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12

The Effects of School Choice in New York City

OVER THE PAST FEW YEARS, the Congress and many state legislatures have put forward proposals that would offer families vouchers or scholarships so that they may choose among a wide range of public and private schools. In 1990 the Wisconsin legislature enacted a pilot program giving public school students access to secular private schools in the City of Milwaukee; in 1996 the legislature expanded this program to include religious schools. After surviving a constitutional challenge in state courts, the program went into effect in the fall of 1998. A similar program for Cleveland, enacted by the Ohio legislature, began its third year of operation

in the fall of 1998. Florida has established a program scheduled to go into effect in fall 1999. At the federal level, a pilot program for the District of Columbia received congressional approval in 1998, but was vetoed by President Bill Clinton.

Many interest groups, political leaders, and policy analysts have debated the desirability of continuing and expanding these and other ongoing school choice programs. Supporters of school choice assert the following:

—low-income inner city children learn more in private schools;

—the more orderly educational climate in private schools enhances learning opportunities;

—private schools use their limited resources more efficiently;

—families develop closer communications with schools that they have chosen themselves;

—school choice reduces the amount of mobility from school to school, both within the school year and from one year to the next; and

—choice fosters racial and ethnic integration.[1]

Critics challenge these claims by arguing as follows:

—any perceived learning gains in private schools are due to the more selected nature of private-school families;

—private schools select out the "best and the brightest," leaving behind the disadvantaged;

—low-income families choose schools more on the basis of location, religious affiliation, and sports programs than educational quality;

—public schools have a broader range of programs to serve needy populations;

—when choices are available mismatches often occur, and private schools expel problem students, adding to the instability of the education of children from low-income inner city families;

—private school rules, such as uniforms and dress codes, interfere with a child's creativity;

—private schools balkanize the population into racially and ethnically homogeneous educational environments.[2]

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1. Recent works that make a case for school choice include Brandl (1998); Coulson (1999); Cobb (1992); Bonsteel and Bonilla (1997). For a collection of essays that report mainly positive effects of school choice, see Peterson and Hassel (1998).

2. See Ascher, Fruchter, and Berne (1996); Carnegie Foundation for the Advancement of Teaching (1992); Gutmann (1987); Levin (1998); Fuller, Elmore, and Orfield (1996); Rasell and Rothstein (1993); Cookson (1994).

Much of the debate over school choice is particularly intense, in part because high-quality information about school choice programs is limited. Although many studies comparing public and private schools have been published, they have been criticized for comparing dissimilar populations. Even when statistical adjustments are made, it remains unclear whether findings describe actual differences between public and private schools or simply differences in the kinds of students and families that attend them.[3]

The best way to make sure that two populations are similar is to assign individuals randomly to treatment and control groups. This procedure is standard in medical research. Recently, it has also been used in a number of educational studies, such as Tennessee's Project STAR, which finds that first grade students learn more if classes are smaller.[4] Until now, though, this type of research design has not been used carefully to study the question of school choice.

In this paper we report outcomes from a randomized experiment in New York City made possible by the privately funded School Choice Scholarships Foundation (SCSF). Under the pilot program, a lottery allocates scholarships randomly to applicants, the lottery is administered by an independent evaluation team that can guarantee its integrity, and baseline data on student test performance and family background characteristics are collected from students and their families prior to the lottery. The first year follow-up has a response rate of approximately 83 percent. Inasmuch as data of this quality have not previously been available, the program provides the best opportunity to estimate the effects of a school choice program on student test performance and parental perceptions of school life.

The School Choice Scholarships Foundation Program

In February 1997, the SCSF announced that it would provide 1,300 scholarships worth up to $1,400 annually for four years to children from low-income families who were then attending public schools. The scholarships could be applied toward the cost of attending a private school, either religious or secular. SCSF received initial application forms from over 20,000

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3. Major studies that find positive educational benefits from attending private schools include Coleman, Hoffer, and Kilgore (1982); Chubb and Moe (1990); Neal (1996). Critiques of these studies are found in Goldberger and Cain (1982); Wilms (1985).

4. See Mosteller (1995). Also, see chapter 6 by Frederick Mosteller and chapter 7 by Eric Hanushek in this volume.

students between February and late April 1997. In order to become eligible for a scholarship, children had to be entering grades one through five in fall 1997, live in New York City, attend a public school at the time of application, and come from families with incomes low enough to qualify for the federal free school lunch program. To ascertain eligibility, students and an adult member of their family were asked to attend meetings to verify their family income and public school attendance. Only families who attended these sessions and documented their eligibility were considered for a scholarship.

Since many more families applied than scholarships were available, a lottery was held to ensure that every family had a fair chance of being offered a scholarship. This evaluation compares two statistically equivalent groups: 1,000 scholarship families and 960 "control" families, randomly chosen from those who had applied.[5] After the lottery, the SCSF assisted scholarship families in finding private school placements. In mid-September 1997, the foundation reported that places had been found at 225 private schools for approximately 75 percent of all those offered scholarships.

