4.1—Descriptive Statistics for Charter and Public Students

	Students only observed in public schools	Students observed in charter schools for at least one year	Students observed first in public school and then in charter school
Number of students	3,870,804	38,668	21,239
Percentage white	43.3	22.0	20.3
Percentage African-American	14.4	37.5	35.7
Percentage Hispanic	39.1	38.4	42.6
Percentage Asian	0.7	0.4	0.4
Average Math score in first year observed	.003	-.406	-.370
Average Reading score in first year observed	.002	-.344	-.309

CHARTER SCHOOLS IN TEXAS

We examine charter schools in Texas through the 2003-04 school year, looking specifically at the students who move to a charter school during our data. Table 4.1 shows average student characteristics for Texas students that we only observe in traditional public schools, that we observe for at least one year in a charter school, and that we observe first in traditional public school and then in a charter school. Comparing the last two columns, we can see that students that we observe moving to charters during our data have similar average characteristics to the full set of students we observe in charter schools. Also, out of 38,668 students we observe in charter schools during our data, we observe 21,239 of them first in traditional public schools, so we see 55 percent of our charter students before they move to charter schools. This is important, as these are the students for whom we can make comparisons between the charter school they move to and the traditional public school they left, as well as make inferences about what factors are associated with moving to a charter school.

Comparing the charter movers in the third column with the overall sample in the first column, students transferring to charter schools are more likely to be African-American, less likely to be white, and on average have lower standardized reading and math scores, relative to the general student population. The students we observe transferring to a public school have slightly higher average math and reading scores than the full charter sample, but still significantly lower than for the statewide student average.

MODEL

We model a student's likelihood of transferring to a charter school between grades 3 and 8 as a function of the availability of charter schools, as well as student demographic and achievement characteristics that are associated with being more or less likely to attend a charter school. Also included are campus and district characteristics for the campus and district the student is first observed in, as well as grade-by-year indicators for the first grade and year the student is observed in.

We model the charter transfer probability using a probit model as follows:

$$(1) \qquad T_i = \phi CA_c + \alpha X_i + \beta Y_c + \gamma M_d + C_i + \nu_i$$

where T_i is a binary variable that equals one if the ith student transfers to a charter school during our sample, CA_c is a vector of charter availability measures for the cth campus in the last year that the student is observed, X_i is a vector of student characteristics, Y_c is a vector of campus characteristics for the first campus we observe the student in, M_d is a vector of district characteristics for the first district we observe the student in, C_i is a cohort indicator for the first grade and year we observe the student, and v_i is the error term. Students who are not observed in a traditional public school prior to being observed in a charter school are omitted from our analysis.

Note that this model can only predict the likelihood that a student will transfer to a charter school between grades 3 and 8, after being first observed in a traditional public school in at least grade 3. If the factors influencing this decision are substantially different than the factors influencing the decision to go to a charter school in an earlier or later grade, or to start school in a charter without ever entering a traditional public school, then the predicted probability may not be representative of the overall charter school population.

DATA DESCRIPTION

The data set used in this chapter is a subset of the full student data set described in Chapter I, with data on Texas students in grades 3-8 from 1993-94 through 2003-04 All data were obtained from the Texas Education Agency. The data include student math and reading test scores for every tested student in the state of Texas on the TAAS test (through 2001-02) or the TAKS test (2002-03 and 2003-04), both statewide standardized achievement tests. The data also include student demographic indicators, including race/ethnicity, gender, free or reduced price lunch eligibility, limited English proficiency, special education status, whether the student is classified as At-risk. The data include a unique student identifier, which we use to track individual students over time as they move between charter schools and traditional public schools. We also have campus-level and district-level data sets with campus and district demographic data.

In order to estimate the probability that any student in our sample will transfer to a charter between grades 3 and 8, we construct a dataset that has one observation for each student observed in our data. We omit students who were first observed in campuses that were more than thirty miles from the nearest charter school in the last year that the student was observed. We also omit students that were not in a public school in the first year that they were observed, and students in cohorts that would never have an opportunity to transfer to a charter school in our data (8^{th} graders in 1995-96, 7^{th} and 8^{th} graders in 1994-95).

Because there is considerable variation between charter schools and traditional public schools in how students are classified as eligible for free or reduced price lunch, limited English proficient, special education, and At-risk, we use indicators for whether the student was ever in those categories, rather than indicators for whether they are in those categories in the first year they are observed.

