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NORTH CAROLINA

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ABSTRACT

A defining characteristic of charter schools is that they introduce a strong market element into public education. In this paper, we examine the evolution of the charter school sector in North Carolina between 1999 and 2012 through the lens of a market model. We examine trends in the mix of students enrolled in charter schools, the racial imbalance of charter schools, the quality of the match between parental preferences in charter schools relative to the quality of match in traditional public schools, and the distribution of test score performance across charter schools relative those in traditional public schools serving similar students over time. Taken together, our findings imply that the charter schools in North Carolina are increasingly serving the interests of relatively able white students in racially imbalanced schools.

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I. Introduction

Since their birth in Minnesota in the early 1990s, charter schools have represented a growing component of the K-12 education policy landscape in many U.S. states. Such schools share features of both public and private schools. In return for public funding they are not allowed to charge tuition, must admit students through a lottery if they are oversubscribed, and are subject to the same accountability standards as regular public schools. They are similar to private schools in that they are operated by nongovernmental entities, are relieved of many restrictions on their use of inputs, and are schools of choice in that no students are assigned to attend them. In contrast to private schools, they require a charter to operate that is subject to periodic state-mandated review.

The right to establish charter schools, where it exists, is based on state, not federal, legislation. As a result of different charter school laws and educational contexts across states, charter schools have proliferated at different rates in different states and with different consequences. As of 2013, more than 40 states had at least one charter school, with California having more than 1000, and Arizona and Florida each having more than 500.¹ North Carolina, which is the subject of this study, ranked 14th in 2013 with its 107 charter schools.

A defining characteristic of charter schools is that they introduce a strong market element into public education. In a standard private sector market with differentiated products, new firms enter a market in response to profit-making opportunities. Over time, the firms that are well run and that satisfy consumer preferences will tend to expand or be replicated while those that are less successful—perhaps because they are not well managed or because they misjudged the

¹ See, National Charter School Study, Center for Research on Education Outcomes (CREDO) Report, 2013.

nature of the demand—will not attract and keep customers and consequently have to go out of business. As a result of this Darwinian process of entry and exit, one would predict that the firms that survive in a newly established market space would, as a group, become more successful over time in delivering what customers want. If we apply this reasoning to the market for schooling, more choice should produce a better educational fit between what schools offer and what parents want for their children and ultimately lead to better outcomes, at least in terms of the outcome most widely valued and readily measured, standardized test scores.

In this paper, we examine the extent to which a similar market process has emerged in the charter school sector in North Carolina, an examination that builds on similar research by Baude et al. (2014) in Texas. In doing so, we take careful note of some significant features of the charter school sector. For example, while entry into the sector is far freer for charter schools than for traditional public schools, entry is still constrained by the requirement that each charter school must first obtain a charter from the state. Thus, state policies toward charters, including the procedures of the chartering agency or agencies, are likely to influence how the market evolves. Another relevant feature—one that emerges clearly from extensive prior research on parental choice of school in a variety of contexts and one that applies to traditional public schools as well—is that in choosing schools, parents care not only about the quality of the education being offered but also about the mix of students in a school. This feature means the market will be subject to externalities, in the sense that the decisions of some parents affect the value of schooling available to others. In addition, this feature and other considerations are likely to affect who benefits and who loses from the introduction of market forces in education. Because schooling is so important to the life chances of children, this attention to winners and losers has considerable policy significance. Thus an evaluation of the charter school sector

requires close attention to whether the charter school sector serves the needs of those who are not well served by the traditional public school sector.

This paper proceeds as follows. In section II, we describe the charter school context in North Carolina, and provide descriptive information on the sector's growth over time. In section III we explore the extent to which charter schools appear to be satisfying the preferences of the families who enroll their children in them, with attention to whose preferences are being satisfied. In section IV, we use value-added models to compare the distribution of test score gains in charter schools to the distribution of gains for comparable students in the larger public school sector, and in sections V and VI we explore possible explanations for those trends. Although most of the analysis in the paper is descriptive, we provide some plausibly causal estimates of charter school effects in section VI. In Section VII, we conclude.

Except where noted, all the data in this paper come from the North Carolina Education Research Data Center (NCERDC). The center provides data from the NC Department of Public Instruction on all students in the state on a confidential basis to researchers. All identifying information has been removed.

II. North Carolina Context and Charter School Trends

When Republicans in North Carolina first raised the possibility of charter school legislation in the mid-1990s, advocates for poor and minority students were strongly opposed. This opposition may have reflected the state's historical experience with school choice during the 1960s when "freedom academies" were established to provide a way for white students to avoid integrated schools (Myers 2004). Eventually Democrats agreed to support charter school enabling legislation out of concern that the alternative form of choice being pushed by Republicans, vouchers for private schools, would be even more detrimental to the interests of

disadvantaged students.² Thus the state's 1996 charter school enabling legislation was a compromise solution to the politically contentious issue of parental choice and its racial implications. This brief historical context helps to explain the significant differences between the charter school movement in southern states such as North Carolina and northern states such as Massachusetts and Michigan, where debates about charters focused less on race and more on unions, accountability, and the use of charters as a mechanism for helping the poor (Bettinger, 2005, Fuller et al. 1996).

The original North Carolina legislation specified goals related to student learning, teachers, and parents. The first two goals were to improve student learning and to increase learning opportunities especially for students at risk of academic failure or academically gifted. The next two were to encourage new teaching methods and to create new professional opportunities for teachers. Another was to give parents more choice of schooling options. Finally the legislation made it clear that charters were to be held accountable for measurable student achievement results. Of primary interest for this study is the role of parental choice and the focus on measurable student learning.

The original legislation explicitly stated that charter schools could not discriminate on the basis of race or ethnicity. In addition, the legislation stated that within a year of opening, the population of the school "shall reasonably reflect" the racial and ethnic mix of the community in

² A charter school bill was initially introduced in the House by a Republican and in the Senate by a Democrat in 1995 but it failed to pass. The following year the North Carolina Family Policy Council worked closely with the original sponsors to draft a compromise proposal that passed in 1996. For a brief legislative history of charter schools, see article by Will Schultz of the North Carolina History Project, 10/26/14.

which it is located.³ Further, the State Board of Education was encouraged to give preference to applications that demonstrated the capability of serving students at risk of academic failure (GS 115C-238-29D). It also required charter school operators to develop a transportation plan so that transportation would not be a barrier to any student who lived within the district of the charter school. In return for public funding, the charter schools were not allowed to charge tuition or fees, but they were permitted to raise funds from other sources.

The 1996 law gave state officials somewhat more control over the establishment of charter schools than was the case in other states (Bifulco and Ladd, 2006 and 2007). The ultimate authorizing power for all charters was given to the State Board of Education. The number of charter schools statewide was capped at 100, no more than five charters could be authorized in a single district in any one year, and local districts were given the opportunity to provide input before charter applications were approved. In other ways the legislation was relatively permissive in that it allowed any group or individual to apply for a charter and to operate as an independent nonprofit corporation with far more autonomy over the use of for-profit management companies and personnel policies than was the case for traditional public schools.

Despite significant growth in the state's population and periodic efforts by charter proponents to increase the number of charter schools, the cap remained at 100 until 2011. In 2010, the state secured \$400 million in federal Race to the Top funds by promising, among other things, to raise the charter school cap. In 2011, a Republican controlled legislature completely eliminated the cap and made it possible for existing charter to expand their enrollments by 20 percent per year without approval from the State Board. Two years later, the legislature loosened

³ See the 1996 legislation (115C-238.29F) section G (admissions requirements) part 5. That language was changed in 2013 to read, the charter school "shall make efforts for the population of the school to reasonably reflect the racial and ethnic composition of the community."

the regulations further and created an even more charter friendly environment by creating a new North Carolina Charter Schools Advisory Board, made up of charter supporters. Specifically the legislation stated that: “All appointed members of the Advisory Board shall have demonstrated an understanding of and a commitment to charter schools as a strategy for strengthening public education.”⁴

Figure 1 (which is based on appendix Table 1) shows the growth in the state’s charter schools over time.

[Figure 1:]

Thirty-three charter schools were operating in the 1997-1998 school year (all academic years in the figure and throughout the paper are designated by the final year). The number had risen to 97 by 2005, through a combination of new entrants and a few exits, and to the maximum allowed, 100, by 2012. After the cap was removed the number of charters in the state grew rapidly—nine new charter schools opened for the 2012-2013 school year and 23 more for the 2013-14 school year, although five schools also closed during that period. Another 26 schools were granted charters for the 2014-15 school year. The arrival of 71 new applications for the 2015-16 school year, which is shown by the dashed line in the figure, created great concern among charter school skeptics. Counter to the hopes of charter school proponents, however, the charter school advisory board in 2014 recommended that only 11 of them be granted a charter.⁵

⁴ Senate Bill 8 in 2013 enabled additional expansion by permitting charter schools to add one grade higher or lower than it currently offered without the approval of the State Board. The bill also reduced the proportion of charter school teachers in grades K-5 who had to be certified from 75 % to 50% and removed the right of districts to submit impact statements with charter school application and set up a fast track approval process.

⁵ This low approval rate led to criticism by the state legislature, which has indicated interest in using the newly established fast track procedure to set up more charters.

As of 2014, charter school students accounted for 3.6 percent of all public schools students in the state, with the percentage of K-8 students (4.2%) being twice that of 9th to 12th grade students (2.1%). Although the overall percentages are low, they are far higher in some of the urban districts—currently, charter school students account for 15.1% of all students in Durham, 4.7% in Winston-Salem, 6.1% in Charlotte-Mecklenburg, and 4.9% in Wake County Schools.

Table 1 compares the characteristics of students in charter schools to those in traditional public schools over time. This table—and many of our other analyses—uses data only for students in grades 4-8, given the comparative abundance of data, including student test scores, available in these grades.

