

The New York City Charter Schools Evaluation Project

How New York City's Charter Schools Affect Achievement



September 2009

reporting on results through
the 2007-08 school year

**Principal Investigators:
Caroline M. Hoxby, Sonali Murarka, Jenny Kang**

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THE NEW YORK CITY CHARTER SCHOOLS EVALUATION PROJECT

The New York City Charter Schools Evaluation Project is a multi-year study in which nearly all of the city's charter schools are participating. This is the second report in the study and analyzes achievement and other data from the 2000-01 school year up through the 2007-08 school year. The next report in the study will analyze achievement up through the 2008-09 school year. The previous report (July 2007) and a technical report may be downloaded from the following site: www.nber.org/~schools/charterschoolseval.

This *report* (August 2009) analyzes the achievement of 93 percent of the New York City charter school students who were enrolled in test-taking grades (grades 3 through 12) in 2000-01 through 2007-08. The remaining students are not covered by this report for one of two reasons. 5 percent of charter school students in test-taking grades were enrolled in schools that opened from 2006-07 onwards. Their achievement will be covered by the next report of the New York City Charter Schools Evaluation Project. 2 percent of charter school students in test-taking grades were enrolled in schools that declined to participate in the study.

The most distinctive feature of the study is that charter schools' effects on achievement are estimated by the best available, "gold standard" method: lotteries. 94 percent of charter school students in New York City are admitted to a school after having participated in a random lottery for school places. This is because the city's charter schools are required to hold lotteries whenever there are more applicants than places, and the charter schools are routinely oversubscribed. In a lottery-based study like this one, each charter school's applicants are randomly divided into the "lotteried-in" (who attend charter schools) and the "lotteried-out" (who remain in the regular public schools. These two groups of students are essentially identical at the time of the lottery. They are not identical just on dimensions that we can readily observe, such as race, ethnicity, gender, poverty, limited English, and disability. They are also identical on dimensions that we cannot readily observe like motivation and their family's interest in education. The lotteried-in and lotteried-out students who participated in the same lottery are identical on these subtle dimensions because *they all applied* to the charter school. They are separated only by a random number.

We follow the progress of lotteried-in and lotteried-out students. We compute the effect that charter schools have on their students' achievement by comparing the lotteried-in students to their lotteried-out counterparts. This is a true "apples-to-apples" comparison. Lottery-based studies are scientific and reliable. There are no other methods of studying the achievement of charter school students that have reliability that is "in the same ballpark" (details below).

The New York City Charter Schools Evaluation Project reports on the city's charter schools *in the aggregate*. We do not identify individual charter schools with their individual results. However, we do describe the variation in charter schools' performance in this report, and we show the association between charter schools' policies and their effects on achievement. In general, it is important to remember that charter schools differ, and no charter school is a mirror image of the aggregate results.

The New York City Charter Schools Evaluation Project is funded by a grant from the Institute for Education Sciences, which is the research arm of the United States Department of Education. The study would not be possible without the generous cooperation and help of the New York City Department of Education, the New York City Charter School Center, and the charter schools located in New York City. More information about the project may be found in the Frequently Asked Questions.

EXECUTIVE SUMMARY

The distinctive feature of this study is that charter schools' effects on achievement are estimated by the best available, "gold standard" method: lotteries. 94 percent of charter school students in New York City are admitted to a school after having participated in a random lottery for school places. In a lottery-based study like this one, each charter school's applicants are randomly divided into the "lotteried-in" (who attend charter schools) and the "lotteried-out" (who remain in the regular public schools). These two groups of students are identical not just on dimensions that we can readily observe, such as race, ethnicity, gender, poverty, limited English, and disability. They are also identical on dimensions that we cannot readily observe like motivation and their family's interest in education. The lotteried-in and lotteried-out students who participated in the same lottery are identical on these subtle dimensions because *they all applied* to the charter school. They are separated only by a random number.

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The key findings of this report are as follows.

- Charter school applicants are much more likely to be black and much less likely to be Asian or white than the average student in New York City's traditional public schools. [Chapter II]
- Charter school applicants are more likely to be poor than the average student in New York City's traditional public schools. [Chapter II]
- Charter schools' lotteries appear to be truly random, as they are designed to be. Our tests for randomness are based on students' race, ethnicity, gender, prior test scores, free and reduced-price lunch participation, special education participation, and English Learner status. [Chapter II]
- Students who actually enroll in charter schools appear to be a random subset of the students who were admitted. [Chapter II]

EXECUTIVE SUMMARY, CONTINUED

● Lottery-based analysis of charter schools' effects on achievement is, by far, the most reliable method of evaluation. It is the only method that reliably eliminates "selection biases" which occur if students who apply to charter schools are more disadvantaged, more motivated, or different in any other way than students who do not apply. [Chapter III]

● On average, a student who attended a charter school for all of grades kindergarten through eight would close about 86 percent of the "Scarsdale-Harlem achievement gap" in math and 66 percent of the achievement gap in English. A student who attended fewer grades would improve by a commensurately smaller amount. [Chapter IV]

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● On average, a lotteried-out student who stayed in the traditional public schools for all of grades kindergarten through eight would stay on grade level but would not close the "Scarsdale-Harlem achievement gap" by much. However, the lotteried-out students' performance does improve and is better than the norm in the U.S. where, as a rule, disadvantaged students fall further behind as they age. [Chapter IV]

● Compared to his lotteried-out counterpart, a student who attends a charter high school has Regents examination scores that are about 3 points higher for each year he spends in the charter school before taking the test. For instance, a student who took the English Comprehensive exam after three years in charter school would score about 9 points higher. [Chapter IV]

● A student who attends a charter high school is about 7 percent more likely to earn a Regents diploma by age 20 for each year he spends in that school. For instance, a student who spent grades ten through twelve in charter high school would have about a 21 percent higher probability of getting a Regents diploma. [Chapter IV]

● The following policies are associated with a charter school's having better effects on achievement. We emphasize that these are merely associations and do not necessarily indicate that these policies *cause* achievement to improve.

- a long school year;
- a greater number of minutes devoted to English during each school day;
- a small rewards/small penalties disciplinary policy;
- teacher pay based somewhat on performance or duties, as opposed to a traditional pay scale based strictly on seniority and credentials;
- a mission statement that emphasizes academic performance, as opposed to other goals.

[Chapter V]

CHAPTER I. NEW YORK CITY'S CHARTER SCHOOLS

When did New York City's charter schools open?

The New York State Charter Schools Act of 1998 authorized the establishment of charter schools in New York State. The first year of operation for charter schools in New York City was 1999-00, and twelve schools were operating by 2000-01. Four of these schools were converted from previously-existing public schools: Wildcat Academy, Renaissance, KIPP Academy, and Beginning with Children. By the 2005-06 school year, 36 more charter schools had opened (including one conversion school, Future Leaders Institute) and one charter school had closed.

As of the writing of the report, New York City has 78 charter schools operating and another 26 whose operations are scheduled to begin in fall 2009 or fall 2010.

Which New York City charter schools are participating in this study?

Nearly all of New York City's charter schools are participating in the *study*. The study contains multiple reports, including a technical report of July 2007 that we will mention several times. All the reports can be downloaded from the website listed on page i.

This *report* analyzes achievement data up through 2007-08, and it analyzes charter schools that were operating as of the 2005-06 school year. These data represent 93 percent of charter school students who were in test-taking grades (grade three through twelve) up through 2007-08.

There are a few schools that were operating in 2005-06 and that are not covered by this report. Two schools, UFT Elementary Charter School and South Bronx Charter School for International Cultures and the Arts, declined to participate in the study. Readnet Bronx Charter School closed in 2005-06. The NY Center for Autism Charter School is not included in the study because it serves a very special population and is not compatible with many elements of the study.

A full list of New York City's charter schools is in Table Id at the end of this chapter. They are listed by their year of opening. All of the schools that opened by 2005-06 are included in this report, with the exception of the four named above.

How are students admitted to New York City's charter schools?

Any student who lives in one of the five boroughs of New York City can apply to its charter schools. The typical charter school application simply asks for the student's name, his date of birth, the parent or guardian's contact information, and the grade to which the student is applying. Some applications ask for more information of this basic type but charter schools never ask students to provide their school transcript, write an essay, or otherwise demonstrate their academic performance. Think of a single sheet of paper, not a college application.

Charter schools are required to take all applicants if they have space for them. (Charter schools that specifically serve disabled students or drop-outs only consider applications from students who fit their service model.) If a charter school does not have enough space for all applicants, it is required to hold a random lottery among the applicants. *94 percent of students who apply to New York City charter schools are put into one of these lotteries.*

In this study, we are to check whether the lotteries are random, and we find no evidence that they are not.

A lottery is specific to a school and a grade. For example, Explore Charter School may hold one lottery for its kindergarten places, another for its first grade places, and so on. A student may apply to more than one charter school in a single year, but we find that this is not at all common. Much more detail on the lotteries can be found in our technical report.

Is New York City a typical environment for charter schools?

Nothing about New York City is typical! However, we shall see that its charter schools enroll a disadvantaged population of students that is very similar demographically to charter school students you would see in other cities in the U.S. Also, nearly all charter schools in the U.S. hold admissions lotteries, as New York City's schools do, when they are oversubscribed. Most urban charter schools are routinely oversubscribed, as are New York City's charter schools.

There are a few things that are distinctive about the city's charter school environment. The Chancellor of the New York City schools, Joel I. Klein, is supportive of charter schools, and his Department of Education has an Office of Charter Schools that performs important functions. Also, New York City charter schools often share buildings or campuses with traditional public schools.

What grades are served by New York City's charter schools?

Of the charter schools covered by this report, the majority serve elementary or middle school grades. Less than a quarter serve high school grades. We describe the grades served in more detail later in the report. (See Table IIIa.)

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A typical feature of charter schools in New York City is that they open with only their lowest grade, the “intake” grade, and add a grade each subsequent year. This is known as "rolling-up." For example, a charter high school may open with only ninth grade in its first year. In its second year, the ninth graders will roll up to become tenth graders and the school will welcome a new batch of ninth graders, thereby serving ninth and tenth graders. By its fourth year, the school will be serving all of the high school grades from nine to twelve. Because kindergarten and first grade are both traditional intake grades, charter elementary schools in New York City often open with both kindergarten and first grade and then add one grade each year. Thus, they serve kindergarten through grade five by their fifth year of operation. The logic of rolling-up is that it gives schools a manageable way to grow and to instill the school’s culture in students.

Charter schools do not always roll up, however. Some open by admitting students into intake and non-intake grades alike. This makes their first year of operation different from subsequent years in which their admissions will be dominated by the intake grades. Typically, non-intake grades admit only a small number of students to fill places that open up when students depart. Conversion charter schools in New York City typically convert to charter school status with their full complement of grades.

Table Ia shows that kindergarten alone accounts for a third of all applicants, and kindergarten and first grade by themselves accounts for about half of all applicants. In general, higher grades account for fewer applicants. (Grades five and six are intake grades for middle schools so they have somewhat more applicants than grades four and seven.)

Table Ia	
	<i>Grade accounts for this percentage of all applicants</i>
Kindergarten	31.6%
Grade 1	16.5%
Grade 2	9.7%
Grade 3	7.6%
Grade 4	5.4%
Grade 5	13.9%
Grade 6	6.9%
Grade 7	2.4%
Grade 8	1.0%
Grade 9	2.5%
Grade 10	1.8%
Grade 11	0.4%
Grade 12	0.2%

Note: Table includes the New York City charter schools covered by this report.

Where are New York City's charter schools located?

New York City's charter schools are generally concentrated in Harlem and the South Bronx. They are scattered throughout Brooklyn, and there are a few in Queens. Starting in the 2009-10 school year, Staten Island will have a charter school. Figure Ia shows a map of New York City with the locations of the charter schools that were operating as the 2008-09 school year. The schools covered by this report are indicated by a red star. The others are indicated by a blue dot.



What are the charter schools' neighborhoods like?

When a charter school locates in a neighborhood, it can expect to serve students who are disproportionately from that neighborhood. This is especially true for schools that serve elementary grades. Thus, it is important to know something about the neighborhoods where charter schools locate. We use tract data from the U.S. Census to describe these neighborhoods. (A Census tract is a small, fairly homogeneous neighborhood with about 4000 people living in it.)

Comparing the average charter school's census tract to New York City as a whole, we see that charter schools locate in neighborhoods that have unusually low proportions of white non-Hispanic and Asian residents and unusually high proportions of black and Hispanic residents. For instance, charter schools' neighborhoods are about 40 percent black non-Hispanic whereas New York City as a whole is only about 22 percent black non-Hispanic. Charter schools' neighborhoods are about 38 percent Hispanic whereas New York City as a whole is only about 25 percent Hispanic.

Charter schools' neighborhoods are also economically disadvantaged. For instance, the average household income in charter schools' census tracts is \$37,639 while it is \$59,743 in New York City overall. 43.7 percent of households in charter schools' neighborhoods have incomes less than \$20,000, but only 28.4 percent of New York City households have such low incomes.

Table 1b
Charter School Neighborhoods Compared to New York City as a Whole

<i>Neighborhood Characteristic</i>	<i>Neighborhoods of the charter schools covered by this report</i>	<i>New York City as a Whole</i>
% White (non-Hispanic)	14.3%	38.7%
% Black (non-Hispanic)	39.6%	22.4%
% Hispanic	37.7%	24.8%
% Asian	5.2%	11.0%
% Other races/ethnicities	3.3%	2.1%
Average household income	\$37,639	\$59,743
% households with income less than \$20,000	43.7%	28.4%
% of adults who have no high school diploma or GED	41.0%	28.0%
% of adults with bachelor's degree or higher	15.2%	27.9%
% of families with children are single parent families	57.0%	39.2%

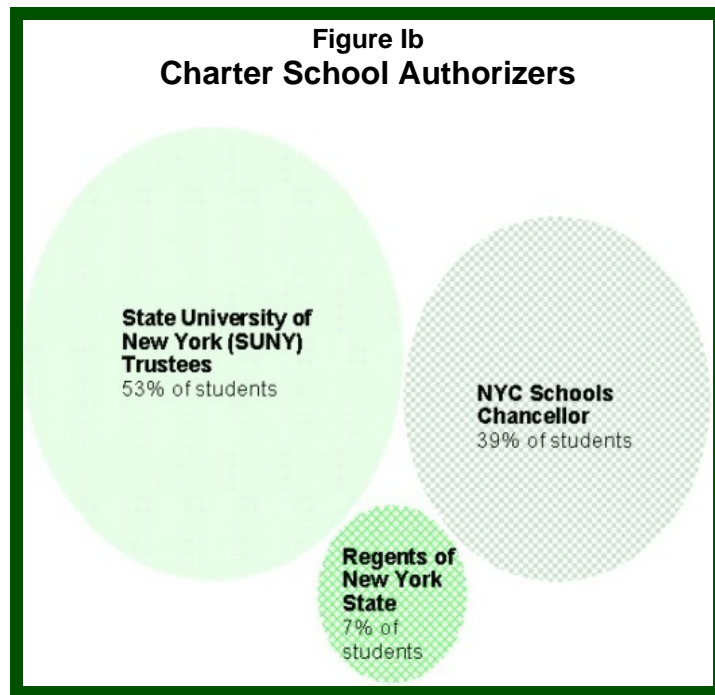
Source: Authors' calculations based on Geolytics 2008 estimates of U.S. Census of Population and Housing data.

Finally, charter schools' neighborhoods are educationally and socially disadvantaged. 41.0 percent of their adults have no high school diploma or GED. In contrast, only 28 percent of New York City adults have such a low level of education. Only 15.2 percent of adults in charter school neighborhoods have a four-year college degree, whereas 27.9 percent of New York City adults have such a degree. Perhaps most dramatic is the difference in the share of families that are headed by single parents. 57.0 percent of families with children are headed by single parents in charter schools' neighborhoods, whereas only 39.2 percent of such families are headed by single parents in New York City as a whole.

Wildcat Academy charter school is located in an affluent neighborhood but is exclusively targeted at high school drop-outs. Its downtown Manhattan location makes sense not because its students reside near the school but because they do internships with nearby firms as part of their education.

Who authorizes New York City's charter schools?

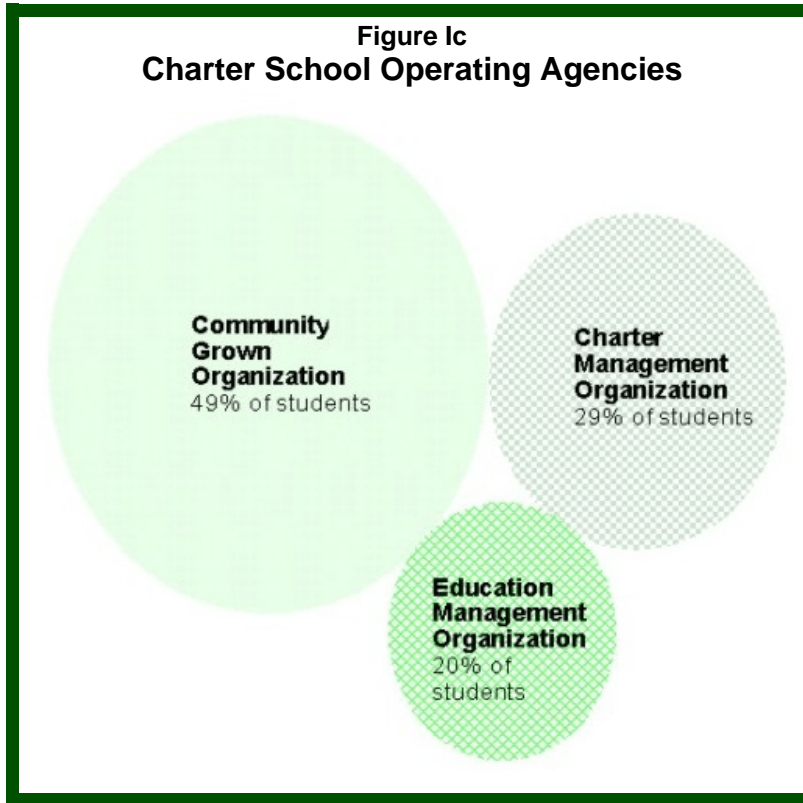
There are three agencies that have the power to authorize new charter schools in the city: the State University of New York (SUNY) trustees, the Chancellor of the New York City Schools, and the New York State Board of Regents. When a group of individuals decides to form a charter school, they submit a proposal to only one authorizer at a time. As Figure 1b shows, most of the charter schools covered by this report were authorized by SUNY or the Chancellor. The Board of Regents authorized only three of the schools. However, the Board of Regents authorizes many charter schools in New York State outside of the city.



Who operates New York City's charter schools?

Distinct from the authorizer is the operating agency. There are three broadly-defined types of operating agencies in New York City: non-profit Community Grown Organizations (CGOs), non-profit Charter Management Organizations (CMOs), and for-profit Education Management Organizations (EMOs). CMOs and EMOs are formal organizations that exist to manage charter schools. Some larger ones in New York City are the KIPP Foundation (CMO), Achievement First (CMO), and Victory Schools (EMO), all of which operate multiple schools in the city. CGOs, on the other hand, are much more varied. They may consist of a group of parents and teachers, or a community organization that already provides social services to local residents, or an individual from the business world who partners with people working in education. Some CGOs operate multiple schools--for instance, Harlem Children's Zone and Harlem Village Academies. As Figure 1c shows, a little over half of the charter schools covered by this report are CGOs. A smaller

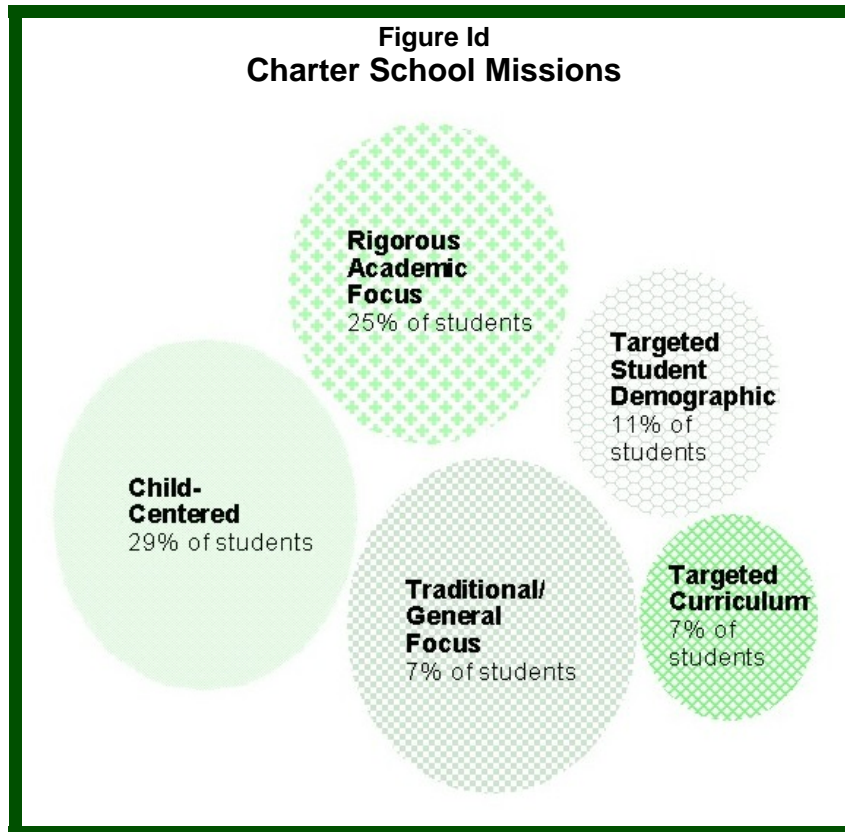
proportion are CMOs and even smaller proportion are EMOs, though the EMOs enroll more students than the CMOs. Conversion charter schools have been grouped under CGOs because many of them were started as non-traditional public schools by groups of parents and teachers or community organizations.



Do all charter schools have the same mission?

Charter schools craft a mission statement that describes their overall vision and focus as a school. Schools with the same operating agency sometimes share the same mission statement, but they do not always do so. A school's mission statement is a strong indicator to parents, students, school staff members, and the public of the school's educational philosophy. In New York City, there are several broad educational philosophies held by clusters of schools. Obviously, there is no way to summarize the schools' carefully crafted mission statements in a simple framework, and we encourage people to read each statement for itself. They reveal a variety of thoughtful educational strategies and policies.

