CHARTER SCHOOLS IN NORTH CAROLINA

Robert Bifulco
University of Connecticut

Helen F. Ladd
Duke University

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Legislation authorizing charter schools in North Carolina was passed in 1996, and the first charter schools opened in fall 1997. As of 2002, only seven states had more charter schools than North Carolina, and of those, only five had a greater concentration of charter schools: Arizona, Florida, Wisconsin, Michigan and California. Though its policy is less permissive than that of Arizona and Michigan, North Carolina has taken a moderately permissive approach to charter schools compared to most other states and its program includes many of the elements recommended by charter school advocates.

Because the state has been testing all students in grades 3-8 since the early 1990s, it is possible not only to track students as they move between traditional public schools and charter schools but also to examine their performance on statewide math and reading tests over time. These rich longitudinal data make it possible to do more careful analysis of the charter school system in North Carolina than is possible in many other states.

This paper draws heavily on our published research on charter schools in North Carolina (Bifulco and Ladd, 2005, 2006, and forthcoming). As a result, most of the analysis ends in the academic year 2001/2002. The first two sections describe the North Carolina policy context and the administrative data used for this research. Subsequent sections then explore the patterns of racial segregation within charter schools; measure the effects of charter schools on the achievement of the students who attend them; describe the links between segregation, achievement and test score gaps; and examine how charter schools affect the performance of students in the traditional public schools. We conclude that the North Caroline school system has increased racial segregation, been

detrimental on average to student achievement, and has widened the black-white test score gap.

I. Background and policy context

. As shown in figure 1, charters in North Carolina can be granted by a local district, the state university or the State Board of Education, but final approval for a charter must come from the State Board of Education. The number of charter schools statewide is capped at 100 and the annual growth in the number of schools per district is limited to five. In addition, local districts are given an opportunity to provide input before charter applications are approved. Together these provisions give the state of North Carolina more control over the establishment of charter schools than is the case in several other states.

Nevertheless, the North Carolina legislation is quite permissive in that it allows any individual or group to apply for a charter and does not require local district approval of a charter application. North Carolina charters operate as independent nonprofit corporations, act as their own employers, and are automatically exempt from several regulations. In addition, they receive operating funding at the same level and are subject to the same testing requirements as traditional public schools.[1] Charter schools are required to develop a transportation plan so that transportation is not a barrier to any student who resides in the district in which the school is located. As is the case in most other states, the state provides no funding for start up costs, although charter schools are eligible for federal start up funds.

[1] An independent study of charter school financing found that per pupil revenues in charter schools were within 5 percent of revenues in traditional public schools statewide (Speakman and Hassel, 2005) and another found that per pupil expenditures were about 3 percent less than traditional public schools in the same districts (Nelson, Muir and Drown, 2003).

. Of the 94 charter schools established before 2002 that served students in grades 3 through 8, sixteen previously were private schools (some of which were quite new) and one previously was a regular public school. Thus, most of North Carolina's charter schools were established from scratch as new schools. The charter school applications filed with the state Department of Instruction indicate that, despite their wide range of programmatic offerings, all the charter schools follow the North Carolina Standard Course of Study, which serves as the basis for the state tests.[2] At least two charter schools that converted from private schools, both located in rural areas, have long-standing missions to serve students with special emotional or family problems. In addition, about one-quarter of North Carolina charter school applications outline specific interventions or recruitment efforts targeted for at-risk students

Charters can be revoked for a number of reasons including poor student performance and financial mismanagement. Between 1997 and 2002 the State Board revoked seven charters, and seven more relinquished their charter voluntarily or closed due to low enrollment or financial problems. Overall, about 12 percent of the charter schools that have been opened are now closed. However, in no case was the decision to revoke a charter or to close due primarily to low student performance (Manuel 2002).

Table 1 details the growth in charter schools in North Carolina. By 2000-2001 there were 90 charter schools and over 15,000 charter school students. Growth in the number of charter schools has slowed since 2000-2001 primarily because the state law caps the number of charter schools at 100. Since 2002, the State Board has approved seven new charter schools. Charter schools in North Carolina are more likely to be

[2] Examples of the range of offerings include art-infused curriculums (8 schools), experiential learning (19 schools), and emphasis on African or African-American themes (5 schools).

elementary or middle schools than high schools, and most charter schools serve at least some students between grades 4 and 8, which are the grades examined in most of the analysis we describe below. The 93 charter schools in 2001-2002 are spread across 46 of North Carolina's 100 counties. During the 2001-2002 school year, Wake County, home to the state capital of Raleigh, and nearby Durham County had the highest concentration of charters, 12.4 and 18.2 percent of public schools, respectively. In Charlotte-Mecklenberg the state's most populous county, only 6 of 130 public schools were charters in 2002. As of 2006, there were 95 charter schools, of which 14 were in Wake County, seven were in Durham, and nine were in Charlotte-Mecklenberg.

Table 2 shows how the mix of students in North Carolina charter schools differs from that in traditional public schools. Compared to traditional public schools, charter schools have a larger percentage of black students (40 vs. 31 %) and lower percentages of Hispanic (2 vs. 5 %) and white (56 vs. 60%) students. At the same time, charter schools serve a higher percentage of students whose parents are college educated and a lower percentage of students whose parents are high school dropouts. Despite the higher education level of their parents, these students exhibit lower levels of performance on both end–of- grade (EOG) reading and math tests.

Concerned that charter schools might be established to serve as enclaves for white students, state policy makers have encouraged applications for charter schools oriented toward serving educationally disadvantaged students, among whom African Americans tend to be overrepresented. In addition, the legislation explicitly requires that "within one year after a charter school begins operation, the population of the school shall reasonably reflect the racial and ethnic composition of the general population within the district or of

the special population the school seeks to serve residing in the district."[3] In fact, though, the racial compositions of many charter schools throughout the state have differed significantly from the host district, but not generally in the way initially feared by policy makers. Of the 97 charter schools operating in 2000-01, 30 schools were more than 80 percent nonwhite and 20 had a higher percentage of non-white students than any traditional public school in the same district. Only eight charter schools had lower percentages of nonwhite students than any traditional public school in the same district (Manuel 2002).

II. Data for this study

The analysis in this paper is based primarily on administrative data provided by the North Carolina Education Research Data Center for five cohorts of students. Each cohort contains the universe of students in third grade in North Carolina public schools in 1996, 1997, 1998, 1999 and 2000 and follows them through eighth grade or until the 2001-02 school year, whichever comes first.

The information available for each student in each year includes their scale scores on the End-of-Grade (EOG) reading and math tests, their school, whether their school is a charter, their grade, their gender, their ethnicity, and the highest level of education completed by their parents. EOG reading and math tests are multiple-choice tests that measure the achievement of competencies described in the North Carolina *Standard Course of Study,* and are administered in the spring of each year to students in grades 3-8. Individual results are reported as developmental scale scores, which are designed to measure growth in reading and math, and thus are expected to increase as students move

[3] See charter school legislation, NSCSG 115C-238, 29F(g)(5) and state board of education policy EEO-U-003 for official statement of the state's policy on racial and ethnic balance in charter schools.

from lower grades to higher grades. In order to ensure comparability of test scores and test score gains for students in different grades, we use grade-by-year-specific averages and standard deviations to convert the developmental scale scores to standard scores with means of zero and standard deviations of one.