We also include in the model measures of charter school availability. We use two different measures of charter availability. The first is an indicator for the student being initially observed in a district that has at least one charter school by the last year the student is observed. The other is a set of indicators for there being a charter school within a 2.5, 5, or 10-mile radius of the public campus the student is first observed at, in the last year the student is observed.

Also included in the charter mover prediction model are indicators for the achievement quartile of the student in the first year they are observed, for math and reading. These quartile indicators are constructed using standardized math and reading scores, and indicate the quartile of the student in the entire statewide student data, for that subject, grade, and year.

Because we are comparing test scores across different testing regimes with differently shaped student test score distributions, it is important to standardize the scores so that they are comparable over time. We use rank-based Z-score to standardize the scores, which fit the statewide student score distributions onto a normal distribution by grade, year, and test, ensuring comparability over time and across different testing regimes.

Some of the results included in this chapter are extensions of the achievement models described in Chapter II, and of the charter competition models described in Chapter III. For those models, see the original chapters for more detailed explanations of the models and the included variables.

Table 4.2—Summary Statistics for Chapter IV Estimation Sample

Variable	Overall Sample Mean	Mean for Students Observed Transferring to a Charter
Number of students	2,613,054	21,715
District has charter schools	.393	.719
At least one charter within 2.5 miles of public campus	.260	.601
At least one charter within 5 miles of public campus	.481	.824
At least one charter within 10 miles of public campus	.730	.937
Female	.501	.492
African-American	.153	.391
Hispanic	.382	.415
Ever FRL Eligible	.556	.805
Ever limited English proficient	.181	.187
Ever in special education	.111	.147
Ever classified as At-risk	.541	.752
Lowest initial reading quartile	.272	.385
Second initial reading quartile	.245	.261
Third initial reading quartile	.237	.192
Highest initial reading quartile	.245	.162
Lowest initial math quartile	.266	.400
Second initial math quartile	.248	.257
Third initial math quartile	.245	.197
Highest initial math quartile	.242	.146
Campus percent African-American	.151	.282
Campus percent Hispanic	.388	.456
Campus percent FRL eligible	.511	.686
Campus percent LEP	.175	.226
Campus percent special education	.109	.101
District percent African-American	.154	.249
District percent Hispanic	.384	.449
District percent FRL eligible	.466	.586
District percent LEP	.144	.185
District percent special education	.113	.109

Table 4.2 has the summary statistics for the student sample used in the probit regressions modeling the choice of students to transfer to a charter school. The data set contains one observation per student in our data. The first column has the means for the entire estimation sample, the second column only for students that we observe transferring to a charter school. Comparing the two columns, it is clear that students who transfer to charter schools are much more likely to be first observed in districts that have charter schools, and to be first observed in public schools that are within 2.5, 5, or 10 miles of a charter school. Students who transfer to charter schools are also much more likely to be African-American, ever have been eligible for free or reduced price lunch, and to ever have been classified as At-risk, compared to the overall student sample.

Comparing the indicators for the initial student reading and math quartile, we can see that students who transfer to a charter school are more likely to be in the lowest initial achievement quartile in both reading and math, compared to the full student sample. Charter movers also tend to come from campuses and districts with higher percentages of African-American, Hispanic, FRL eligible, and LEP students.

RESULTS

The aggregate statistics comparing students in charter schools with students in traditional public schools show that a higher percentage of charter school students are African-American than in traditional public schools, and that a lower percentage of charter students are white than in traditional public schools. However, this aggregate look does not tell us what is driving this differential. One possibility is that charter schools locate in areas where the public schools have more African-American students than the state average, and that charter schools have demographics similar to surrounding public schools. Another possibility is that African-

American students are more likely to move to charter schools than white students, and this difference in preferences is driving the different demographics in charters and traditional public schools.

Additionally, raw averages across the state could mask interesting patterns that vary across student types. Table 4.3 takes a closer look at the difference in the percent of students that are white, African-American, or Hispanic, comparing the percentages at the charter the student moves to with the percentages at the public school that student left. In addition to looking at these differentials for all students that we observe moving from a traditional public school to a charter school, we also do these comparisons separately for white, African-American, and Hispanic students.

The first column shows these comparisons for all students that we observe moving from a traditional public school to a charter school. Here we can see that, although charter schools statewide have a lower percentage of white students than traditional public schools, when you compare the percent white at the public schools that students are leaving to go to charters it is actually lower than the percent white at the charter schools. Similarly, while the percent black is higher in charter schools than at the public schools that these students leave (36.5 percent compared to 28.4 percent), the public schools that these charter movers are leaving have a higher percentage of black students than the state as a whole (13.9 percent).