While we cannot reduce mission statements to simple variables, we can categorize them roughly. Using the statements, we grouped charter school into five broad missions (in descending order of prevalence): a child-centered or progressive philosophy (29 percent of students), a general or traditional educational mission (28 percent of students), a rigorous academic focus (25 percent), a mission to serve a targeted population of students (11 percent of students), and a mission to offer a specific curriculum (7 percent of students). Figure 1d shows the proportions of students and schools in each category.



While clearly there is much overlap in schools' missions, there are a few key features of schools' statements that helped us categorize them. Child-centered or progressive schools typically seek to develop students' love of learning, respect for others, and creativity. Such schools' mission statements may also focus on helping students realize their potential and on building strong connections between students and their families and communities. Schools with a general or traditional educational mission typically seek to develop students' core skills and would like to see their students meet or exceed New York State academic standards. Schools with a rigorous academic focus are characterized by mission statements that almost exclusively mention academic pursuits such as excelling in school and going to college. These schools also frequently state that they would like students to become leaders. Schools with a mission to serve a targeted population of students use their statement to describe their target: low-income students, special needs students, drop-outs, male students, female students. The targeted curriculum category contains schools that use a special focus, such as science or the arts, to structure their whole curriculum.

Does each charter school have its own policies and practices?

We cannot emphasize too often that charter schools are not all alike. In fact, there are many reasons to expect charter schools to differ. They are independent and fairly autonomous. Their founding groups or agencies have a variety of histories. They are most often start-ups and therefore more likely to experiment with new policies than are established schools. On the other hand, there are some reasons to think that charter schools will share certain policies. We have seen that they commonly serve disadvantaged students; they are all under pressure to attract parents and to satisfy their authorizers; they may imitate one another consciously (as when they purposely adopt another school's policy that seems to be working) or unconsciously (as when teachers who have worked at

one school are hired by another and bring their knowledge with them).

It is no surprise, therefore, that charter schools in New York City exhibit a variety of policies, but that there are still distinguishable patterns. Table Ic shows the policies of the charter schools covered by this year's report. Of course, we are only able to include characteristics that can be measured objectively with data that are available for most schools. Schools have many characteristics that plausibly affect student achievement but that are not measurable. For instance, the leadership style of the school head is important, but it is very difficult to measure in a way that is consistent across schools.

There are two things to take away from an examination of charter schools' policies, as shown in Table Ic. First, we can gauge what policy innovations the charter schools have made. Second, we can appreciate the *range* of policies pursued by charter schools. In Chapter V, we will show that different charter schools have different effects on achievement, and we will attempt to see which policies are associated with more positive effects on achievement.

There are a few policies that the vast majority of charter schools in New York City have adopted but that are uncommon in the traditional public schools. 89 percent of charter school students wear school uniforms or follow a strict dress code. 92 percent of charter school students take approximately two internal evaluations each year. An internal evaluation is a test that used to track students' progress and to identify students who need extra or different instruction. Popular tests include Terra Nova, the Iowa Test of Basic Skills, and the Stanford 9. Such evaluations are not required by the state or city. *All* charter schools administer the New York State standardized exams.

89 percent of students who attend charter schools that serve middle or high school grades experience an advisory system. In an advisory system, a teacher or pair of teachers is assigned to a group of students for an entire school year. Teachers meet frequently (daily or weekly) with their students and are responsible for making sure that each student is making progress and is not "falling through the cracks." Because elementary schools typically assign students to a single teacher for most of the school day, advisory systems would be duplicative and are therefore not used by them.

The average charter school student experiences a school year that is 192 days long. In other words, they attend school for an extra two and a half weeks each year. (A 180-day school year is used by the traditional public schools.) It is interesting to note that a small number of charter schools have very extended school years of 200 to 220 days (four to eight extra weeks). The average charter school student experiences a school day that is 8 hours long.

The average charter school student experiences a school year that is 192 days long. In other words, they attend school for an extra two and a half weeks each year.

This is about 90 minutes more per day than the traditional public schools. The average charter school student learns English language arts (reading) for 112 minutes per day. 90 minutes is the length of the literacy block mandated for elementary school grades by the Children First initiative in New York City. Half the charter school students learn math for ninety or more minutes per day, where regular public elementary schools in New York City are required to have between 60 and 75 minutes of math instruction daily, depending on the grade. The majority of charter school students attend a school that offers Saturday School (sometimes mandatory, sometimes optional), and the

vast majority attend a school that has an after-school program.

There are no dominant math or English language arts curricula in the New York City charter schools although substantial minorities of students experience Saxon Math, Everyday Math, SRA reading, or Open Court reading. About a quarter of students experience a curriculum developed by their own school or its operating agency. See the Frequently Asked Questions for short descriptions of each curriculum. Two-thirds of charter school students learn via a direct instruction teaching style in at least their math class. Direct instruction is a method of teaching that emphasizes the explicit introduction of skills through lectures, scripted exercises, or demonstrations. It is often contrasted with methods in which a student learns by doing. These other methods are variously known as exploratory learning, discovery learning, or inquiry-based learning.¹

The average class size experienced by charter school students is 23. We are wary of comparing this number to the numbers for traditional public schools that are reported in New York City's annual class size report. Our caution is due to the fact that the charter school number is based on schools' informal self-reports and the traditional public school numbers are based on registers. We conclude that class size is in about the same range for the same grades in the charter and traditional public schools.

At least 22 percent of charter school students experience a "small rewards/small punishments" disciplinary strategy. This strategy is based on the idea that rewarding small courtesies and penalizing small infractions is important. Such discipline is usually carried out in the classroom and sometimes employs an explicit system of points. This is in contrast to disciplinary strategies that focus more on preventing or punishing large infractions and that are carried out mainly by administrators above the classroom level. A school may call its disciplinary policy by a variety of names but we classified it as "small rewards/small punishments" if it clearly fit the description given above. Since we erred on the side of not classifying a school if its strategy was hard to characterize, we believe that the 22 percent number understates the share of charter schools with small rewards/small punishments.

About half of charter schools students attend a school where parents are asked to sign a contract. These contracts are not legally enforceable, but they may help to set parents' beliefs about what the school expects of them. A typical parent contract specifies expectations about attendance, on-time arrival at school, homework, and similar issues.

For about 60 percent of charter school teachers, some of their pay is based on their performance and duties they undertake. The standard pay scale experienced by teachers in the traditional public schools is largely based on seniority and credentials, such as whether a teacher has a master's degree. The standard scale does allow pay to depend a little on duties but it does not

For about 60 percent of charter school teachers, some of their pay is based on their performance and duties they undertake.

allow pay to depend on performance, such as whether a teacher raises her students' achievement. Although a small minority of New York City charter schools do have unionized teachers, this phenomenon is not as interesting as it seems at first glance. The vast majority of the unionized charter school teachers are in the conversion charter schools, all of which converted with

unionization in place. Since all the conversion schools were experimental and fairly autonomous *before* they converted, it is not clear that they have ever had typical unionized environments.

Many of the policies just described tend to appear in “packages.” For example, it is very common for schools with a long school year also to have a long school day. Because such packages exist, charter schools do fall into types that parents and authorizers should be able to recognize. We discuss the association between schools' policies and their effect on achievement in Chapter V.

Table 1c
Policies and Characteristics of New York City Charter Schools

	<i>average for NYC charter school students</i>
Years that school has been operating	6
Operated by a Charter Management Organization (CMO)	29%
Operated by an Education Management Organization (EMO)	21%
Operated by a Community Grown Organization (CGO)	49%
Number of days in the school year	192
Number of hours in the school day	8
Saturday school (mandatory for all or certain students)	57%
Optional after-school program available	80%
Number of minutes of English language arts per day	112
Long mathematics period (90 minutes or more)	50%
Saxon math curriculum	39%
Scott Foresman math curriculum	8%
Everyday Math curriculum	30%
SRA reading curriculum	15%
Scott Foresman reading curriculum	10%
Open Court reading curriculum	25%
Core Knowledge curriculum	17%
School's/operating agency's own math and language arts curriculum	28%
Direct instruction style of teaching	66%
Class size	23
Internal evaluations regularly administered	92%
Number of internal evaluations per year	2
Student-faculty advisory (middle and high schools)	82%
School uniforms or strict dress code	89%
Small rewards/small punishments disciplinary philosophy	22%
Parent contract	52%
Seat on the Board of Trustees reserved for a parent	58%
Teacher pay based on performance/duties (not just seniority and credentials)	59%
Number of school leaders	2

Notes: Table describes the schools covered by this report. Schools' characteristics are weighted by their 2007-08 enrollment, so the table represents the experience of New York City charter school students.

Table 1d
New York City Charter Schools, in order of when they opened

<i>School Name</i>	<i>Year Opened</i>	<i>Grades Offered as of 2008-09</i>	<i>Grades the School Plans to Offer</i>
Sisulu-Walker CS	1999	K-5	K-5
Amber CS	2000	K-6	K-6
Bronx Preparatory CS	2000	5-12	5-12
Brooklyn CS	2000	K-5	K-5
Community Partnership CS	2000	K-5	K-5
Harbor Sciences and Arts CS	2000	1-8	1-8
John V. Lindsay Wildcat Academy CS	2000	9-12	9-12
Kipp Academy CS	2000	5-8	5-9
Merrick Academy CS	2000	K-6	K-6
Renaissance CS, The	2000	K-12	K-12
Beginning with Children CS	2001	K-8	K-8
Carl C. Icahn CS	2001	K-8	K-8
Family Life Academy CS	2001	K-5	K-5
Harlem Day CS	2001	K-5	K-5
Harriet Tubman CS	2001	K-8	K-8
Explore CS	2002	K-8	K-8
Our World Neighborhood Charter	2002	K-8	K-8
Bronx CS for Better Learning	2003	K-5	K-5
Bronx CS for the Arts	2003	K-6	K-6
Brooklyn Excelsior CS	2003	K-8	K-8
Harlem Village Academy CS	2003	5-10	5-12
KIPP S.T.A.R. College Preparatory CS	2003	5-8	5-9
Bronx CS for Children	2004	K-5	K-5
Bronx CS for Excellence	2004	K-5	K-5
Bronx Lighthouse CS, The	2004	K-6	K-12
Excellence CS of Bedford Stuyvesant	2004	K-5	K-8
Grand Concourse CS of New York	2004	K-5	K-5
Opportunity CS, The	2004	6-11	6-11
Peninsula Preparatory Academy CS	2004	K-5	K-5
Williamsburg Charter High School	2004	9-12	9-12
Achievement First Crown Heights CS	2005	K-3, 5-7	K-9
Achievement First East New York CS	2005	K-3	K-7
Future Leaders Institute CS	2005	K-8	K-8
Girls Preparatory CS of New York (Lower E Side)	2005	K-4	K-5
Harlem Children's Zone/ Promise Academy CS	2005	K-5, 8-9	K-10
Harlem Children's Zone/ Promise Academy II	2005	K-4	K-5
Harlem Link CS	2005	K-4	K-5
Harlem Village Academy Leadership CS	2005	5-8	5-9

Table 1d, continued
New York City Charter Schools, in order of when they opened

<i>School Name</i>	<i>Year Opened</i>	<i>Grades Offered as of 2008-09</i>	<i>Grades the School Plans to Offer</i>
Harlem Village Academy Leadership CS	2005	5-8	5-9
Hellenic Classical CS	2005	K-7	K-7
Kipp AMP (Always Mentally Prepared) CS	2005	5-8	5-9
Kipp Infinity CS	2005	5-8	5-9
Manhattan CS	2005	K-4	K-5
South Bronx CS for Int'l Culture & the Arts	2005	K-4	K-5
UFT CS	2005	K-4	K-12
Williamsburg Collegiate CS	2005	5-8	5-9
Achievement First Bushwick CS	2006	K-6	K-8
Achievement First Endeavor CS	2006	5-7	5-8
Community Roots CS	2006	K-3	K-5
Democracy Prep CS	2006	6-8	6-9
East New York Preparatory CS	2006	K-3	K-8
Harlem Success Academy 1 CS	2006	K-3	K-4
Hyde Leadership CS	2006	K-2, 6-8	K-12
International Leadership CS	2006	9-11	9-12
Leadership Prep CS	2006	K-3	K-4
New Heights Academy CS	2006	6-7, 9-11	5-12
Ross Global Academy CS	2006	K-3, 6-8	K-12
South Bronx Classical CS	2006	K-3	K-5
Carl C. Icahn Bronx North CS II	2007	K, 2-3	K-5
Kings Collegiate CS	2007	5-6	5-8
Achievement First Brownsville CS	2008	K-1	K-7
Bedford Stuyvesant Collegiate CS	2008	5	5-12
Bronx Academy of Promise CS	2008	K-2	K-8
Bronx Community CS	2008	K-1	K-8
Bronx Global Learning Institute for Girls CS	2008	K-1	K-5
Brooklyn Ascend CS	2008	K-2	K-12
Carl C. Icahn South Bronx CS III	2008	K, 1	K-5
DREAM CS	2008	K-1	K-8
Green Dot NY CS	2008	9	9-12
Harlem Success Academy 2 CS	2008	K-1	K-5
Harlem Success Academy 3 CS	2008	K-1	K-5
Harlem Success Academy 4 CS	2008	K-1	K-5
La Cima CS	2008	K-1	K-5
Mott Haven Academy CS	2008	K-1	K-8

Table 1d, continued
New York City Charter Schools, in order of when they opened

<i>School Name</i>	<i>Year Opened</i>	<i>Grades Offered as of 2008-09</i>	<i>Grades the School Plans to Offer</i>
NYC Charter High School for Architecture, Engineering, & Construction Industries	2008	9	9-12
PAVE Academy CS	2008	K-1	K-5
St. HOPE Leadership Academy CS	2008	5-7	6-12
VOICE CS of New York	2008	K-1	K-8
Academic Leadership CS	2009		K-5
Believe Northside CS	2009		9-12
Believe Southside CS	2009		9-12
Brooklyn Prospect CS	2009		6-12
Brooklyn Scholars CS	2009		K-8
Brownsville Ascend CS	2009		K-6
Brownsville Collegiate CS	2009		5-9
Carl C. Icahn CS IV	2009		K-6
Coney Island Prep CS	2009		5-12
Crown Heights Collegiate CS	2009		5-8
Equality CS	2009		6-11
Equity Project CS, The	2009		5-8
Ethical Community CS	2009		K-12
Excellence CS for Girls	2009		K-8
Explore II CS	2009		K-8
Fahari Academy CS	2009		5-12
Girls Preparatory CS of East Harlem/Bronx	2009		K-4
Growing Up Green CS	2009		K-5
Hebrew Language Academy CS	2009		K-5
John W. Lavelle Preparatory CS	2009		6-12
Leadership Prep. East New York/Brownsville CS	2009		K-8
Summit Academy CS	2009		6-12
Achievement First North Crown Heights CS	2010		not yet known
East New York Collegiate CS	2010		not yet known
Leadership Preparatory Brownsville CS	2010		not yet known
Leadership Preparatory Flatbush CS	2010		not yet known

CHAPTER II. THE STUDENTS OF NEW YORK CITY'S CHARTER SCHOOLS

In this chapter, we look at who applies to New York City charter schools. How do they compare to New York City students as a whole? How do they compare to the students who were lotteried-in? Finally, how do they compare to the students who ultimately chose to enroll in charter schools?

There are no right or wrong answers to these questions. There is no group of students who is supposed to apply to charter schools and there is no group of students who is not supposed to apply. Furthermore, students are not *supposed* to attend just because they apply and are offered a place.

This report analyzes achievement results up through 2007-08 and includes 93 percent of all applicants who were taking tests in that year or a previous year. However, this report does not include students who applied to a charter school in 2006 or 2007, most of whom were kindergarteners, first, or second graders in 2007-08. Thus, throughout this chapter, when we refer to the "most recent year of applicants," we are referring to 2005-06.

The race, ethnicity, and gender of New York City's charter school applicants

Before looking at statistics on the race and ethnicity of charter school applicants in New York City, it is important to discuss a fact that often causes confusion. As will be seen, New York City's charter schools draw from a student population that is overwhelmingly black and Hispanic. Therefore, if a school's applicants are disproportionately more black, they will automatically be disproportionately less Hispanic. If a school's applicants are disproportionately more Hispanic, they will automatically be disproportionately less black. This is somewhat confusing because, in most areas of the U.S., when we hear that a school is more black or more Hispanic, we (correctly) assume that this means that the school is less white. However, in the neighborhoods from which New York City charter schools draw, this assumption would be incorrect. The white share of these neighborhoods is so small that a school cannot become much more black or much more Hispanic by becoming much less white.

The bottom line is that when we say that a charter school is more black, we are automatically saying that it is less Hispanic, and vice versa. If a school is more black and less Hispanic, these are *not* two separate findings: they are two ways of stating the same finding.

Table IIa shows the race, ethnicity, and gender of students who applied to New York City's charter schools, students who were lotteried-in, and students who actually enrolled in the charter schools. The table also shows a column for New York City as a whole. By comparing charter school applicants to this column, we learn how the presence of charter schools is changing the population of students who attend the city's whole system traditional public schools.

To ensure that the columns of Table IIa can be compared, we used data from the same school years (2000-01 to 2005-06) to construct each column.

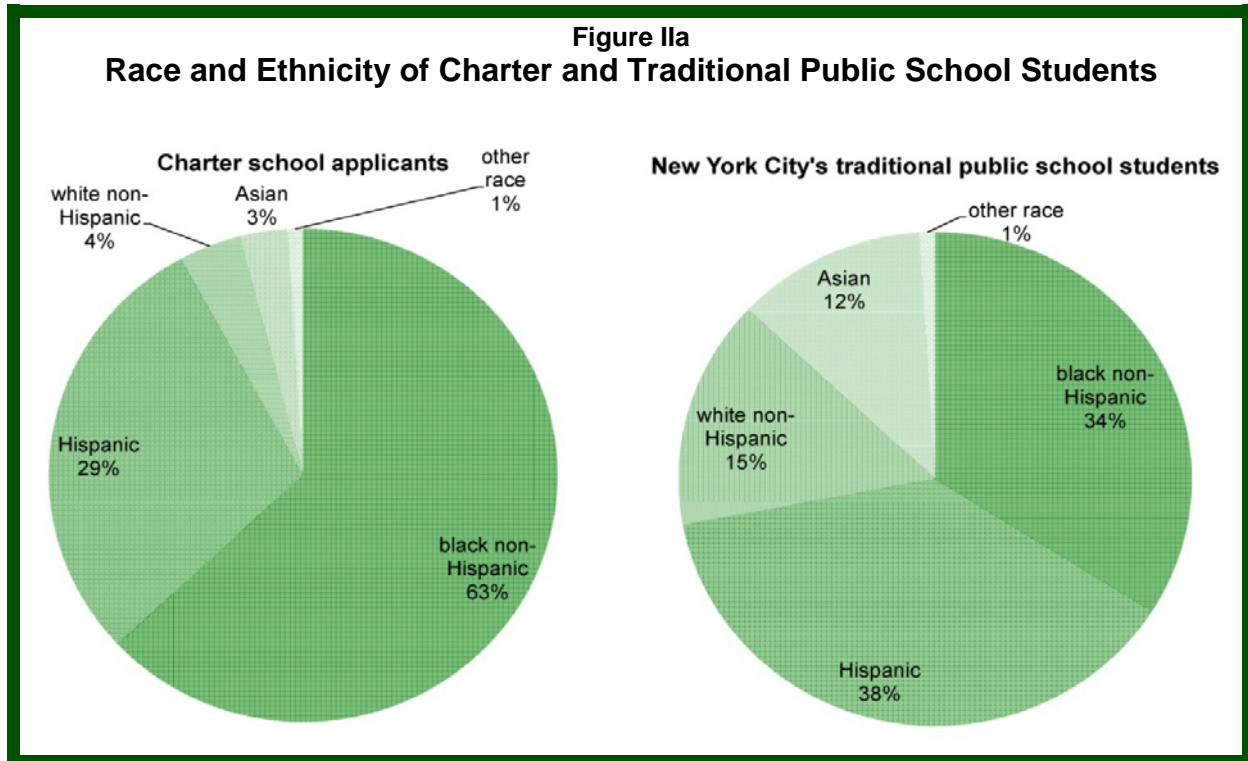
Table IIa
The Race, Ethnicity, and Gender of Charter School Applicants and Students in the Traditional Public Schools

	<i>All applicants to charter schools</i>	<i>Applicants who were lotteried-in</i>	<i>Applicants who enrolled in charter schools</i>	<i>New York City's traditional public schools</i>
% black non-Hispanic	63	64	61	34
% white non-Hispanic	4	4	4	15
% Hispanic	29	28	29	38
% Asian	3	3	4	12
% other race	<1	<1	<1	<1
% female	50	50	52	50

Note: The table includes data for all years of applicants covered by this report: 2000-01 to 2005-06.

Table IIa shows that New York City's charter school applicants were very largely black (63 percent) and Hispanic (29 percent). Only a few percent were white, Asian, or another race. (Because percentages are rounded to the nearest whole number, the race and ethnicity percentages may not add up to 100.) The lotteried-in applicants look just like the applicants as a whole. Formally, there are no statistically significant differences between the lotteried-in applicants and lotteried-out applicants. This confirms that the lotteries were indeed random. The students who enrolled in charter schools also look like a random subset of applicants. They were nearly all black (61 percent) or Hispanic (29 percent). Formally, the students who enrolled are not statistically significantly different than those who applied.

New York City's charter school applicants were very largely black (63 percent) and Hispanic (29 percent). Only a few percent were white, Asian, or another race.



Comparing the charter school students to traditional public schools citywide (Figure IIa), we see that charter school applicants were almost twice as likely to be black as the average traditional public school student. As already discussed, saying that a student is more likely to be black is roughly equivalent to saying that he is less likely to be Hispanic, and this is indeed true. Because they were more likely to be black, charter school applicants in our study were about 10 percentage points less likely to be Hispanic than the average traditional public school student.

Summing up, New York City's charter school students are disproportionately black and disproportionately not white or Asian. The existence of charter schools in the city therefore leaves the traditional public schools less black, more white, and more Asian.

The existence of charter schools in the city leaves the traditional public schools less black, more white, and more Asian.

Charter school applicants, lotteried-in applicants, and charter school enrollees are all about equally likely to be male and female. So too are students in New York City's traditional public schools.

Prior test scores of New York City's charter school applicants

People are often interested in the prior test scores of students who apply to charter schools because they would like to know whether a district's high-achievers or low-achievers are disproportionately applying to charter schools.