[Table 1]

The trends in the racial mix of students tell a clear story. In the early years, black students were substantially overrepresented and white students were underrepresented in the charter schools relative to traditional public school enrollments. In other words, contrary to the fears of charter school opponents that charters would become havens for white students trying to avoid minority students, the charters initially served a disproportionate share of black students. Over time, however, that pattern has changed. The white share of charter school students increased from 58.6 percent to 62.2 percent over the full period, while their share of traditional public school student *declined*, from 64.1 percent to 53.0 percent. Thus, by 2012, white students were significantly overrepresented in the charter school sector. During this same period, Hispanic students increased from 0.8 percent of charter students to 5.5 percent in 2012, still well below their 13.5% share of traditional public school students. Combining these two minority groups, we find that, as of 2012, charter schools served a disproportionately small number of minority

students; black and Hispanic students accounted for 31.8 percent of the charter school students in this grade range, which was well below their 39.2 percent share of traditional public school students.⁶

This marked change in the racial composition of charter schools largely reflects two complementary trends: the closure of charter schools with relatively small proportions of white students and the opening of charter schools with high proportions. To illustrate this uneven turnover of charter schools, we compared the racial composition of charter schools to the racial composition of their surrounding school district. Of the 12 charter schools that closed between 2005 and 2012, for example, all but one had a lower percentage of white students than the white percentage in the corresponding school district. In contrast, of the 19 charter schools that opened between 2005 and 2012, 13 had white percentages *higher* than their corresponding district. Where there was once a sector that included many heavily-minority schools, the charter school sector in North Carolina has over time become one that includes many more schools with relatively high percentages of white students.

The second panel in Table 1 documents that in 1998 and 2005, students whose parents have at least a college degree were overrepresented in charter schools relative to the traditional public sector. In 1998 close to 43 percent of the charter school parents had college degrees in contrast to only 25.8 percent of those in traditional public schools.⁷ This overrepresentation of students with college-educated parents should not be surprising. Despite the fact that charter

⁶ A similar analysis for students in the broader 3-12 range of grades provides a comparable picture, albeit one that shows slightly stronger trends. For the broader grade range, black students were overrepresented in charter schools relative to traditional public schools in 1998 (41.3 % to 29.1 %) but by 2012 were underrepresented (24.9% to 27.3% .) Correspondingly, the white underrepresentation in charter schools relative to traditional public schools in 1998 (54.7% to 64.9%) turned to an overrepresentation (64.3% to 53.7 %) by 2012.

⁷ Because the state stopped collecting information on parental education in 2008, we are not able to extend the data to 2012.

schools are often billed as a way to expand options for disadvantaged students, parents must gather information and take the initiative to seek out a charter school, actions that are easier for college educated parents than for those with limited education.

The entries in the bottom two panels are average reading and math scores for all students in the two sectors. All the test scores are normalized by subject and grade by year across the state to have a mean of 0 and a standard deviation of 1. For that reason, the averages for the bulk of students, namely those in the traditional public schools, are close to zero. One must be careful in comparing the entries for charter schools to those from traditional public schools. The differences between the two school types reflect some unknown combination of selection (that is, who selects into the charter school sector) and the relative effect of being in a charter school. In a subsequent section we explore the achievement of students in charter schools in some detail, and look more carefully at the test scores of the students who select charter schools. At this point, we simply use these average test scores to characterize the students in the charter sector relative to those in traditional public schools by grade and over time.

With one exception (grade 6 students) the children in charter schools in 1998 were performing at lower levels than their counterparts in traditional public schools. The most obvious interpretation of that pattern is that the initial charter schools attracted low-performing students. By 2012, however, charter school students were outperforming their counterparts by substantial amounts at all grade levels. That improvement could indicate that higher achieving students moved into the sector over time, an interpretation that would be consistent with the rising share of white students and overrepresentation of children with a college educated parent in charter schools. Alternatively, it could indicate a charter school sector that improved over time in its

ability to raise students' achievement. We return to the topic of improvement versus selection in Section VI.

Given the salience of race to the policy discussion surrounding charter schools in North Carolina, we end this descriptive section with information on the racial mix of students within individual charter schools and how that has changed over time. The fact that there are a large number of black and Hispanic students—albeit a declining share of all charter students—in the charter school sector as a whole need not mean that the charter schools themselves are racially balanced. In fact, as shown in Figure 2a, that is far from the case.

[Figure 2a]

[Figure 2b]

The shaded bars represent the patterns in 2014 and the outlined boxes the pattern in 1998. In both periods, most charter schools were racially imbalanced, in that they were either predominantly white (less than 20 percent non-white students) or predominantly minority (more than 80 percent nonwhite). In other words, few charter schools had racially balanced student bodies. Over time this racial imbalance has intensified, with the share of students in predominantly white charters nearly doubling, from 24.2 to 47.1 percent. With a declining overall share of minority students in charter schools, the share of students in predominantly minority schools has declined somewhat but has become more concentrated in schools that are more than 90 percent minority. These patterns are strikingly different from the racial mix of students in traditional public schools, shown in figure 2b.

For the early years of North Carolina's charter school program, the racial imbalance in charter schools reflects choices made by both black and white families. Studying 4th through 8th graders who switched into the charter school sector, Bifulco and Ladd (2007, Table 2)

documented that students from each racial group gravitated to charter schools containing more of their own group than the school they were leaving. Black students moved out of traditional public schools that were on average 53 percent black to charter schools that averaged 72 percent black, White choosers left schools that were on average 28 percent black in favor of schools that averaged less than 18 percent black. Conditional logit models designed to infer the preferences of charter school choosers confirmed that black and white parents had very different preferences with respect to a school's racial composition. In particular, the preferred mix for black parents was a school that was between 40 and 60 percent black while the preferred mix for white parents was 20 percent black. Not surprisingly, these preferences are often incompatible with racial balance. Even though black parents might prefer racially balanced schools, the fact that white parents prefer schools with far lower proportions of black students sets up a tipping point. Once a school becomes "too black," it becomes almost all black as white parents avoid it.

These patterns and trends hint at the major factors influencing the operation of the charter school sector over time: the rising proportion of white children attending charter school and the fact that many of them are in schools that have very few minority students. We return to the implications of these trends in a later section of the paper.

III. Patterns and Trends in the Relative Match Quality of Charter Schools

As noted above, a central feature of private sector markets is that firms have the autonomy and incentive to respond to consumers' demands. Because charter schools have more autonomy than traditional public schools, are small enough to be able to tailor their offerings to specific groups of students, and enroll only students who have chosen to be there, we would expect parents of charter school students to be more satisfied with their children's schools than they would have been with traditional public schools. Moreover, the market model would predict

that, over time, the charter school sector would become increasingly successful in satisfying the educational preferences of the families whose children they serve. That is the case because in the early years of charter schools (or of any specific charter school), the schools may still be learning how to operate and parents may still be gathering information about specific schools.

One way to determine whether remaining charter schools are in fact providing what parents want would be simply to ask parents how satisfied they are with the schools their children attend. The researchers who have done that typically find that parents with children in charter schools report greater satisfaction than those with children in traditional schools, and that charter school parents report being more satisfied when their children are in charter schools than when they were in traditional schools (Schneider, Teske, & Marscha 2002; Buckley & Schneider 2006). One limitation of that approach is that the survey respondents are typically limited to those who have kept their children in a charter school.

In this paper, we take a different approach. We infer the quality of the match between parental preferences and the school by using information from the NCERDC on whether students return to a school the following year (provided the school offers the subsequent grade). This proxy for match quality—which, for convenience, we often refer to as “parental satisfaction”—reflects a combination of parental satisfaction with the school and movement out of the school for other reasons. Some parents, for example, may withdraw their child from a school for reasons unrelated to the perceived quality of the school such as a job-related move. In addition, schools themselves may either dismiss a child or send a signal that the school is not the right one for the child. Regardless of whether the departure from a school is initiated by the parent or the school, high departure rates most likely signal a poor match between the parents’ educational expectations and the offerings of the school.

We estimate models at the individual level in which the dependent variable, R_{ist} , takes on the value 1 if the student i in year t returns to the school s in year $t+1$ (regardless of whether she advances to the next grade or is retained in grade) and the value 0 if she leaves the school. The sample is all students in both charter and traditional public schools in grades 4 through 8, provided the school is open the following year and offers the next grade for that student. The model takes the following form:

$$R_{ist} = \beta_0 + \beta_1 X_i + \alpha_s + \gamma_{gt} + \varepsilon_{isgt} \quad [1]$$

where X_i is a vector of student characteristics such as the race and gender of the students, free and reduced price lunch status, math and reading test scores, special needs or gifted status, and number of years the student has been in the school. Controlling for these student characteristics is important because some types of students are far more likely to transfer among schools than are others. It is well documented, for example, that children from low income families in urban areas often move from school to school as their families adjust to changing circumstances and housing arrangements. The grade by-year fixed effects control for differences in average movement rates across grades by year.

The charter school fixed-effects are central to this analysis. Their coefficients represent the average rate at which the students in each charter school remain in the school relative to similar students in traditional public schools (which is the left out category, and is captured by the constant in the model). A positive coefficient for a specific charter school signifies that the school is better matched to the preferences of the parents than are the traditional public schools. A negative coefficient signifies that the charter school is less well matched to parents' preferences. For the state as a whole, we would expect charter school parents to be more

satisfied on average than parents whose children attend traditional public schools, simply because those charter parents had to make an active decision to put their child in a charter school.

In light of the significant degree of racial imbalance across charter schools that we documented in figure 2, we are interested in whether the quality of the match differs by the racial mix of students in the charter school. Figures 3a and 3b summarize our findings for an early and a recent period. They depict the coefficients on the charter school fixed effects (that is, the average return rate for each school, after statistically adjusting for the characteristics of the students) relative to the return rate for comparable students in traditional public schools. Although we did the analysis for four separate 3-year time periods starting in 2003, we present graphs only for an early period (2003-2005) and the most recent period (2009-2011). Our results confirm first that charter schools appear to be a better match than public schools for demographically similar students as is evident from the large number of points above the reference line for traditional public schools (at 0) in Figures 3a and 3b.