Almost 9,000 of the students in our five cohorts of 3rd through 8th graders are observed at least once in a charter school. We rely on two subsets of this full set of charter students for various parts of our analysis.[4] First, we use a subset of 6,480 school "switchers" to examine changes in the composition of student peers as students transfer from a traditional public school to a charter school. This subset is similar to the full sample of charter school students except that students in the subset are slightly less likely to be black and have higher average third-grade test scores. Second, we use a subset of 5,754 charter school students for whom we observe one or more test-score grains while the student was enrolled in a charter school and also in a traditional public school to identify how charter schools affect achievement. Though comparable in most ways to the full set of charter school students, the students in this subset have higher average third grade test scores, are significantly less likely to have first entered a charter school before grade 4 and are more likely to have left a charter school. Though these differences might generate some bias in our estimates of the achievement effects of charter schools, as we have shown in our earlier work, the bias is likely to be small (Bifulco and Ladd, 2006).[5]

III. Charter schools and racial segregation

[4] For more complete descriptive data on these subsets, see Bifulco and Ladd, forthcoming, Table 1.
[5] Also see discussion below in section IV on the extent to which the overrepresentation of exiters affects the estimates.

Both black and white charter school students in North Carolina attend more racially segregated schools on average than their counterparts in traditional public schools [6] That is illustrated in Figure 2 which is based on data for all charter schools in North Carolina for the 2001-02 school year.[7] Specifically, the typical black charter school student attends a school that is more than 70 percent black while his black counterpart in a traditional public school attends a school that is less than 50 percent black. Analogously, the typical white charter school student is in a more racially isolated environment than her counterpart in a traditional public school: the peers of the typical white charter school student are only 18 percent black in contrast to about 24 percent for the student in a traditional public school. In some areas, particularly Charlotte/Mecklenberg and Wake, the cross sector differences in these racial percentages are even more marked (not shown).

Given the possibility that charter schools could be drawing students from traditional public schools that are predominantly black or predominantly white, these average racial patterns need not imply that charter schools have increased racial isolation. For that purpose we need to examine how the racial mix of a typical student's peer group changes as she transfers to a charter school. To that end, we examine the 6,480 switchers in our administrative data set, namely the students who we observe in a traditional public school the year before they entered a charter school. Table 3, which compares the characteristics of the other students in the same grade and school during each student's

[6] We focus on the choices made by and the effects of charter schools on African-American and white students. Although Hispanics are a rapidly growing group in North Carolina, the number of Hispanic students and other ethnic groups who have selected into charter schools is too small for most of our statistical analysis.

[7] The figure is based on data from the Common Core of Data from the National Center of Education Statistics for all districts that had at least one charter school in 2001-02. This data source includes all the charter schools and students in the state. In subsequent analysis based on NC administrative data, we focus on charter school students in grades 3-8.

first year in a charter school and during the immediately prior year when the student was enrolled in a traditional public school (TPS), shows that the move to a charter school typically does increase racial isolation. .

As shown in the top panel, black switchers have transferred from traditional public schools that are 53 percent black on average to charter schools that are 72 percent black on average. Notice also that black switchers are transferring to charter schools with lower levels of average achievement in both reading and math than the schools they left. White students who transfer into charter schools are making very different kinds of choices. First of all, the charter schools they select tend to have lower percentages of black students than the traditional public schools they previously attended. Also, in stark contrast to black switchers, white switchers are transferring into charter schools that provide significantly higher percentages of peers with college educated parents and higher average levels of achievement. Thus, charter schools in North Carolina clearly increase the extent to which students are racially segregated.

The bottom panel of Table 3 shows that students from families with different educational backgrounds also sort into different types of charter schools. Switchers in families with parents without four-year degrees selected schools in which less than 30 percent of students have college educated parents, while those with college educated parents selected schools in which nearly 60 percent of students have college educated parents. For the students with educated parents, the exposure to students with similar educational backgrounds increased by 17 percentage points with the transfer to a charter school.

It is clear from Table 3 that students who choose to enroll in North Carolina charter schools tend to end up in schools and grades with higher percentages of students who look more like themselves racially and/or in terms of family background than was the case in their traditional public schools. Moreover, for black students and children of parents without a college degree, this increase in the proportion of students who look like themselves is accompanied by a marked reduction in the average level of achievement among their classmates.

Explaining the racial isolation of charter schools

As we show in section IV below, North Carolina charter school students in general, and black students who move to more racially isolated charter schools in particular, achieve at lower levels than they would have had they remained in traditional public schools. One might reasonably ask why so many black students select into racially segregated charter schools that weaken their academic performance. One possible explanation is simply that, despite the lower academic quality of such schools, black families would prefer to have their children attend racially segregated schools.than ones that are more racially mixed. If that were the case, policy makers would face a tradeoff between the promotion of academic achievement and the provision of schools with other characteristics that black families value. Alternatively, many black families could be choosing racially segregated charter schools because they do not have access to the more racially balanced charter schools that they would prefer. If this were the case, efforts to promote more integrated schooling options might be warranted. In the following analysis we make inferences about the preferences of black and white families for particular mixes of students by race within charter schools and conclude that the latter explanation,

namely that black families end up in racially segregated charter schools despite their preference for more integrated schools, is closer to the truth. .

Our analysis is based on the specific choices made by charter school families in five North Carolina metropolitan areas. We limit our analysis to these metropolitan areas because of the greater number of charter school options in those areas relative to the rest of the state and the fact that the options are characterized by a range of racial profiles.[8] We focus on the choices made separately by all the black and white families who switched their child to a charter school during the 2000-01 and 2001-02 school years and who had at least two charter schools from which to choose within a 10-mile radius of their traditional public school. [9]

Our strategy is to estimate conditional logit models of the choice of charter school, conditional on the student switching to a charter school. Such a model allows us to make inferences about the value that choosers place on various characteristics of the charter schools in their choice sets. Although the magnitudes of the parameter coefficients from a logit model are difficult to interpret, the signs of the coefficients have a clear interpretation: a positive sign indicates that the characteristic is valued by the chooser and a negative sign that it is disvalued.

Preferences of black charter school families

Of most interest is the implicit value that black switchers place on schools with particular racial profiles. Thus the key variables in the model are a set of 0-1 variables

[8] See Bifulco and Ladd (fothcoming) Table 6 for information on the characteristics of the choice sets available to charter school students in the five metropolitan areas. Those areas are Durham/Chapel Hill, Forsythe, Guilford, Meckelenberg and Wake.

[9] The decision to use a 10-mile radius is based on the fact that for about 90 percent of the transfers to charter schools, the distance between the charter school in which the student enrolled and the schools the student attended the previous year was less than 10 miles.

indicating whether a charter school is 0-20 percent black, 20-40 percent black, 60-80 percent black, or 80-100 percent black, with the base or left-out category being 40-60 percent black. In addition to these variables, we include in the basic model two measures of accessibility. The first is the distance between the student's previous traditional public school and the charter school.[10] The second is the number of spaces in the school, specified as the logarithm of the school's enrollment. In a second model, we add additional characteristics for each charter school.

The basic results of the conditional logit analysis for black charter school students are reported in the first column of Table 4. The negative signs on all the racial profile variables in that column indicate that, other factors relating to accessibility held constant, black families are more likely to choose schools with 40-60 percent black students (those in the base category) to schools that are characterized by either higher or lower percentages of black students. The negative sign on the distance variable indicates that black families prefer charter schools that are closer to their previous school to those that are further away.