Unfortunately, there is a serious problem with studying the prior test scores of charter school applicants. Because students do not take tests until grade three, we only have prior test scores for students who apply to grades four or higher from another New York City public school. This gives us prior test scores for only 22 percent of applicants. There is just no guarantee that such applicants are typical of charter school applicants. Logically we expect them to be *atypical* because they are disproportionately students who are not applying to an intake grade.

It would be unwise to use data on only 22 percent of applicants to draw conclusions about how charter schools affect the student population that attends traditional public schools. It is simply impossible to compare the prior test scores of the *average* charter school applicant to the *average* student in New York City.

We *can*, however, compare the prior test scores of charter school applicants to those who are lotteried-in and to those who enroll in charter schools. These are apples-to-apples comparisons, and they show that the lotteries are random.

With these caveats in mind, examine Table Iib. It shows the prior test scores of charter school applicants, lotteried-in students, and students who enroll in charter schools. All of the scores are expressed as *standard scores*. A standard score is created by subtracting the New York City-wide mean score from a student's score and dividing the resulting difference by the New York City-wide standard deviation. This procedure puts all scores on the same basis. (The New York City-wide means and standard deviations are specific to each grade tested and each year of testing.)

Standard scores are very commonly used in education studies. They are also called z-values, z-scores, normal scores, and standardized variables. Expressing an achievement change in standard scores or standard deviations is often called the "effect size."

Standard scores are ideal for studies like this, where we follow students over several grades and several school years. With the standard scores, we can make computations that are unaffected by superficial changes in the way New York State scored tests. Also, effects that are expressed in standard scores can be compared to the effects of any other policy that might affect achievement.

If a standard score changes by 1, that means that a student's score has changed by a whole standard deviation. A standard deviation is a *large* difference in achievement. On most tests it corresponds to more than a grade's worth of learning and more than a performance level.

Because the New York City-wide mean and standard deviation are used to create the standard scores, the traditional public school system will always have an average standard score of zero.

**Table IIb
Prior Test Scores of Charter School Applicants
and Students in the Traditional Public Schools**

	<i>All applicants to charter schools</i>	<i>Applicants who were lotteried-in</i>	<i>Applicants who enrolled in charter schools</i>	<i>New York City's traditional public schools</i>
Math standard score	-0.002	-0.014	-0.012	0
English language arts standard score	-0.007	-0.006	-0.007	0

Note: None of the standard scores shown in three applicant-based columns of the table is statistically significantly different from any of the other standard scores shown in these columns. The data are for all years of applicants covered by this report: 2000-01 to 2005-06. Because about 80 percent of charter school applicants have not taken a prior test when they apply, the above table is not representative of New York City charter school applicants. It is accurate for the subset of applicants who do have a prior test score.

The main conclusion to draw from Table IIb is that, *as regards the lotteries for which prior test scores are available*, the lotteries were indeed random. Also, the students who actually enrolled in charter schools were a random subset of those who were lotteried-in. The math standard score of applicants is -0.002, which is not statistically significantly different from the math standard score of lotteried-in students (-0.014), which is again not statistically significantly different from the math standard score of students who enrolled in charter schools (-0.012). The same can be said for the English language arts scores.

For the reasons given above, it is not possible to draw conclusions about how charter school applicants' achievement compares to that of students in New York City's traditional public schools.

Free and reduced-price lunch, special education, and English Learner services participation of New York City's charter school applicants

It is also interesting to know whether charter school applicants participate in the National School free and reduced-price Lunch program, special education, and/or services for English Learners. (Participation in the National School Lunch Program is often used a rough proxy for income because a student generally cannot participate if his family's income is higher than 185 percent of the federal poverty line. This threshold is currently \$40,792 for a family of four.)

It would be nice if schools had some objective, consistent way of recording whether students were *eligible* for these programs because we would then know which students were poor, which were disabled, and which were not native English speakers. Unfortunately, eligibility is not what is recorded. Instead, schools record whether students participate in the programs. Participation is not the same thing as eligibility, and participation is influenced by the school the student attends. Our previous report describes, in detail, the numerous ways in which participation measures are problematic when some students are attending traditional public schools and other students are

attending charter schools. The problem boils down to the fact that the traditional public schools and charter schools not only do not record eligibility, they do not even record participation in the same way.

Because of these measurement difficulties, we will look at charter school applicants' program participation *at the time they applied*. By focusing on the time when they applied, we can see how participation was recorded by the traditional public school system. This allows us to perform comparisons on data that were recorded in a consistent manner.

Unfortunately, although examining program participation at the time students applied to charter schools is helpful to some extent, we are left with the problem that the modal charter school applicant does not have a history of program participation. This is because he is applying to kindergarten or first grade (see Table Ia) and therefore has little or no history in the traditional public schools. In short, the data on program participation is not representative of charter school applicants, and we will not be able to say what the *average* charter school applicant was like. The problem is akin to the problem of not having prior test scores for all applicants.

We present information on students' program participation at the time they applied, making a simple adjustment for the fact that charter schools have a disproportionate number of students in their early grades. (For instance, a charter school that is "rolling-up" may only have students in kindergarten through grade three. We need to compare the program participation of its applicants to students who are in the same grades in the traditional public schools. The adjustment is easily accomplished by weighting the data on charter school applicants so that they have the same grade composition as the traditional public schools.²)

Table IIc
Prior Program Participation of Charter School Applicants and Students in the Traditional Public Schools

	<i>All applicants to charter schools</i>	<i>Applicants who were lotteried-in</i>	<i>Applicants who enrolled in charter schools</i>	<i>New York City's traditional public schools</i>
% who participated in the Free or Reduced-Price lunch program (at the time they applied if applicants)	92	91	91	72
% who participated in special education (at the time they applied if applicants)	11	11	11	13
% who used services for English Learners (at the time they applied if applicants)	4	4	4	14

Note: For the columns dealing with charter school applicants, the participation information is recorded at the time the applicant applied to a charter school. The data are reweighted so that the charter school applicants have the same grade composition as students in the traditional public schools. The table includes data for all years of applicants covered by this report: 2000-01 to 2005-06.

The main conclusion to draw from Table IIc is that, *as regards applicants for whom a program participation history existed at the time they applied*, the lotteries were indeed random. Also, the students who actually enrolled in charter schools were a random subset of those who were lotteried-in. For instance, 92 percent of applicants participated in the free or reduced-price lunch program, 91 percent of the lotteried-in participated in the same program, and 91 percent of students who enrolled in charter schools participated in the same program. These numbers are not statistically significantly different from one another. Similarly, the same percentage of applicants, lotteried-in students, and charter school enrollees participated in special education (11 percent) and in services for English Learners (4 percent).

For the reasons given above, it is not possible to draw firm conclusions about how charter school applicants' program participation compares to that of students in New York City's traditional public schools. However, the data suggest that--if anything-- charter school applicants were poorer than the average student in New York City's traditional public schools or the composite feeder school. It appears that they had about the same probability of participating in special education, and they were less likely to be participating in services for English Learners. This last conclusion makes sense because we know that they were less likely to be Hispanic, and most English Learners in the New York City schools are Hispanic. However, all of the above conclusions are tentative because they are not based on representative data.

Summing up: charter school applicants

The data indicate that charter school applicants are much more likely to be black (and, thus, somewhat less likely to Hispanic) than the average student in New York City's traditional public schools. Charter school applicants are also much less likely to be white or Asian than the average student in the city's traditional public schools. It is safe to conclude that charter school applicants were poorer than the traditional public school students. However, on prior test scores, special education, and English learner services, it is impossible to make firm comparisons between the average charter school applicant and the average traditional public school student. The numbers suggest that the charter school applicants and traditional public school students are fairly similar on these grounds, and it is not possible to be more exact because there are no data that accurately represent the average charter school applicant.

The data indicate that the charter schools' lotteries were indeed random. See the study's previous report and technical report for more detail on this point.

The data also indicate that the students who actually enrolled in the charter schools were a random subset of the students who were lotteried-in.

Charter school applicants are poorer than the average New York City public school student.

The data indicate that the charter schools' lotteries were indeed random. The data also indicate that the students who actually enrolled in the charter schools were a random subset of the students who were lotteried-in.

CHAPTER III. THE SUPERIORITY OF LOTTERY-BASED ANALYSIS

Why is lottery-based evaluation the gold standard?

Lottery-based analysis is *by far* the best way to determine the effect of a charter school on the achievement of the sort of students who tend to apply to charter schools. In fact, lottery-based analysis produces results that are so much more reliable than those of any other method that no other results should be given any credence when lottery-based results are available. Only when lottery-based results are unavailable should one turn to other methods--and even then only with caution. If a charter school runs a lottery, its effects on achievement should be evaluated via the lottery method, even if this involves gathering some data.

Guaranteeing an "apples to apples" comparison

While students at traditional public schools normally attend the school closest to where they live, students attending charter schools have specifically chosen to apply to them. Thus, if we simply compare students who attend a charter school to students who attend traditional public schools, we may be comparing "apples to oranges." We will almost certainly confuse evidence on the *effects* of the charter school with evidence on who *selects into* the charter school. This is known as selection bias.

Lottery-based analysis completely eliminates this bias so long as a charter school holds a random lottery among applicants and has a sufficient number of lotteried-in and lotteried-out students. Intuitively, the reason why lottery-based analysis eliminates bias is that *both* the lotteried-in and lotteried-out students have applied to the same charter school, so there is no difference in selection between the two groups.

What about students who are offered a charter school place via a lottery but who decide not to attend?

We conduct a lottery-based analysis that accounts for the fact that some students who are lotteried-in decide not to attend the charter school after all. The basic intuition is this: we adjust the achievement differences between lotteried-in and lotteried-out students to take account of the fact

that only some percentage of lotteried-in students enroll in charter schools. For instance, if 90 percent of lotteried-in students actually enroll in charter schools, the adjustment factor would be 90 percent. This adjustment is the standard procedure in lottery-based studies, including medical trials.

Readers who have some technical expertise will want to know that, formally, we estimate treatment-on-the-treated effects by using lotteried-in status as an instrument for enrollment. This gives us the same results as we would get using the Wald method (described in the previous paragraph), but it allows us to test the robustness of the results by controlling for covariates. More information is available in our technical report.

What about other evaluation methods, for occasions when lottery-based analysis is not available?

When lottery-based analysis is not available, researchers usually compare charter school students to students in traditional public schools, most of whom did not apply to charter schools. These comparisons are usually biased. Researchers may be able to remedy some of the bias by using statistical methods to adjust for differences that we can readily observe between students who do and do not apply to charter schools. Unfortunately, a researcher does not really know when the statistical adjustments are making the bias better and when they are making the bias worse! The only way to know for sure is to compare the statistically adjusted results to results from a lottery-based study of the same data. However, if we have lottery-based results, there is really no point in computing statistically adjusted results.

How about analyzing gains in achievement?

Lottery-based analysis automatically analyzes gains since we start with two groups who are identical (lotteried-in and lotteried-out) and follow their progress.

However, when people say that they are doing "gains analysis," they usually are not referring to lottery-based analysis. As a rule, they are talking about comparing the *gains* made by charter school students to the *gains* made by traditional public school students. Comparing gains can be helpful, just as statistical adjustments can be helpful. Unfortunately, like statistical adjustments, comparing gains can make the selection bias worse.

We have just described a couple of methods that *can* work well but do not reliably work well. These two methods (statistical adjustment and comparison of gains) tend to work better when used by a really expert researcher, but it is not easy for people to judge who is expert and who is not. Even in the hands of an expert researcher, these methods can go wrong.

Are there any evaluation methods that should not be used?

There are a couple of methods that should not be used because, instead of making the selection bias better, they make it dramatically worse. These methods are: (1) pure value-added and (2) matching based on students' prior history in the traditional public schools ("TPS-history-matching"). Both methods have been used by a variety of researchers. We describe them below.

First, let us understand the basic problem, something that requires no technical expertise. Think about applying to charter school from the family's point of view. If a family decides to apply for a kindergarten place in a charter school, it is probably thinking that the charter school provides a better

environment than the traditional public school its child would otherwise attend. Families that make such decisions might be more motivated or might be more disadvantaged, and this is one form of selection bias.

However, a family that puts its kindergarten-aged child in a lottery is probably *not* doing so because it detects that the child has started in struggle in school or does not fit in at his traditional public school. In fact, since the child has never yet attended school, the family really could not detect such things. Thus, there is *not* selection bias of the type that would come from students applying only if their families already detected that they were on a bad trajectory.

Thus, with the kindergarten applicant, we have one form of selection bias (families who apply are different) but not the second form of selection bias (students who apply are known by their families to be on a bad trajectory). Let us call the second type of selection bias "switcher bias" to make it memorable.

Now, let us think about a family who decides that its child should apply for a fourth grade place in a charter school. Fourth grade is not an intake grade and it is not an early grade, so the family is deciding that its child should be separated from classmates and a school that he or she knows well. This is not a decision that a family would take lightly. When we see a family do this, we should immediately suspect that the family has detected that the child is going off the trajectory it expected him or her to be on. Perhaps something is wrong with his traditional public school experience; perhaps something is wrong with his classmate interactions; perhaps something is wrong at home. Whatever the cause, we now have a serious problem of switcher bias.

In general, switcher bias is less of a problem when a student is applying to an earlier grade because, the earlier the grade, the less their families are detaching them from a familiar school and classmates. Switcher bias is also somewhat lower for intake grades than non-intake grades, especially if lots of students change schools at a certain intake grade. For instance, if nearly all students have to go to an unfamiliar school with unfamiliar classmates in the ninth grade *anyway*, the family is not making a very dramatic decision when it decides that its prospective ninth grader should apply to a charter school. The bottom line is that switcher bias is worse in grades that are higher and grades in which few students *have* to switch to an unfamiliar school with unfamiliar classmates.

Fortunately, switcher bias is solved by lottery-based methods because the applicants to--say--a certain charter school's fourth grade lottery have the same switcher bias on average. Thus, when we compare lotteried-in and lotteried-out students from the same lottery, the switcher bias nets out.

Unfortunately, switcher bias is nearly impossible to solve with statistical methods. This is well known. In fact, the problem has spawned a whole literature.³ Assuming that he or she cannot use a lottery-based method, the best thing for a researcher to do is minimize switcher bias by avoiding data on students who switch schools in later grades. For instance, a researcher who was forced to rely on statistical adjustments would probably be best off if he or she focused on students who applied to charter schools as kindergarteners or first graders.

The pure value-added method and the TPS-history-matching method do exactly the opposite. They

rely on students who apply to charter schools in later grades, ignoring students who apply as kindergarteners and so on. Thus, they exacerbate whatever switcher bias exists!

Let us walk through how this happens. To do pure value-added analysis, a researcher finds students who were tested at least twice in the traditional public schools, who then switched to a charter school, and who subsequently tested at least twice in the charter school. All other students' data is thrown out because the pure value-added method will not work on them. The researcher takes the student's two test scores from the traditional public schools and computes the student's gain in the traditional public schools. The researcher then takes the two test scores from the student's charter school experience and computes the student's gain in the charter school. The researcher compares these gains. Unfortunately, he is now comparing gains for those students, and only those students, who apply to charter schools in late grades. In New York City, the youngest students who could be in a pure value-added analysis would be those who applied to the fifth grade. The oldest students would be those who applied to the seventh grade.

To do the TPS-history-matching (as in the recent CREDO study), a researcher finds students who are currently in charter school but who were previously enrolled in traditional public schools long enough to establish a program participation history (free lunch participation, special education, English Learner services). Then, the researcher matches the charter school student to one or more students in his or her previous traditional public school. The match is based on whether the students have the same race and ethnicity, the same program participation, and similar prior test scores. The researcher compares each student to his or her matched counterparts. Also, a researcher can use the switchers' histories to find matches for the charter school classmates of switchers, even if these classmates are not themselves switchers. The point is that the entire matching process is based on those students, and only those students, who apply to charter schools in late grades. These switchers are non-representative students and are precisely the students for whom switcher bias is most serious. (The CREDO study also has a serious statistical problem that causes its estimates of charter schools' effects to be negatively biased. An explanation of this problem can be found in a memo posted on the website for this study: www.nber.org/~schools/charterschoolseval.)

In short, although they are different methods, pure-value analysis and TPS-history-matching share the same problem: they focus on the students who are most likely to have switcher bias. They not only do not remedy selection bias: they systemically exacerbate it. This makes them worse methods than statistical adjustment or comparison of gains, which at least do not *systemically* make bias worse.

Value-added and matching methods are used in many other contexts where they work perfectly well. There is nothing wrong with these methods *in general*. What is wrong is that, in this context, they generate estimates that are driven by a peculiarly selected group of students: the switchers.⁴

How do we *know* which evaluation methods work well?

Lottery-based results serve as a gold standard as long as they are available. We can use data like New York City's to test the different methods because each method can be used: lottery-based, statistical adjustment, comparison of gains, pure value-added, and matching-on-previous-history. When we conduct such tests, we find that statistical adjustment and comparison of gains *sometimes* work but do not reliably do so. Value-added analysis and matching-on-previous-history produce

systemically biased results, as we would logically expect them to do.⁵

What is the bottom line on methods?

Methods do matter, and some methods consistently produce misleading results. By sticking with lottery-based analysis whenever possible, you are most likely to end up with accurate results. An advantage of lottery-based analysis is that it is also easy to understand. You do not need to be an expert in statistics to see why comparing lotteried-in and lotteried-out students generates accurate estimates of the effects of charter schools.

How exactly do we use lottery-based data to estimate charter schools' effects?

Using lottery data to estimate effects is logically simple. We compute average achievement for lotteried-in students, compute average achievement for lotteried-out students, and compare them.

For the technically inclined

Some notes follow for readers who interested in knowing some technical details but who do not want to read the whole technical report.

We carry out the comparison using linear regression. The basic regression model computes the average achievement of the lotteried-out students and the difference between the achievement of the lotteried-in and lotteried-out students:

$$\textit{standard test score}_{it} = \alpha + \beta I_{it}^{\textit{lotteried-in}} + \dots + \varepsilon_{it}$$

In the equation, the subscript i keeps track of individual students, the subscript t keeps track of the year that the test was taken, $I_{it}^{\textit{lotteried-in}}$ is an indicator that a student was lotteried-in, and the last term is the error term.

There are a few things we add to the equation. First, we include an indicator variable for every lottery (for example, the kindergarten lottery in Renaissance Charter School). These indicator variables must be included because, while randomization makes the lotteried-in and lotteried-out students in any given lottery comparable, there is no guarantee that applicants to one charter school/grade combination are like the applicants to any other charter school/grade combination. Second, when a student's prior year test score is available, we control for it. This is not important and does affect the results much. (When a prior test score is not available, we use the standard procedure of including an indicator of its lack of availability and setting the missing test score to zero.) Third, we include indicator variables for the grade of the test and the year of the test. These variables are also not important because we have already standardized students' test scores.

There are reasonable arguments to be made in favor of using only balanced lotteries (those where the lotteried-in and lotteried-out students are statistically similar on all covariates) and in favor of using all lotteries. We favor using balanced lotteries where balance is determined by Hotelling's T^2 test. However, we obtain similar results when we use all lotteries.

We conduct a variety of robustness tests by adding covariates such as a student's race, ethnicity, gender, and program participation at the time of application (free lunch and so on). These also do

not affect the results much because randomization makes the lotteried-in and lotteried-out students have very similar covariates.

We estimate standard errors that are clustered at the level of the student.

As mentioned above, we used instrumental variables to estimate treatment-on-the-treated effects so that, in fairly standard notation, our estimating equations end up being:

first stage:

$$I_{it}^{attend\ charter\ school} = \delta_1 + \delta_2 I_{it}^{lotteried-in} + I_i^{lottery} \delta_3 + I_{it}^{grade} \delta_4 + I_t^{school\ year} \delta_5 + \delta_6 standard\ test\ score_{i,t-1} + v_{it}$$

second stage:

$$standard\ test\ score_{it} = \gamma_1 + \gamma_2 I_{it}^{attend\ charter\ school} + I_i^{lottery} \gamma_3 + I_{it}^{grade} \gamma_4 + I_t^{school\ year} \gamma_5 + \gamma_6 standard\ test\ score_{i,t-1} + \epsilon_{it}$$

A wealth of other detail is available in our technical report (July 2007), which is written for readers with technical expertise.

CHAPTER IV. THE EFFECTS OF NEW YORK CITY'S CHARTER SCHOOLS ON ACHIEVEMENT

A Preview of the Main Findings

If you are a reader who wants to know quickly the bottom line on achievement effects and what it all means, you may want to skip ahead to the section entitled: "What do these results mean for a child, in everyday terms?" You can then return here to learn more. We do not mind giving away the main findings right away. They are:

- *On average, a student who attended a charter school for all of grades kindergarten to eight would close about 86 percent of the achievement gap in math and 66 percent of the "Scarsdale-Harlem" achievement gap in English. A student who attended fewer grades would improve by a commensurately smaller amount.*
- *On average, his lotteried-out counterpart who stayed in the traditional public schools for all of grades kindergarten to eight would stay on grade level but would not close the "Scarsdale-Harlem" achievement gap by much. However, the lotteried-out students' performance does improve and is better than the norm in the U.S. where, as a rule, disadvantaged students fall further behind as they age.*
- *Compared to his lotteried-out counterparts, a student who attends a charter high school has Regents examination scores that are about 3 points higher for each year he spends in the charter school before taking the test. For instance, a student who took the English Comprehensive exam after three years in charter school would score about 9 points higher.*
- *A student who attends a charter high school is about 7 percent more likely to earn a Regents diploma by age 20 for each year he spends in that school. For instance, a student who spent grades ten through twelve in charter high school would have about a 21 percent higher probability of getting a Regents diploma.*

WHY TEST SCORES AND REGENTS DIPLOMAS?

Test scores and graduating with a Regents Diploma are *not* the only outcomes that we would like study when we evaluate charter schools or any schools. In fact, in future reports, we hope to study outcomes such as post-graduation pursuits (college, jobs, and so on).

For this report, however, test scores are the most practical outcome to study. This is because New York State has a fairly comprehensive system of testing, and test performance is recorded in the same way for lotteried-in students who attend charter schools and lotteried-out students who attend traditional public schools.

Math and English language arts tests are taken every year by nearly all students in grades three through eight. Fourth and eighth graders take science exams, and fifth and eighth graders take social studies exams.