[Figure 3a]

[Figure 3b]

The concentrations of schools at the far left and the far right of the graphs reflect the U-shaped distribution of the charter schools by the racial mix of their students shown earlier in figure 2a. Of interest here is that for both sets of years the charter schools disproportionately serving white students (those on the left) appear to be somewhat more successful in meeting the expectations of parents than are the schools serving concentrations of minority students (those on the right). Indeed, a simple correlation confirms this relationship, with the return rate and the percentage minority in the school having a correlation coefficient of about -0.3 for both time periods. At the same time there is no clear trend across the two time periods, other than the

decline in the number of schools with racial compositions between 40 and 80 percent minority students.

One potential concern with this analysis is that it compares the match quality of charter schools to the match quality for comparable students in any public school in the state, including schools in rural areas where there may be no charter schools. Although our many student-level statistical controls help to address that concern, one might argue that it would be preferable to compare the match quality of charters to that for other schools in the same district where the charter school is located. Hence, we also estimated alternative models, restricted to counties containing at least two charter schools.

We show in figure 4 the patterns for three counties, the state's two largest counties, Mecklenburg (which includes the city of Charlotte) and Wake (which includes Raleigh, the state capital) and also for Durham County, which has the largest share of charter school students in the state and features a large black and Hispanic student population that accounts for 75 percent of the district's students. In all three districts, charter schools are racially imbalanced. Moreover, although not shown in the figure, the predominantly white schools are generally larger than the predominantly minority schools in each of the three districts.⁸ In contrast to the statewide pattern, the few high minority schools in Mecklenburg appear to be equally successful in satisfying parental expectations relative to the public schools as the predominantly white schools. In Wake County, the charter schools that serve predominantly white students appear to be more successful in satisfying parents than the traditional public schools, as indicated by the lower retention rates in high-minority schools, perhaps because those charter schools are less racially balanced than

⁸ Based on the 2011 enrollment used for the analysis in the graphs, the largest charter school in Mecklenburg is Lake Norman with 929 students, Franklin in Wake County with 623 students and Voyager Academy in Durham with 605 students. All three of these schools primarily serve white students and are far larger than any of the charter schools serving black and Hispanic students.

many of the traditional public schools in the district. Durham, with its heavily minority population, has three charter schools that appear to be satisfying the wishes of parents, as indicated by their high retention rates; these schools are far whiter than the district average and the whitest of them, Voyager Academy, is substantially larger than all of the other schools. The five charter schools in the district serving mainly minority students do only slightly better than the traditional public schools in retaining their students.

[Figure 4a]

[Figure 4b]

[Figure 4c]

One takeaway from this analysis is that, as a market model would predict, parents in charter schools seem generally more satisfied with their schools—as evidenced by their willingness to remain in these schools when that option is available—than parents of comparable students in traditional public schools. Importantly, however, this relative satisfaction may reflect factors other than simply the quality of education the school delivers. The finding that families with children in the predominantly white charter schools appear to be more satisfied with their schools than are the families whose children are in other charter schools may simply mean that the white parents who want their children to go to mostly white schools are able to achieve that goal by enrolling them in charter schools. In sum, the charter school sector as a whole may be doing more to satisfy the preferences of white families for predominately white schools than it is in providing better options for large numbers of minority students. In light of the state’s history of segregation academies in the post-*Brown* years, in which parental choice was used to keep white students apart from minority students, this pattern is cause for concern (Myers 2004).

IV. Trends in Test Scores: Charter Schools versus Traditional Public Schools.

In tracing the evolution of charter schools since their introduction, we seek to compare trends in student test scores in charters and traditional public schools. Although many factors other than schools influence student test scores, we focus on this measure because of its policy salience and because North Carolina's initial charter school legislation specifically mentioned the intent to hold charter schools accountable for measurable student learning.⁹

To make this comparison, we estimate models that generate average gains in test scores in each charter school and in each traditional public school serving students in any combination of grades between 4 and 8. We estimate the models separately for each year from 1999 to 2012 and control statistically for the demographic backgrounds of the students, their grade level and whether they are new to the school. Once we have our school-specific average gains for each year, we can compare the distributions for each type of school over time. Our approach is similar to that used by Baude et al (2014) in their study of the evolution of charter schools in Texas.

Although the average test score gains for each school are derived from value added models that are similar to those often used to measure the effectiveness of individual teachers (e.g., Hanushek and Rivkin 2010), we caution against interpreting our measures as indicators of school quality or school effectiveness. Instead, they simply indicate how well the students in each school perform on state level tests, given their prior achievement levels and their demographic characteristics. Strong performance of a school's students might indicate the school

⁹ The legislation did not specifically mention that the accountability criterion would be gains in student test scores, based on the state's standardized tests. In fact, it left open the possibility that some charters might want to develop other measurable accountability measures. In practice, however, the only charter schools that were approved were those that agreed to be held accountable based on the state's tests.

has effective programs. It might well reflect, however, the school's success in attracting able and motivated students.

The basic model (see equation 2) takes the following form for student i in grade g and school s (with no year indicator because we run separate models for each year).¹⁰

$$A_{igs} = \alpha_0 + \beta_X X_i + \mu_g + \delta_s + \epsilon_{igs} \quad [2]$$

The dependent variable, A_{igs} , is an individual student's performance in a given subject (math or reading). X_i is vector of individual-level background covariates, μ_g is a vector of grade fixed-effects, and δ_s is a vector of school fixed effects (our parameters of interest). In X_i we include: free/reduced lunch status, gifted status in reading and math, race/ethnicity (indicators for black, Hispanic, and other), whether the student is new to the school, whether a student is exceptional, and individual students' lagged math and reading scores. The lagged test scores are included because our goal is to estimate average gains, rather than levels, of test scores for each school. We have intentionally not included peer composition variables in equation [2], such as the percent of students who are eligible for free or reduced lunch or who are minorities in a student's school-grade. A long literature has documented that peers may have either positive or negative spillover effects on student achievement (e.g., Hanushek et al. 2003; McEwan 2003). Moreover, student composition may play a role in attracting (or deterring) high quality teachers who are able to produce achievement gains (Clotfelter et al. 2006; Lankford et al. 2002). Given our

¹⁰ We cluster our standard errors to the school level, to address possible intra-school correlations in student performance. Combining this with a school fixed effect likely means that our standard errors are conservatively estimated.

interest in comparing average achievement gains across schools, however, it would not be appropriate to control for any school level variables such as peer characteristics.¹¹

To estimate the school value-added coefficients, we use a procedure suggested by McCaffrey et al. (2012).¹² This increasingly-common approach to estimating a large number of fixed effects adds an additional assumption—that the fixed effects sum to 0—to standard fixed effects models. This assumption allows us to produce estimates for all school fixed effects, both charter and traditional public schools without leaving out any of the fixed effects. As such, the constant in these models (α_0) shows the “grand mean.”¹³ Thus, the value-added coefficients can be interpreted as deviations from the overall mean of school fixed effects, in standardized units. For example, a fixed effect value of 1 means that the school is 1 standard deviation above the overall mean of school value added estimates.

We note that the results we report below are not adjusted for Bayesian shrinkage, an adjustment that is often used in the estimation of value added measures for teachers (Chetty, Friedman, and Rockoff, 2013; Kane and Staiger, 2008). That type of adjustment is less relevant in the context of schools than of teachers because of the larger samples of students in schools than in a teacher’s classroom.¹⁴

The objective of our analysis is to compare the distribution of the school fixed effects, the δ_s ’s, across charter and traditional public schools (TPS). We are particularly interested in the

¹¹ As it turns out, including a set of peer characteristics in our value-added models does little to change the conclusions we outline below.

¹² McCaffrey et al. (2012) outline several ways of estimating many fixed effects. Our approach utilizes the “xtreg” command, followed by the “predict, u” post-estimation command in STATA.

¹³ For more of this standard approach STATA utilizes, see:

<http://www.stata.com/support/faqs/statistics/intercept-in-fixed-effects-model/>

¹⁴ We made the adjustment in some of our early analyses and concluded that it made very little difference to our results. In light of the small effect and the computation time needed to back-out the standard errors for each of the fixed effect estimates from our estimation procedure, we chose not to implement this adjustment.

extent to which the two distributions converge over time as would be predicted by a market model.

Figures 5a and 5b portray the distributions for reading and math in our estimates for charter and traditional public schools for selected years (with all school level estimates weighted by the number of students in the school). Table 2 reports the comparable means of the distributions for each sector for each year. The figures show that in the early years (1999-2003), the distribution of gains across charter schools was below that for traditional public schools, and that was true for both math and reading. These shortfalls in the charter sector in the early years are fully consistent with the findings reported by Ladd and Bifulco using a different methodology more specifically designed to get at charter schools effects (a student fixed effects approach that relies on switchers between the traditional public school and charter sectors), the North Carolina results from the CREDO study of charter effects across the United States (2013), and preliminary results by Baude et al. (2014) in Texas.

[Figure 5a]

[Figure 5b]

Over time, however, student achievement in the charter school sector has improved, by this measure, relative to that in the TPS. During the 13 years that we include in our analysis, the mean charter school gain in reading rose by 0.081 σ (from -0.078 to 0.003) and in math by 0.105 σ (from -0.056 to 0.045), while the TPS sector distribution remained relatively unchanged over that same time period. In recent years, the average achievement gain in charter schools has surpassed those in the traditional public schools serving demographically similar students. This shift occurred as early as 2003 for reading but not until 2009 for math. By 2012 average

achievement gains in the charter schools exceeded the average achievement gains of students in the traditional public schools in both subjects.¹⁵

We are also interested in the variation in the gains estimates across schools within each sector. Table 2 shows that the variation across schools (as measured by the standard deviation) in the charter sector greatly exceeded that in public sector until the most recent few years when the variation across sectors became approximately the same in both subjects. The declining variation across schools in the charter sector is generally consistent with what one would expect to observe in a maturing market responding to market pressures. It may also reflect, however, improvements in the way the state has regulated and supported charter schools over time.