Table 4.3—Comparing Traditional Public and Charter Peer Environments for Charter Movers by Race/Ethnic Background of Student

	Total	White	African-American	Hispanic
Number of students	15,300	2,977	5,405	6,480
Percent white in public	21.2	50.0	14.2	12.9
Percent white in charter	22.7	56.0	12.0	15.1
Difference	1.5	6.0	-2.2	2.2
Percent African-American in public	28.4	15.7	52.7	14.1
Percent African-American in charter	36.5	16.8	68.6	19.0
Difference	8.1	1.1	15.9	4.9
Percent Hispanic in public	47.8	30.5	30.8	71.1
Percent Hispanic in charter	39.1	23.6	18.1	64.8
Difference	-8.7	-6.9	-12.7	-6.3
Racial Herfindahl in public	.605	.519	.567	.682
Racial Herfindahl in charter	.655	.570	.699	.662
Difference	.050	.051	.132	.020

Notes: All differences are significant at the 5% level unless noted otherwise. The public percentages are for the public school the student attended prior to moving to a charter.

The last lines of the table show the difference in the racial Herfindahl index, which is the product of the different racial percentages at the campus.[25] For students overall, the racial Herfindahl is .655 at the charter school the student moves to, and .605 at the public school they left, meaning that on average charter movers are moving to charter schools that are more racially concentrated than the public schools they leave.

More informative are the last three columns of Table 4.3, which make the same comparisons separately for white, African-American, and Hispanic students. The first obvious difference is that each group attends both charter schools and traditional public schools that are more like them than the state averages. White students who transfer to charters leave schools that are on average 50.0 percent white and go to charters that are on average 56.0 percent white. African-American students leave public schools that are on average 52.7 percent black and go to charters that are on average 68.6 percent black, a difference of almost 16 percentage points. Only Hispanic students transfer to charter schools with a lower average percentage of Hispanic students than the public schools they left, 64.8 percent compared to 71.1 percent, which is not surprising considering that the public schools the charter students are leaving are already so predominantly Hispanic.

Those racial percentage differences imply that for white students, and especially for African-American students, the charter movers are moving to charter schools that are more racially segregated than the public schools they left. The comparisons of racial Herfindahls bear this out, with white students on average going to charters with .050 higher Herfindahls than the traditional public school that they left, and African-American students going to charters with .132 higher Herfindahls on average.

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[25] The racial Herfindahl is a measure of the degree of segregation at the campus. A Herfindahl of 1 would be perfectly segregated, the lower the Herfindahl the less segregated the school is.

Table 4.4 compares average math and reading scores for students who transfer to charter schools with the average scores in the public schools they leave. The first table shows the comparison for all charter movers. The scores are standardized so that the state average score is equal to zero, but for both math and reading the average score at the public schools that charters are leaving is much lower, -.248 for math and -.232 for reading. However, the average score of the charter movers is even lower, -.478 in math and -.392 in reading. On average, charter schools are attracting students from public schools with lower average scores than the state as a whole, and they are attracting the lowest performing student from those campuses.

In the last three columns of the table we make the same comparisons separately for white, African-American, and Hispanic students. Here the more interesting comparison is the difference between the score of the charter mover and the average score of students with the same race as the mover at the public school that they left. This difference is negative for all three racial categories in both reading and math, but in both subjects the difference is largest for African-American students (-.279 difference in math scores, -.223 difference in reading scores), and lowest for Hispanic students. That isn't to imply that the African-American students at the public schools the African-American charter movers leave were doing well, in fact they had very low average scores (-.529 in math, -.392 in reading), but the African-American charter movers have even lower average scores (-.808 in math, -.615 in reading), so the difference is still large and negative.

Table 4.4—Comparing Average Math and Reading Scores of Charter Movers to Other Students at the Public Schools That They Leave

	Total	White	African-American	Hispanic
Number of students	18,351	3,810	6,474	7,560
Prior Math score of movers	-.478	-.028	-.808	-.438
Prior Math score of public peers	-.248	.025	-.380	-.281
Difference with public peers	-.230	-.053	-.428	-.157
Prior Math score of public peers of same race/ethnicity as mover	-	.191	-.529	-.312
Difference with public peers of same race/ethnicity	-	-.219	-.279	-.126
Prior Reading score of movers	-.392	.104	-.615	-.463
Prior Reading score of public peers	-.232	.065	-.312	-.337
Difference with public peers	-.160	.039	-.303	-.126
Prior Reading score of public peers of same race/ethnicity as mover	-	.248	-.392	-.380
Difference with public peers of same race/ethnicity	-	-.144	-.223	-.083

Notes: All differences are significant at the 5% level unless noted otherwise. The public averages are for the public school the student attended prior to moving to a charter, but for the year after the student moved.