Black families might prefer racially integrated charter schools to those with more racially segregated environments for various reasons unrelated to race, including, for example, a preference for smaller classes or for specific educational programs. Hence in the second column, we include the pupil-teacher ratio as a proxy for class size and indicator variables for a variety of programmatic offerings. The negative sign on the pupil-teacher ratio indicates that, as expected, black families prefer smaller to larger classes. The programmatic characteristics are derived from the mission statements of

[10] We would prefer to define this variable as distance from the student's residence but we do not have information on home addresses.

each charter school at the time of application. Because of the possibility of multicollinearity among these programs and the limited availability of some of the programs across charter schools, we are not able to learn much about the value placed on specific programs. Of more interest is that even when these variables are included in the regression, the preferred racial mix is still 40-60 percent black.[11]

Thus, we conclude that the black charter school families who had racially balanced charter schools (defined as those with between 40 and 60 percent black students) in their choice sets tended to prefer them to more segregated schools. We must be careful, however, not to attribute similar preferences to all black students who made racially segregating moves into charter schools (defined as moves to charter schools that are more than 60 percent black and more than 10 percent blacker than the school they left behind). Though they might have similar preferences, we do not know that for a fact since only 19 percent of these students had at least one racially balanced charter school in their choice sets. Thus, the substantial majority of black students who made racially segregating moves did not have access to charter schools with racially balanced student profiles, schools that these students might have preferred had they been available.

Preferences of white charter school students

If substantial numbers of black charter school student prefer schools that are 40 to 60 percent black, why are there so few charter schools available with that racial mix of students? A partial answer to that question emerges from our analysis of the choices

[11] At the same time, we note that the negative coefficients at the two extremes of racial isolation – less than 20 percent black and more than 80 percent black -- are smaller than in model 1, although only significantly so for the 0-20 percent black category. One interpretation of the smaller size of these two coefficients relative to the estimates in the first columns is that part of the weaker preferences of black charter school families for those schools is attributable to the programs they offer relative to the programs in other schools.

made by white charter school families. As shown in the last two columns of Table 7, white charter school families exhibit their strongest preference for schools that are less than 20 percent black and, as indicated by the large negative coefficient for the last racial category, they are strongly averse to charter schools in which over 80 percent of the students are black. Moreover the patterns are even stronger after we control for the pupil teacher ratio and programmatic variables. Thus, the models suggest that white charter school families have very different preferences with respect to the racial composition of the school than do their black counterparts. In sharp contrast to black charter school families in metropolitan areas, whites prefer charter schools in which less than 20 percent of the students are black.

Given the asymmetry of the preferences of black and white charter school families, it would be difficult to end up with many racially balanced charter schools. Though black families might prefer such schools, the fact that white families prefer schools with far lower proportions of black students sets up a tipping process. Attempts to have racially balanced charter schools are likely to fail as white families who are looking for alternatives to traditional public schools select into whiter charter schools or private schools when such options exist. The result is the observed pattern in which many black students end up in racially segregated charter schools.

IV. Effects of North Carolina Charter Schools on Student Achievement

Among the most important and controversial issues in the charter school debate is how charter schools affect the achievement of the students who attend them. This issue is hotly debated in part because the effects are hard to estimate. The most serious estimation problem arises because charter school students are self-selected and are likely to differ in

unobserved ways from otherwise similar students who choose to remain in traditional public schools. To address this challenge, we follow the strategy used by Hanushek, Kain, and Rivkin (2002) and use repeated observations on individual students to control for individual fixed-effects to generate our preferred estimates. In the preferred model, we are essentially comparing the test score gains of students in charter schools to the test score gains made by the same students when they are observed in traditional public schools. (See Bifulco and Ladd, 2006 for details).

For purposes of comparison, we estimate three basic models: a "levels" model, a "gains" model, and a "fixed effects" model, with the latter generating the preferred estimates. Each of these models is a restricted form of a more general model that we discuss elsewhere (Bifulco and Ladd, 2006. p.64-66)

The first model, which we refer to as a "levels model" can be written as:

$$Y_{iGT} = \alpha CH_{iGT} + X_{iGT}\mathrm{B} + \eta_{GT} + \varepsilon_{iGT} \qquad (1)$$

where Y is a test score for student i in grade G in year T and CH, the variable of most interest, indicates whether that student attended a charter school in year t. X is a vector of individual student characteristics, some of which do not change over time such as the student's race or gender, and others of which do, such as whether the student changed schools during the year. Finally, the η_{GT} are a set of grade-by-year fixed effects and ε_{iGT} is an error term.

This model, which we estimate using OLS and robust standard errors, yields the difference in levels of performance between charter school students and traditional public school students controlling for observable student characteristics and grade-by-year effects. A serious limitation of this model is that it ignores the effects of the student's

educational experiences in previous years. Because the past educational experiences of the student and other unobserved factors such as the student's motivation are likely to influence both student test scores and the decision to enroll in a charter school, omitting these variables is likely to bias the estimates of the charter school effect.

A second approach incorporates the prior year achievement levels by focusing on the gains in achievement from one year to the next rather than the levels. This model can be written as

$$\begin{aligned} \Delta Y_{iGT} = Y_{iGT} - Y_{i(G-1)(T-1)} &= \alpha CH_{iGT} + X_{iGT}\mathrm{B} + \lambda_{GT} + \nu_{iGT} \\ \lambda_{GT} &= \eta_{GT} - \eta_{(G-1)(T-1)} \\ \nu_{iGT} &= \varepsilon_{iGT} - \varepsilon_{i(G-1)(T-1)} \end{aligned} \tag{2}$$

where the λ_{GT} variables represent fixed effects for the changes from one grade to the next by year. We call this the "gains model" because it estimates the difference between the average test score gain made by charter school students and traditional public school students controlling for observable student characteristics and grade-by-year effects. Though preferred to the levels model, this model implicitly assumes no decay from one year to the next in the effects of prior year achievement In addition, if unobserved student characteristics have additive effects rather than a one-time effect, then estimates of α from the gains model will generate biased estimates of the effect of attending a charter school.

The third model is similar to the gains model except that it includes an individual fixed effect, γ_i.

$$\begin{aligned} \Delta Y_{iGT} = Y_{iGT} - Y_{iG(T-1)} &= \alpha CH_{iGT} + X_{iGT}\mathrm{B} + \gamma_i + \lambda_{GT} + \nu_{iGT} \\ \lambda_{GT} &= \eta_{GT} - \eta_{(G-1)(T-1)} \\ \nu_{iGT} &= \varepsilon_{iGT} - \varepsilon_{i(G-1)(T-1)} \end{aligned} \tag{3}$$

The inclusion of the individual fixed effect means that the coefficients are estimated using only the variation within students (Baltagi 1995), which eliminates any effects of unobserved differences between charter school students and traditional public school students that remain constant over time. In addition, the X vector now includes only the student-level variables that change over time, with the time-invariant student characteristics incorporated into the student fixed effects. Estimation of this model requires three or more observations for each student, which, with the exception of studies using Texas and Florida data, has not been available in previous quasi-experimental evaluations of school choice programs (Booker *et al.* 2004; Hanushek, Kain & Rivkin 2002; Hanushek, Kain, Rivkin and Brand, 2005; Sass, 2006).

Model (3), which we refer to as the "fixed effects" model, provides powerful protection against self-selection bias. However, this protection comes at a cost. Note that the estimated effects of charter schools from this model are based on the experiences of only those students for whom we can observe test score gains at least once in a charter school and at least once in a traditional public school. The estimator could provide biased estimates of the effects averaged across all charter school students if the subsample of students used to identify the charter school effect were not representative of that larger group. We return to this issue below.

Estimated achievement effects

The first three columns of Tables 5A and 5B present our estimates of the three models for math and for reading, respectively. The estimated effects of each of the time invariant student characteristics in the first two models are generally consistent with expectations. Females exhibit higher levels of achievement in both math and reading, and

larger annual gains, although the difference in gains is significant only for math. Blacks and Hispanics exhibit lower levels of achievement than whites. Hispanics, however, make larger annual gains in both reading and math than either blacks or whites. Both the level of achievement and annual gains in achievement are higher for students with more educated parents. Children of college graduates, for example, score more than one standard deviation higher than children of high school dropouts. Finally, as can be seen for all three models, students who change schools, either because of a move or because they are making a structural change such as to a middle school, make smaller gains during their transition year than students who remain in the same school.