[Table 2:]

In sum, the trend is clear; in the early years of charter schools, the students in those schools were performing at lower levels, given their demographic characteristics and prior achievement levels, than their counterparts in the traditional public schools. Over time, however, that relationship changed, with the change coming sooner for performance on reading tests than on math tests. By the final year, 2012, charter school students were outperforming students in the traditional public schools in both subjects. Moreover, over time, the variation in average student performance across charter schools has declined and is now no greater than that across traditional public schools.

In the following sections, we explore two potential contributors to the observed pattern. One relates to the entry and exit of charter schools during the period. The other focuses on changes over time in the type of students who enroll in charter schools.

¹⁵ The improvement in the last few years is also consistent with the recent changes reported in the CREDO study (2013) for North Carolina. .

V. Charter School Entry and Exit

In a typical private sector market with differentiated goods, one would predict that market forces would induce weak firms to exit the market and strong firms to enter it, resulting in improved average performance over time. The analogue in this case, is that charter schools whose students are performing poorly would shut down, those whose students are doing well would remain (or “persist”) in the market, and new schools would seek to enter the market and do well enough to survive. The one difference in the charter school case is that the decision to enter or exit the sector is not solely up to the schools themselves, but is also a function of the state granting a charter to operate.

Figure 6 portrays the student-weighted distributions of school value-added estimates by the three categories—“entrants”, “persisters”, and “exiters”—over the entire period. A clear pattern emerges: the test score gains of the students in the schools that exit are typically lower than those in charters that remain open, and the test score gains of the students in charters during their first year of operation are lower than those of students in the schools that persist, albeit only slightly higher than schools that eventually exit. Thus, even though poor academic performance is typically not the reason for revoking a charter in North Carolina, the process of entry and exit nevertheless has much the same effect—the closing of schools whose students are not performing well.

[Figure 6]

In Table 3, we shed light on the changes over time by examining the average test scores gains of the three types of schools in two periods: the early period of charter schools (1999-2005) and the more recent period (2006-2012). The larger number of new charters entering the market in the early period relative to the later period reflects the rush to open charter schools in the early

years before the cap was binding. In later years, as the state's charter school cap was approached, entry of new charter schools into the charter school market became less common.¹⁶

[Table 4]

In both periods, we see that the schools that exit are those with the lower test scores gains, and that is true for both subjects. The new charter entrants, however, appear to have improved over time. In the early period (1999-2005), new charter schools featured lower average test score gains than the persisting schools, although they still exhibited higher gains than exiting schools. During the 2006-2012 period, in contrast, the test scores gains of students in the newly entering charters were higher than those in the persisting schools. This change is likely the result of a significant policy change that took effect in November in 2006. Starting in that year, all new charters were required to delay a year after approval before they could admit students. That permitted the state's Office of Charter Schools to make sure that they were ready to open, and to provide technical support as necessary.

Thus, the overall gains in achievement of charter school students relative to traditional public school students described in the previous section reflect a combination of the departure in both periods of charter schools with relatively low achievement gains and, in the recent period, the entrance of schools demonstrating relatively larger achievement gains.

VI. Student Selection into Charter Schools

In this section we shift the focus away from the charter schools themselves to the trends in the mix of students entering the charter school sector. One possibility is that the rise in test

¹⁶ These numbers reflect the number of observations in our analyses. These will be lower than the numbers reported in Figure 1 for two reasons: first, because we only include charter schools with grades 4-8 and second, because of list-wise deletion in our models that occurs due to the sporadic missingness in some of our model controls.

score gains in the charter school sector relative to those in the public sector is mainly attributable to the entry of increasingly able students in recent years. The rising proportion of white students in charter schools that we documented in Table 2 could be consistent with this possibility but, by itself, says nothing about trends in the academic ability of the entering students. An alternative possibility is simply that the charter schools themselves are doing an increasingly good job of raising the test scores of the students that they enroll.

We begin by comparing the average prior-year test scores, and also the number of absences as a measure of student motivation, for students entering the charter school sector to those of students who stayed behind in traditional public schools for selected years (see Table 4). We focus on students entering charters in grades 6, 7 and 8 because far more students transfer to charters in those grades than in the earlier grades.¹⁷ The test scores are all normalized by year and grade to have a mean of 0. The use of lagged test scores and absences assures that our measures of student achievement and behavior are prior to the year students enroll in a charter school.

Table 4 provides clear evidence of the first possibility, namely that the charter schools have been attracting a relatively more able group of students over time. This trend is evident for both reading and math test scores in grades 6, 7, and 8th grade. In each of the early years, the entering students were typically less able than their counterparts who remained in traditional public. In the more recent years, however, the situation changed quite dramatically. In these years, the average test scores of the new charter school students exceeded those of their former public school peers by more than 0.2 standard deviations in reading and about 0.15 standard deviations in math. Although we do not have data on student absences for the early years, the

¹⁷ Sample sizes would only be about 600 in the recent years for grades 4 and 5.

absence data for the later years indicates that, consistent with their higher test scores, the new entrants to charter schools had about 20 percent fewer absences on average than those who stayed behind. Given the importance of absentee behavior for student performance, this pattern provides additional support for the possibility that the rising test score gains for charter schools over time is largely attributable to the changing mix of students they attract, rather than the quality of the programs they offer.

Further support for that conclusion emerges from our efforts to determine how enrollment in a charter school affects student achievement. Following the approach used by Bifulco and Ladd (2006), we have estimated student level achievement models of the following form: .

$$A_{igt} = \alpha C_{ist} + \gamma_i + \eta_{gt} + \varepsilon_{igt} \quad [3]$$

The outcome of interest remains achievement for a given student (A_{igt}). The variable of interest— C_{ist} —indicates whether student (i) attended a charter school (s) in year (t). Also included in the model are student fixed effects (γ_i), and grade-by-year fixed effects (η_{gt}).¹⁸ The use of student fixed effects means that we are comparing the achievement of students once they are in a charter school to the achievement of the same students while they were in a traditional public school. The advantage of this approach is that it controls for both the measurable and unmeasurable characteristics of students, which provides strong protection against any selection bias associated with additive, time-invariant characteristics of students.¹⁹ Thus, these estimates represent plausibly causal estimates of the impact of charter schools on student achievement.

¹⁸ The results do not change significantly or substantively if we include other controls for when the student enters the charter school.

¹⁹ One potential concern with such models is that they do not account for relevant individual-level characteristics that vary over time, such as previous test score performance. One might be concerned, for example, that charter school student might have a pre-entry dip in test scores and then a reversion to mean performance levels. Our examination of patterns in student test scores prior to entry provides no evidence to support a pre-entry dip and hence no evidence of regression to the mean. .

The limitation is that we obtain estimates only for the students whom we observe in both the public and the charter sectors.

We estimate the models for two time periods, 2003-2007 and 2008-2011, to highlight the trends over time. The findings, which are displayed in Table 5, are quite clear. For both math and reading test scores for 4th through 8th graders, the estimated charter school effects are negative (although not always statistically significant) in both periods and are more negative in the earlier period than in the later period. The trends in the coefficients are consistent with the state's efforts during the more recent period to improve the quality of charter schools. At the same time, the absence of positive coefficients implies that the charter schools are no more effective than the traditional public schools in raising student achievement. In light of these findings, we conclude that the patterns of test score gains in the charter schools relative to traditional public schools in the recent years is mainly attributable to the success of charter schools in attracting more able and more well behaved students away from the traditional public schools.

VII. Conclusion and Extensions

A defining characteristic of charter schools is that they introduce a strong market element into public education. In this paper, we have examined the evolution of the charter school sector in North Carolina between 1999 and 2012 with attention to three market-related considerations. First, we find that the state's charter schools, which started out disproportionately serving minority students, have been serving an increasingly white student population over time. In addition, during the period, individual charter schools have become increasingly racially imbalanced, in the sense that some are serving primarily minority students and others are serving

primarily white students. The resulting market segmentation in the charter school sector reflects a major difference between charter schools and the typical textbook version of a private sector market. In the case of schools, consumers—in this case, parents—care not only about the quality of a school’s program but also the mix of students in the school. As a result, market forces will tend to lead not only to more satisfied consumers, but also to market segmentation, which in the case of schools is typically by the race of the student.

Second, we find that, as would be predicted, the quality of the match between parental preferences and the offering of the schools is in general higher for charter schools than for traditional public schools, where our proxy for match quality is the demographic-adjusted proportion of parents who keep their children in the charter school the next year relative to similar parents whose children are in traditional public schools. Importantly, however, we conclude that the charter school parents whose children are enrolled in predominantly white charter schools are more satisfied than those whose children are in predominantly minority charter schools. Although we have no way to test explicitly for motivation, this difference in apparent satisfaction is consistent with the view that many white parents are using the charter schools, at least in part, to avoid more racially diverse traditional public schools.

Third, we document that the charter schools as a group initially started out behind the traditional public schools in terms of the test score gains of their students. Over time, however, the distributions across schools in the two sectors converged and now charter school students tend to have higher test score gains than those attending the traditional public schools. This finding reflects in part the winnowing out of charter schools whose students performed poorly, and, in recent years, the entry of schools whose students performed better, a process that is consistent with predictions that market forces would drive under-performing schools out of

business. The apparent success of the charter schools entering after 2006 has likely been enhanced by a policy change in that year that required charter schools to delay opening for a year after their charter was approved, and the associated support provided by the state's Office of Charter Schools during and after that year.