Table 4.5—Probit Regressions for Predicted Probability That a Student Will Move to a Charter

Variable	All Students	African American Students	Hispanic Students	Other Students
Public campus has a charter school within a 2.5-mile radius	.223	.156	.291	.129
	(.007)	(.012)	(.271)	(.014)
Public campus has a charter school within a 5-mile radius	.125	.089	.108	.153
	(.009)	(.018)	(.016)	(.015)
Public campus has a charter school within a 10-mile radius	.142	.208	.142	.148
	(.012)	(.029)	(.022)	(.017)
Public geographic district has at least one charter school	.158	.075	.194	.154
	(.007)	(.014)	(.011)	(.013)
Student is African-American	.109	-	-	-
	(.010)			
Student is Hispanic	-.056	-	-	-
	(.009)			
Student is Female	-.013	-.025	-.024	.017
	(.005)	(.010)	(.008)	(.010)
Student is ever FRL eligible	.179	.173	.179	.190
	(.008)	(.015)	(.017)	(.012)
Student is ever limited English proficient	-.190	-.330	-.163	-.337
	(.009)	(.067)	(.010)	(.033)
Student is ever in special education	.088	.054	.106	.102
	(.008)	(.015)	(.013)	(.014)
Student is ever classified as At-risk	.206	.231	.204	.220
	(.007)	(.013)	(.013)	(.012)
Student's initial Reading score is in the lowest quartile	-.042	-.031	-.045	-.068
	(.010)	(.020)	(.017)	(.019)
Student's initial Reading score is in the second quartile	-.041	-.049	-.031	-.048
	(.009)	(.019)	(.016)	(.016)
Student's initial Reading score is in the third quartile	-.023	-.013	-.032	-.021
	(.009)	(.019)	(.016)	(.014)
Student's initial Math score is in the lowest quartile	.088	.115	.069	.044
	(.010)	(.021)	(.016)	(.019)
Student's initial Math score is in the second quartile	.048	.060	.044	.029
	(.009)	(.020)	(.015)	(.016)
Student's initial Math score is in the third quartile	.035	.041	.029	.033
	(.009)	(.020)	(.015)	(.014)
Public campus percent LEP	-.248	.054	-.243	-.473
	(.034)	(.081)	(.044)	(.093)
Public campus percent FRL eligible	.180	-.136	.377	.305
	(.032)	(.050)	(.057)	(.060)
Public campus percent African-American	-.016	.335	-.406	.065
	(.034)	(.054)	(.066)	(.068)
Public campus percent Hispanic	.097	.188	.210	.028
	(.040)	(.079)	(.065)	(.087)
Public campus percent special education	-.474	-.335	-.915	.264
	(.092)	(.162)	(.155)	(.169)
Public district percent LEP	.156	-.224	-.296	1.12
	(.055)	(.117)	(.078)	(.137)
Public district percent FRL eligible	-.100	-.506	-.272	.172
	(.046)	(.084)	(.0780	(.086)
Public district percent African-American	.578	.627	1.28	.019
	(.043)	(.079)	(.079)	(.080)
Public district percent Hispanic	.033	.932	.509	-.471
	(.050)	(.100)	(.084)	(.100)
Public district percent special education	.062	-1.08	.783	-.579
	(.160)	(.331)	(.271)	(.280)
Number of observations	2,613,054	397,523	996,880	1,206,667

Notes: Regressions contain one observation per student. Indicators for the grade-by-year that the student is first observed are also included.

We have seen the average characteristics of students who transfer to charter schools during our data, but we can also explicitly model which factors influence the decision to move to a charter school. Earlier in this chapter we described a probit model for estimating the probability that a student will transfer to a charter school during the years and grades that we observe them, and those results are presented in Table 4.5. The first column shows the results for the probit on the entire student sample, the remaining three columns show separate probit results for African-American, Hispanic, and other students.

The availability of charter schools plays an important role in determining who transfers to a charter.[26] We include two different measures of charter availability. The first is an indicator for the student being first observed in a district that has at least one charter school by the last year the student is observed. The other is a set of indicators for the being a charter school within a 2.5, 5, or 10-mile radius of the public campus the student is first observed at, in the last year the student is observed. As expected these effects are positive and significant. There appears to be little difference in the effect of charter availability on the charter transfer decision when the probit is run separately for African-American, Hispanic, and other students.