Turning to the charter school coefficients, we find that students in charter schools do less well than their counterparts in traditional public schools. Because the dependent variable is expressed as a standard score with a mean of 0 and a standard deviation of 1, the coefficients in Tables 5A and 5B can be interpreted as proportions of a standard deviation. In the levels models, charter school students, on average, score 0.16 of a standard deviation lower in reading and about 0.25 of a standard deviation lower in math than observationally similar students in traditional public schools. From the gains models, we see that students in charter schools also make smaller annual gains, on average, than observationally similar students. In neither case, however, can we be sure that the lower performance is attributable to being in a charter school since it could possibly reflect unobserved differences in the characteristics of the students who select into those schools.

That alternative explanation does not arise in our preferred model third model with student fixed effects. The negative estimates from those models indicate that the

smaller gains made by charter school students do indeed appear to be attributable to being in a charter school given that the student fixed effects control for any time-invariant unobserved differences between charter school students and students in traditional public schools.

Based on the fixed effect models, the negative effects of attending a charter school are large. Charter school students exhibit gains nearly 0.10 standard deviations smaller in reading and 0.16 standard deviations smaller in math, on average, than the gains those same students had when they were enrolled in traditional public schools. Given that the typical charter school student in our sample is observed in a charter school for 1.66 years, the preferred estimates suggests that such a student would score 0.16 standard deviations (= 0.10 x 1.66) lower in reading and 0.27 standard deviations (0.16 x 1.66) lower in math than if she remained in a traditional public school. The difference in achievement growth due to being enrolled in a charter school appears to be considerably larger than the differences in growth between children of high school dropouts and the children of parents with graduate degrees and between blacks and whites—differences that are the object of considerable concern. The negative impacts of enrolling in a charter school are also substantially larger than the negative impacts of changing schools or making the transition from elementary school to junior high.

This finding of a negative average effect need not mean that all North Carolina charter schools are unsuccessful in raising the achievement of their students. Nonetheless, as shown in figure 3, many of them appear to exhibit negative impacts on achievement in both math and reading. The figure depicts our estimates of charter school impacts for each of the charter schools in each of the two subjects. Marks in the

southwest quadrant represent schools with negative estimated impacts in both subjects. Those in the northeast quadrant exhibit positive impacts in both subjects. The fact that so many schools are in the southwest quadrant indicates that the negative average impact of charter schools on student achievement is not driven by a few atypical outliers. However, it is also worth noting that a handful of charter schools in North Carolina do appear do provide significant achievement benefits for their students.

Disaggregated results

In our previous work we have refined and disaggregated these basic results in a number of ways. We summarize some of those additional analyses: here: potential biases from the fact that exiters are overrepresented in our identifying sample, the possibility that the effects might be less negative for the more established charter schools; that the effects might vary by the number of years a student has been enrolled in a charter school, and that the effects may differ based on the race and socioeconomic background of the student. We briefly summarize those results here.[12]

Differences between exiters from and entrants to charter schools

We first disaggregate the results by whether the student is observed exiting from or entering and remaining in a charter school. This disaggregation is driven by the observation that students who leave charter schools to return to traditional public schools are overrepreented in our identifying sample relative to the full set of charter school students. This overrepresentation of exiters would make the achievement effects appear more negative than would be the case for the full sample to the extent that these students

[12] In our previous work, we have also examined a number of other factors that could potentially bias the results. These include, for example, the fact that our identifying sample underrepresents children entering charter schools in the younger grades within the 3-8 grade range and the possibility that the students who transferred to a charter school were more likely than others to have been experiencing a downward trend in their achievement prior to the transfer. See Bifulco and Ladd, 2006, pp. 71-74.

leave because of a poor academic experience in charter schools. The size of the bias depends both on the extent to which exiters are overrpresented in the sample and on the magnitude of the difference in outcomes between charter schools students who exit and those who do not. Based on disaggregated results not shown here for exiters and non exiters, we find that the estimates reported in the final columns of Tables 5A and 5B are too negative, but only by about 5–6 percent. Thus, the conclusion remains that on average charter schools in North Carolina have a negative effect on student achievement, at least as measured by performance on the statewide tests.

Differences by age of school

Given the challenges of opening a new school, one might expect that the charter schools that have been operating for longer periods of time would be more effective than those that recently opened. To examine this possibility, we estimated the achievement effects of charter schools separately by the number of years that the school has been operating. Those results, for the fixed effects model, are shown in Table 6 Consistent with our expectations, the negative effects are largest for charter schools during the first year. Importantly, however, the effects remain negative and statistically significant even for charter schools that have been operating for four or five years (and remain negative even after we adjust them for the bias discussed just above). This finding that the negative effects persist for older schools differs from those that emerge from comparable studies in Texas and Florida Although studies for those states also find negative overall achievement effects for charter schools, the negative effects in those states disappear for

charter schools that have been operating for three or more years in Texas and four or more years in Florida (Hanushek, Kain, Rivkin, & Brand 2005; Sass, 2006).[13]

Differences by years enrolled

An additional extension involves disaggregating the charter school effects not only the age of the charter school, but also by whether it is the first year a student has been in the school. The key results, which are not shown here, are that the large negative overall effects appear to be driven largely, but not entirely, by the achievement of students during the their first year in a charter regardless of the age of the school. (See Bifulco and Ladd, 2006, Tables 7A and 7B). Given that the models separately control for the generic effect of changing schools, this finding means the year a student newly transfers into a charter school she does even less well than if she were transferring to another traditional public school. Also students who choose to remain in charter schools do not continue to accumulate negative impacts after their initial year. This finding is reassuring in that it justifies the decision of many parents to keep their children in charter schools once they are there. It is also clear, however, that even this group, which is harmed least by their decision to attend a charter school, still has lower levels of achievement as a result of that decision. Finally, the students who ultimately leave charter schools typically exhibit poorer performance in math relative to what they would have done in a traditional public school, both during their first year in a charter school and in subsequent years.

Disggregation by race and parental education of the student

[13] Sass (2006) finds that charter schools open five years or more in Florida have small positive effects on reading.

Finally, we look at how the achievement effects vary by the race and parental education level of the parents. The results are shown in Table 7. In each panel, the first column replicates the results from the preferred model in Table 5A or 5B, the second column includes an interaction term that allows us to measure the differential effect on black students, and the third column includes two interaction terms that allow us to differentiate students both by their race and by the educational level of their parents. The most interesting results emerge for math. As shown by the first entry in the second column, a negative math achievement effect of –0.138 emerges for white charter school students, and an even more negative effect of –0.0193 (=-0.138 + (–0.055)) for black students. Thus, the negative achievement effect for black students is nearly 40 percent larger than that for white students. The third column shows that a student's race and level of parental education have negative and statistically significant, independent influences on the size of the math achievement effect. These estimates imply that black children of less educated parents are the group most adversely affected by charter schools. Specifically, the negative effect of charter schools on the math achievement of black students whose parents do not have a four-year college degree is 0.209 standard deviations per year (the sum of all three coefficients), which is twice as large as the 0.104 standard deviation loss experienced by white students with college educated parents.

The final three columns of Table 7 summarize the results for reading. Though the average effects are negative as was shown in Table 5B and replicated in column 4, the effects on reading scores of attending a charter school do not differ significantly across racial or educational groups.