Data Collection

During the verification sessions, students were asked to take the Iowa Tests of Basic Skills in reading and mathematics. Students in kindergarten applying for a scholarship for first grade were exempted from this requirement. Parents were asked to provide information on their satisfaction with the school their children were then attending, their involvement in their children's education, and their demographic characteristics.[6] These sessions took place during March, April, and early May 1997.

The response rate on the baseline surveys and tests was 100 percent, because completion of the instruments was a prerequisite to participating in the program. Since scholarships were allocated by a lottery, there were few differences between scholarship recipients and the control group. However, the baseline test scores of nonrecipients were somewhat higher.[7]

5. The procedures for constructing the analysis sample with 1,000 scholarship families and 960 control families are described in Hill, Rubin, and Thomas (1998).

6. Questionnaires are available from Mathematica Policy Research on request.

7. These findings are reported in Peterson and others (1997) and also at (http://data.fas. harvard.edu/pepgl [June 1999]).

The first-year follow-up data were collected in April, May, and June of 1998. The families were invited to attend sessions during which students took the Iowa Test in Basic Skills in mathematics and reading and adult family members completed surveys that asked a wide range of questions about the educational experiences of their oldest child within the age range eligible for a scholarship. Students in grades three, four, and five were also asked to complete short questionnaires.

Eighty-three percent of those selected for participation attended the testing and questionnaire sessions. This high response rate was achieved in part because the SCSF conditioned the renewal of scholarships on participation in the evaluation. Nonrecipients who were selected for the control group were compensated for their expenses and told that they would automatically be eligible to apply for a new lottery if they participated in these follow-up sessions.[8]

Data Analysis and Reporting Procedures

The analysis of the data from the first year of the SCSF program takes advantage of the fact that the scholarships were awarded by lottery. As a result, it is possible to compare two groups of students who were similar, on average, in almost all respects except that the members of the control group were not offered scholarships. Two questions frame the analysis reported here. First, what was the effect of the offer of a scholarship on a group of low-income applicants, as measured by test scores and as perceived by the applicants themselves? And second, what was the effect of attending a private school?

For some analysts, the crucial policy question is as follows: what happens when a school choice program is put into effect? What are the impacts on the population of low-income families who apply for a school choice scholarship? This is similar to a question often asked in medical research: what will happen if a particular pill is marketed? How will the health of potential users be altered, whether or not all patients use the pill as prescribed?

8. For a comparison of the characteristics of respondents and nonrespondents, see Peterson and others (1998); also at (http://data.fas.harvard.edu/pepgl [June 1999]).

But other analysts also want an answer to a second question: what is the impact of attending a private school? Specifically, they want to know what difference it makes whether children from low-income inner-city families attend public or private schools. The parallel question in medical research is: what are the consequences of actually taking a pill, as prescribed? The answer to this second question requires comparison between private school students and similar individuals remaining in public school.[9]

Thus in addressing these two questions below, we present four types of information: the responses of all those offered a scholarship, the estimated impact of being offered a scholarship, the responses of all those who attended private school, and the estimated impact of attending private school.

The analytical techniques needed to address these two questions differ in important ways. The first question can be answered straightforwardly, by comparing the responses of those who were offered a scholarship with the responses of the control group. Because scholarships were awarded at random, the two groups may be assumed to be, on average, statistically equivalent, save for the offer of a scholarship. Any differences in outcomes between the two groups can be attributed to the offer.[10]

To compute the effects of a scholarship offer on children's test scores, we estimate statistical models that take into account whether a student was offered a scholarship, as well as baseline reading and math test scores and variables that define the randomization process. Baseline test scores were included to adjust for chance differences between the scores of treatment and control groups on the achievement tests, and to increase the precision of the estimated impacts. We use a similar approach to compute the effects of the program on the parent and student survey responses. However, we

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9. To compute the program's impact on those who attended private school, we used an instrumental variables estimator; see Angrist, Imbens, and Rubin (1996). By comparing those in private school with members of the control group remaining in public school, we can estimate the impact of attending a private school.

10. As discussed in the appendix to Peterson and others (1998), differential response rates for test and control groups could account for some differences between the two groups. The observed results most likely to be affected by differential response rates have to do with likelihood of remaining in school throughout the school year and of returning to the same school the next year. Since nonrespondents are likely to be more mobile, differences between test and control group may be underestimated. The response rate for the treatment group was 84 percent; for the control group, 80 percent.

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do not include baseline data in equations predicting parent and student responses.[11]

A Context for Interpreting Program Effects

When considering the effects that we report in this chapter, two contextual issues must be taken into account: first, the possibility of response bias from both the treatment group and the control group, and second, the population to which one can generalize the findings.