As expected, African-American students have a higher probability of transferring to charters than other students. However, Hispanic students actually have a lower probability of transferring to a charter than white students, once the other factors are controlled for. Students who were ever free or reduced price lunch eligible, in special education, or classified as At-risk are also more likely to transfer to a charter, while students who were ever classified as limited English proficient are less likely to transfer to a charter.

Student who are low performing in math in the first year we observe them are more likely to transfer to a charter, as measured by indicators for the performance quartile of the

[26] Students who are first observed at a public campus that is more than thirty miles from a charter school in the last year we observe the student are omitted from the probit sample.

student. Once the effect of math scores and being ever classified as At-risk are accounted for, students with low reading scores actually have a slightly lower chance of transferring to a charter school.

We showed earlier that African-American students who transfer to a charter school are likely to transfer to charter schools with a significantly higher percentage of African-American students than the public schools that they left. In Chapter II we looked at the effects of attending a charter school on student test score gains, allowing the charter school effect to vary for African-American, Hispanic, and other students. Those results are in Table 2.9, and they show that the effect of attending a charter school is the most positive for African-American students, and least positive for non-African-American, non-Hispanic students. In Table 4.6A we extend this analysis to see if African-American students who transfer to charter schools with at least ten percentage points more African-American students than the public school that they left do better or worse in charter schools than those that go to charter schools with the same percent of students that are African-American (within ten percentage points either way), or than those that go to charter schools with more than ten percentage points fewer African-American students than the public school that they left.

Table 4.6A—Charter Attendance Effects, Effect Varies by the Percent African-American at the Charter School, Relative to the Public School the Student Left

	All Students		African-American Students	
Variable	Math	Reading	Math	Reading
1st year charter, higher percent African-American than public	.003 (.064)	-.027 (.057)	-.123 (.088)	-.096 (.078)
2nd or 3rd year charter, higher percent African-American than public	.164 (.045)	.096 (.036)	.104 (.070)	.051 (.052)
4th through 8th year charter, higher percent African-American than public	.134 (.049)	.094 (.042)	.164 (.044)	.117 (.036)
1st year charter, same percent African-American as public	.008 (.065)	.038 (.041)	-.101 (.104)	-.002 (.087)
2nd or 3rd year charter, same percent African-American as public	.072 (.043)	.056 (.031)	.149 (.070)	.095 (.055)
4th through 8th year charter, same percent African-American as public	-.006 (.035)	.026 (.026)	.042 (.071)	.120 (.051)
1st year charter, lower percent African-American than public	-.115 (.070)	.018 (.060)	-.157 (.123)	-.054 (.108)
2nd or 3rd year charter, lower percent African-American than public	.024 (.057)	.014 (.040)	.041 (.074)	.070 (.058)
4th through 8th year charter, lower percent African-American than public	-.090 (.054)	.014 (.038)	-.044 (.082)	.035 (.054)
District mover	-.038 (.005)	-.024 (.005)	-.057 (.012)	-.049 (.012)
Campus mover	-.148 (.005)	-.105 (.004)	-.183 (.010)	-.134 (.009)
Moved to charter from public	-.249 (.042)	-.190 (.029)	-.216 (.059)	-.194 (.039)
Moved to public from charter	.235 (.020)	.166 (.017)	.197 (.029)	.169 (.025)
Moved from one charter to another	-.071 (.058)	-.023 (.045)	-.074 (.080)	-.043 (.062)
Sample size	1,254,704	1,246,878	195,230	193,696

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

Table 4.6B—Charter Attendance Effects, Effect Varies by the Percent Hispanic at the Charter School, Relative to the Public School the Student Left