Regents Examinations, which are offered in a variety of subjects, are taken by nearly all students in grades nine through twelve. To earn a Regents Diploma, a student must pass exams in Living Environment, Mathematics, Global History, Comprehensive English, and U.S. History. Students are recommended to take the examinations in a certain grade, but need not do so. The recommended exam/grade pairings are as follows: Living Environment (biology), grade 9; Math A, grade 10; Global History, grade 10; Comprehensive English, grade 11; U.S. History, grade 11.

Outcomes that are more subjective than test scores, such as disciplinary incidents or grades, may not be recorded in completely uniform manner across charter schools and traditional public schools. They would therefore furnish a more problematic basis of comparison.

We plan to study post-graduation outcomes when a larger number of charter school applicants have reached the twelfth grade. As of now, only a small share of applicants have reached this grade level, giving us insufficient statistical power to study how charter schools affect events that occur after secondary school.

ARE THE ESTIMATES REPRESENTATIVE OF NEW YORK CITY'S CHARTER SCHOOLS?

How does this study represent New York City's charter schools?

The current report covers 93 percent of New York City's charter school students who were in test-taking grades between 2000-01 and 2007-08. It is worth noting that this study is representative of New York City's charter school *students*: the more students a school has enrolled, the more influence it will have on the results of this study. Schools that have affected more students are commensurately more important in the study.

What years of achievement test results are covered by this study?

This report evaluates achievement test results from the school years starting in 2000-01 and ending in 2007-08. These are the years that are currently available in the New York City database. The next report will evaluate test results up through 2008-09.

Who has taken the statewide achievement tests at New York City's charter schools?

Most New York City charter schools open with only a subset of their planned grades. They typically add grades as their students are promoted into them. For instance, a school that plans to serve kindergarten through grade five might open with kindergarten and grade one, and then add a grade each subsequent year, ending up with its full complement of grades in its fifth year of operation.

Thus, each year of testing adds to our knowledge of charter schools in three ways. First, each year has seen the introduction of additional schools. Second, each year has seen existing schools add new grades. Third, each year has seen existing schools add test data in their existing grades. This means that this study will become stronger and more informative with each passing year.

These facts are summarized in Table IVa. The test-taking grades (third through twelfth grades) are highlighted. By 2007-08, the final year for which we currently have test data, the third grade tests are administered by 32 charter schools, the fourth grade tests are administered by 25 charter schools, the fifth grade tests by 31 schools, the sixth grade tests by 23 schools, the seventh grade tests by 20 schools, and the eighth grade tests by 15 schools. Grades nine through twelve are much more lightly represented, with ninth grade being operated by only 6 schools and twelfth grade being operated by only 4 schools.

Table IVa
Number and Grades of Charter Schools

school year	# of schools open and covered by this report	Number of schools offering grade...												
		K	1	2	3	4	5	6	7	8	9	10	11	12
1999-00	2	1	1	1	1	0	1	1	1	1	0	0	0	0
2000-01	10	6	7	4	3	2	4	4	2	2	2	2	2	2
2001-02	15	10	12	10	6	4	5	5	5	3	2	2	2	2
2002-03	17	12	13	14	12	7	7	5	5	6	2	2	2	2
2003-04	22	16	17	15	16	13	11	6	5	6	3	2	2	2
2004-05	31	23	24	20	15	16	17	12	7	6	4	3	2	2
2005-06	43	33	35	26	22	17	26	18	11	9	4	4	3	2
2006-07	43	32	34	34	25	21	27	23	16	12	5	4	4	3
2007-08	43	32	34	34	32	25	31	23	20	16	6	5	4	4

Notes: The table shows the grades offered by the New York City charter schools that are covered by this report (more are participating in this study and will be covered by future reports). Highlighted areas mark years in which students take New York State tests for which we have data.

Were the vast majority of New York City's charter schools students admitted via a lottery?

Yes. 94 percent of the students covered by this report were admitted to a charter school through a lottery. This prevalence of admissions lotteries makes lottery-based evaluation very appropriate for New York City's charter schools.

The prevalence of admissions lotteries makes lottery-based evaluation very appropriate for New York City's charter schools.

The small percentage of students who were not admitted through a lottery fall into one of two categories. They applied for a place that was not oversubscribed. Or, they are disabled or a drop-out. Both types of students are served by particular charter schools that do not hold lotteries for some of their places because they offer an environment designed for students with special conditions.

Are there enough data to analyze achievement?

See Table IVb for the number of students covered by this report who took each test in each school year from 2000-01 to 2007-08. The numbers shown include both the lotteried-in and lotteried-out students, and the numbers largely reflect how many charter schools offered each grade in each school year (Table IVa).

There are thousands of students who took the third through eighth grade tests. There are at least one thousand students who took each Regents exam. These numbers of observations give us sufficient statistical power to determine whether charter schools are affecting students' achievement.

Table IVb
Number of Students Available for Assessing the Achievement Effects of New York City's Charter Schools

Charter school applicants who took this test	
Grade 3 math/English tests	14903
Grade 4 math/English tests	12917
Grade 5 math/English tests	13290
Grade 6 math/English tests	12192
Grade 7 math/English tests	10068
Grade 8 math/English tests	7190
Math A Regents exam	2250
Comprehensive English Regents exam	1521
Living Environment Regents exam	2590
Global History Regents exam	1950
U.S. History Regents exam	1557

Notes: The table shows the number of students who took each test between 2000-01 and 2007-08 and who participated in admissions lotteries held by New York City charter schools. If a student took a test before applying to a charter school, that observation is not counted in the table.

LOTTERY-BASED RESULTS: THE EFFECTS OF NEW YORK CITY'S CHARTER SCHOOLS ON MATH AND ENGLISH TEST SCORES IN GRADES 3 THROUGH 8

The Bottom Line

On average, a student who attended a charter school for all of grades kindergarten to eight would close about 86 percent of the achievement gap in math and 66 percent of the achievement gap in English. A student who attended fewer grades would improve by a commensurately smaller amount.

What is the main result for the grade 3-8 tests?

The lotteried-in students who attend New York City's charter schools start out with the same level of achievement as the lotteried-out students who attend the city's regular public schools. By the third grade, which is the first time they are all tested on statewide tests, charter school students' standard math scores are 0.14 units higher and their standard English scores are 0.13 units higher than those of their lotteried-out counterparts. In grades four through eight, the average charter school student gains 0.12 *more* units *each year* in math and 0.09 *more* units *each year* in English than his lotteried-out counterpart. Remember, these gains are in addition to whatever gains the students would have made if they had been lotteried-out and remained in the regular public schools.

These results are shown in Table IVc, and they are statistically significant with confidence of more than 90%. That is, we are very confident that the effects of New York City's charter schools on math and English language arts are not zero or negative. (P-values are shown in parentheses. For an explanation of statistical confidence and p-values, see Frequently Asked Questions.)

What is a standard score and how big is a change of 1 unit?

We described how standard scores are constructed in Chapter II. Recall that we use standard scores so that tests from all years and grades are put on the same basis.

A change of 1 unit in a standard score is a *large* change in achievement because it means that the student's performance has risen by a whole standard deviation. Suppose that a student started out at performance level 1 ("not meeting learning standards") on the New York State tests. If his standard score rose by 1 unit, he would leap up to performance level 3 ("meeting learning standards") in English. In math, he would leap even higher: well into performance level 3.⁶

Table IVc
Lottery-Based Estimates of the Effect of Attending New York City's Charter Schools on Math and English Language Arts Scores in Grades 3 through 8 (shown in standard score units)

Estimated Effect of Attending New York City's Charter Schools, shown in standard score units		
	effect on Math	effect on English
Extra gain up though Grade 3 (cumulative)	0.14 [statistically significant] (p-value = 0.04)	0.13 [statistically significant] (p-value = 0.07)
Extra gain <i>each year</i> in Grades 4 through 8	0.12 [statistically significant] (p-value < 0.01)	0.09 [statistically significant] (p-value < 0.01)
<u>Average</u> extra gain per year spent in charter school	0.09 [statistically significant] (p-value < 0.01)	0.06 [statistically significant] (p-value < 0.01)

Notes: The table shows the effect of attending New York City's charter schools. An effect is judged to be statistically significant if it is statistically significantly different from zero with 90% confidence.

Estimation Details: The results are based on all balanced lotteries. The results are treatment on the treated results--that is, the estimation takes account of which lotteried-in students do and do not actually attend charter schools. The results also account for students who attend school only part of the year, students' grade at the time they take the test, and differences associated with the school year of the test. The estimation includes a full set of lottery fixed effects, and the standard errors are robust and clustered at the student level. Similar results are obtained if the estimation accounts for students' characteristics: race, gender, pre-lottery eligibility for school meals program, pre-lottery participation in special education, pre-lottery limited English proficiency. Similar results are also obtained if all lotteries, not just balanced lotteries, are included in the estimation.

To estimate "treatment on the treated" estimates, an indicator for being lotteried-in is used as an instrument for attending the charter school.

Sources: Student test scores and characteristics are from the New York City Basic Educational Data System (BEDS). Student applicant and lottery lists are from the charter school.

How do I translate the results into scale scores or performance levels?

Table IVd shows the results translated into 2007-08 scale score points.

Again, the lotteried-in students who attend New York City's charter schools start out with the same level of achievement as the lotteried-out students who attend the city's regular public schools. By the third grade, the average charter school student is 5.8 points ahead of his lotteried-out counterpart in math and 5.3 points ahead in English Language Arts. In grades four through eight, the average charter school student gains 5.0 *more* points *each year* in math and 3.6 *more* points *each year* in English than his lotteried-out counterpart. Remember, these gains are in addition to whatever gains the students would have been expected to make in the regular public schools, had they been lotteried-out.

To give you a sense of how much a scale score point is worth, consider that, in grade three, the difference between "not meeting learning standards" (Performance Level 1) and "meeting learning standards" (Performance Level 3) is 26 points in math and 32 points in English. In grades four through eight, the difference between "not meeting learning standards" and "meeting learning standards" is about 31 points in math and 44 points in English.

Appendix Figures 1 and 2 show how scale scores and performance levels are related for math and English Language Arts.

Table IVd
Lottery-Based Estimates of the Effect of Attending New York City's Charter Schools on Math and English Test Scores for Grades 3 through 8
(shown in scale score points)

Estimated Effect of Attending New York City's Charter Schools, shown in scale score points		
	effect on Math	effect on English
Extra gain up though Grade 3 (cumulative)	5.8 [statistically significant] (p-value < 0.01)	5.3 [statistically significant] (p-value < 0.01)
Extra gain <i>each year</i> in Grades 4 through 8	5.0 [statistically significant] (p-value < 0.01)	3.6 [statistically significant] (p-value < 0.01)
<u>Average</u> extra gain per year spent in charter school	3.6 [statistically significant] (p-value < 0.01)	2.4 [statistically significant] (p-value < 0.01)

For notes, see the text that follows Table IVc.

What do these results mean for a child, in everyday terms?

Figures IVa and IVb will help you understand the implications of the results. The figures should also give you a clear sense of what we are doing when we estimate the effects of charter schools on achievement.

Look at Figure IVa first. The horizontal axis has grades three through eight on it. The vertical axis registers the test score improvement that charter schools have caused as of each grade. The bottom blue line represents the achievement of lotteried-out students who attend the regular public schools. It is set at zero for all grades because this figure shows how much charter school students' achievement improves *relative* to the lotteried-out students' achievement. Later, we will examine the gains that the lotteried-out students themselves are making, but--for now--let us think of them purely as a control group.

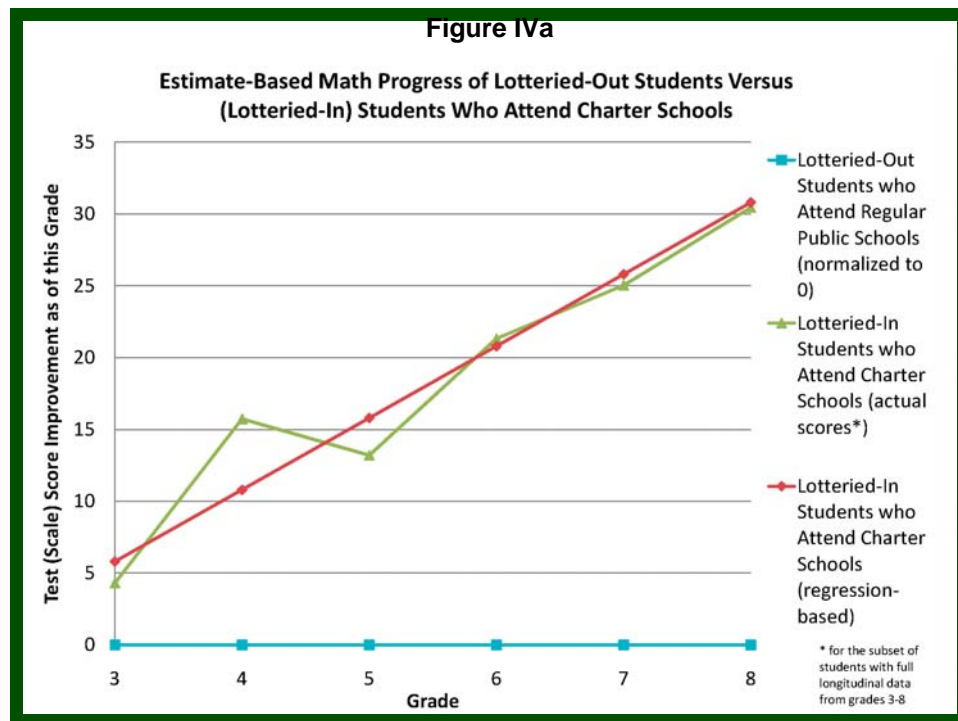
The green line on Figure IVa shows the actual, raw data for lotteried-in students who attended charter schools throughout the third through eighth grades.⁷ You can see that, by the end of third grade, the charter school students' scores are just about 5 points higher than those of their lotteried-out counterparts. By the end of the sixth grade, their scores are about 21 points high than those of their lotteried-out counterparts. And so on up to the eighth grade, at which time their scores are about 30 points higher than those of their lotteried-out counterparts.

The red line on Figure IVa is based on our estimates. It is a regression line or trend line through the data, and you can see that it is just a smooth version of the raw data. In other words, when we estimate the effect of charter schools on their students' achievement, we are really just computing an average effect over the grades we study. (This is the logic of what we are doing. See Chapter III for more technical detail.)

The bottom line of Figure IVa is that, by the time a charter schools student has reached the end of eighth grade, our estimates indicate that he will be scoring about 30 points higher in math than he would have been scoring if he had been lotteried-out and remained in the regular public schools.

By the time a charter schools student has reached the end of eighth grade, our estimates indicate that he will be scoring about 30 points higher in math than he would have been scoring if he had been lotteried-out and remained in the regular public schools.

How much is 30 points? Students in Scarsdale, New York, one of the most affluent suburbs of New York City, routinely score between 35 and 40 points higher than students in Harlem,



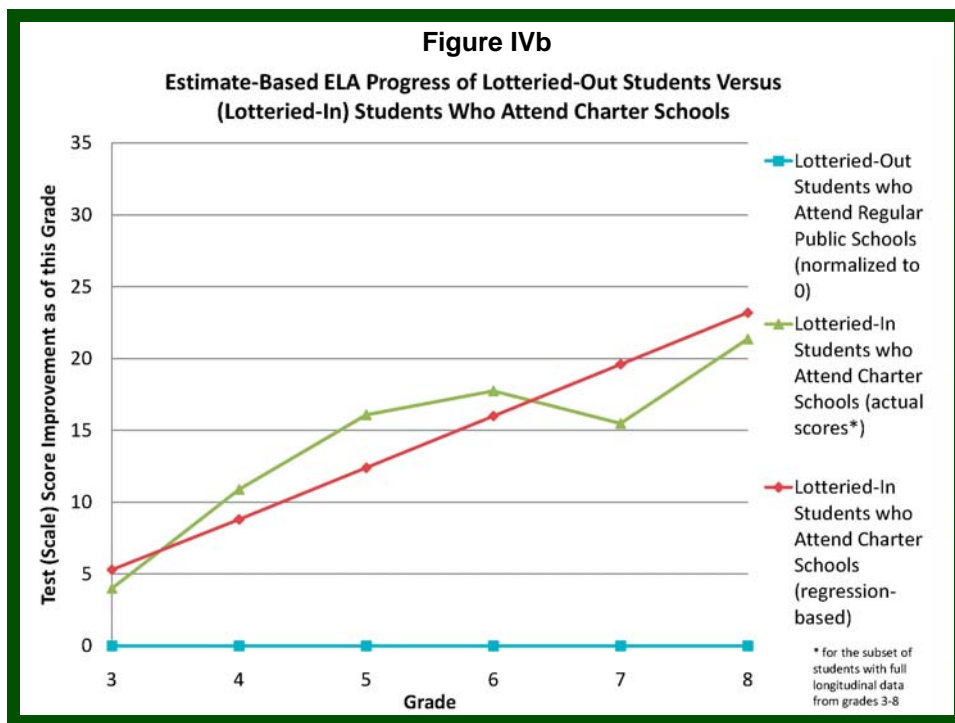
where many of the city's charter schools are located. So, let's call 35 points the "Scarsdale-Harlem achievement gap" to make it memorable. If charter schools in New York City improve their students' scores by 30 points, then their students will have made up about 86% of the Scarsdale-Harlem achievement gap. (The test score gap between Scarsdale and Harlem varies from grade to grade and year to year, so the 35 points is only approximate. We have used Scarsdale not because we want to analyze that district's achievement, but simply as a mnemonic.)

In short, Figure IVa shows that charter school students' gains are meaningful in real world terms. Even through their extra gain in each grade may not seem large, the gains can add up to a substantial closing of the achievement gap over the span of kindergarten through grade eight.

What about the English Language Arts results, in real word terms?

Figure IVb is just like the previous figure, except that it shows English Language Arts instead of math. The bottom line is that our estimates indicate that, by the end of eighth grade, lotteried-in students who attend charter schools are about 23 points ahead of their lotteried-out counterparts. This means that they close about 66 percent of the Scarsdale-Harlem achievement gap.

By the end of eighth grade, lotteried-in students who attend charter schools are about 23 points ahead of their lotteried-out counterparts. This means that they close about 66 percent of the Scarsdale-Harlem achievement gap.



Are New York City's charter schools' effects larger in fourth through eighth grade than in kindergarten through third grade?

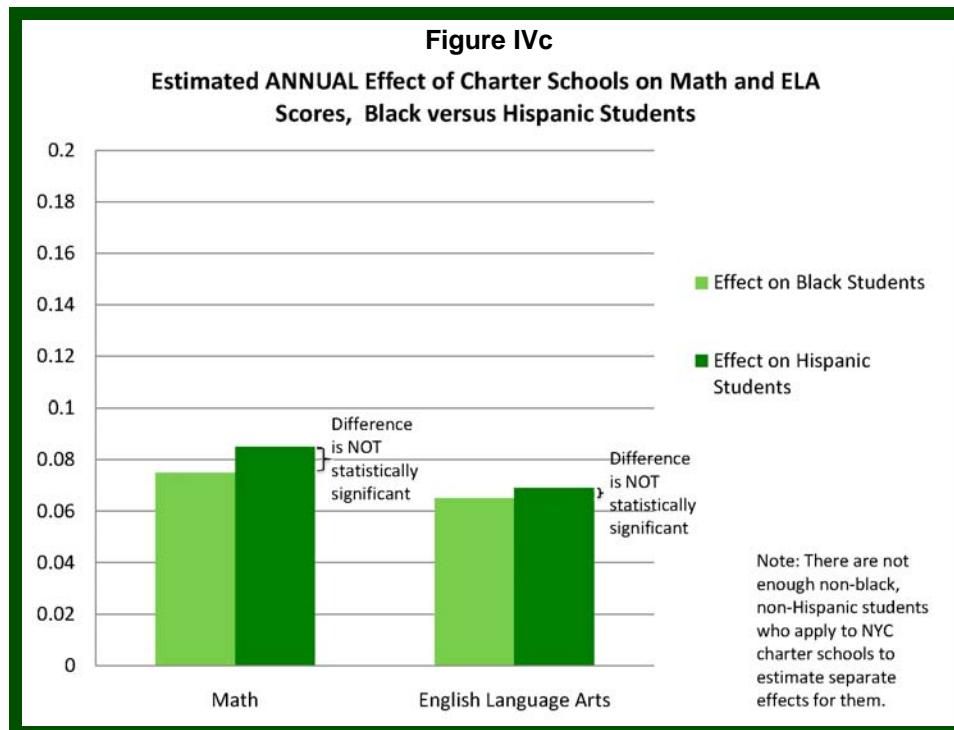
The estimates do suggest that charter schools' effects are somewhat larger in grades four through eight than in kindergarten through grade three. However, we are unwilling to draw a conclusion on this point because students are not tested in kindergarten, grade one, or grade two. Therefore, we cannot control for the previous year's test score when we compute the effect of charter schools on third graders' achievement. This means that we are not computing the cumulative effect though third grade in exactly the same way as we compute the effects for fourth through eighth grade, where we control for the previous year's test score. (That is, for grades four through eight, we are computing the charter school's effect on that year's achievement, given the previous year's achievement.) In short, we do *not* conclude that charter schools have a greater effect on the achievement of fourth through eighth graders.

However, we can confidently say that there is no evidence that charter schools' positive effect on achievement dies out as students reach higher grades.

EFFECTS OF NEW YORK CITY'S CHARTER SCHOOLS ON STUDENTS OF DIFFERENT TYPES

Do charter schools have different effects on students of different race or ethnicity? On students of different gender?