Given that black students are disproportionately represented in charter schools relative to white students in North Carolina, the finding that attending a charter school has, on average, had negative effects on student achievement suggests that the introduction of charter schools has increased the black-white test score gap in North Carolina. That the negative effect of charter schools is larger for black students, at least in math, than for white students magnifies the impact of charter schools on that gap, especially for black children of less educated parents.

V. The Link Between Segregation, Achievement and Test Score Gaps

In this section we test for a relationship between the movement of black students to more racially segregated charter schools and the differentially large negative effect of charter schools on the math achievement of black students. To do so we first identify all the charter school students who made racially segregating transfers defined as a transfer into a charter school that is more than 60 percent black and more than 10 percentage points blacker than the traditional public school previously attended by the student. Approximately 54 percent of the black students that we observe transferring into a charter school made such transfers. We then add various interaction terms to our fixed -effect regression model in order to distinguish the effects of charter schools on three groups of students: white students, black students who did not make racially segregating transfers, and black students who did make racially segregating transfers.

The results of this analysis are presented in Table 8. We focus first on the results for math in the first column. The first entry of –0.137 is an estimate of the negative effect of charter schools on white students. The second entry, which is small and statistically insignificant, indicates virtually no difference between the effects of charter schools on

the math achievement of white students and black students not making a racially segregating transfer. The third entry, in contrast, indicates that the effect of charter schools is significantly more negative for black students who made racially segregating transfers. The point estimates indicate that the negative effects of charter schools on these black students were 51 percent (0.077/(0.137+0.014)) larger than the effects on other black students and 66 percent ((0.077+0.014)/0.137) larger than the effects on white students. Thus, the relatively large negative effect of charter schools for black students reported above in Table 7 is attributable entirely to the experiences of black students who chose charter schools with higher levels of racial segregation than the traditional public schools they were previously attending.

As shown for reading in the third column of Table 8, the negative effects of charter schools on reading test scores are also largest for blacks who made racially segregating moves. However the differences in effects between groups are not statistically significant.

One should not conclude that the relatively large negative effects of charter schools on the achievement of black students who made racially segregating transfers are attributable specifically to the change in the racial profile of their classmates. Because the racial profile of a charter school is so closely related to its other characteristics such as mission, the quality of the teachers it is able to recruit, the programs it offers, or the quality of its facilities, we cannot distinguish the causal effects of a school's racial mix from these other characteristics. We do, however, try to look at one such characteristic, whether the school explicitly targets at-risk students. Of the black charter school students who made racially segregating transfers, 34.2 percent transferred into a charter school

that, according to its mission statement, explicitly targets at-risk students. Perhaps factors such as the peer environment associated with a concentration of students at risk of academic failure or the curricular focus of at-risk programs, account for the relatively large negative effect of charter schools on black students who made racially segregating transfers.

To investigate this possibility we estimated a version of our within-student model that allows the effects on each of our student groups to differ for charter schools targeting at-risk populations from those of other charter schools. The results are reported in the second and the last columns of Table 8. The large and statistically significant positive coefficients on the variable indicating that a charter school is targeted toward students who are at risk of academic failure (see fourth row) implies that such charter schools have much less negative average effects on their students' achievement than do other charter schools.[14] In addition, the estimates in Table 8 imply that both types of charter schools -- that is, those that target at-risk students and those that do not -- generate larger negative effects on black students making racially segregating transfers than on other black students.

To summarize, black students who switch into racially segregating charter schools exhibit even larger negative reductions in achievement relative to what they would have achieved in the traditional public schools than do either white students or other black students who transfer into charter schools. Moreover these larger reductions are not attributable to the fact that about one in three black charter school students select into schools that target at- risk students. Nor can we conclude that the differentially negative

[14] This coefficient specifically captures the difference in effects on white students. However, the effects of at-risk charters on black students are also much less negative than the effects of other charters.

effects are specifically attributable to the racial profiles of the charter schools. Nevertheless, the relatively large negative effects of charter schools on black students who made racially segregating transfers raises legitimate concern about charter schools that are substantially more segregated than nearby traditional public schools and, as shown in section II above, are not the preferred option for many black families. .

VI. Effects of Competition from Charter Schools on Traditional Public Schools

Charter schools have the potential to have broader impacts on student achievement if traditional public schools respond to the threat of losing students to charter schools by improving the quality of their own educational programs. Although the number of charter schools in North Carolina and the nation has grown rapidly over the last decade, they still represent only a fraction of the total number of public schools, and are likely to remain so for a number of years. Still, if North Carolina's traditional public schools improved in response to their presence, the apparently negative effects of charter schools on the achievement of students who attend them might be explained in part by the positive effects on other students. .

To estimate the effects of charter schools on students in traditional public schools, we use information on each school's distance from the nearest charter school to develop indicators of whether or not it faces competition from charter schools. How close does a charter school have to be located to a traditional public school to provide meaningful competition? We observe 6,576 transfers from traditional public schools to charter schools in our data. For 90 percent of these transfers the distance between the charter school where the student enrolled and the school the student attended the previous year is less than 10 miles. If the threat of losing students is what motivates traditional public

schools to respond to charter schools, then only those charter schools located within 10 miles of a given school are likely to exert much effect on the school.

Our data indicate that schools within 2.5 miles of a charter school lose a higher percentage of students to charter schools, and hence appear to face more competition, on average, than do schools 2.5 to 5 miles from the nearest charter, and that the threat of losing students to a charter school depends also on the number of charter schools within a given radius of the school. Therefore, we also investigate whether the effect of charter schools on traditional public schools varies with the number of nearby charter schools as well as with the distance to the nearest charter.

Analysis of the competitive effects must take into account the fact that the location of charter schools is not randomly determined. If charter schools were primarily established in response to dissatisfaction with traditional public schools, charter schools would tend to be located in areas with low quality traditional public schools where students would tend to make below-average test score gains. Alternatively, charter schools might be more likely to attract students in areas where parents tend to be more motivated and more informed. In those areas, gains in student test scores might be higher than in other areas, even in the absence of charter schools.

To address the problem of non-random location, we estimate a regression model that controls for the aggregate effect of unobserved individual and school factors that remain constant over time. This method essentially measures the effect of charter school competition by comparing the gains made by students in a traditional public school prior to the establishment of a nearby charter to the gains those same students made in that school after the arrival of nearby charter schools.

The results (not shown) for reading and for math provided little if any evidence that traditional public schools responded to competition from charter schools by becoming more effective – at least as measured by the learning gains made by individual students in the years immediately following establishment of charter schools. Not only are none of the estimated impacts statistically different from zero, some point in the opposite direction from what was expected. We emphasize, however, that the intensity of competition in the state is not very great. Even schools located close to several charter schools are unlikely to lose a substantial percentage of students. Thus, our finding should not be interpreted as a general statement about the potential of charter school competition to influence traditional public schools.

Conclusion

The findings in this paper raise serious concerns about North Carolina's charter school program. One key finding is that charter schools are more racially segregated than traditional public schools in the same district. More telling is that both black and white charter school families tend to choose charter schools with peers who are more similar to their own children both racially and socioeconomically than in their regular public schools. As a result of these choices, the charter school system clearly increases racial segregation. Moreover, many black students have moved into charter schools with higher proportions of black peers than their previous public schools despite lower average levels of student achievement in those schools.

In addition, we find that charter schools have had larger negative effects on the achievement of black students, and particularly on black students with less well educated parents, than on white students. This finding, together with the finding that charter

schools have negative effects on average and that black students are more likely to opt into charter schools, implies that North Carolina's charter school program has increased the black-white test score gap.