	All Students		Hispanic Students	
Variable	Math	Reading	Math	Reading
1st year charter, higher percent Hispanic than public	-.107	.024	-.114	.061
	(.073)	(.063)	(.098)	(.063)
2nd or 3rd year charter, higher percent Hispanic than public	.062	.036	.050	.002
	(.065)	(.044)	(.083)	(.060)
4th through 8th year charter, higher percent Hispanic than public	-.078	.010	-.137	-.011
	(.049)	(.038)	(.066)	(.052)
1st year charter, same percent Hispanic as public	.003	.050	.076	.138
	(.065)	(.044)	(.109)	(.059)
2nd or 3rd year charter, same percent Hispanic as public	.077	.064	.046	.027
	(.038)	(.028)	(.056)	(.040)
4th through 8th year charter, same percent Hispanic as public	.018	.037	-.028	-.017
	(.036)	(.027)	(.055)	(.039)
1st year charter, lower percent Hispanic than public	.005	-.060	-.028	-.092
	(.065)	(.055)	(.101)	(.064)
2nd or 3rd year charter, lower percent Hispanic than public	.130	.070	.097	.068
	(.044)	(.036)	(.063)	(.048)
4th through 8th year charter, lower percent Hispanic than public	.100	.080	.001	-.015
	(.047)	(.040)	(.076)	(.063)
District mover	-.038	-.024	-.056	-.030
	(.005)	(.005)	(.008)	(.008)
Campus mover	-.148	-.105	-.171	-.123
	(.005)	(.004)	(.008)	(.006)
Moved to charter from public	-.245	-.188	-.225	-.175
	(.041)	(.029)	(.064)	(.046)
Moved to public from charter	.235	.166	.186	.114
	(.020)	(.017)	(.036)	(.028)
Moved from one charter to another	-.071	-.022	-.079	-.048
	(.058)	(.045)	(.105)	(.084)
Sample size	1,254,704	1,246,878	465,220	461,669

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, an indicator for the student being in special education, and campus percent African-American and percent Hispanic.

The first two columns are run for all students, math and reading, and the last two columns are run including only African-American students in the regression sample. For the overall sample, the effect of being in a charter school in its fourth or higher year of operation on test score gains is highest for students moving to charter schools with at least ten percentage points more African-American students than the public school they left, with a coefficient of .134 in math and .094 in reading. This effect holds for African-American students as well, with the largest positive charter effect on the African-American students that transfer to charter schools with at least ten percentage points more African-American students than the traditional public schools they left, and smaller charter attendance effects for other African-American students.

Table 4.6B does the same analysis for Hispanic students, looking at the effect of transferring to a charter school with more, about the same, or fewer Hispanic student than the traditional public school they left. Here we find the opposite effect from Table 4.6A. Both for the full sample and for Hispanic students only, the lowest charter school effects are for students who transfer to charter schools with at least ten percentage points more Hispanic students than the public school they left. For Hispanic students, even those students in charter schools with at least four years in operation have large negative effects in both math and reading at charter schools with more Hispanic students than the public school that they left.

Table 4.7—Charter Competition Effect, Measured by Campus Average Student Probability of Moving to a Charter

Variable	Math	Reading
Campus average student predicted probability of moving to a charter	6.42 (2.69)	5.40 (2.32)
Number of observations	831,826	825,396

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, student mover variables, and an indicator for the student being in special education.

Next, we generate for each student in the probit regression sample a predicted probability of transferring to a charter school during our data, and use this information to extend the analysis of the effect of charter competition from Charter 3. The first extension is in Table 4.7. Here we generate for each public campus the average predicted probability of the students at that campus transferring to a charter school. Because this average predicted probability includes information on the availability of charter schools, it can serve as a proxy for the degree of competition the campus faces from charter schools. This measure of charter competition also has the advantage of taking into account other student and campus characteristics that are associated with a student being more or less likely to move to a charter.

Table 4.7 shows the effect on math and reading when we use the campus average predicted probability of moving to a charter as an alternative charter competition measure in the campus-student spell fixed effect framework from Chapter III. Both math and reading show a large positive effect from this measure of charter competition, with a math coefficient of 6.42 and a reading coefficient of 5.40. A high average predicted probability for a campus would be around .01, so this would imply that a campus with an average predicted probability of .01 would have average math gains of .064 higher than a campus with a zero average predicted probability of moving to a charter, and average reading gains that are .054 higher, a fairly substantial effect.

Table 4.8—Charter Competition Effect, With Different Effects for Students With High or Low Probabilities of Moving to a Charter

	District-level competition		Campus-level competition (# of charters within an N-mile radius)	
Variable	Math	Reading	Math	Reading
District geographic charter percent, high probability student	4.41 (1.28)	3.89 (1.05)	-	-
District geographic charter percent, low probability student	1.85 (1.03)	.604 (.904)	-	-
# of charters within five miles of public campus, high probability student	-	-	.015 (.006)	.019 (.006)
# of charters within five miles of public campus, low probability student	-	-	.014 (.009)	.007 (.009)
# of charters within 6-10 miles of public campus, high probability student	-	-	.023 (.004)	.020 (.004)
# of charters within 6-10 miles of public campus, low probability student	-	-	-.002 (.005)	-.002 (.005)
Sample size	987,350	984,596	882,033	879,673

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, student mover variables, and an indicator for the student being in special education.