RESPONSE BIAS. It is well known that people tend to overestimate their good behaviors and underestimate their less attractive ones. Students and parents are no different. They are likely to overestimate the time spent on homework and volunteering for school, as well as their educational expectations for their children. Parents may also view the school their children attend through rose-tinted glasses; few responsible parents are likely to admit to themselves or to others that they are sending their children to terrible schools.

The interpretation of data from the parental and student surveys in the SCSF program must take into account this very human tendency. No special weight should be placed on the frequency with which a particular type of event is said to take place. For example, one should not take too seriously the claim of third through fifth grade students that they spend, on average, approximately one hour and twenty minutes a day doing homework. But if absolute levels may not be estimated accurately, there is no reason to believe that the two groups of parents differ in the accuracy

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11. Since all eligible children within a family could receive a scholarship, some families had two or more children in the evaluation. The presence of several children from the same family produces clustering effects. When clustering is present and analyses are conducted under the assumption of simple random sampling—that is, that all observations are independent—researchers may underestimate the standard error of the estimated impact, overestimate test statistics, and conclude inappropriately that a difference between the treatment group and the control group is statistically significant. To better approximate the true standard error, in the test score analyses we supplement conventional estimates with estimates using the "bootstrap" method; see Stine (1990); Effron (1982). This method provides a direct estimate of the variability in the effect of a treatment without having to make an assumption about the independence of the observations in the sample.

Prior research has generally found that the effects of attendance at private schools on test scores are either positive or insignificant, and therefore the one-tailed test of significance is preferred in the test score analysis. However, in the analysis of responses from parents and children the two-tailed test is preferred, because there exist few prior studies on which to base expectations.

of their reports, since individuals were assigned randomly to the two groups. Therefore we emphasize differences between groups, rather than absolute values obtained for any one group.

GENERALIZATION. Only a tiny fraction of low-income students in the New York public schools were offered scholarships, and these constituted only a small proportion of the students attending New York private schools. A much larger program could conceivably have quite different outcomes. Also, generalizations must be made cautiously whenever applicants differ from the eligible population, as we discuss below.

Characteristics of Applicants

Critics of school choice argue that vouchers do not give low-income families a viable choice of schools. In the words of education sociologist Amy Wells, "white and higher-SES [socioeconomic status] families will no doubt be in a position to take greater advantage of the educational market."[12] Defenders of private schools reply that private schools have an ethnically and economically diverse population. For example, it has been pointed out that the social composition of the Catholic school student population does not differ substantially from that of public schools in New York City.[13]

To be eligible to apply for an SCSF scholarship, a family had to qualify for the federal free lunch program, have a child currently in a public school, and live in New York City. To have one's name entered into the lottery, applicants had to participate in eligibility verification sessions. It is possible that the application process attracted a population substantially different from a cross-section of all those eligible.

To estimate the extent to which the applicant population differed from a cross-section of the eligible population, Rachel Deyette of the Kennedy School of Government has obtained demographic information on those who would have been eligible had scholarships been offered in 1990, the last year in which a national census was taken.[14] Her estimate is based on

12. Wells (1996, p. 47).
13. Blue Ribbon Panel on Catholic Schools (1993).
14. Deyette (1999). Information is drawn from the Integrated Public Use Microdata Series data set of the census, created at the University of Minnesota.

data collected when economic and social conditions in New York differed from those when parents were surveyed. For example, 1990 was a recession year whereas 1997, the year of application, was in the midst of a boom period. Also, education levels of the adult population rose over this period. Nonetheless, her estimates provide a preliminary basis for comparison.

Deyette finds no significant difference between the median income of applicants and that of the eligible population, once income is adjusted for inflation between 1990 and 1997. Her findings for employment rates for fathers are similar. The residential mobility of the applicant population and the eligible population is about the same, and applicant mothers are only slightly more likely to be foreign born than mothers in the eligible population.

The applicants do differ from the eligible population in other respects, however. Applicants are more likely to be dependent on government assistance for income. Also, the applicant population is less likely to be non-Hispanic white and more likely to be African American. But if these findings suggest that the applicant population is particularly disadvantaged, other findings point in the opposite direction. In the applicant population, mothers and fathers are considerably more likely to have some college education, English is more likely to be the primary language of the household, and mothers are more likely to be employed either full or part time.

Program Effects

In tables 12-1 to 12-6, we report program effects in two ways. The first two columns show the impact of being offered a scholarship, and the third and fourth columns show the impact of actually attending a private school. Specifically, the first column provides the responses of those offered a scholarship; the second column gives the difference between the responses of those offered a scholarship and the control group. Subtracting the second column from the first generates the responses of the control group. Similarly, the third column provides the responses of those with children in private school, and the fourth column gives the estimated difference between the responses of those in private school and those members of the control group who remained in public school. For the control group, the percentages reported in the text can be obtained by subtracting the fourth

column from the third column.[15] To facilitate clear discussion of these findings, we comment only on the differences between those in private schools and the appropriate control group.