Whether these outcomes for North Carolina are generalizable to the charter school programs that have been adopted in 39 other states and the District of Columbia is difficult to say. With respect to the segregating effects of charter schools, one might expect larger effects to emerge in a southern state such as North Carolina that has a relatively well integrated public school system compared to many northern or midwestern states where traditional public schools are more segregated or to western states where African-American populations are much smaller. At the same time North Carolina is clearly not the only state where charter schools are more racially segregated than traditional public schools (Booker, Zimmer and Buddin 2005; Cobb and Glass 2001;Frankenberg & Lee 2003)). Moreover, other studies have found that when given the opportunity to choose, parents select more racially isolated environments (Henig 1996, Weiher & Tedin 2002). Finally, using data and methods similar to those used here, studies of the average effectiveness of charter schools in Texas (Hanushek, Kain, Rivkin, & Brand, 2005) and Florida (Sass, 2006) also find that charter schools have negative achievement effects, albeit effects that are smaller than those that emerge for North Carolina. Thus, while we cannot say with certainty that our North Carolina results are generalizable to other states, we see no compelling reason to think they are not. More research on the effects of charter school programs on racial segregation, minority achievement and black-white test score gaps in other states would be useful.

Our results need not imply that efforts to expand parental choice ought to be abandoned. It is hard to argue that only wealthy parents should enjoy the privilege of choosing where their child will go to school. Although charter school students have not benefited academically on average from expanded opportunities to choose, some students undoubtedly have, and even those who have not benefited academically might have benefited in other ways. Thus, it is difficult to argue against the provision of more choice for disadvantaged students. Nonetheless, our results highlight for policy makers the importance of recognizing that any benefits of expanding choice may well come at the expense of other policy goals such as more racially integrated schools and the reduction of black-white achievement gaps.

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Figure 1. Charter School Policy in North Carolina.

Timing and number

First charter schools established in 1997; limit of 100 schools, with no more than five new charter schools in any district in a single year.

Sponsors and approval of charters

Eligible sponsors are local school districts, the state university or the State Board of Education, but final approval must come from the State Board of Education; local districts can comment on how the charter school would affect them but their approval is not required; charter is renewable for five year periods.

Regulations and restrictions on charter schools

No affiliation with a religious institution; subject only to regulations related to the health safety and discipline of students and specific regulations that apply to charter schools; at least 75 percent of teachers in grades K-5 and 50 percent in grades 6-12 required to be certified.

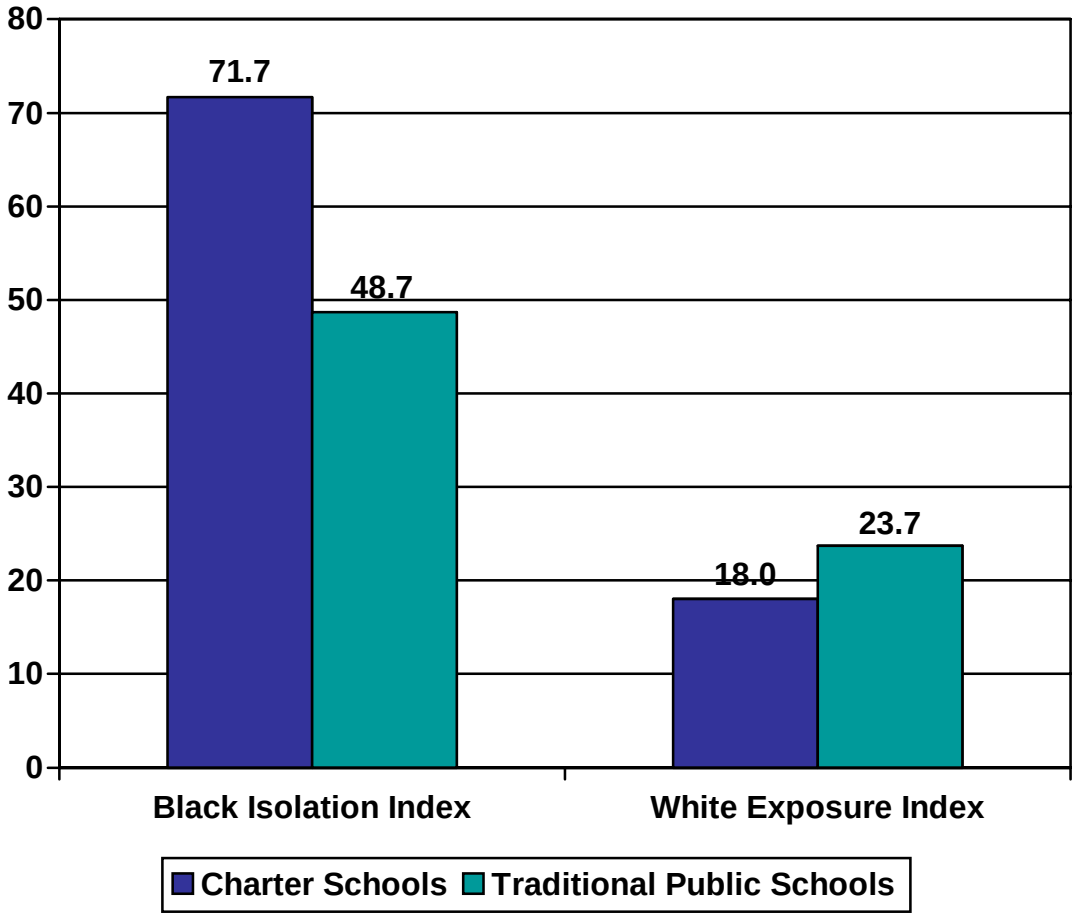
Funding

Access to full per pupil state support for schools in the state plus pro rated share of locally financed supplements for education; no state-supported access to start-up funding; access to federal start up funds.

Accountability

Charter schools are subject to the state testing requirements and to the state's accountability program.

Figure 2: Racial Isolation and Exposure in Charter and Traditional Schools, 2001-2002*



Black isolation index is the percentage of black students in the typical black student's school and the white exposure index is the percentage of black students in the in the typical white student's school. Only traditional public schools from districts that contain at least one charter school are included. Data are from the Common Core of Data, National Center for Education Statistics, U.S. Department of Education.

Figure 3: Distribution of Estimated Charter School Impacts Across Charter Schools