Table 4.8 goes back to the baseline district-level and campus-level charter competition measures from Chapter III, but allows the effect of charter competition to vary depending on whether the student has a high (greater than .01) or low predicted probability of moving to a charter during our data. The charter competition effect is much greater for students with a high predicted probability of moving to a charter, with district-level competition coefficients of 4.41 in math and 3.89 in reading, compared to 1.85 in math and .60 in reading for students with a low predicted probability of moving to a charter. A similarly large gap holds for the campus-level competition effect as well. This provides support for the theory that schools respond to charter competition by focusing their resources primarily on improving the performance of those students that are most likely to leave for a charter school.

Finally, in Table 4.9 we do a similar analysis, but instead of allowing the charter competition effect to vary with the student's predicted probability of moving to a charter school, we allow the charter competition effect to vary depending on the campus average predicted student probability of moving to a charter school, with a high average campus being one where the campus average predicted probability is more than .01. Here we find a much smaller effect, with a slightly larger district-level competition effect on math and reading, and basically no difference in the campus-level competition specification. This would indicate that there is little evidence of districts responding to charter competition by allocating resources towards campuses that appear more likely to lose students to charter schools.

Table 4.9—Charter Competition Effect, With Different Effects for Campuses With High or Low Average Student Probability of Moving to a Charter

	District-level competition		Campus-level competition (# of charters within an N-mile radius)	
Variable	Math	Reading	Math	Reading
District geographic charter percent, high average probability campus	4.23 (1.28)	3.44 (1.00)	-	-
District geographic charter percent, low average probability campus	3.01 (1.17)	2.88 (1.00)	-	-
# of charters within five miles of public campus, high average probability campus	-	-	.016 (.007)	.018 (.006)
# of charters within five miles of public campus, low average probability campus	-	-	.018 (.007)	.020 (.007)
# of charters within 6-10 miles of public campus, high average probability campus	-	-	.017 (.005)	.015 (.004)
# of charters within 6-10 miles of public campus, low average probability campus	-	-	.009 (.005)	.009 (.004)
Sample size	831,826	825,396	725,411	719,836

Notes: Robust standard errors, adjusted for within-school clustering, in parenthesis. Regressions also include grade-by-year effects, student mover variables, and an indicator for the student being in special education.

SUMMARY

We find that there are significant differences between those students who choose to transfer to a charter school and those that remain in traditional public schools, and that those differences vary by the race/ethnicity of the student. African-American students in particular move to charter schools that have on average a much higher percentage of African-American students than the traditional public schools that they leave, and both white and African-American charter movers move to charter schools that are on average more racially concentrated than the public schools they left. Charter schools appear to be taking students from primarily low performing campuses, and taking the lowest performing students from those campuses, with the differential being the largest for African-American charter students.

We model the individual student's probability of transferring to a charter school and find logical relationships between charter availability, student demographic characteristics and initial achievement levels, and the probability of transferring to a charter. We also revisit the framework for estimating the competitive effects of charter schools in Chapter III, and find that the charter competitive effects are more positive for students with a high predicted probability of leaving for a charter school, indicating that traditional public schools may respond to charter competition by focusing on improving the achievement gains of students that appear more likely to leave for a charter school.

CHAPTER V

CONCLUSIONS

In Chapter II, we examined the effect of attending a charter school on student achievement. We find four primary results. First, we find that students who enter charter schools tend to have lower scores in both reading and math during their first year in the charter school, and that this negative first-year charter student effect is consistent across different vintages of charter. This result is consistent with the findings in Booker et al. (2004a).

Second, we find that once you control for the negative first-year student effect, new charter schools tend to have student math and reading achievement gains comparable to those in traditional public schools. We also find that the performance of charter schools tends to improve as the schools are in operation for additional years, and that charter schools that have been in operation for more than one year tend to perform better than traditional public schools, once the negative first-year charter student effect is accounted for. Although most research has found that charter schools improve as they become more experienced, the results have been mixed on whether experienced charter schools outperform traditional public schools. The total charter school effect is a combination of the first-year charter student effect and the overall charter effect by years of operation, and it does not appear that overall well-established charters are performing significantly better than traditional public schools.