An additional explanation for bigger achievement gains among charter school students would focus on the changing clientele of charter schools. Our analysis of the changing mix of students who enroll in charter schools over time leads us to believe that a major factor contributing to the apparent improved performance of the charter schools over the period may have as much or more to do with the trends in the types of students they are attracting than in improvements in the quality of the programs they offer. Our analysis of changes over time in the prior-year test scores of the students entering charter schools in grades 6, 7 and 8, for example, shows a dramatic shift over time: In the early years, the new students in charter schools tested at lower levels than their peers who remained in traditional public schools, but, by the end of the period, the new charter school students were apparently far more able (as measured by their prior year test scores) than their peers who remained in the public schools. At the same time our analysis of student achievement using student fixed effects shows that charter schools are no more effective than traditional public schools in raising the achievement of students who switch into public schools. Hence, we conclude that the apparent gains in the test scores of charter school students over time have far more to do with selection than with the quality of the programs they offer. Taken together, our findings imply that the charter schools in North Carolina have become segmented over time, with one segment increasingly serving the interests of middle class white families.

Moving forward, the charter school sector in North Carolina is likely to grow significantly, although probably not as fast as its proponents would like. On the one hand, the 2011 removal of the 100-school cap, the 71 applications for new charters in 2014, and legislative changes that make it easier for existing charter schools to expand without specific approval all point to large increases in the size of the sector over the next few years. On the other hand, by recommending that only 11 of the 71 new charter applications be forwarded to the State Board for approval, the Charter School Advisory Board has put a bit of a damper on the rate of growth, at least in the short term. Not happy with this outcome, however, the Legislature has now approved a “fast-track” option for charter school operators that have experience operating successful schools and want to replicate them. Such schools would not have to go through the typical planning year, and could open months after their approval at the start of the following academic year. As the state’s charter sector grows, we would expect to see a continuation of the trends that we have documented here, with the possibility that new entrants may once again struggle as the proliferation of new schools exceeds the limited capacity of the Office of Charter Schools to oversee and support them during their start-up periods.

In this paper, we have said nothing about how the growth of charters in particular districts is likely to affect the ability of those districts to provide quality schooling to the children in the traditional public schools. That issue is currently an urgent concern in the Durham County, for example, where the rapid growth of charters has not only increased racial segregation, but also has imposed significant financial burdens on the school district. One recent study found that the net cost to the Durham Public Schools could be as high as \$2,000 per student enrolled in a charter school, although the precise amount differs based on the assumptions (Troutman, 2014). Major contributors to this burden are the fact that the charter schools serve far lower proportions

of expensive-to-educate children than the traditional public schools and that the district cannot reduce its spending in line with the loss of students because of its fixed costs. In ongoing research we plan to investigate further the evolving financial and other implications of charter schools on districts' traditional public schools.

In another line of inquiry we are exploring the extent to which the goals of charter schools have been changing over time. One approach is to compare the goals stated in the charter school applications of charters approved at different points over time to examine changes in the types of students they intend to serve (e.g. low income and minority, disabled students, or all students), their subject focus (e.g. STEM, general purpose, or other) and their pedagogical approach (e.g. normal grade format, mixed grades, or Montessori). Another approach is to examine the backgrounds of charter school board members over time to tease out the extent to which charters are becoming more of a business proposition and less of an innovative way of providing education.

As would be predicted by the standard market model of competition, the charter school sector in North Carolina will undoubtedly continue to evolve. In this case, however, state policy makers have both the power and the responsibility to influence that evolution. In particular, they have the authority to limit the number of entrants or to alter the authorization and review processes. The question is whether they will use that authority to assure that the sector serves the public interest and not just the private interests of those who send their children to charter schools.

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Section VIII. Tables & Figures:

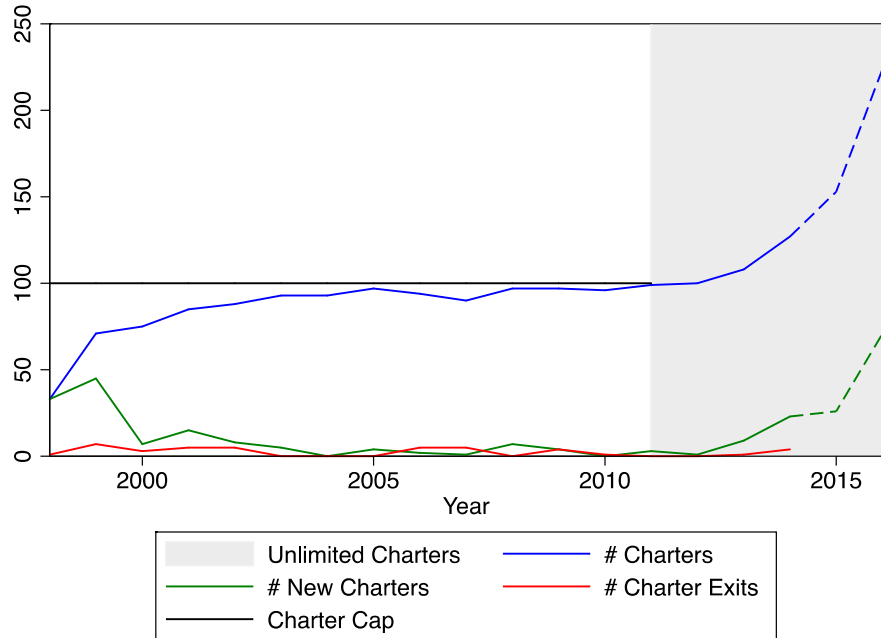


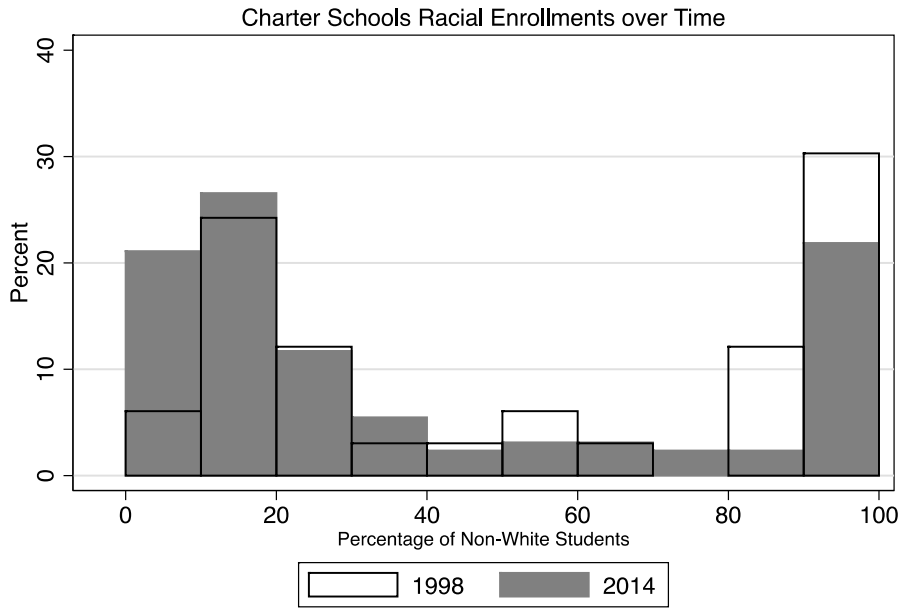
Figure 1: Growth in North Carolina charter schools (1998-2016)

Note: Dashed lines indicated projections based on information released by North Carolina’s Department of Public Instruction regarding future charter openings. Closings for these years are yet to be determined. Sources are provided in appendix **Table A.1** }.

Table 1. Descriptive Statistics: Charter vs. Traditional Public Schools (Grades 4-8)

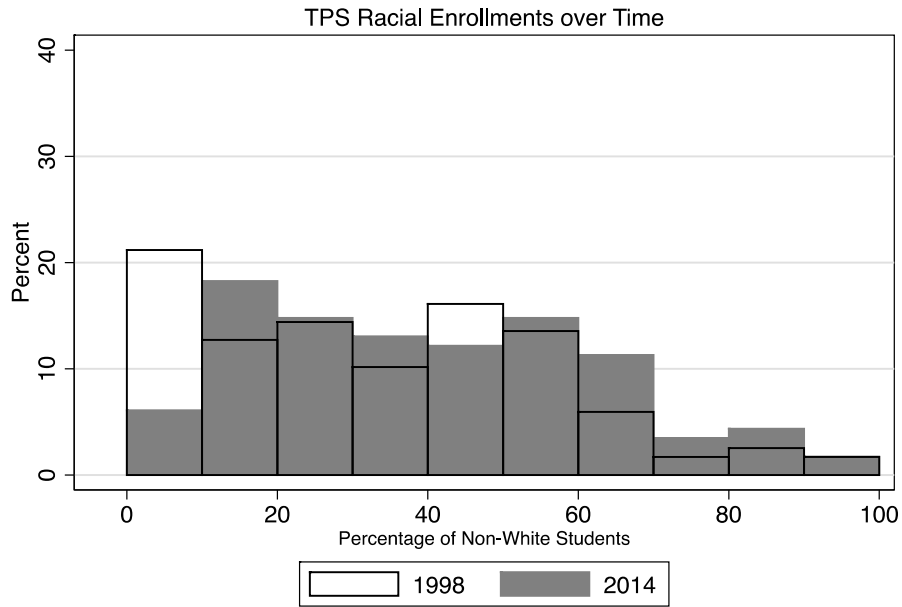
	1998		2005		2012	
	<u>Charter</u>	<u>TPS</u>	<u>Charter</u>	<u>TPS</u>	<u>Charter</u>	<u>TPS</u>
Number of Students	2,232	474,552	11,378	529,166	20,020	533,415
Ethnicity (% students)						
Black	35.7	29.6	32.6	29.8	26.3	25.7
Hispanic	0.8	2.7	2.9	7.5	5.5	13.5
White	58.6	64.1	59.2	56.8	62.2	53.0
Other	4.8	3.7	5.3	5.9	6.0	7.8
Parent Education (% students)						
High School or Less	32.2	55.4	32.1	51.6	.	.
Some Post High School	19.8	18.5	23.4	21.3	.	.
College Graduate +	48.1	55.4	32.1	51.6	.	.
Average Reading (standardized)						
4 th Grade	-0.075	0.000	-0.084	0.002	0.201	-0.007
5 th Grade	-0.029	0.000	-0.034	0.000	0.228	-0.009
6 th Grade	0.153	-0.000	0.072	-0.002	0.242	-0.010
7 th Grade	-0.070	0.000	0.077	-0.002	0.257	-0.010
8 th Grade	-0.495	0.001	0.110	-0.002	0.289	-0.010
Average Math (standardized)						
4 th Grade	-0.257	0.001	-0.213	0.005	0.031	-0.001
5 th Grade	-0.266	0.001	-0.138	0.003	0.052	-0.002
6 th Grade	0.054	-0.000	-0.038	0.001	0.169	-0.007
7 th Grade	-0.148	0.001	-0.023	0.001	0.195	-0.007
8 th Grade	-0.534	0.001	0.058	-0.001	0.146	-0.005