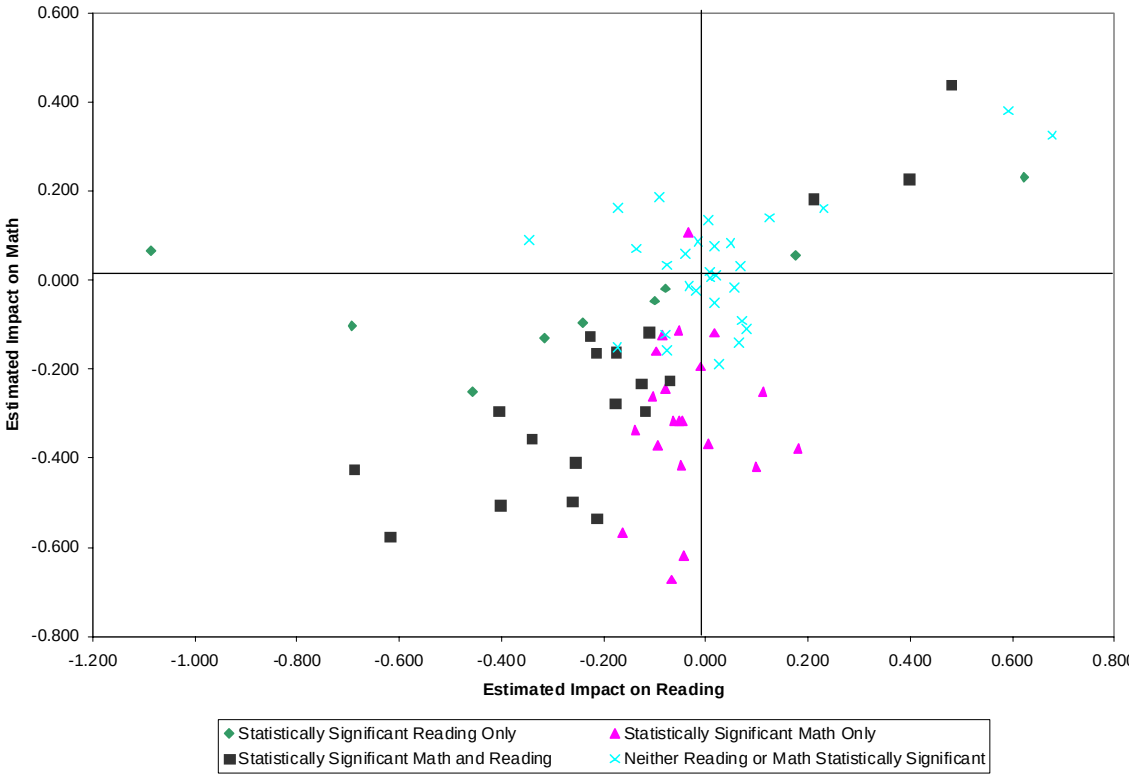


Table 1: Number of Charter Schools and Charter School Students in North Carolina by Grade Level and Year[a]

	Grades K-8		High School		Unitary		Total	
	Schools	Students	Schools	Students	Schools	Students	Schools	Students
1997-1998	27		1		6		34	
	(2.0%)		(0.3%)		(5.8%)		(1.9%)	
1998-1999	44	7,249	4	270	11	1,036	59	8,555
	(2.6%)	(0.8%)	(1.3%)	(0.1%)	(9.1%)	(3.0%)	(2.8%)	(0.7%)
1999-2000	52	9,667	6	526	19	2,498	77	12,691
	(3.1%)	(1.1%)	(1.9%)	(0.2%)	(15.2%)	(8.1%)	(3.6%)	(1.0%)
2000-2001	63	12,371	7	783	20	2,369	90	15,523
	(3.6%)	(1.3%)	(2.1%)	(0.2%)	(19.2%)	(9.8%)	(4.1%)	(1.2%)
2001-2002	67	13,517	8	1,263	18	3,455	93	18,235
	(3.7%)	(1.4%)	(2.3%)	(0.4%)	(17.0%)	(11.6%)	(4.1%)	(1.4%)

a. Enrollment figures are taken from the NCES Common Core of Data, which does not provide information on charter schools for 1997-98. Enrollment counts are for schools in the identified category - not for students in the grade ranges indicated. Figures in parentheses are the percentages of all North Carolina schools in the category that are charters and the percentage of all students in the category that are in charter schools.

Table 2: Descriptive Statistics on Charter and Traditional Public Schools, 2001-2002

	Charter Schools	Traditional Public Schools
Average enrollment[a]	196	574
% female[a]	48.9	48.8
Ethnic Compostion[a]		
% black	39.9	31.2
% Hispanic	2.1	5.3
% white	55.5	60.0
Parent Education[b]		
% less than high school	3.9	10.6
% high school grad	34.6	43.7
% some college, but did not graduate	4.8	4.1
% two year college degree	11.6	13.4
% four year college degree	36.6	22.8
% graduate school degree	8.6	5.3
% that changed schools in last year[b]	47.4	13.2
Avg performance on EOG reading[b,c]	-0.057	0.001
Avg performance on EOG math[b,c]	-0.133	0.002

a. Figures calculated using Common Core data and are based on entire population of schools.

b. Figures computed using individual student End of Grade files maintained by the North Carolina Education Research Data Center, and thus are based only on students in Grades 3-8.

c. EOG test scores converted to standard scores with mean of 0 and standard deviations of 1. Grade specific means and standard deviations were used to make the conversions.

Table 3: Changes in Peer Environment Experienced by Charter School Students [a]

	Black Students			White Students		
	Charter	TPS	Average Change[c]	Charter	TPS	Average Change[c]
N	2550	2550	2550	3548	3548	3548
% black	0.718	0.532	0.186	0.175	0.282	-0.107
% with college educated parents	0.290	0.268	0.022	0.473	0.348	0.125
Average lagged EOG reading score[b]	-0.417	-0.107	-0.310	0.265	0.112	0.153
Average lagged EOG math score[b]	-0.520	-0.139	-0.381	0.198	0.108	0.090
	Parents without 4 Year Degree			Parents with 4 Year Degree		
	Charter	TPS	Average Change[c]	Charter	TPS	Average Change[c]
N	3881	3881	3881	2599	2599	2599
% black	0.460	0.409	0.051	0.296	0.347	-0.051
% with college educated parents	0.265	0.249	0.017	0.579	0.409	0.170
Average lagged EOG reading score[b]	-0.222	-0.070	-0.152	0.234	0.140	0.094
Average lagged EOG math score[b]	-0.304	-0.077	-0.227	0.164	0.115	0.049

a. Averages for all students observed at least once in a charter school and once in a traditional public school prior to entering charter school. Columns labeled "Charter" report average characteristics of students in the same grade and school during first year in a charter school, and columns labeled "TPS" report same figure for the closest year preceding entrance to a charter school. The sum of black students and white students does not equal the total number of students reported in Table 1, because the latter total includes students in other ethnic groups.

b. Individual test scores converted to standard scores with mean a zero and standard deviation of one.

c. All differences are statistically significant at 0.01 level

Table 4. Determinants of Charter School Choice, Conditional Logit Analysis

	Black Students		White Students	
0-20% Black	-3.153**	-1.974**	2.615**	2.809**
	(0.305)	(0.483)	(0.663)	(0.797)
20-40% Black	-1.603**	-1.663**	1.852	1.065**
	(0.271)	(0.588)	(0.666)	(0.970)
40-60% Black (Base)	--	--	--	--
60-80% Black	-2.064**	-2.327**	0.429	-2.895**
	(0.321)	(0.597)	(0.767)	(1.119)
80-100% Black	-1.004**	-0.733*	-3.060**	-4.747**
	(0.152)	(0.431)	(0.534)	(1.194)
Distance	-0.231**	-0.213**	-0.358**	-0.369**
	(0.025)	(0.029)	(0.036)	(0.046)
Log of Enrollment	0.121	0.470**	0.890**	0.219
	(0.080)	(0.165)	(0.155)	(0.521)
Pupil/teacher ratio		-0.071**		-0.110**
		(0.014)		(0.046)
Targets At-Risk Students		-0.137		1.112**
		(0.350)		(0.415)
Targets Gifted Students		1.153**		-0.705
		(0.461)		(0.465)
Community Oriented Mission		1.799**		1.910**
		(0.404)		(0.603)
Emphasis on African or African Amer. Studies		0.246		
		(0.378)		
Emphasis on character or moral education		-0.468**		0.106
		(0.235)		(0.531)
Emphasis on experiential instruction		-0.182		1.782**
		(0.263)		(0.593)
Emphasis on individualized education plans		0.369		-1.145*
		(0.227)		(0.657)
Emphasis on alternative assessments		0.336		1.086**
		(0.237)		(0.397)
Number of observations	2835	2367	1954	1954
Number of cases	667	629	549	549
Log Likelihood	-727.1	-556.5	-251.1	-187
Psuedo R-squared	0.200	0.300	0.614	0.704

Estimated using transfers into a charter school observed during the 2001 and 2002 school years in Durham/Chapel Hill, Forsythe, Guilford, Mecklenberg and Wake.