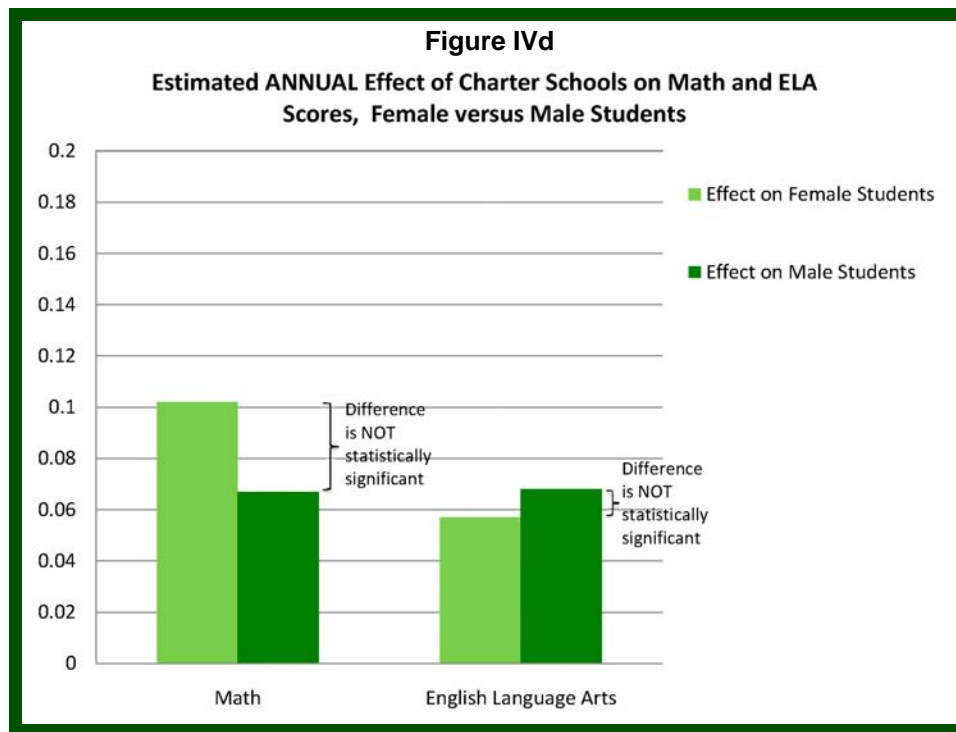
Figure IVc shows the effects of charter schools on black students' achievement and on Hispanic students' achievement. It turns out that, both in math and English Language Arts, the estimated effect of charter schools is about the same for black and for Hispanic students. Formally, the difference in the effect by race/ethnicity is statistically indistinguishable from zero.



There are not enough white, Asian, or native American students who apply to charter schools to compute effects separately for them.

Figure IVd shows the effects of charter schools on female students' achievement and on male students' achievement. For math standard scores, the estimated effect of charter schools is 0.07 units per year for males and 0.10 units per year for females. This difference may seem large, but it is not statistically distinguishable from a zero difference at conventional levels of confidence. In English Language Arts, the estimated effect of charter schools is about the same for female and for male students. That is, the difference in the effect by gender is statistically indistinguishable from zero.

Summing up, charter schools have about the same effect on achievement regardless of the student's race, ethnicity, or gender.



Charter schools have about the same effect on achievement regardless of the student's race, ethnicity, or gender.

We have tried breaking down the estimated achievement effects of charter schools in several other ways. We looked for patterns based on the grade at which the student had entered the charter school: Were students who entered as kindergarteners affected differently from, say, students who entered as fifth graders? We looked for patterns that suggested

that students might first experience a positive effect and then plateau. We looked for patterns that suggested that students might first experience a negative effect and then a positive effect. We did not see statistically significant evidence of any of the patterns mentioned above.

The main reason why we do not see such patterns is probably that students with a particular entry timing in New York City's charter schools have much less in common than students in a particular charter *school* regardless of their entry timing. Given the differences among the charter schools in their intake grades, the grades they have offered in each school year, and the policies they employ, there is little reason to think that there would be much commonality among students who have similar entry timing but who attend different schools.

WHAT IS THE ACHIEVEMENT OF THE LOTTERIED-OUT STUDENTS?

The Bottom Line

On average, his lotteried-out counterpart who stayed in the traditional public schools for all of grades kindergarten to eight would stay on grade level but would not close the "Scarsdale-Harlem" achievement gap by much. However, the lotteried-out students' performance does improve and is better than the norm in the U.S. where, as a rule, disadvantaged students fall further behind as they age.

How do lotteried-out students fare on the grade 3-8 tests?

So far, we have been treating the lotteried-out students purely as a control group. That is, we have measured all of the gains for the charter school students *relative* to learning gains made by the lotteried-out students. Doing this is helpful if we want to know what effects the charter schools are having, but it does not tell us how the lotteried-out students themselves are doing.

Historically, American students who are as disadvantaged as New York City's charter school applicants have fallen further and further behind the average student as they age. This pattern has somewhat changed recently as districts have enacted reforms, but this is the backdrop against which you should judge New York City's lotteried-out students.

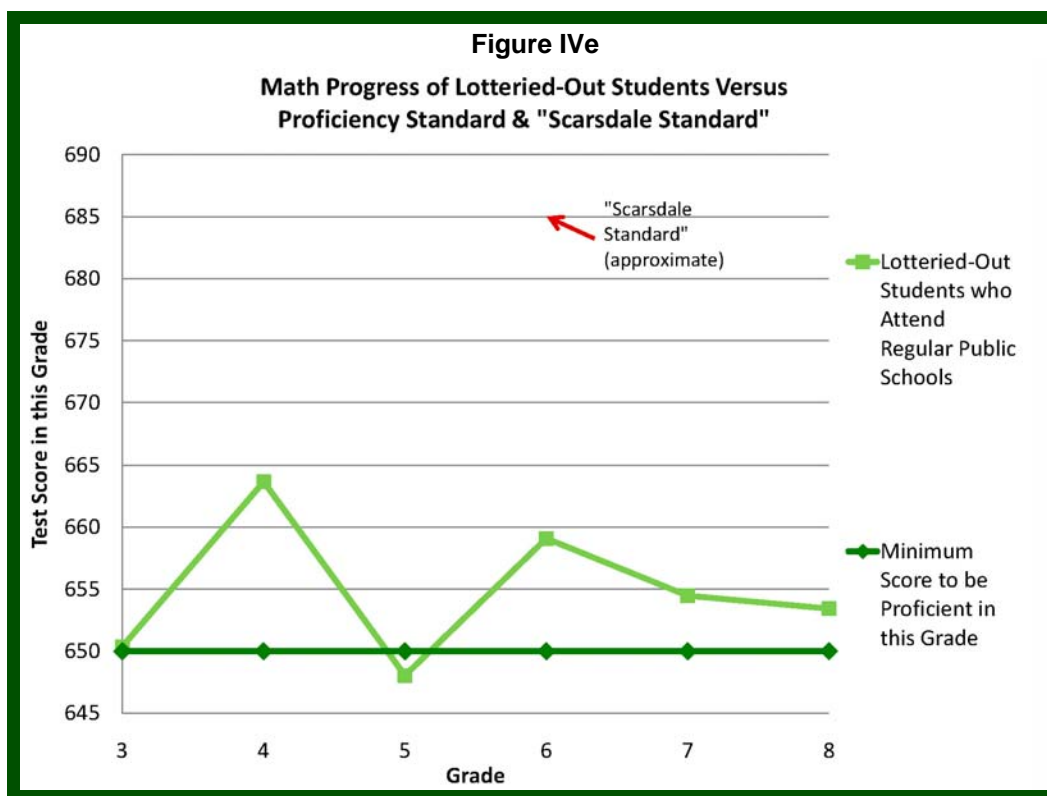
It is fairly easy to summarize how the lotteried-out students are doing. At the end of third grade, the average lotteried-out student is just at the proficiency threshold in math and about 10 points below the proficiency threshold in English Language Arts. As they ascend to higher grades, the lotteried-out students continue to be a little above or a little below the proficiency threshold for each grade that they are in. In other words, they make enough progress to keep up with the rise in the proficiency threshold that occurs as they ascend into higher grades. At the end of eighth grade, they are about 4 points above the proficiency threshold in math and at the proficiency threshold in English Language Arts.

All in all, the lotteried-out students start out on or somewhat below proficiency threshold, and they make enough progress to end up a little above or on the proficiency threshold. Indeed, relative to the proficiency threshold, *they improve slightly in both subjects*. They are *not* falling further behind other students, as we might expect. On the other hand, they are not closing the achievement gap by much: their achievement starts out quite far below that of the average Scarsdale student and the gap stays quite wide.

Now that we have summarized the achievement of lotteried-out students, let us look at the data.

New York State exams are scored so that a score of 650 means that a student has just reached the proficiency threshold. This is equally true of each exam from the third through the eighth grades. Thus, if a student scores 650 in every grade, he or she is making regular progress--just keeping at the proficiency threshold, in fact. This is a bit tricky since it may seem as though a student who makes the same score every year is not making any progress whereas, in fact, he or she is making about a grade's worth of progress every year.

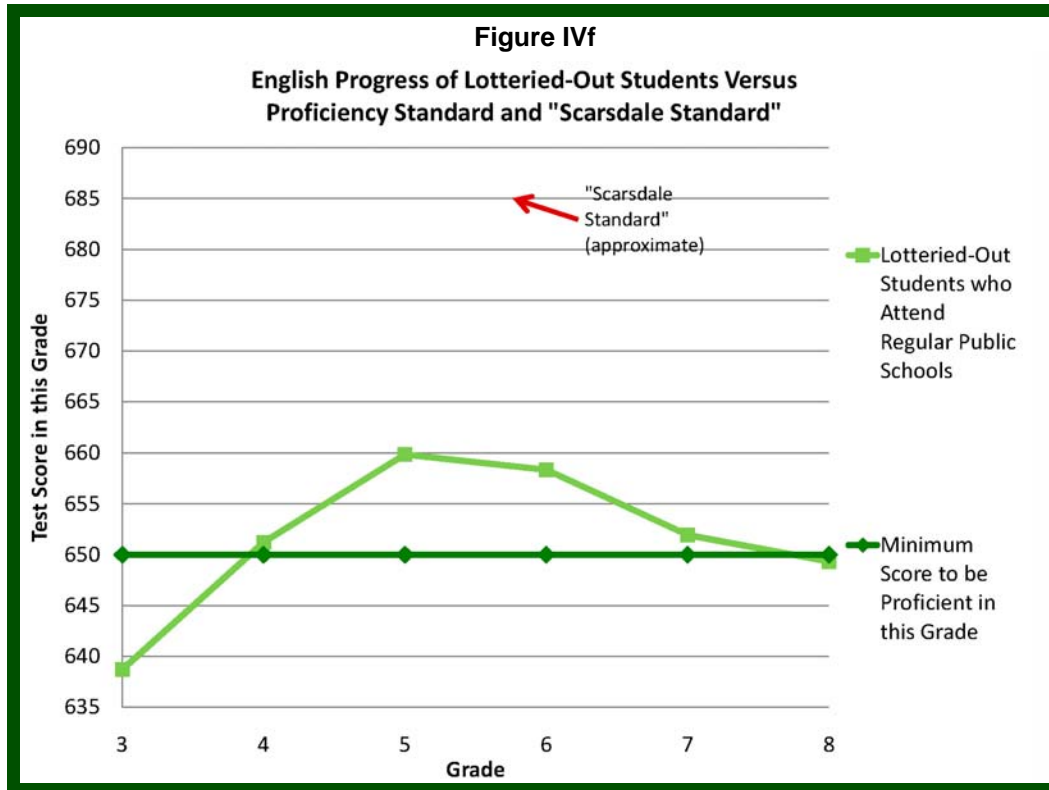
Figure IVe shows the math progress of students who entered lotteries for kindergarten through grade three, were lotteried-out, and who subsequently attended the regular public schools for all of grades three through eight. Their scores are shown by the light green line. The minimum score to be proficient in each grade (650) is shown by the dark green line. The approximate level at which the average Scarsdale student scores is indicated by the red arrow.



You can see that lotteried-out students score right at the proficiency threshold in grade three. They score higher than it in grade four, a bit below it in grade five, somewhat above it in grade six, and just a bit above it in grades seven and eight.

Figure IVf shows the English Language Arts progress of students who entered lotteries for kindergarten through grade three, were lotteried-out, and who subsequently attended the regular public schools for all of grades three through eight. Their scores are shown by the light blue line. The minimum score to be proficient in each grade (650) is shown by the dark blue line. The approximate level at which the average Scarsdale student scores is indicated by the red arrow.

You can see that lotteried-out students score about 11 points below the proficiency threshold grade three. They score just at the threshold in grade four, and they score somewhat above the threshold in grades five and six. However, in grades seven and eight, they are scoring just on the threshold again.



LOTTERY-BASED RESULTS: THE EFFECTS OF NEW YORK CITY'S CHARTER SCHOOLS ON SCIENCE AND SOCIAL STUDIES TEST SCORES IN GRADES 4, 5, AND 8

What is the main result on how charter schools affect science and social studies scores in grades up through eight?

Charter schools have a positive effect on students' achievement in science and social studies. The effects are large in magnitude. This statement is based on effect sizes greater than 0.15 *per year* of attending charter school. However, the effects are not estimated with much precision. This is because we have only about one quarter as many observations for science and social studies as we have for math and English. This is simply because students in most grades do not take the science and social studies test.

Let us look at the estimates more closely. See Table IVe. By the fourth grade, which is the first time students are tested in science, the average charter school student's standard science score is 0.17

units ahead of his lotteried-out counterpart's. In grades five through eight, the average charter school student gains 0.23 *more* units *each year* in science than his lotteried-out counterpart. Remember, these gains are *in addition* to whatever gains the students would have made if they had been lotteried-out and remained in the regular public schools.

Table IVe
Lottery-Based Estimates of the Effect of Attending New York City's Charter Schools on Science and Social Studies in Grades 4 through 8
(shown in standard score units)

Estimated Effect of Attending New York City's Charter Schools, shown in standard score units		
	effect on Science	effect on Social Studies
Extra gain up though Grade 4 (Science, cumulative) or Grade 5 (Social Studies, cumulative)	0.17 [marginally statistically significant] (p-value = 0.15)	0.03 [not statistically significant]
Extra gain <i>each year</i> in Grades 5 through 8 (Science) or Grades 6 through 8 (Social Studies)	0.23 [marginally statistically significant] (p-value = 0.14)	0.17 [marginally statistically significant] (p-value = 0.15)

For notes, see the text that follows Table IVc.

In the fifth grade, which is the first time students are tested in social studies, the average charter school student's social studies standard score is almost exactly the same as that of his lotteried-out counterpart. Thus, it looks as though there is no charter school effect on social studies up through the fifth grade. However, in grades six through eight, the average charter school student gains 0.17 *more* units *each year* in social studies than his lotteried-out counterpart. Remember, these gains are *in addition* to whatever gains the students would have made if they had been lotteried-out and remained in the regular public schools.

The confidence on our science and social studies estimates is only about 85%. In other words, we are less certain that charter schools' effects on science and social studies are positive. Also, the estimates may somewhat understate or overstate the true effects.

LOTTERY-BASED RESULTS: THE EFFECTS OF NEW YORK CITY'S CHARTER SCHOOLS ON REGENTS EXAMINATION SCORES

The Bottom Line

Compared to his lotteried-out counterparts, a student who attends a charter high school has Regents examination scores that are about 3 points higher for each year he spends in the charter school before taking the test. For instance, a student who took the English Comprehensive exam after three years in charter school would score about 9 points higher.

What is the main result for the Regents Examinations?

New York City's charter schools have a strong positive effect on the Regents Examination scores of ninth through twelfth graders. See Table IVf, which shows results for the five examinations required for a high school diploma in New York State: Mathematics A, Comprehensive English, Living Environment, Global History, and U.S. History. Compared to lotteried-out students, charter school students have Mathematics A standard scores that rise by 0.19 units more *per year* spent in charter school. Similarly, compared to lotteried-out students, charter school students have Comprehensive English standard scores that rise by 0.18 units more *per year* spent in charter school. Charter schools raise students' Living Environment standard scores by 0.25 units per year spent in charter school. They raise students' Global History standard scores by 0.13 units per year spent in charter school. Finally, compared to lotteried-out students, charter school students have U.S. History standard scores that rise by 0.14 units more per year spent in charter school.

Table IVf
Lottery-Based Estimates of the Effect of Attending New York City's Charter Schools on Regents Examination Scores
(shown in standard score units)

	Estimated Effect of Attending New York City's Charter Schools				
	effect on Math A	effect on Comprehensive English	effect on Living Environment	effect on Global History	effect on U.S. History
Extra gain each year from Grade 9 through the date on which the Regents exam was taken	0.19 [statistically significant] (p-value=0.02)	0.18 [statistically significant] (p-value<0.01)	0.25 [statistically significant] (p-value<0.01)	0.13 [statistically significant] (p-value=0.01)	0.14 [statistically significant] (p-value=0.02)

Notes: See notes to Table IVg.

All of these estimated effects are statistically significant. It is worth noting that, when we compute these estimated effects, we not only have the "apples to apples" comparison of students who were lotteried-in and lotteried-out of charter schools. We also control for how students scored on the eighth grade examination in the same subject (math for Mathematics A, English Language Arts for Comprehensive English, and so on). Thus, we comparing charter school students to lotteried-out students who scored similarly in the eighth grade.

What are these positive effects when translated into scale score points?

Although showing the effects in standard score units is best for making comparisons between the Regents Examinations and other measures of achievement, readers may wish to know what the estimated effects are in scale score points. On each Regents Examination, a student must have 65 scale score points to pass and must have 85 scale score points to pass with distinction.

Table IVg shows the estimated effects of charter schools on Regents Examination scale score points. Compared to lotteried-out students, charter school students have Mathematics A scores that rise by 3.0 points more *per year* spent in charter school. In other words, if a student entered a charter school at the beginning of ninth grade and took the Mathematics A examination at the end of eleventh grade, he could expect to score 9 points (3.0 points times 3 years) higher than a similar student who was lotteried-out.

Similarly, compared to lotteried-out students, charter school students have Comprehensive English scores that rise by 3.0 points more *per year* spent in charter school. Charter schools raise students' Living Environment scores by 3.7 points per year spent in charter school. They raise students' Global History scores by 2.3 points per year spent in charter school. Finally, compared to lotteried-out students, charter school students have U.S. History scores that rise by 2.5 points more per year spent in charter school.

How do we interpret the magnitude of these effects?

The average student who applies to a New York City charter school that includes grades nine through twelve has eighth grade test scores that suggest he or she will be close to the passing grade (65 points) if he or she continues in the regular public schools. Therefore, by raising a student's scores by 2 to 3 points *per year*, charter schools make it more likely that students will pass their Regents examinations.

In the next section, we test whether students are more likely to get a Regents diploma if they attend a charter school. We will see that they *are* more likely to do so. This evidence confirms the importance of charter school students' getting higher scores on Regents examinations.

Table IVg
Lottery-Based Estimates of the Effect of Attending New York City's Charter Schools on Regents Examinations Scores
(shown in scale score points)

	Estimated Effect of Attending New York City's Charter Schools, shown in scale score points				
	effect on Math A	effect on Comprehen- sive English	effect on Living Environment	effect on Global History	effect on U.S. History
Extra gain <i>each</i> year from Grade 9 through the date on which the Regents exam was taken	3.0 [statistically significant] (p-value = 0.02)	3.0 [statistically significant] (p-value < 0.01)	3.7 [statistically significant] (p-value < 0.01)	2.3 [statistically significant] (p-value = 0.01)	2.5 [statistically significant] (p-value = 0.02)

Notes: The table shows the effect of attending New York City's charter schools on a student's Regents Examination scores. An effect is judged to be statistically significant if it is statistically significantly different from zero with 90% confidence. The examinations shown are those that are required for a Regents diploma. Students are recommended to take the examinations in a certain grade, but need not do so. The exam/grade combinations are as follows: Comprehensive English, grade 11; Math A, grade 10; Living Environment (biology), grade 9; Global History, grade 10; U.S. History, grade 11. . A student needs 65 scale score points to pass a Regents Examination and needs 85 points to pass it with distinction.

Estimation Details: The results are treatment on the treated results--that is, the estimation takes account of which lotteried-in students do and do not actually attend charter schools. The results also account for students who attend school only part of the year, students' grade at the time they take the test, and differences associated with the school year of the test. The estimation includes a full set of lottery fixed effects, and the standard errors are robust and clustered at the student level. Similar results are obtained if the estimation accounts for students' characteristics: race, gender, pre-lottery eligibility for school meals program, pre-lottery participation in special education, pre-lottery limited English proficiency.

Sources: Student test scores and characteristics are from the New York City Basic Educational Data System (BEDS). Student applicant and lottery lists are from the charter school.

LOTTERY-BASED RESULTS: THE EFFECTS OF NEW YORK CITY'S CHARTER SCHOOLS ON GRADUATING WITH A REGENTS DIPLOMA

The Bottom Line

A student who attends a charter high school is about 7 percent more likely to earn a Regents diploma by age 20 for each year he spends in that school. For instance, a student who spent grades ten through twelve in charter high school would have about a 21 percent higher probability of getting a Regents diploma.

Do charter schools make a student more likely to graduate with a Regents Diploma?

New York City's charter schools have a strong positive effect on the probability that a student graduates with a Regents diploma of some form (regular, advanced, or honors). See Table IVh. Compared to lotteried-out students, charter school students are 7 percent more likely to graduate with a Regents Diploma for every year they spend in charter school in grades 9 through 12. This means that a student who was lotteried-in in grade 10 and enrolled in charter school through grade 12 would have a 21 percent higher probability of earning a Regents Diploma than a student who was lotteried-out in grade 9 and enrolled in regular public schools thereafter.

Unfortunately, because we have only a limited number of observations on students who have reached the age of 20, the estimated effect is statistically significant with only 85 percent confidence. This means that the 7% estimate may somewhat overstate or understate the true effect.

Keep in mind that we are comparing charter school students to lotteried-out students who scored similarly in the eighth grade.

Table IVh Lottery-Based Estimate of the Effect of Attending New York City's Charter Schools on Graduating with a Regents Diploma by the Age of 20	
	Estimated Effect of Attending New York City's Charter Schools on Probability of Graduating with a Regents Diploma by Age 20
Extra gain in probability for <i>each year</i> spent in charter schools from Grade 9 through Grade 12	7% [marginally statistically significant] (p-value = 0.15)

Notes: The table shows the effect of attending New York City's charter schools on the probability that a student graduates with a Regents diploma (Regents, Regents Honors, Regents Advanced) by the end of the school year in which he is 20 on or before December 31 of the school year. For other notes, see notes to Table IVg.

DO ALL OF NEW YORK CITY'S CHARTER SCHOOLS HAVE SIMILAR EFFECTS?

In this section, we investigate the *range* of effects that we found on test scores for grades three through eight. We do so in a way that does not identify individual charter schools; however, what we show would allow a reader to say what *share* of charter school students are experiencing a strong positive effect, a weak positive effect, no apparent effect, and so on.