Notes: Racial composition is based on students for whom race/ethnicity is observed. The percentage for each type of school is calculated by dividing the number of students in an ethnic group by the total number of students in that type of school (charters or TPS) in a given year. Similarly, percentages for parental education are based on students for whom parental attainment (for the highest-attaining parent) is reported. In the early years, parent education does not have a category for high school +, jumping from high school graduate to trade school/community college. 2008 was the last year information on parent education was collected. All reading and math scores have been standardized by grade and year to have mean zero and standard deviation of 1.



Source: National Center for Education Statistics Common Core of Data & NCDPI; Author's calculations.

Figure 2a. Distribution of charter school students by racial mix of schools (1998 & 2014)



Source: National Center for Education Statistics Common Core of Data & NCDPI; Author's calculations.

Figure 2b. Distribution of traditional public school (TPS) students by racial mix of schools (1998 & 2014)

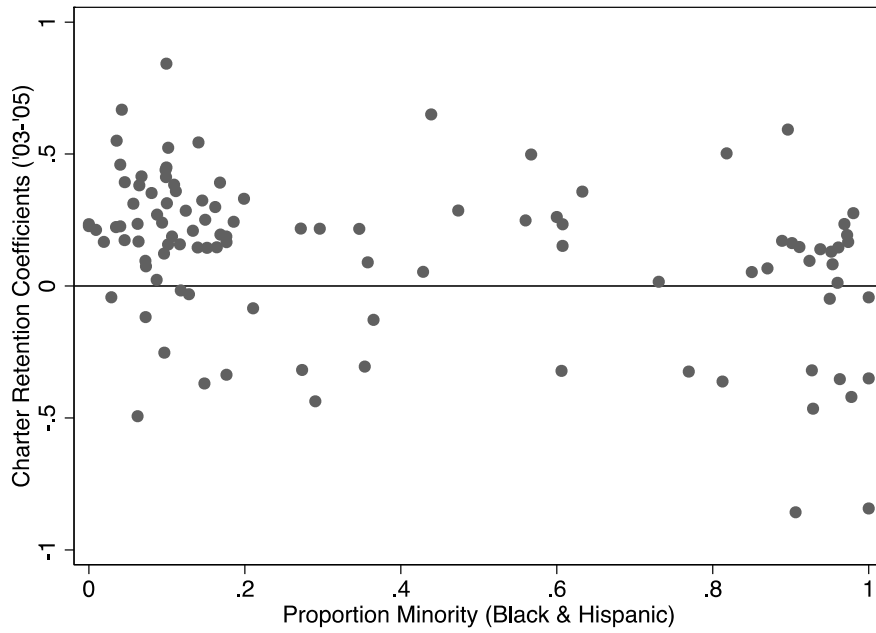


Figure 3a. Relative return rates for all charters (2003-2005)

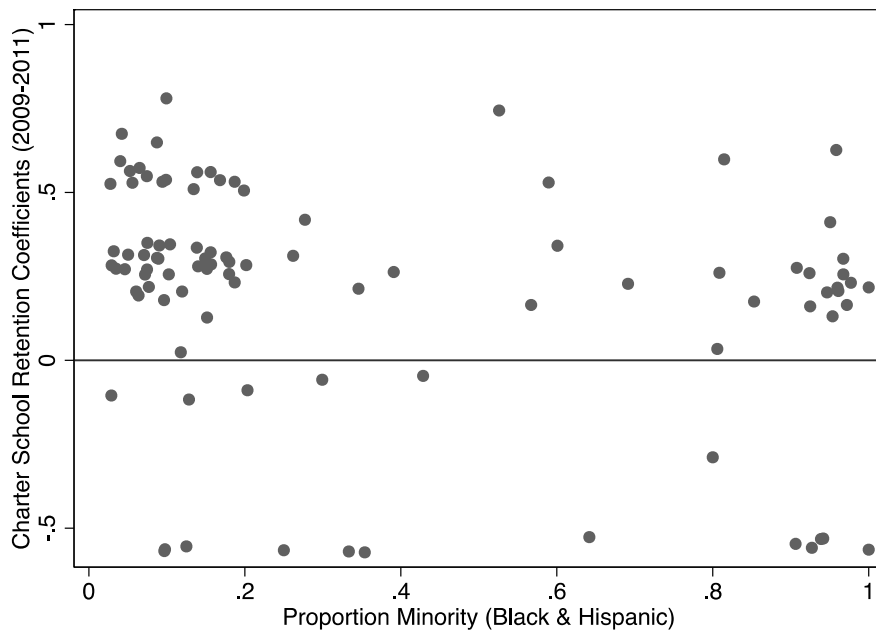


Figure 3b. Relative returns rates for all charters (2009-2011)

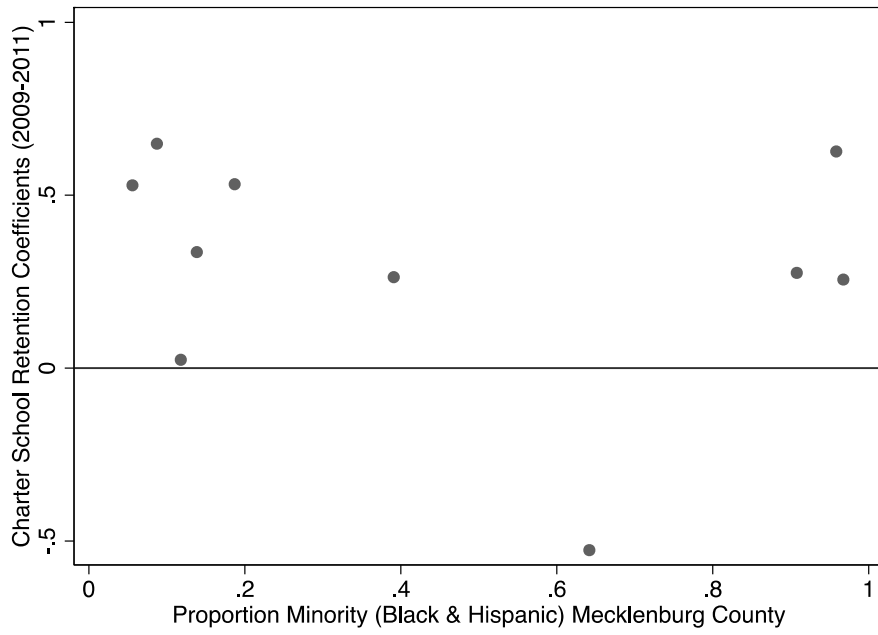


Figure 4a. Mecklenburg charter schools (2009-2011)

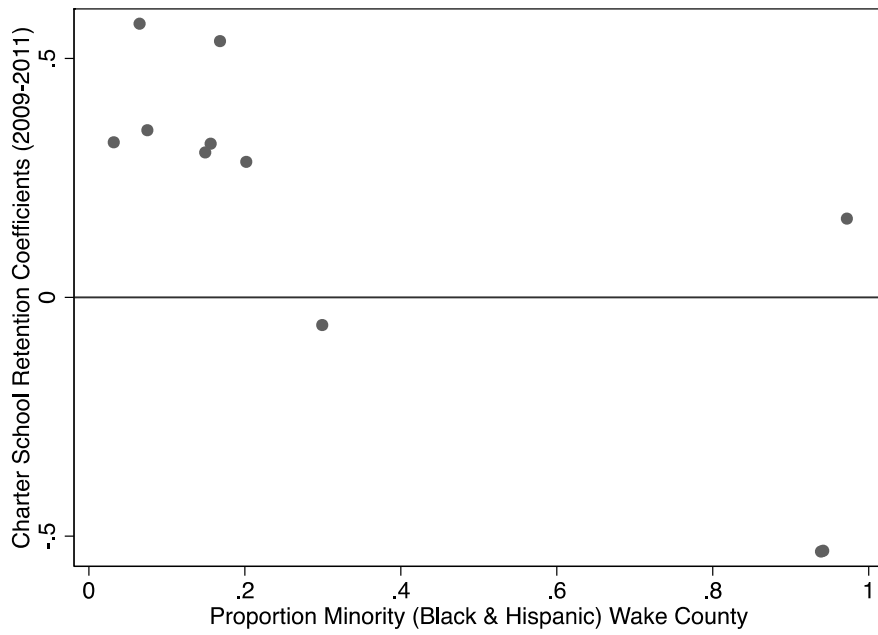


Figure 4b. Wake County charter schools (2009-2011)