* significant at 0.10 level, ** significant at 0.05 level

Table 5A: Estimated Impacts of Attending a Charter School on Math Test Scores.

	Levels	Gains	Fixed Effects
Charter School	-0.255**(0.073)	-0.076**(0.021)	-0.160**(0.021)
Gender (Male=0, Female=1)	0.036**(0.002)	0.009**(0.001)	
Ethnicity			
(reference category Asian and American Indian)			
Black	-0.464**(0.023)	-0.019**(0.005)	
Hispanic	-0.046 (0.024)	0.020**(0.006)	
White	0.155**(0.023)	-0.020**(0.005)	
Parent Education			
(reference category H.S. dropout)			
High school grad	0.386**(0.005)	-0.007**(0.002)	
Some college, did not graduate	0.603**(0.006)	0.005 (0.003)	
2-year college degree	0.705**(0.006)	0.004 (0.003)	
4-year college degree	1.076**(0.008)	0.029**(0.003)	
Graduate school degree	1.404**(0.014)	0.058**(0.004)	
Change schools in last year	-0.160**(0.005)	-0.030**(0.004)	-0.027**(0.005)
Made structural change in last year	-0.044**(0.008)	-0.068**(0.008)	-0.061**(0.010)
Total Observations	1,533,367	1,520,132	1,502,339[a]
Total Students	446,855	443,548	425,654[c]

All models include grade/year fixed effects. Dependent variable is EOG development scale scores expressed as a standard score. Figures in parentheses are robust standard errors calculated using generalization of Huber/White Sandwich estimator and are robust to clustering within schools.

a. Sample count includes only those observations of students with at least three valid test score measures, which is the minimum required to identify fixed effects and effect estimates for non-constant variables.

* indicates statistical significance at .05 level, ** indicates statistical significance at the .01 level.

Table 5B: Estimated Impacts of Attending a Charter School on Reading Test Scores.

	Levels	Gains	Fixed Effects
Charter School	-0.158**(0.044)	-0.062**(0.009)	-0.095**(0.014)
Gender (Male=0, Female=1)	0.174**(0.002)	0.001 (0.001)	
Ethnicity			
(reference category Asian and American Indian)			
Black	-0.351**(0.023)	-0.029**(0.004)	
Hispanic	-0.002 (0.025)	0.041**(0.005)	
White	0.235**(0.023)	-0.011**(0.004)	
Parent Education			
(reference category H.S. dropout)			
High school grad	0.444**(0.005)	0.005* (0.002)	
Some college, did not graduate	0.679**(0.006)	0.016**(0.003)	
2-year college degree	0.784**(0.006)	0.016**(0.002)	
4-year college degree	1.130**(0.008)	0.022**(0.002)	
Graduate school degree	1.419**(0.011)	0.027**(0.003)	
Change schools in last year	-0.133**(0.005)	-0.018**(0.003)	-0.013**(0.004)
Made structural change in last year	-0.048**(0.007)	-0.065**(0.006)	-0.056**(0.007)
Total Observations	1,527,157	1,512,587	1,494,885[c]
Total Students	445,562	441,863	424,066[c]

All models include grade/year fixed effects. Dependent variable is EOG development scale scores expressed as a standard score. Figures in parentheses are robust standard errors calculated using generalization of Huber/White Sandwich estimator and are robust to clustering within schools.

a. Sample count includes only those observations of students with at least three valid test score measures, which is the minimum required to identify fixed effects and effect estimates for non-constant variables.

* indicates statistical significance at .05 level, ** indicates statistical significance at the .01 level.

Table 6: Variation in estimated impacts of attending a charter school by the number of years the charter school has been operating.

	Math	Reading
First Year Charter School	-0.312**(0.051)	-0.184**(0.027)
Second Year Charter School	-0.131**(0.028)	-0.064**(0.019)
Third Year Charter School	-0.081**(0.027)	-0.056**(0.021)
Fourth Year Charter School	-0.092**(0.030)	-0.064**(0.021)
Fifth Year Charter School	-0.198**(0.060)	-0.159**(0.050)
Change in Schools	-0.025**(0.002)	-0.011**(0.001)
Structural Change in Schools	-0.092**(0.001)	-0.044**(0.001)

* indicates statistical significance at 0.05 level, ** indicates statistical significance at the 0.01 level.

Both sets of estimates include grade/year and individual student fixed effects. Dependent variables are EOG scale scores converted to a standard score with a mean of 0 and standard deviation of 1.

Table 7: Impacts of North Carolina Charter Schools on Achievement Gains, by Student Characteristics

	Mathematics			Reading		
Charter school	-0.160**	-0.138**	-0.104**	-0.095**	-0.099**	-0.085**
	(0.021)	(0.028)	(0.030)	(0.014)	(0.017)	(0.015)
Charter school * Black student		-0.055**	-0.040*		0.009	0.016
		(0.025)	(0.024)		(0.019)	(0.021)
Charter school * Parents no college degree			-0.065**			-0.027
			(0.024)			(0.020)
Changed schools in –last year	-0.027**	-0.028**	-0.027**	-0.013**	-0.013**	-0.013**
	(0.005)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)
Made structural change in last year	-0.061**	-0.061**	-0.061**	-0.056**	-0.056**	-0.056**
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Total observations		1,520,238			1,512,688	
Total students		443,553			441,869	

All models include grade/year fixed effects and are estimated using the "within" student estimator. Dependent variable is annual gain in EOG development scale scores expressed as standard scores with mean of zero and standard deviation of one. Figures in parentheses are robust standard errors calculated using generalization of Huber/White Sandwich estimator and are robust to clustering within schools.

* indicates statistical significance at 0.10 level, ** indicates statistical significance at the 0.05 level.

Table 8: Impacts of North Carolina Charter Schools on Achievement Gains, by Student's Race, Type of Transfer and School Program

	Mathematics		Reading	
Charter School	-0.137**	-0.188**	-0.099**	-0.134**
	(0.026)	(0.024)	(0.018)	(0.018)
Charter School * Black	-0.014	0.003	0.029	0.019
	(0.033)	(0.030)	(0.029)	(0.027)
Charter School * Black * Segregating Move[a]	-0.077**	-0.108**	-0.037	-0.028
	(0.037)	(0.037)	(0.032)	(0.032)
Charter School * At-Risk[b]		0.173**		0.121**
		(0.048)		(0.045)
Charter School * At-Risk * Black[b]		-0.026		0.082
		(0.077)		(0.084)
Charter School * At-Risk * Black * Segregating Move[a,b]		0.043		-0.096
		(0.082)		(0.090)
Changed schools in last year	-0.028**	-0.028**	-0.013**	-0.013**
	(0.005)	(0.005)	(0.004)	(0.004)
Made structural change in last year	-0.033**	-0.061**	-0.043**	-0.056**
	(0.008)	(0.010)	(0.006)	(0.007)

All models include grade/year fixed effects and are estimated using the "within" student estimator. Dependent variable is annual gain in EOG development scale scores expressed as standard scores with mean of zero and standard deviation of one. Figures in parentheses are robust standard errors calculated using generalization of Huber/White Sandwich estimator and are robust to clustering within schools. Sample counts are the same as in Table 3.

a. "Segregating Move" is an indicator variable equal to one if student transferred into a charter school with more than 60 percent black and with percent black 10 or more percentage points higher than in the traditional public school from or to which the student transferred, and equal to zero otherwise.

b. At-risk is an school level indicator value equal to one if the mission and purpose statement in the schools charter application outlined specific intervention or recruitment efforts targeted to students at-risk of academic failure, and equal to zero otherwise.

* indicates statistical significance at 0.10 level, ** indicates statistical significance at the 0.05 level.