There are reasons to expect the effects of New York City's charter schools to differ

Although New York City's charter schools operate under a single New York state charter school law, they have different authorizers, different school leaders, different mission statements, different policies, and somewhat different curriculums (for example, different math textbooks). New York City's charter schools also have different histories: some have been in operation for a considerable time (especially the schools that converted to charter status); some had been open only a couple of years. In short, there are many reasons to expect that New York City's charter schools might have effects that are not all alike.

There are reasons to expect the effects of New York City's charter schools to converge

All of New York City's charter schools are under pressure to perform, and the pressure comes from three sources. First, they are subject to formal accountability systems: New York City's, New York State's, and No Child Left Behind. Second, they can be held accountable by their authorizers and boards of trustees. The authorizers wield especially great power when the schools' charters are up for renewal. Third, the charter schools need to attract parents. This necessity imposes an indirect accountability to parents. In short, there are some commonalities in pressure to perform among the charter schools.

Although the charter schools are not forced to learn from one another, they may choose to do so when under similar pressures. They may learn from one another informally (for instance, by hiring staff who have worked at other charter schools) or more formally (by consciously adopting a policy that seems to be working well for another school). The density of New York City's charter schools--which are especially dense in Harlem and the South Bronx--promotes opportunities for learning.

In short, there are reasons why New York City's charter schools might have different effects and reasons why they might have convergent effects. The data must speak for themselves.

Thinking about the *range* of effects among New York City's charter schools

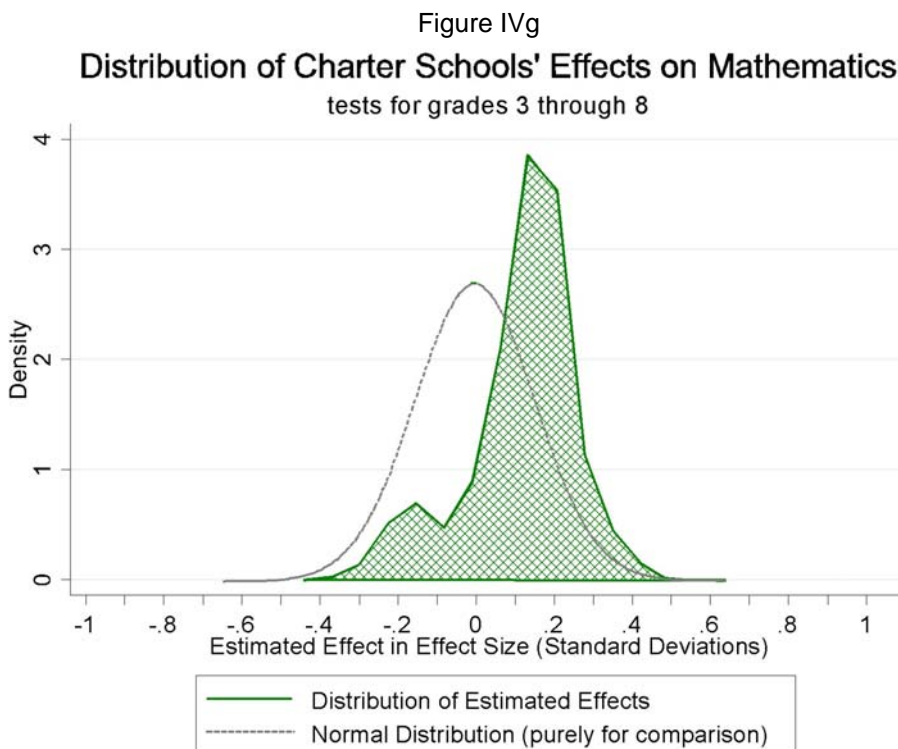
Recall that the *average* effect of New York City's charter schools is 0.09 standard score units in math and 0.06 units in English, *per year*, for kindergarden through eighth grade. In other words, students improve by about 0.9 units in math and by about 0.6 units in English for each year they spend in the charter schools, relative to the gains they would have attained in the traditional public schools. These average effects are statistically significant and are based on all students who apply to charter schools through a balanced lottery. See the bottom row of Table IVc.

How do math effects differ among New York City's charter schools?

See Figure IVg for the range of estimated effects of New York City's charter schools on math in grades three through eight. We created this figure by estimating an effect on math for each school separately. Then we plotted the distribution of the schools' effects, taking care that schools were represented according to the number of students they enroll. Thus, the distribution of effects is representative of the charter school *students* of New York City. We smoothed the distribution slightly so that readers could not pick out the effects of individual charter schools.⁸

People are most familiar with bell-shaped distributions like the well-known Normal Distribution, and--just for comparison--we've shown a Normal Distribution with a mean effect of zero. The Normal Distribution is there to help you think about the control group. There is (by construction) a zero effect for students in the control group *on average*, but control group students experience a range of achievement effects. Some experience a positive effect in their traditional public school; some experience a negative effect.

When you look at the distribution of estimated math effects of New York City's charter schools (the shaded area), the first thing you see is that it is shifted to the right, relative to the Normal Distribution. This means that the average effect of attending a charter school is positive--something you already know. You should then notice that most charter school students attend a school that has a positive effect on math. A small fraction of students attends a charter school that has a negative effect on math.



Notes: The shaded area shows the distribution of estimated effects of charter schools on math (grades three through eight) that are sufficiently precise that they are either statistically significantly different from zero with 85 percent confidence or that an effect of 0.1 standard deviations would be statistically significantly different from zero with 85 percent confidence. See preceding text for shares of students in various intervals within the distribution. The normal distribution is centered on a zero effect is shown purely for comparison.

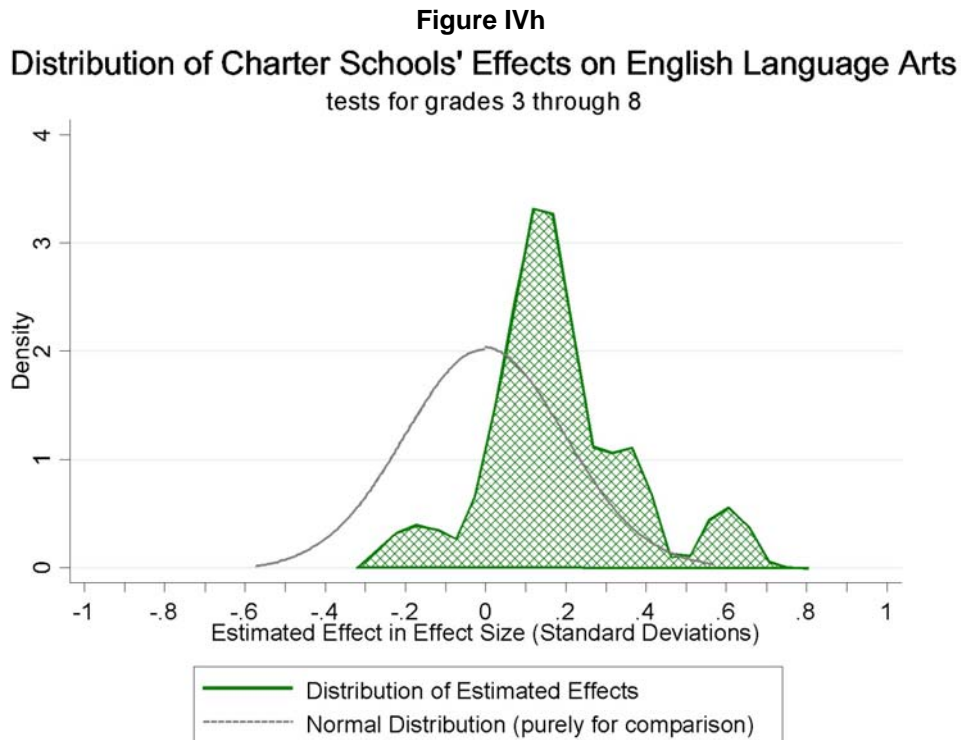
Let us make these statements precise. About 10 percent of charter school students attend a school that is estimated to have a positive effect on math that is greater than 0.2 standard deviations. About 59 percent of charter school students attend a school that is estimated to have a positive effect on math that is between 0.1 and 0.2 standard deviations. About 17 percent of charter school students attend a school that is estimated to have a positive effect on math between 0 and 0.1 standard deviations. Finally, the remaining 14 percent of students attend a school that is estimated to have an effect on math that is negative. (Percentages do not add up to 100 because of rounding.)

The Normal Distribution may help you remember that some charter school students would have experienced a negative effect and some would have experienced a positive effect anyway, even if they had remained in the traditional public schools.

How do English effects differ among New York City's charter schools?

See Figure IVh, which is constructed like the previous figure, except that it shows English.

When you look at the distribution of estimated English effects of New York City's charter schools (the shaded area), you can see that the vast majority charter school students attend a school that is having a positive effect on English. A very small fraction of students attends a charter school that has a negative effect on English.



Notes: see notes for Figure IVg.

Let us make these statements precise. About 31 percent of charter school students attend a school that is estimated to have a positive effect on English that is greater than 0.2 standard deviations. About 45 percent of charter school students attend a school that is estimated to have a positive effect on English that is between 0.1 and 0.2 standard deviations. About 16 percent of charter school students attend a school that is estimated to have a positive effect on English between 0 and 0.1 standard deviations. Finally, the remaining 8 percent of students attend a school that is estimated to have an effect on English that is negative. (Percentages do not add up to 100 because of rounding.)

Summing up

The vast majority of charter schools for which an individual school estimate can be computed with reasonable precision are having a positive effect on their students' math and English achievement in the third through eighth grades. Some schools in this majority have a strong positive effect (more than 0.2 standard deviations per year) and others have a modest positive effect (less than 0.1 standard deviations per year). Most have an effect that is in-between (0.1 to 0.2 standard deviations per year). A small share of students attend a school

The vast majority of charter schools for which an individual school estimate can be computed with reasonable precision are having a positive effect on their students' math and English achievement in the third through eighth grades.

that is estimated to have a negative effect. Keep in mind that all of these statements are relative to the *average* experience of a lotteried-out students. Some charter school students would have experienced a positive effect and some would have experienced a negative effect anyway, if they had attended traditional public schools.

None of this is too surprising. Any effect that is positive on average is going to be a combination of greater and lesser effects. What would be useful to know, however, is whether there are any characteristics of charter schools that make them more likely to have a strong positive effect?

CHAPTER V. ASSOCIATING CHARTER SCHOOLS' EFFECTS WITH THEIR POLICIES

In Chapter I, we showed that New York City's charter schools differ amongst themselves on a number of dimensions--how long they have been in operation, the type of organization that manages them, the length of the school year and school day, curriculum, disciplinary policy, and so on. In this chapter of the report, we investigate whether certain school characteristics are routinely associated with positive effects on achievement.

What method do we use for this investigation?

We do this investigation using regression, a statistical method of examining the correlation between variables. We follow normal statistical procedure by giving weight to a school's estimated effect that is commensurate with the number of observations used to estimate it.

We use *one-variable* regression to examine one characteristic of a school at a time. For instance, we can compute the association between a charter school's effect on achievement and its having a long school year. Then we can move on to computing the association between achievement and a long school day. And so on, taking the schools' characteristics one by one.

We use *multiple-variable* regression to examine several characteristics of a school simultaneously. The idea of multiple-variable regression is that we can compute the association of, say, a charter school's effect on achievement and its having a long school year, *while holding other characteristics constant*.

Associations, not causation

We cannot make causal claims about charter schools' characteristics and their effects on achievement. We can only describe associations between characteristics and achievement effects. This may seem like a subtle distinction, but it is in fact an important one. An example will illustrate the difference.

Suppose that charismatic school leaders were a key cause of positive achievement effects, and suppose that charismatic leaders just happened to like long school years. We cannot measure

charisma, but we can measure the length of the school year. Therefore, we might find an *association* between a long school year and positive achievement effects even if the charisma, and not the long school year, *caused* higher achievement. The distinction could matter a lot in practice. A school that lengthened its school year might be disappointed in the results, not realizing that what it had really needed to do was to hire a charismatic leader.

What kinds of answers can we give?

A few examples will illustrate the kinds of answers we can and cannot give.

Suppose that half of New York City's charter schools have adopted a curriculum (textbooks, lesson plans, and so on) known as A and the other half have adopted a curriculum known as B. It is fairly likely that, if one of the two curricula were associated with substantially more positive effects on achievement, we would discern this association statistically. However, if the two curricula were associated with only slightly different effects, we would probably not be able to discern the difference.

If the vast majority of schools used curriculum A and only a few used curriculum B, we might not be able to discern the difference even if the difference were substantial. This is because we need to have a certain share of charter schools pursue a policy before we can detect its association with achievement.

Another dimension on which New York City charter schools differ is school uniforms. Suppose that a quarter of New York City charter schools had curriculum A and uniforms, a quarter had curriculum A and no uniforms, a quarter had curriculum B and uniforms, and a quarter had curriculum B and no uniforms. In this case, we would probably be able to discern the association of curricula A and B with achievement *and* be able to discern separately the association of school uniforms with achievement. Now suppose instead that every school that adopted curriculum A also adopted uniforms and that every school that adopted curriculum B had no uniforms. Then, we could answer questions about the "package" of curriculum A and uniforms as opposed to the package of curriculum B and no uniforms. We could not, however, answer questions about the effect of uniforms *separately* from the effect of curriculum A. The prevalence of "packaging" poses a real problem for understanding the association between charter schools' characteristics and their effects on achievement. Although New York City charter schools do not adopt policies in formal packages, we see informal packages. For instance, schools that adopt a long school year very often also adopt a long school day.

Which is more informative, one-variable or multiple-variable regression?

Because of the packaging problem just described, it is a good idea to estimate both one-variable and multiple-variable regressions. We will illustrate this with an example that happens to be true, in practice. One-variable regressions tell us that a long school year is associated with a more positive achievement effect and that a long school day is also associated with a more positive achievement effect. However, when we include *both* a long school year and a long school day in a multiple-variable regression, it looks as though only the long school year is associated with a more positive achievement effect. Does this mean that the long school day does not matter? Well, no. The fact is that schools with long school years tend also to have long school days. Thus, when we put both characteristics into a multiple-variable regression, the regression has a hard time assigning

responsibility to the long year separately from the long day--because they are so often found together. In other words, the multiple-variable regression may *suggest* that the long school year matters more than the long school day, but we should be very cautious about taking this suggestion. It would be a mistake to recommend only the long school year as a policy (and tell schools that the length of their school day does not matter) because, in fact, we see very few strong-performing schools that actually use a long school year and a short school day.

What's the bottom line on the association between achievement and charter school policies?

We are confident that the following policies are associated with charter schools' having more positive effects on students' achievement:

- a long school year;
- a greater number of minutes devoted to English during each school day;
- a small rewards/small penalties disciplinary policy;
- teacher pay based somewhat on performance or duties, as opposed to a traditional pay scale based strictly on seniority and credentials;
- a mission statement that emphasizes academic performance, as opposed to other goals.

We are confident about the characteristics listed above because both one-variable and multiple-variable regression indicate that they have a positive association with a school's achievement effect. These associations are statistically significantly different from zero with at least 90 percent confidence.

Some care must be taken to interpret the associations listed above because of the packaging problem we have already mentioned. For instance, the long school year is usually packaged with a long school day. Also, a greater number of minutes devoted to English is usually packaged with a long school day (no surprise there) and a greater number of minutes devoted to math.

The long school year

The association between a long school year and a positive achievement effect is the most important result of this chapter. We have singled out the long school year because its association is extremely robust. It shows up strongly no matter which other policies we control for. The result also showed up strongly in our last report (July 2007), when we had less data to analyze.

The following policies are associated with charter schools' having more positive effects on students' achievement:

- a long school year;
- a greater number of minutes devoted to English;
- a small rewards/small penalties disciplinary policy;
- teacher pay based somewhat on performance or duties;
- a mission statement that emphasizes academic performance.

The association between a long school year and a positive achievement effect is the most important result of this chapter.

How do charter schools manage to have a longer school year while operating with a budget that is less than that of regular public schools? They save money in various ways: they have small administrative staffs, they have younger teachers, and so on. However, one important way they manage to have a longer school year is to expand their class sizes slightly. We find that schools with longer school years often have slightly larger class sizes, and this makes sense when you realize how much money a school frees up when it expands class size a bit. For instance, by expanding class size by just 3 to 4 students, a charter school may be able to free up 15 percent of its budget.

Other associations between achievement effects and charter school characteristics

One-variable regression, in which we consider the characteristics one by one, suggests that a larger number of characteristics are associated with a stronger positive effect on achievement. These characteristics include:

- a long school year;
- a long school day;
- a greater number of minutes devoted to English during each school day;
- a direct instruction style of teaching;
- use of the Core Knowledge program;
- use of internal evaluations (tests) for diagnostic purposes;
- a greater number of internal evaluations per school year;
- a small rewards/small penalties disciplinary policy;
- teacher pay based on performance or duties, as opposed to a traditional pay scale based strictly on seniority and credentials;
- a mission statement that emphasizes academic performance.

We have only found one school characteristic that has a negative association with a charter school's effect on achievement: having at least one seat *reserved* for a parent on the school's board. We are very skeptical that the negative association comes from the parent seat *per se*. It is more likely that reserving one or more seats for a parent indicates something about the school's general management style that is not conducive to improving student achievement.

Charter school characteristics, considered one by one

In order to interpret the associations with care, we now consider school characteristics one by one.

Years in Operation

When considered either by itself or simultaneously with other characteristics, a charter school's years in operation does *not* have an association with achievement effects that is statistically significantly different from zero. In other words, we have no evidence one way or the other about whether schools improve with experience. This suggests that it is a school's policies, not its years in operation, that matter.

Operating Agency Type

When considered either by itself or simultaneously with other characteristics, a charter school's operating agency type (CMO, EMO, or CGO) does *not* have an association with achievement effects that is statistically significantly different from zero. In other words, we have no evidence one way or the other about whether a school's operating agency type matters. This suggests that it is a school's policies, not its agency type, that matter.

Table Va
Associations between Charter Schools' Characteristics
and their Effects on Achievement

<i>Characteristic</i>	<i>An increase of a unit in this characteristic is associated with what change in the school's achievement effect</i>	
	<i>one-variable regression</i>	<i>multiple-variable regression</i>
Years that school has been operating	not stat. significant	
Community Grown Org (CGO) operating agency	not stat. significant	
Charter Management Org (CMO) oper. agency	not stat. significant	
Educational Management Org (EMO) oper. agency	not stat. significant	
Number of days in school year/10	0.05**	0.15***
Number of hours in school day	0.04*	not confirmed
Saturday school	not stat. significant	
Optional after-school program	not stat. significant	
Saxon math curriculum	not stat. significant	
Scott Foresman math curriculum	not stat. significant	
Everyday Math curriculum	not stat. significant	
SRA reading curriculum	not stat. significant	
Scott Foresman reading curriculum	not stat. significant	
Open Court reading curriculum	not stat. significant	
School's own math & reading curriculums	not stat. significant	
Direct instruction style of teaching	0.06*	not confirmed
Curriculum is core knowledge	0.11*	not confirmed
Number of minutes of math per day/10	not stat. significant	not confirmed
Number of minutes of English per day/10	0.01*	0.02*
Average class size	not stat. significant	
Internal evaluations administered	0.15*	not confirmed
Number of internal evaluations per year	0.06*	not confirmed
Student Advisory (middle & high schools)	cannot test: see notes	
School uniforms or strict dress code	cannot test: see notes	
Small rewards/small punishment discipline	0.13**	0.31*
Parent contract	not stat. significant	
Reserved seat(s) for parent on board	-0.18***	-0.24**
Pay based on performance/duties (not merely on seniority & credentials)	0.16***	0.16*
Mission statemt emphasizes academic performance	0.17***	0.32***
Number of school leaders	not stat. significant	

Notes: Table shows estimates of the associations between schools' characteristics and their effects in math and English achievement. Asterisks indicate level of statistical significance: ***=99%, **=95%, *=10%. A few policies cannot be tested because nearly all charter schools use them.

Long School Year

When considered either by itself or simultaneously with other characteristics, a long school year is strongly positively associated with a school's having a greater effect on achievement. The association from the multiple-variable regression is statistically significantly different from zero with 99 percent confidence, and it indicates that schools with ten more days in the year have achievement effects that are 0.15 standard deviations higher. This is an association of considerable magnitude because a ten day difference is quite common. (Twelve days is the standard deviation in the length of the school year among charter schools.)

Long School Day

When considered by itself, a long school day is positively and statistically significantly associated with a school's having a greater effect on achievement. However, when considered simultaneously with other characteristics, the association of the long school day with achievement effects is not statistically significantly different from zero. Here, we run into the package problem. Having a long school year and a long school day are highly correlated: most schools that have one policy have the other.

What it seems safe to say is that a package that combines a long school year and a long school day is associated with more positive achievement effects. With the data we have now, we do not know whether having just a long school day is associated with positive achievement effects.

Saturday School

When considered either by itself or simultaneously with other characteristics, Saturday School does *not* have an association with achievement effects that is statistically significantly different from zero. In other words, we have no evidence one way or the other about whether Saturday School matters.

The effect of Saturday school is difficult to discern because it is usually adopted in combination with a long school year. Indeed, if Saturday School is mandatory for everyone, not just students struggling with their school work, then Saturday School automatically adds days to the school year.

Optional After-School Programs

When considered either by itself or simultaneously with other characteristics, a charter school's having an optional after-school program does *not* have an association with achievement effects that is statistically significantly different from zero. In other words, we have no evidence one way or the other about whether an optional after-school program matters.

Math and Reading Curriculums

We describe math and reading curriculums in the appendix, using descriptions that rely on the publisher's own materials. We describe only curriculums used by at least a few New York City charter schools. The math and reading curriculums we describe do *not* have associations with achievement effects that are statistically significantly different from zero. Because the standard errors are large, this does not provide evidence one way or the other about the question of whether math curriculums have a positive, negative, or zero association. That is, we have *not* found zero associations. Rather, we simply do not know.

Direct Instruction in Math

Direct instruction is a method of teaching that emphasizes the explicit introduction of skills through lectures, scripted exercises, or demonstrations. It is often contrasted with methods in which a student learns by doing. These methods are variously known as exploratory learning, discovery learning, or inquiry-based learning.

We classified a school as using direct instruction if its math curriculum is designed to be used with the direct instruction teaching method. (It is less easy to say whether a reading curriculum is designed for such use.)

When considered by itself, direct instruction is positively and statistically significantly associated with a school's having a greater effect on achievement. However, when considered simultaneously with other characteristics, the association of achievement effects with direct instruction is not statistically significantly different from zero.