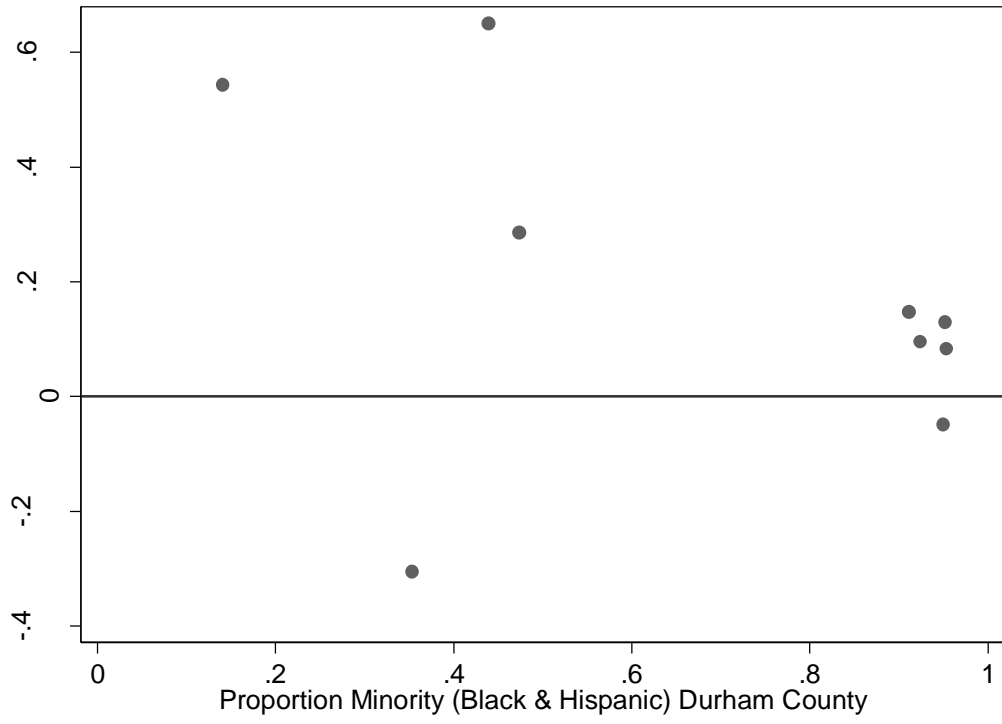


Figure 4c. Durham County charter schools (2009-11)