Third, we find that students who stay in a charter for two or more years generally have slightly lower average math and reading score growth than they would have had in a traditional public school. This finding is different from that in Booker et al., which found that students that stayed in charter schools caught back up to where they would have been in traditional public school by the end of the second year in reading, and by the end of the third year in math.

However, the total difference in average effects is relatively small, the effect is just slightly more negative in this more recent work.

Finally, we find that African-American students on average have higher performance gains than other student groups in charter schools that have been in operation for at least one year, and that non-African-American, non-Hispanic students have the poorest performance in these charter schools. This finding is the opposite of what Bifulco and Ladd (2006) found in North Carolina, where African-American charter students had the lowest performance of all charter student groups.

Overall, the two findings that are consistent in the literature on charter achievement are that charter school performance improves as the charters have been operation longer, and that charter students perform poorly in their first year in a charter school, and our findings reinforce both of those conclusions. Most of the findings in the literature comparing average performance across the two sectors find either small differences or no difference, and our results basically concur. This is unsurprising, as both sectors will have both high-performing schools and low-performing schools, and given the large variation in charter institutional environments across states there is no reason to expect that the charter school achievement effect would be identical across all states.

In Chapter III, we examined the effect of charter schools on student achievement in surrounding public schools, which can be characterized as the charter competition effect. Our primary result here is that there is a relatively small but consistently positive effect of charter competition on math and reading score gains in surrounding public schools. This positive competitive effect is consistent whether the competition is measured at the district-level by percentage of students in charters, or at the campus-level using charter penetration within a five or ten-mile radius of the public campus. The results are also robust to several different specifications.

The existing literature on the competitive effects of charter schools is mixed, with Bifulco and Ladd (2006) finding no evidence of competitive effects in North Carolina, and Sass (2006) and Booker et al. (2004b) finding positive competitive effects in Florida and Texas, respectively. Our results fall in the second group, and they are consistent enough that even if one doesn't believe that the effect is necessarily a competitive response by traditional public schools, it is still clear that something is leading to higher test score growth in public schools that have nearby charter schools, whether it is a competitive effect, positive peer effects associated with losing low-performing students to charters, or some other related effect.

We also find a couple of interesting results when examining which students have the largest gains due to charter competition. We find that the effects of charter competition are felt most strongly for African-American and Hispanic students, with effect sizes approximately 2.5 times larger than those for other students in traditional public schools. We also find that the positive effects of charter competition are completely felt by the by campuses in the bottom half of the initial average achievement distribution, and that campuses that were initially high-performing demonstrate no effect from charter competition. This second result is consistent with Booker et al..

In Chapter IV, we examined the effect of charter schools on the distribution of students, both by ability and by race/ethnicity, as well as examining which student, campus, and district characteristics are most associated with a student having a high probability of transferring to a charter school. We have three primary findings in this section. First, we find that African-American students, and to a lesser degree white students, on average transfer to charter schools that have a significantly higher percentage of students with the same race/ethnicity as the mover, and that are more racially segregated, relative to the traditional public school they left. This is consistent with the North Carolina results from Bifulco and Ladd (2004).

Second, we find that students who move to charter schools tend to leave traditional public schools with lower average math and reading scores than the state as a whole. Additionally, the charter movers are not only low-performing relative to the other students at the public school they left, but have low average test scores even compared to the average scores of the other students of the same race/ethnicity at the public school they left. These test score differences are smallest for Hispanic students and largest for African-American students. This is likely due at least in part to the way the Texas charter law was structured to encourage charter schools to focus primarily on students that were At-risk, who on average have much lower test scores than other students.

Third, we find that if we predict the probability of each student we first observe in a traditional public school transferring to a charter school between grades 3 and 8, then average this predicted student probability up to the campus level and use it as a measure of charter competition using the models from Chapter III, we find that again charter competition using this alternative measure has a positive and significant effect on student math and reading gains. Additionally, when we use our original measures of charter competition, but allow the competitive effect to vary depending on whether the traditional public student is estimated to have a high or low probability of ever moving to a charter, we find that the competitive effects are much stronger on those students who appear likely to leave for a charter school, relative to students with low predicted probabilities of leaving for a charter. This is evidence that traditional public schools may be reallocating resources towards improving the performance of students that appear more likely to leave for charter schools.

Overall, this dissertation makes several important contributions to extending our understanding of the different effects that charter schools have in Texas, both on the students attending them and on students in traditional public schools. As more high-quality charter school studies become available in other states, as well as additional research in Texas, hopefully we can start to capture more fully what factors, both institutional, organizational, and instructional, lead to different effects of charter schools.

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