What it seems safe to say is that policy packages that include direct instruction are associated with more positive achievement effects. However, we do not know whether direct instruction itself is what makes such packages work.

Core Knowledge

The Core Knowledge program is described in the Appendix. It is not a curriculum or textbook, but a suggested progression of knowledge that students should acquire at each grade level.

When considered by itself, the use of Core Knowledge is positively and statistically significantly associated with a school's having a greater effect on achievement. However, when considered simultaneously with other characteristics, the association of achievement effects with Core Knowledge is not statistically significantly different from zero.

Number of Minutes of Math and English per Day

When considered either by itself or simultaneously with other characteristics, the number of math minutes per day is not statistically significantly associated with a school's having a greater effect on achievement.

When considered either by itself or simultaneously with other characteristics, the number of English minutes per day is positively and statistically significantly associated with a school's having a greater effect on achievement.

A greater number of English minutes per day is, in practice, often found in conjunction with a greater number of math minutes per day and a longer school day. What it seems safe to say is that something about this "many minutes" package is associated with more positive achievement effects. However, it is hard to say whether it is the length of the school day that matters, the number of minutes on math, or the number of minutes on English.

Class Size

When considered either by itself or simultaneously with other characteristics, average class size does not have an association with achievement effects that is statistically significantly different from zero. The standard error is such that we can rule out negative associations less than -0.01 . Remember that, with class size, *negative* associations are desirable: larger class size means fewer teachers per child. In other words, we can rule out the notion that the reason why some charter schools have larger achievement effects is that they have smaller classes.

Internal Evaluations

Internal evaluations are tests that a school uses for diagnostic purposes--for instance, letting a teacher know which math skills have and have not been learned by her students. When considered by itself, a policy of administering internal evaluations is positively and statistically significantly associated with a school's having a greater effect on achievement. However, when considered simultaneously with other characteristics, the association of achievement effects with an internal evaluation policy is not statistically significantly different from zero.

What it seems safe to say is that policy packages that include internal evaluations are associated with more positive achievement effects. However, we do not know whether the internal evaluations themselves are what makes such packages work.

The Number of Internal Evaluations Per Year

Similarly, when considered by itself, the number of internal evaluations per year is positively and statistically significantly associated with a school's having a greater effect on achievement. However, when considered simultaneously with other characteristics, the association of achievement effects with the number of internal evaluations is not statistically significantly different from zero.

What it seems safe to say is that policy packages that include more internal evaluations are associated with more positive achievement effects. However, we do not know whether the number of the internal evaluations it itself what makes such packages work.

Student Advisory System

A student advisory system gives each student a particular teacher or other staff member who has overall responsibility for his or her performance. Such systems are designed to keep students from "falling through the cracks" in grades where students take different subjects from different teachers. Schools with self-contained classrooms, where students are taught all subjects by the same teacher, do not need advisory systems.

We cannot analyze student advisory systems because they are so widely adopted by the New York City charter schools that do not have self-contained classrooms. Any policy that is very widely adopted is hard to analyze because there is not much variation in it.

School Uniforms and a School Dress Code

Similarly, we cannot analyze school uniform and strict dress code policies because they are so widely adopted by New York City charter schools.

Small Rewards/Small Punishments Disciplinary Policy

Small rewards/small punishments disciplinary policies are based on the idea that expecting small courtesies and punishing small infractions (usually at the classroom level) is important. This is in contrast to disciplinary strategies that focus more on preventing or punishing large infractions (often at an administrative level above the classroom). We classified a school's policy as small rewards/small punishments if it clearly fit the description given above. When it was unclear whether a policy fit, we erred on the side of *not* calling it small rewards/small punishments.

When considered either by itself or simultaneously with other characteristics, a small rewards/small punishments disciplinary policy is strongly positively associated with a school's having a greater effect on achievement. The association from the multiple-variable regression is statistically significantly different from zero with 94 percent confidence, and the association is of considerable magnitude.

Parent Contracts

Some charter schools ask parents to sign a contract. The typical parent contract specifies expectations about attendance, on-time arrival at school, homework, and similar issues. Parent contracts are not legally enforceable, but they do help to set parents' beliefs about what the school expects of them.

When considered by itself or simultaneously with other characteristics, a policy of asking parents to sign a contract does *not* have an association with achievement effects that is statistically significantly different from zero. Because the standard errors are large, this does not provide evidence one way or the other about the question of whether parent contracts have a positive, negative, or zero association. That is, we have not found a zero association. Rather, we simply do not know.

Teacher Pay based on Performance or Duties, as Opposed to Seniority and Credentials

Some charter schools (and nearly all traditional public schools) use a strict salary schedule, in which nearly all of a teacher's pay is determined by her seniority and credentials. For instance, a typical strict schedule has "steps" for each year of seniority and master's degrees. If you know a teacher's seniority and her credentials, you more or less know her pay. There may be a little variation in pay associated with a teacher's taking on extra duties.

Other charter schools pay teachers more flexibly. They may pay teachers based on their measures of their performance, such as whether they raise students' test scores or how the principal rates their contribution to the school. They may also pay teachers based on their willingness to take up duties, so that a teacher who works on supervises extracurricular activities is paid extra. We asked schools to characterize their pay systems. They are recorded as having non-traditional pay if they reported having pay based on performance or duties and not having pay almost wholly determined by seniority and credentials.

When considered either by itself or simultaneously with other characteristics, non-traditional teacher pay is strongly positively associated with a school's having a greater effect on achievement. The association from the multiple-variable regression is statistically significantly different from zero with 92 percent confidence, and the association is of considerable magnitude.

Reserving One or More Seats for Parents on the School's Board

Some charter schools reserve one or more seats on their board for parents. This ensures that there is parent representation. Of course, parents may serve on a board even if there is no seat *reserved* for them. As noted already, all parents exercise indirect control on charter schools because they can "vote with their feet." The parent on the board is, thus, meant to guarantee parent control through a direct channel.

When considered by itself or simultaneously with other characteristics, a policy of reserving one or more seats on the board for parents has a negative association with achievement effects that is statistically significantly different from zero. As mentioned above, we are skeptical that it is the reserved seat *per se* that is associated with worse achievement effects. We suspect that the reserved seat hints at a management style that is problematic in some more general way.

A Mission Statement that Emphasizes Academic Performance

As noted in Chapter I, some charter schools' mission statements emphasize academic performance while other schools' statements express a different goal or goals for students.

When considered by itself or simultaneously with other characteristics, a mission statement that emphasizes academic performance has a positive association with achievement effects that is statistically significantly different from zero.

It is important to realize that this effect is *not* due to families who are academics-oriented self-selecting into schools that emphasize academic performance in their mission statements. If the lotteried-in students who apply to such schools come from academics-oriented families, so do the lotteried-out students who apply to such schools!

Number of School Leaders

Some charter schools have multiple school leaders--for instance, a chief officer and a headmaster. When considered by itself or simultaneously with other characteristics, a policy of having multiple leaders does not have an association with achievement effects that is statistically significantly different from zero.

Other School Characteristics

There are a number of other school characteristics that we do not mention above. This is either because they cannot be measured in a consistent way across schools or because there was insufficient variation in their use among New York City charter schools for us to compute their associations with any sort of precision

Summing Up

We are cautious about all of the associations with achievement that we describe above. First, these associations may change as more data are added or more New York City charter schools open. Second, the associations can be difficult to interpret because some policies are routinely found together in packages: an example is the package of a long school year and long school day. It is difficult to disentangle the role played by each part of a package. Third, it is essential to remember that none of the associations we have described is a causal effect. We are *not* asserting that if a school adopts a certain policy, its achievement effects will rise. One must have causal effects to

make such assertions. We cannot tell whether the policies themselves make the difference or whether the policies are merely correlated with factors that do make the difference (great leadership and so on). We strongly discourage readers from treating the associations as though they were causal effects--for instance, by changing a policy based on the estimates shown.

With all these caveats, the positive associations are with a long school year (this is especially strong), the number of minutes spent on English per day, a small rewards/small punishments disciplinary strategy, teacher pay based on performance or duties, and a mission statement that emphasizes academic performance.

CHAPTER VI. STUDENTS WHO LEAVE CHARTER SCHOOLS OR LEAVE THE STUDY

Students who leave charter schools and return to the traditional public schools

Because most charter schools in New York City do not cover all of the grades from kindergarten to twelve, charter school students do generally return to the traditional public schools if they enroll in a charter elementary school or charter middle school. So far, about 14 percent of charter school students analyzed in this report have returned to the traditional public schools. In future studies, we will be able to analyze how they perform when they are back in the traditional public schools. Unfortunately, they are still too small in number for such an analysis.

A small share (8 percent) of students return to the traditional public schools even though the charter school they are attending does serve their grade. On test scores, these "voluntary returnees" do not differ from their fellow charter school students who did not return to the traditional public schools. Thus, there is no evidence that the charter schools are pushing out students whose test scores are low. The voluntary returnees also do not differ on prior program participation (free and reduced-price lunch, special education, English Learner services). However, the voluntary returnees are more likely to be white or Asian than their fellow charter school students who did not return to the traditional public schools. This may be because charter schools, as noted above, have such a strong draw for black and Hispanic students. It may be that a white or Asian family whose child begins attending a charter school worries about their child being isolated from his or her racial group. This could be a reason behind some voluntary returns.

Students who leave the study

Students, both lotteried-in and lotteried-out, can leave the study for several reasons. Almost identical shares of lotteried-in and lotteried-out students covered by this report have left the study for any reason: 24.8 percent of lotteried-in students have done so; 24.9 percent of lotteried-out students have done so. See Table VIa.

One reason students leave the study is that they graduate from high school. Since the charter school students are more likely to graduate (see Section IV), it is not a surprise that 3 percent of charter school students have left the study by graduating while only 1.1 percent of lotteried-out students

have left through this channel.

Table VIa shows a variety of other reasons that students have left the study and the percentage who have left for each reason. By far the most common reason is transferring to a school outside of New York City or to a private school inside the city. This accounts for 16.7 percent of charter school students and 22 percent of lotteried-out students. In addition, some students (1.4 percent of lotteried-in and 0.9 percent of lotteried-out) leave because their new address is unknown. Most of these students are likely to be transferring outside of New York City or to a private school.

Very small fractions (always less than 2 percent) of lotteried-in and lotteried-out students leave for the other reasons enumerated: being in a GED or similar program; voluntarily withdrawing due to absences or pregnancy; being deceased or institutionalized; and so on.

Table VIa Probability that Student has Left the Study, Overall and by Reason		
	Lotteried-In	Lotteried-Out
Left the study for <i>any</i> reason	24.8%	24.9%
Left the study due to graduating from high school	3.0%	1.1%
Left the study due to:		
transferring to a school outside of NYC or to a private school	16.7%	22.0%
address unknown (could be a transfer or a withdrawal)	1.4%	0.9%
in a GED program or similar program	0.1%	0.1%
voluntarily withdrawn due to absence or pregnancy	1.7%	0.4%
all other reasons (deceased, in non-DOE institution, over age 21 etc.)	1.8%	0.4%

Once one removes the students who leave the study because they graduate, it is clear that lotteried-in students are less likely to leave the study. Thus, there is no evidence that charter schools are pushing students out from New York City's public schools altogether. However, it might still be that charter schools are more likely to push a student out if he is low achieving than the traditional public schools are. If this is so, we should find that leaving the study has a stronger negative correlation with achievement among charter school students than it has among lotteried-out students. (That is, we should find that being a low achiever makes a charter school student more likely to leave than being a low achiever makes a lotteried-out student likely to leave.) Using regression analysis (results shown in Table VIb), we find no evidence that the correlation between achievement and leaving is different for lotteried-in and lotteried-out students. To be clear, we are referring to leaving for reasons other than graduating from high school.

Table VIb shows that lotteried-in students are slightly less likely to leave the study for reasons other than graduating. Students with higher math scores are very slightly more likely to leave the study, but students with higher English scores are less likely to leave the study. Being lotteried-in has *no* effect on whether a student leaves the study when he or she is low-achieving, in either math or English.

Table VIb
Effect on Probability that Student has Left the Study
for Any Reason Other than Graduation
(results from multiple-variable regression)

Lotteried-In?	-0.01*
Most recent test score in math (in standard score units)	0.01*
Most recent test score in English language arts (in standard score units)	-0.03***
Lotteried-In x most recent test score in math	-0.003
Lotteried-In x most recent test score in English language arts	0.001

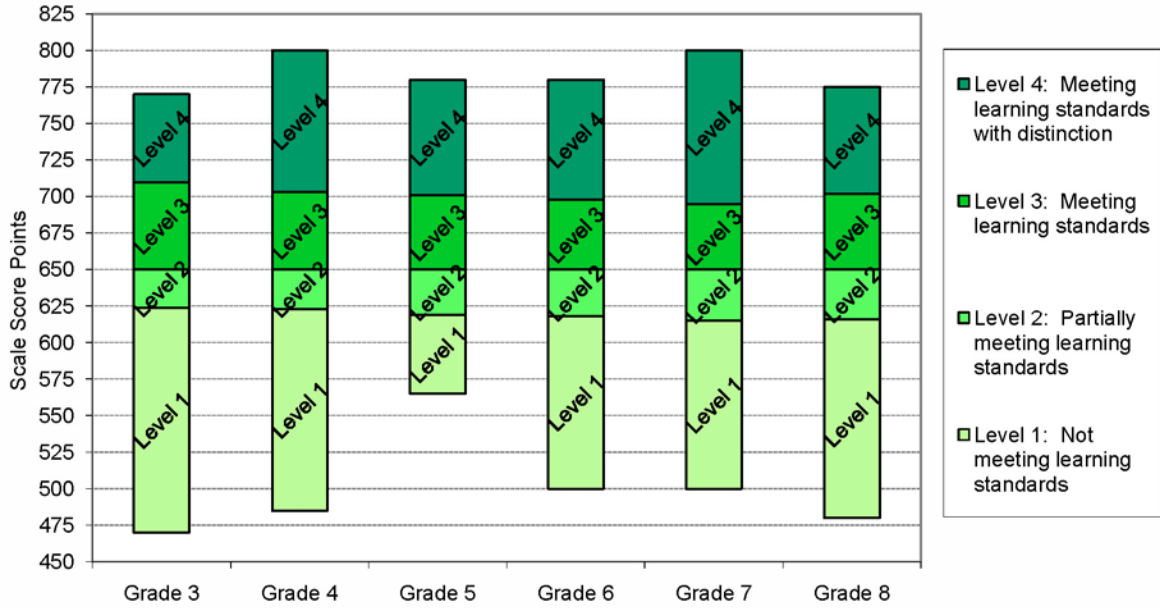
Notes: Table shows estimates of the associations between students' characteristics and their probability of leaving the study for any reason other than graduating from high school. The results are from a linear probability multiple regression. Asterisks indicate level of statistical significance: ***=99%, **=95%, *=10%. The estimation includes a full set of lottery fixed effects.

APPENDIX

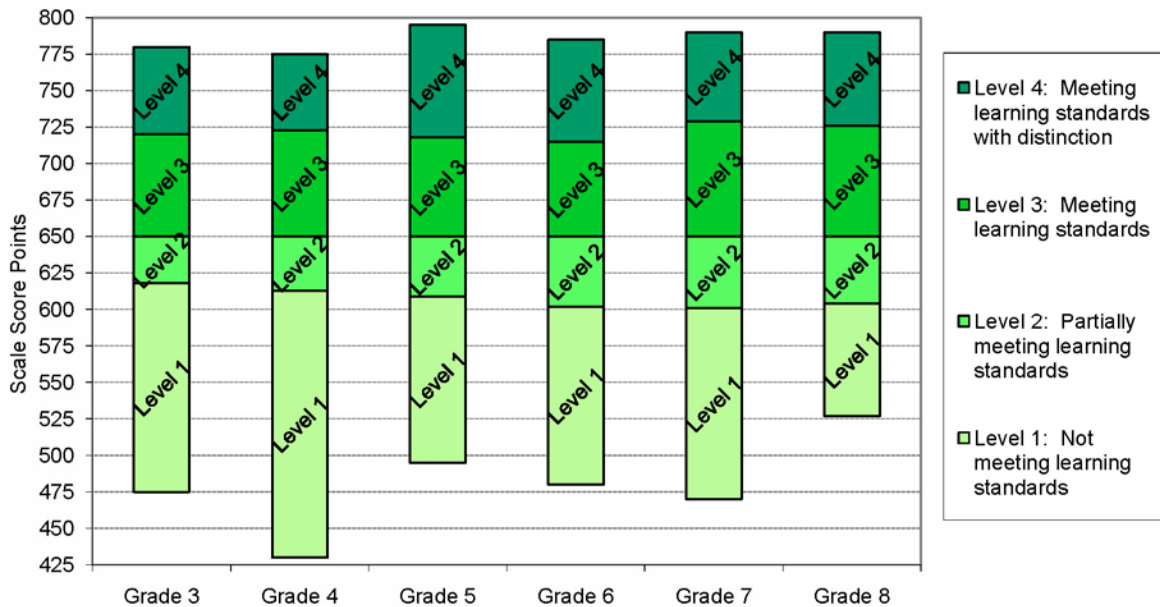
Endnotes

1. We classified a school as using direct instruction if its math curriculum is designed to be used with the direct instruction teaching method. It is less easy to classify schools based on their language arts teaching style. Note that we are discussing a general class of teaching methods that fit into the direct instruction school of thought. We are not discussing Direct Instruction, a specific program designed by Siegfried Engelmann and Wesley Becker.
2. This weighting is not a full solution because students who decide to apply when they are entering fourth grade are fundamentally different from students who apply as kindergarteners. Thus, up-weighting the fourth graders who apply and down-weighting the kindergarteners who apply does not make charter schools fully comparable to traditional public schools. Nevertheless, the adjustment goes some ways toward making the data comparable.
3. "Switcher bias" is the problem identified decades ago as plaguing the evaluation of training programs. It is therefore sometimes called the program evaluation problem. There is a massive literature on the subject, of which two famous articles are: Robert LaLonde, "Evaluating the Econometric Evaluations of Training Programs with Experimental Data," *American Economic Review*, 76.4 (September 1986), 604-620; and Orley Ashenfelter and David Card, "Using the Longitudinal Structure of Earnings to Estimate the Effect of Training Programs on Earnings," *Review of Economics and Statistics*, 67.4 (November 1985), 648-60.
4. For instance, value-added analysis is often used to evaluate teachers' effects on students' achievement. In such a context, it works well so long as students are assigned to teachers in a way that is fairly random. If teachers got to select students based on the students' achievement trajectories, value-added analysis would not work well for teacher evaluation either. Matching per se is not the problem with TPS-history-matching. The matching would be fine if it were based on the traditional public schools that all charter school students would have attended in the absence of the charter school (as a rule, the traditional public schools geographically associated with the students' residences). The problem derives from the fact that matching is based solely on switching students' prior history in traditional public schools.
5. See Caroline Hoxby and Sonali Murarka, "Methods of Assessing the Achievement of Students in Charter Schools," in *Charter Schools: Their Growth and Outcomes*. Mahwah, NJ: Lawrence Erlbaum Associates, 2007.
6. In math, the difference between the top threshold for performance level 1 and the bottom threshold for performance level 3 is about 0.6 of a standard deviation. In English, the difference between these thresholds is about 0.85 of a standard deviation.
7. To keep this figure simple (since it is only for expositional purposes), we used raw data on only those students who attended charter schools from kindergarten through eighth grade.
8. When we compute effects for individual charter schools, some of the schools currently have too little data for us to compute their individual school effect with confidence. These schools are therefore not useful for thinking about how the effects differ among charter schools in New York City. Specifically, if a school's estimated effect has such large standard errors that it is statistically insignificant and that an effect size of 0.1 would also be statistically insignificant, we do not use it for considering the range of effects. The confidence standard is 90 percent.

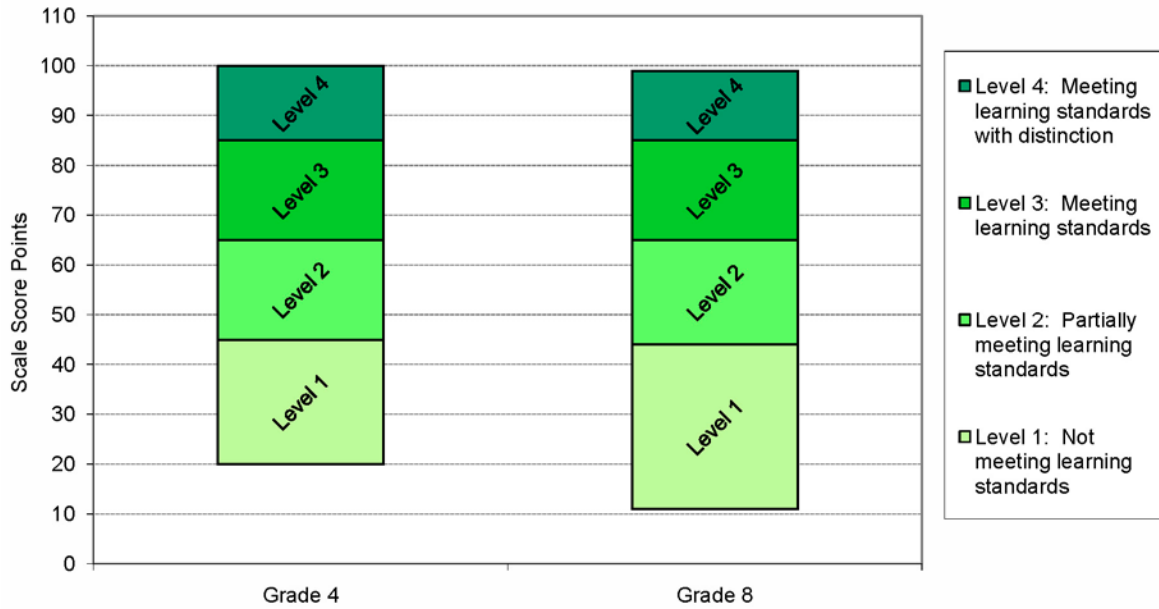
Appendix Figure 1
Relationship between Scale Scores and Performance Levels,
Math 2007-08



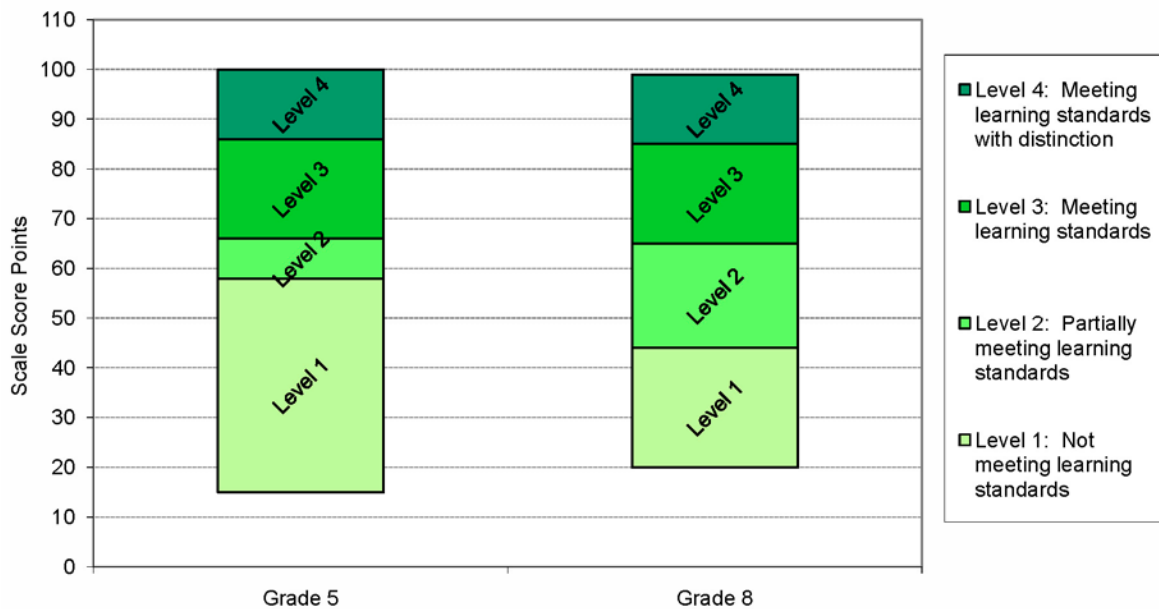
Appendix Figure 2
Relationship between Scale Scores and Performance Levels,
English Language Arts 2007-08



Appendix Figure 3
Relationship between Scale Scores and Performance Levels,
Science 2007-08



Appendix Figure 4
Relationship between Scale Scores and Performance Levels,
Social Studies 2007-08



FREQUENTLY ASKED QUESTIONS

Who conducted this report and how is it funded?