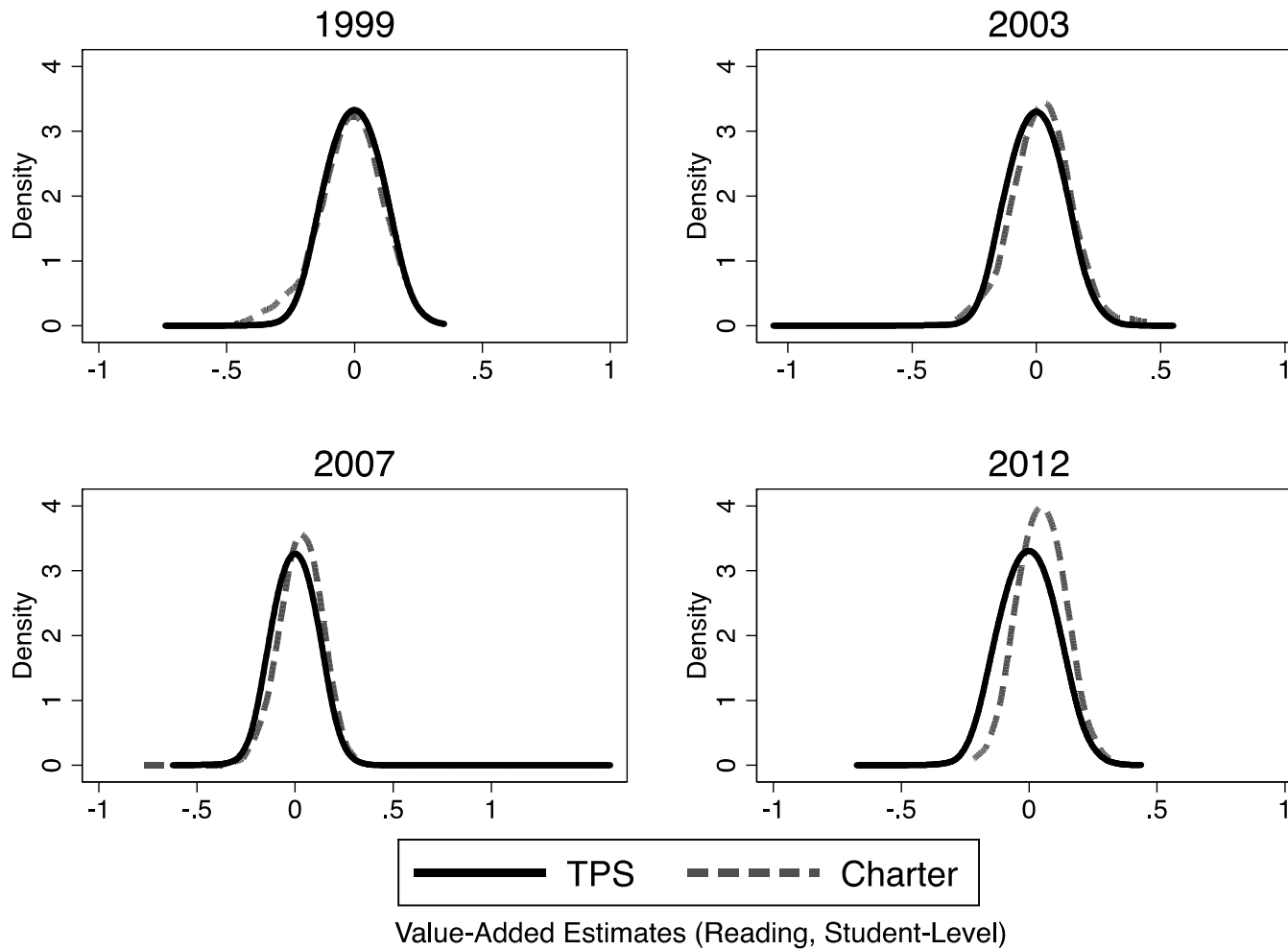


Figure 5a. Relative Reading Gains, Charter vs. TPS, 1999-2009

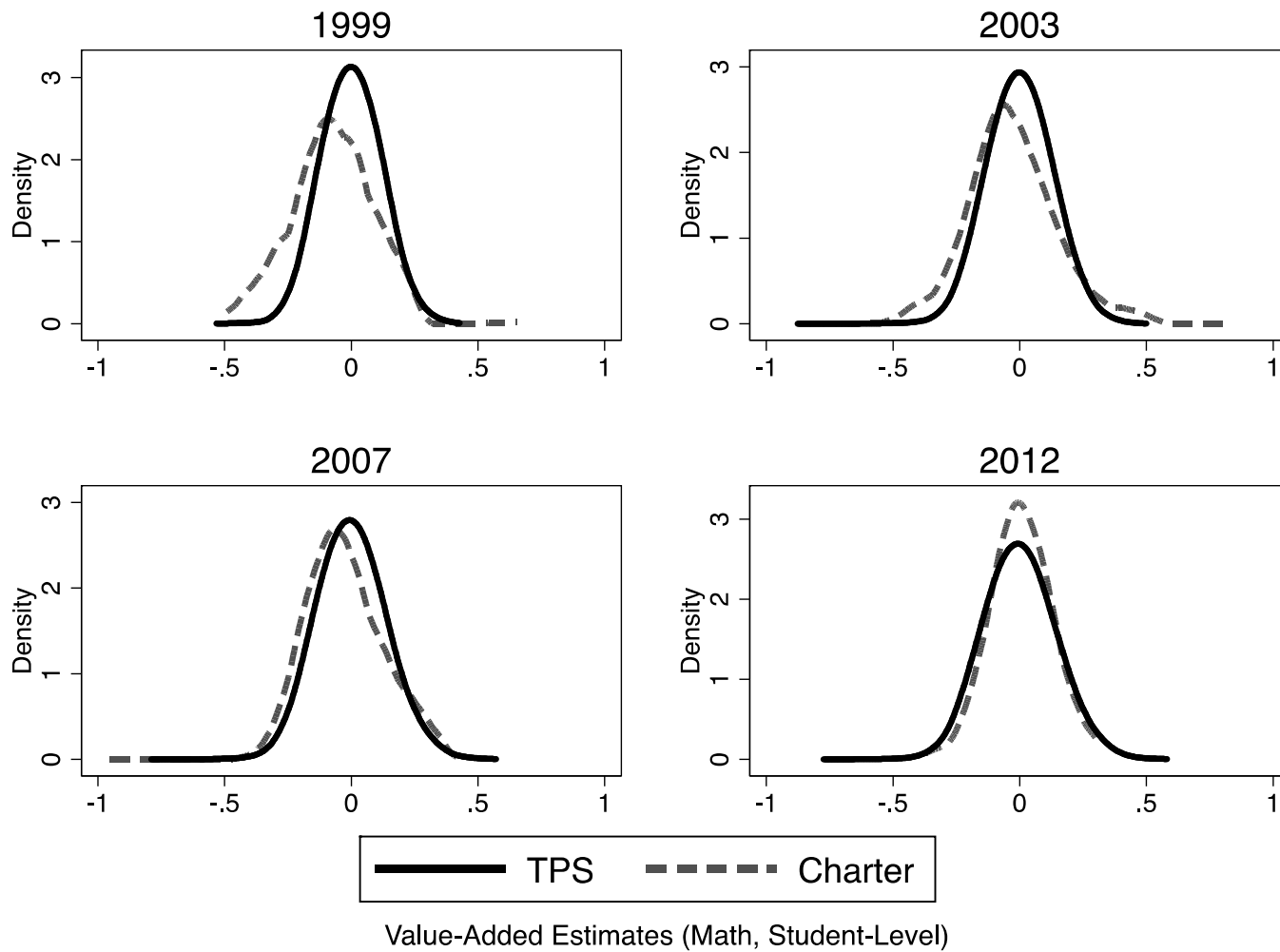


Figure 5b. Relative Math Gains, Charter vs. TPS, 1999-2009

Table 2: Descriptive Statistics for Estimates of School Gains

Year	Math			Reading		
	Charter Mean (S.D.)	TPS Mean (S.D.)	Sign of Charter-TPS	Charter Mean (S.D.)	TPS Mean (S.D.)	Sign of Charter-TPS
1999	-0.078 (0.155)	0.001 (0.084)	-	-0.056 (0.112)	0.003 (0.068)	-
2000	-0.080 (0.167)	0.001 (0.088)	-	-0.050 (0.122)	0.001 (0.077)	-
2001	-0.007 (0.179)	0.000 (0.109)	-	0.008 (0.100)	0.000 (0.078)	+
2002	-0.037 (0.144)	0.001 (0.104)	-	-0.018 (0.130)	0.000 (0.075)	-
2003	-0.029 (0.164)	0.000 (0.099)	-	0.023 (0.107)	0.000 (0.071)	+
2004	-0.035 (0.132)	0.001 (0.099)	-	0.016 (0.090)	0.000 (0.072)	+
2005	-0.012 (0.125)	0.000 (0.097)	-	0.007 (0.087)	0.000 (0.068)	+
2006	-0.016 (0.144)	0.000 (0.106)	-	0.042 (0.083)	-0.001 (0.074)	+
2007	-0.025 (0.140)	0.001 (0.110)	-	0.029 (0.089)	-0.001 (0.074)	+
2008	.	.	.	.	.	.
2009	0.015 (0.109)	0.000 (0.108)	+	0.058 (0.078)	-0.002 (0.063)	+
2010	0.032 (0.115)	-0.001 (0.104)	+	0.066 (0.062)	-0.002 (0.061)	+
2011	0.017 (0.109)	0.001 (0.110)	+	0.058 (0.071)	-0.002 (0.064)	+
2012	0.003 (0.109)	0.000 (0.117)	+	0.049 (0.067)	-0.002 (0.069)	+

Notes: Table 2 provides descriptive statistics for our school value-added estimates. In it we report the mean and the standard deviation of performance (S.D. in parentheses). These statistics are based on student-level estimates, to correspond with the student-level unit of analysis in our value-added models. Thus, these are analogous to frequency weighted school-level estimates. Non-weighted estimates produce similar results. A negative difference between the charter and the TPS mean signifies that the charters exhibit lower average gains in test scores than the traditional public schools. 2008 is excluded so as to make the models similar across year; the 2008 data does not have the Free Reduced-Price Lunch variable, a key predictor in our models.

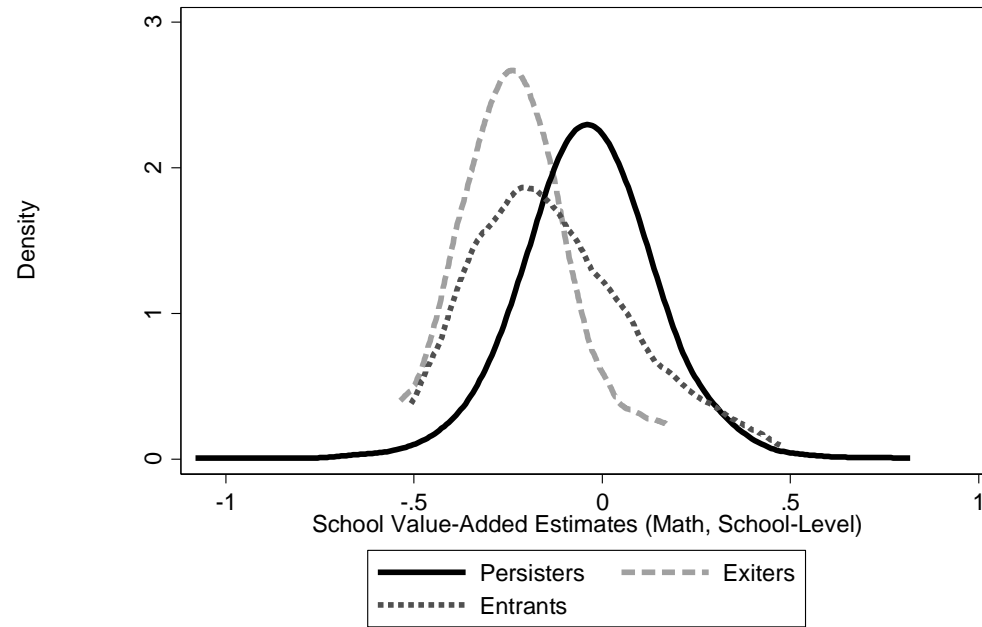


Figure 6. Figure 6: Distribution of Value Added by School Status, 1999-2012

Table 3: Student gains by Charter School Exit, Persistence, and Entry

	Exiting Schools	Persisting Schools	Entering Schools
Reading, 1999-2005			
Mean Gains	-0.246	-0.028	-0.169
Number of School-Years	9	408	40
% of Charter Enrollment	0.67	94.55	4.77
Reading, 2006-2012			
Mean Gains	-0.136	0.005	0.077
Number of School-Years	12	601	13
% of Charter Enrollment	0.54	97.83	1.63
Math, 1999-2005			
Mean Gains	-0.078	0.006	-0.100
Number of School-Years	9	408	40
% of Charter Enrollment	0.67	94.55	4.77
Math, 2006-2012			
Mean Gains	-0.043	0.051	0.090
Number of School-Years	12	601	13
% of Charter Enrollment	0.54	97.83	1.63

Notes: Entering schools become persisting schools after their first year being open, unless they exit.

Table 4: Student Selection into Charter Schools

	Early Years						Recent Years					
	2000		2001		2002		2010		2011		2012	
	New To Charter	Remain in TPS	New To Charter	Remain in TPS	New To Charter	Remain in TPS	New To Charter	Remain in TPS	New To Charter	Remain in TPS	New To Charter	Remain in TPS
6th Grade												
Avg. Read (lagged)	-0.070	0.001	-0.002	0.000	-0.048	0.001	0.232	-0.008	0.232	-0.009	0.242	-0.010
Avg. Math (lagged)	-0.206	0.003	-0.083	0.001	-0.084	0.001	0.149	-0.005	0.162	-0.006	0.169	-0.007
Days Absent (lagged)	.	.	.	.	.	.	5.1	5.8	4.2	5.0	3.8	4.7
N	1,200	95,281	1,463	98,110	1,748	99,848	3,717	103,328	4,019	104,925	4,289	106,623
7th Grade												
Avg. Read (lagged)	-0.062	0.001	0.034	-0.000	-0.052	0.001	0.274	-0.009	0.259	-0.009	0.257	-0.010
Avg. Math (lagged)	-0.155	0.002	-0.051	0.001	-0.149	0.002	0.213	-0.007	0.179	-0.006	0.195	-0.007
Days Absent (lagged)	.	.	.	.	.	.	5.2	6.1	4.2	5.3	4.0	5.1
N	1,162	92,849	1,149	95,325	1,546	98,837	3,537	102,070	3,682	103,791	4,004	105,056
8th Grade												
Avg. Read (lagged)	-0.094	0.001	-0.010	0.000	0.011	-0.000	0.287	-0.009	0.299	-0.010	0.289	-0.010
Avg. Math (lagged)	-0.167	0.002	-0.099	0.001	-0.051	0.001	0.154	-0.005	0.183	-0.006	0.146	-0.005
Days Absent (lagged)	.	.	.	.	.	.	5.2	6.5	4.5	5.7	4.2	5.4
N	851	90,103	1,014	91,899	1,205	94,880	3,142	101,415	3,445	102,175	3,711	103,917

Notes: The table compares the mean values of the three outcomes for those who were observed in the traditional public school in the prior year and in a charter school in the specified year with those who remained in the same traditional public school from the prior year to the specified year. The entries are the values of test scores and absences in the prior year, that is, before the students enrolled in a charter school. All reading and math scores have been standardized to mean zero and standard deviation of 1. N is the number of reading observations we have—the other two variables are similarly populated, with some missing observations. Absences were capped at 50 to minimize the effect of outliers.

Table 5: Estimates of how charter schools affect student achievement, models with student fixed effects, by time period .

2003-2007		
	Reading	Math
Charter School	-0.008** (0.001)	-0.025** (0.003)
N	2,369,534	2,376,323
2008-2011		
	Reading	Math
Charter School	-0.002+ (0.001)	-0.015 (0.003)
N	1,543,524	1,518,017
2003-2011		
	Reading	Math
Charter School	-0.006** (0.001)	-0.023** (0.002)
N	3,913,058	3,894,340

Robust standard errors in parentheses p<0.01, p<0.05, +p<0.1. Estimates from students in grades 4-8. The results do not change if controls are added to account for the initial year in a different school. .

Appendix

Table A.1 Number of Charters, Charter Exits, & New Charters Statewide by Year

Year	# Charters	# Charter Exits	# New Charters
1991-92	0	0	0
1992-93	0	0	0
1993-94	0	0	0
1994-95	0	0	0
1995-96	0	0	0
1996-97	0	0	0
1997-98	33	1	33
1998-99	71	7	45
1999-00	75	3	7
2000-01	85	5	15
2001-02	88	5	8
2002-03	93	0	5
2003-04	93	0	0
2004-05	97	0	4
2005-06	94	5	2
2006-07	90	5	1
2007-08	97	0	7
2008-09	97	4	4
2009-10	96	1	0
2010-11	99	0	3
2011-12	100	0	1
2012-13	108	1	9
2013-14	127	4	23
2014-15	153	.	26*
2015-16	224	.	71**

Source: Educational Directory and Demographic Information Exchange. # of Charter exits is the number of charters that close at the end of the given school year. # of New Charters is the number of charters opened at the beginning of the given school year. Found at: <http://apps.schools.nc.gov/pls/apex/f?p=125:1:> *Approved Charters for 2014-2015 found at: <http://www.ncpublicschools.org/charterschools/applications/2014-15/>. **Applications received for 2015-2016 found at: <http://www.ncpublicschools.org/charterschools/>