This is the second report from an independent study of New York City's traditional public schools and charter schools. It is funded by the Institute for Education Sciences, which is the research arm of the United States Department of Education.

The principal investigator for the study is Dr. Caroline M. Hoxby, professor of economics at Stanford University and director of the Economics of Education Program at the National Bureau of Economic Research (NBER). The principal authors of this year's report are Dr. Hoxby, Jenny Kang, Project Manager of the New York City Charter Schools Evaluation, and Sonali Murarka, former Project Manager. They are grateful for the cooperation and help they have received in the data gathering process from the New York City Department of Education, the New York City Charter School Center, and the charter schools located in New York City. All of these organizations have also helped the investigators by answering questions and clarifying details about the data. However, the investigators are solely responsible for the content of the report.

How can we get a copy of the full report?

You can download a copy of the full report from this website:

<http://www.nber.org/~schools/charterschoolseval>

How does this September 2009 report relate to the overall study?

The first year report was released in July 2007 and included achievement results through the 2005-06 year. The July 2007 report is available at the website above. This September 2009 report includes achievement result for 2006-07 and 2007-08 for “incumbent” students, by which we mean all the students in the July 2007 report but no other students or schools. In other words, the September 2009 report follows all of the students from the July 2007 report for an additional two years.

The study is funded for several years, and we expect to produce another report by September 2010 that will include all students from this September 2009 report as well as new student applicants to charter schools for the 2006-07 through 2009-10 school years. There may also be additional reports in future years.

Is there a technical version of this report directed towards researchers?

There is no technical version of this report, but a copy of the technical version of the July 2007 report can be downloaded from the Working Papers section of the website www.nber.org. The technical report covers the same material and results, but contains additional details on statistics and computations. The statistical techniques used in the September 2009 report are nearly identical to those used in the July 2007 report.

What is the source of the data used in the report?

Most of the data in this report comes from the databases of the New York City Department of Education, which has a very active research and evaluation program. Visit the website <http://schools.nyc.gov/Accountability/DOEData> for more information on the Department's data for research. Data from the applications of students who applied to the charter schools come from the charter schools themselves. See Section V of the report for information on how these two sources

of data were combined. Some additional data are derived from published statistics of the United States Census of Population and Housing.

Can I have access to the data you used for this study?

We regret that we are unable to provide any of the NYC Department of Education data used for this study as we are under a strict confidentiality agreement.

Can we see information and results on individual charter schools?

The study will not be issuing results for individual charter schools, and we report results in such a way that individual charter schools are not identified. However, this overall report does describe the variation among New York City charter school on many dimensions, including their effects on achievement.

Which charter schools are included in this study?

There were 48 charter schools that had opened in New York City as of 2005-06, and all but a few participated in the study at that time. Two schools, UFT Elementary Charter School and South Bronx Charter School for International Cultures and the Arts, have declined to participate in the study and are not included in this year's report. Manhattan Charter School was not included in the 2007 report but is included in this report. The NY Center for Autism Charter School is not included in the study because it serves a very special population and is not compatible with many elements of the study. Two schools closed during this time period and are not included in the study (see next question).

This report follows the first cohort of students in the original 43 participating charter schools since they were described in the July 2007 report. Subsequent cohorts of students in these schools are not described in this report but will be included in a separate report. Because there are new charter schools opening each year in New York City, some schools that are currently operating are not covered by this year's report even though they are participating in the study.

Does the aggregate report include closed charter schools?

Our study does not include the two charter schools that have closed in New York City, Reisenbach (closed spring 2004) and Readnet Bronx (closed spring 2006), as we have been unable to retrieve retrospective data on the students who applied to them and did not enroll.

Where can I get more information on individual charter schools' mission statements, policies, locations and the like?

Many charter schools have their own websites that contain such information. To find links to them and information on charter schools in New York City in general, we encourage readers to visit the websites of the Office of Charter Schools in the New York City Department of Education (<http://schools.nyc.gov/community/planning/charters>), the Charter Schools Institute of the State University of New York (<http://www.newyorkcharters.org/>), the New York State Board of Regents (<http://www.regents.nysed.gov/>), the New York City Charter School Center (www.nycchartercenter.org), Inside Schools (www.insideschools.org), and GreatSchools (www.greatschools.net).

How is the average grade calculated? Why might it be negative?

To make the averages work out neatly, we treat pre-kindergarten as grade equal to -1 and kindergarten as grade equal to 0. Grades 1-12 are given the appropriate numerical equivalents. Because we are calculating average grade *at the time of application*, an average grade of zero or less than zero means that a majority of students are applying as preschoolers or kindergarteners.

What does "statistical significance" mean?

The indicators of statistical significance are signs about whether we are confident about a particular result. If a result is statistically significant at the 90 percent level ("yes"), this roughly means that we are 90 percent confident that the result you see is not the same as zero. For example, let's say that 65 percent of lotteried-in students are female and 60 percent of lotteried-out students are female. The difference is 5 percentage points. We might report that this 5 percentage point difference is statistically significant at the 90 percent level. This means that we are 90 percent confident that the 5 percentage point difference indicates a real difference between the two groups and that the true difference is not zero.

What is a "p-value"?

A p-value is another conventional way of describing the statistical significance of a result. If you subtract the p-value from the number 1, you obtain our confidence that the result is not the same as zero. For instance, if the p-value for a result is 0.05, then our confidence that the result is not zero is 0.95 or 95 percent.

Why did you choose the race categories you use in the tables?

The race categories we use are black and non-Hispanic ("black" for short), white and non-Hispanic ("white" for short), Hispanic, Asian, and "other". These are the categories given to us by the New York City Department of Education. We are therefore unfortunately unable to break down the data into more specific groups, such as Asian subgroups or mixed race groups.

What is the difference between a student who is lotteried-in and a student who enrolls in a charter school?

A lotteried-in student is anyone who applied to a charter school, had his application entered in a lottery owing to the scarcity of places, and was offered a place in the charter school. A student who enrolls is anyone who applied to a charter school and enrolled in it at some point. The main difference between lotteried-in and enrolled groups of students is the subset of students who are offered a place but decline to enroll. These "decliners" are in the lotteried-in group but not the enrolled group. Another reason that the lotteried-in and enrolled groups of students differ is that some students apply and enroll but do not have to participate in lotteries because there is sufficient space for them in the grade and school to which they apply. See Section V for additional detail.

Why are some comparisons of special education, English Language Learner status, and free and reduced-price lunch statistics unreliable?

Charter schools and traditional public schools do not have the same recording procedures for recording indicators of a student's participation in special education, classification as an English Language Learner, and certification for free and reduced-price lunch. This makes some statistics unreliable for the purpose of comparing charter school applicants to traditional public school students. We show only reliable statistics based on pre-application indicators in this report.

However, pre-application data are not available for all charter school applicants. There is no perfect fix for the problems associated with the differences in recording the indicators.

Fortunately, the recording problems do not affect the lottery-based analysis of achievement. This is because that analysis depends on comparison of lotteried-in and lotteried-out *among* applicants. It does not depend on comparison of applicants to non-applicants.

Are there other reasons to be concerned about the free and reduced-price lunch numbers?

It can be difficult to make comparisons among schools based on the percentage of students who qualify for the federal National School Lunch Program. Comparisons between school systems are particularly likely to be problematic. Small differences may not be interpretable and all differences should be interpreted with caution. It is important to note that, so far as the federal government is concerned, each of New York City's charter schools is a school system ("Local Education Agency" in federal terminology).

Schools vary in their efforts to qualify children for the school lunch program. A student who is *eligible* for the program (household income within 185 percent of the federal poverty line) needs to be *qualified* for the program through a process of reporting the household's income and composition. Thus, a student who is eligible might be qualified for the program if he were to attend one school but not if he were to attend another. Variation in qualifying students takes several forms: some schools may be more insistent about parents or guardians filling out applications; schools may answer questions about eligibility, household composition, and what goes into the income calculation in slightly different ways; schools may differ in how they explain the certification and verification processes. Furthermore, not all schools have the same incentive to qualify students for the program. Some schools, by qualifying more students, can become eligible for a schoolwide program. Other schools already have a schoolwide program and have less incentive to qualify the marginal student who is eligible. Still other schools could not become eligible for a schoolwide program even if every eligible student were qualified. In addition, small schools, like some charter schools, may find it financially unattractive to participate in the federal lunch program even if they run a school meal program. This is because federal reimbursement is on a strictly per-pupil basis. In a small school, the reimbursement is less likely to cover the relatively fixed administrative costs (paperwork and so on) of running a program that earns federal reimbursement. The National School Lunch Program itself reports that schools differ widely in the degree to which they qualify eligible students for the program.

Are there other reasons to be concerned about the special education and English Language Learner numbers?

It can also be difficult to make comparisons among schools based on the percentage of students who participate in special education or who are classified as English Language Learners. This is because there are always students who are on the margin of participation or classification. One school might find that, given its circumstances, a student on the margin is best off in regular education in a mainstream classroom. Another school, with different circumstances, might find the student is best off with an Individual Education Program (special education) or English language services. Small differences in special education and English language learners may not be interpretable and all differences should be interpreted with caution.

Why are some statistics shown for students at the time they applied?

Lunch program qualification, special education participation, and English Language Learner classification are shown for charter school applicants at the time they applied because all of these statistics are based on how the New York City traditional public schools qualify and classify students. Thus, when comparing applicants to students in the traditional public schools, these numbers are helpful because the "yardstick" is the same. However, time-of-application statistics are not available for the *typical* charter school applicant because he or she is likely to be applying for kindergarten or first grade and has thus often not yet been qualified or classified. Unfortunately, it is *impossible* to do a fair comparison between the typical charter school applicant and the average student in the New York City public schools. Therefore, all comparisons of lunch program qualification, special education participation, and English Language Learner classification should be interpreted with caution as small differences may not be interpretable.

Are there outcomes besides test scores that can be analyzed?

The main reasons we focus on test scores are strictly practical. They are available for nearly all students in the test-taking grades, the tests are the same in all the schools in the study (traditional public and charter schools alike), and the scores are available now.

There are many other outcomes that we would like to analyze in order to make a holistic assessment of achievement. Some of these outcomes will be available for future years' reports but are not available for this year's report. For example, we would like to analyze how charter schools affect a student's probability of dropping out of school, graduating from high school on time, and attending various types of postsecondary schools. However, we simply do not have a sufficient number of charter school applicants who have reached higher grades to examine such indicators in this year's report. Another example is attendance. We are interested in attendance data and are working on including it in the study. However, the data were not available in time for this year's report.

There are also outcomes that we would like to analyze but that are hard to measure. Keep in mind that applicants who do not enroll in charter schools are spread out across the traditional public schools in New York City. Thus, if we were to conduct an attitudinal survey, say, we could do it fairly efficiently in the charter schools because many participants in the study are located in each school. However, we would be far less efficient in the traditional public schools because a school might contain only one or two charter school applicants who had not enrolled. It is likely that we would end up with different rates of participation from charter school enrollees and non-enrollees, making it very hard to interpret any results.

We are open to suggestions about outcomes that readers might find interesting and that they believe could be collected in practice.

Why might a school have a lottery that is unbalanced?

A lottery is *not* balanced if the students who are offered spots (the lotteried-in) have characteristics that are statistically significantly different from those of the students who are lotteried-out. Even if every lottery is random and fair, not every lottery will be balanced. This is because lotteries with small numbers of lotteried-in or lotteried-out students are unlikely to balance as a purely statistical matter. For instance, suppose that a school has two places open in its fourth grade class and twenty students apply for the places. It is unlikely that the two lotteried-in students will happen to have the same average characteristics as the eighteen lotteried-out students. This outcome would cause a

lottery to be unbalanced even though it was truly random. On the other hand, if 50 students were lotteried-in and 50 were lotteried-out, the two groups are likely to be similar on average and the lottery is likely to be balanced statistically.

Are all charter school students who are in the study included in the lottery-based achievement results?

Not all students who are in the study are included in the lottery-based analysis of achievement. A student may be excluded for one of three reasons: (1) he had not yet taken a New York State test as of 2005-06; (2) he applied to a charter school that did not need to hold a lottery for the grade and year for which he applied; or (3) he participated in an admissions lottery but it was unbalanced. The vast majority of students who are in the study but not included in achievement analysis are in kindergarten through second grade, grades in which there are no required New York State exams. The tables in Sections III and V contain details about how many students are in the study and how many are included in the lottery-based analysis of achievement.

Why are there no results based on comparison-of-gains or other non-lottery methods?

We are obtaining data from the New York City Department of Education that will allow us to conduct analysis based on comparisons of gains. In this method, charter students can be compared to similar students in the schools and neighborhoods from which they were drawn. We may include some analysis based on comparison of gains in future reports if we think that it provides helpful additional information. It should be noted, however, that results from lottery-based methods are strictly superior to results based on comparison-of-gains for achievement data where both methods are available. Comparison-of-gains methods are mainly helpful for data on which lottery-based methods cannot be used. See Section III for information on why value-added methods are not appropriate for comparing achievement in charter schools to achievement elsewhere. Researchers interested in methodological questions should consult the June 2007 technical report available online in the Working Papers section of the website www.nber.org.

What do the indicators of statistical significance mean?

The indicators of statistical significance are signals of whether we are confident about a particular result. If a result is statistically significant at the 95 percent level, say, this means that we are 95 percent confident that the result is not equal to zero.

What is a "p-value"?

A p-value is another conventional way of describing the statistical significance of a result. If you subtract the p-value from the number 1, you obtain our confidence that the result is not the same as zero. For instance, if the p-value for a result is 0.05, then our confidence that the result is not zero is 0.95 or 95 percent.

What are lottery "fixed effects"?

It is not random *whether* a student participates in a lottery because, of course, he has to apply to participate. What is random is whether he is offered a place as a result of the lottery. Therefore, we want to use the randomness *within* lotteries to ensure an apples-to-apples comparison but we do not want to use the non-random differences *between* lotteries. This may sound complicated but lottery "fixed effects" are actually a simple statistical technique that does just what we want. The technique accounts for differences between lotteries but still allows us to use all of the random assignment

within lotteries. Researchers interested in further information should consult the June 2007 technical report available online in the Working Papers section of the website www.nber.org.

What are “robust standard errors clustered at the student level”?

Robust standard errors clustered at the student level are used so that a student who applies to a charter school multiple times or applies to multiple charter schools is not treated as multiple, separate individuals. For example, suppose that a student applies to two charter schools and is lotteried out of both. He keeps attending his traditional public school. The robust standard errors ensure that he gets counted only as one person, not two people.

The report frequently refers to the expected gains of lotteried-out students. Do we know what these expected gains are?

Calculating the average gain of lotteried-out students is complicated because New York City changed tests between 2004-05 and 2005-06. There is unfortunately no widely accepted way to rescale the old tests and the new tests so that a student's gain from 2004-05 to 2005-06 makes sense. We realize, however, that people may be interested in this statistic since charter schools' estimated effect on achievement is *relative* to the gains made by lotteried-out students. A reader may get an approximate idea of the gains by consulting the reports published by the New York City Department of Education that are based on scores from 2004-05 and previous years. A reader who wants only an approximate idea may also consult the authors by writing to them at the address shown at the front of this report.

What are some of the curricula used by New York City charter schools?

Below, we offer short descriptions of the curricula mentioned in Section III. These descriptions are based on the published materials for each curriculum. Consult the websites given below for additional detail.

Saxon Math

Using Saxon Math Courses 1, 2, and 3 each day, students work toward mastery in three ways: by reviewing, maintaining and building upon previously learned skills; through direct, explicit instruction of new content, mathematical thinking and vocabulary; and by applying, reinforcing and demonstrating cumulative learning.

Source: <http://www.harcourtachieve.com> (accessed June 2007).

Scott Foresman-Wesley Addison Mathematics

Scott Foresman-Addison Wesley Mathematics (Diamond Edition) is a research-based Pre-K-6 curriculum that focuses on developing students' conceptual understanding and skills through step-by-step instruction. The focus is on key ideas in mathematics, rich problem-solving lessons that build the reading and writing skills necessary for powerful problem solving, and differentiated instructional options to meet the needs of varied learners.

Source: <http://www.scottforesman.com> (accessed June 2007).

Everyday Mathematics

Everyday Mathematics is a research-based curriculum developed by the University of Chicago School Mathematics Project. Development of Everyday Mathematics began with a research phase. Based on their findings, the authors established several basic principles that have guided the development of Everyday Mathematics: Students acquire knowledge and skills, and develop an

understanding of mathematics from their own experience; children begin school with more mathematical knowledge and intuition than previously believed; teachers, and their ability to provide excellent instruction, are the key factors in the success of any program.

Source: <http://everydaymath.uchicago.edu/about.shtml> (accessed June 2007).

SRA Reading Mastery Plus

Reading Mastery Plus gives students the skills and the clear, explicit instruction and guidance they need to master the fundamentals of reading. Oral language, phonemic awareness, and systematic phonics are the starting point. Vocabulary development, fluency, and comprehension are fundamental throughout. The program is set up so students are active participants. Group responses make learning highly efficient and enable teachers to provide instant feedback that confirms or corrects their responses. Less-structured activities and opportunities for independent work help students develop self-reliance. On-going assessment tools are used by the instructor to ensure that no student "falls though the cracks."

Source: www.sraonline.com (accessed June 2007).

Scott Foresman Reading Street

Scott Foresman Reading Street 2008 is an all-new reading program for Grades PreK–6. Reading Street is designed to help teachers build readers through motivating and engaging literature, scientifically research-based instruction, and a wealth of reliable teaching tools. The program takes the guesswork out of differentiating instruction with a strong emphasis on ongoing progress-monitoring and an explicit plan to help with managing small groups of students. In addition, Reading Street prioritizes skill instruction at each grade level, so teachers can be assured they will focus on the right skill, at the right time, and for every student.

Source: <http://www.scottforesman.com> (accessed June 2007).

Open Court Reading

Open Court Reading is a complete elementary basal reading program for Grades K-6. It maintains strong instruction in the areas of decoding (learning how to read), comprehension (understanding what you read), inquiry and investigation (learning how to apply what you have read), and writing (how to communicate with others in print). Open Court Reading is designed such that no assumptions are made about students' prior knowledge. Each skill is systematically and explicitly taught in a logical progression to develop understanding and mastery.

Source: www.sraonline.com (accessed June 2007).

Core Knowledge Reading

Core Knowledge does not at present require any particular reading program. Schools are free to select from programs on the market. However, we recommend that schools choose a program that has strong phonics instruction, and we recommend that schools build oral language through frequent reading aloud on topics in the Core Knowledge Sequence. An ideal reading program will include good phonics instruction (followed by fluency work) combined with frequent reading aloud to expose children to new words and key subjects like the subjects listed in the Core Knowledge Sequence. Moreover, the reading aloud will include not only fictional stories but also generous amounts of nonfiction.

Source: www.coreknowledge.org (accessed June 2007).

What is the study doing to ensure a high match rate between applicants and their New York City Department of Education records?

We have asked charter schools to collect certain information on applications that some of them did not collect before participating in this study. For instance, we have asked them to collect information on the student's prior school and grade at the time of application.

What about students who have priority because they are siblings of students who have already been lotteried into and enrolled in a charter school?

Such students can be thought of as applying in a special group with other students who are applying to the same grade and school and who *also* have sibling-based priority. In some cases, a school has room for all such students and they were effectively lotteried-in with their siblings. In other cases, a school must run a new lottery among such students, and they are effectively in a fresh lottery.

What about students who have priority because they reside in the same community school district (CSD) as the charter school they are applying to? What about preference given to students who are zoned to attend a “failing” school?

Priority for students based on CSD was first implemented in New York City in lotteries for the 2008-09 year. Because the September 2009 report includes students who applied up through the 2005-06 year, CSD preference was not taken into account in these lotteries. Priority for students who are attending or are zoned to attend a “failing” school, as determined by the most recent NYC Department of Education Progress Report, is only given by some charter schools but was not implemented until lotteries for the 2009-10 year. Thus, the lotteries included in this report never gave preference to students from failing schools.