Experiences in School

Table 12-1 shows that attendance at a private school had a substantial impact on the daily life of students at school, according to parental reports. Private school parents were less likely to report the following as serious problems at school: students destroying property, being late for school, missing classes, fighting, cheating, and racial conflict. For example, 39 percent of the private school parents thought fighting was a serious problem at their school, compared with over two-thirds of parents in the control group. For tardiness, 38 percent of the private school parents versus 60 percent of the control group perceived this as a serious problem. Nearly 30 percent of private school parents but 47 percent of the control group said destruction of property was a serious problem.

Although student reports of the climate in schools and classrooms are not as sharply differentiated, they are consistent with parental assessments. Scholarship students, for example, were more likely to report that students got along with teachers and were proud to go to their school.

It appears that public and private schools use somewhat different mechanisms to maintain discipline. Private schools seem to emphasize dress and orderliness; public schools use rules and regulations. No less than 97 percent of the private school parents reported that their schools required uniforms, as compared with 26 percent of parents in the control group. Similarly, 94 percent of the private school parents reported that certain kinds of clothing were forbidden, whereas less than half of the control group did so. By contrast, sign-in sheets and hall passes are more frequently employed by public schools. More than 95 percent of the control group reported that parents had to sign in when they came to school, compared with only about 80 percent of the private school parents. To leave their classes, 87 percent of students in the control group had to obtain hall passes, according to their parents, whereas only about 71 percent of the private school parents said that this was a requirement.

15. If a value in the fourth column is negative, the percentage for the control group is obtained by adding the third and fourth columns.

Table 12-1. *Effects of the School Choice Scholarship Fund Program on School Climate*[a]

Percent

Sample and report	Scholarship offered	Scholarship offer effect	Attends private school	Private school effect
Parents				
Serious problems				
Fighting	44	−20***	39	−29***
Tardiness	42	−15***	38	−22***
Kids miss class	38	−12***	35	−18***
Kids destroy property	32	−12***	29	−18***
Cheating	35	−7**	33	−10**
Racial conflict	32	−5*	31	−7*
School rules				
School uniform	82	49***	97	71***
Certain dress forbidden	85	35***	94	50***
Visitors must sign in	83	−11***	79	−17***
Hall passes required	74	−11***	71	−16***
N	817–32	...	676–91	...
Students				
Proud to attend this school	64	8***	66	12***
Behavior rules strict	68	6	69	8
Get along with teachers	60	5**	61	8**
Feel "put down" by teachers	21	−4	20	−6
Have four or more friends who use bad language	20	−3	19	−4
N	547–78	...	404–30	...

Source: Authors' calculations.

a. Weighted values are reported. The first column reports effects for all applicants offered a scholarship, the second reports differences in outcomes between those offered a scholarship and the control group, the third reports effects for those attending a private school, and the fourth reports differences between those attending a private school and the control group (see text for further details). Statistical significance at the 0.1 level (two-tailed test) is denoted by *; at the 0.05 level (two-tailed test), by **; and at the 0.01 level (two-tailed test) by ***.

Table 12-2. *Effects of the SCSF Program on Homework*[a]

Percent

Sample and report	Scholarship offered	Scholarship offer effect	Attends private school	Private school effect
Parent				
Child has more than one hour of homework	51	15***	55	21***
Homework too easy	10	–6**	8	–8**
N	834–39	...	693–98	...
Student				
Trouble keeping up with homework	25	2	25	3
Do all homework	83	4	84	6
Teachers return homework most of time	44	–9***	40	–13***
N	573–609	...	486–514	...

Source: Authors' calculations.
a. See table 12-1, note a, for interpretation of table.

Homework

Table 12-2 reports the program's effects on homework. According to parents, students in private schools are asked to do more homework. Of the private school parents, 55 percent reported that their child had at least one hour of homework a day, whereas only a third of parents in the control group reported as much homework. Private school parents were also less likely to say that the homework was too easy.

Students' assessments of their homework situation varied somewhat from that of their parents. However, the wording of the questions for parents and students is sufficiently different that the results do not directly contradict each other. Students were asked whether it was true that they "had trouble keeping up with the homework." Twenty-five percent of private school students said this was true, but 22 percent of the students in the control group gave a similar response. Students were also asked "how much" of their homework they "usually" did. If their answers are to be believed, they are model students: about 80 percent of both groups claimed to do "all" of their homework. Over half of the students in the control

Table 12-3. *Effects of the SCSF Program on Communication between School and Parents*[a]

Percent

Parent report	Scholarship offered	Scholarship offer effect	Attends private school	Private school effect
Receive grade information	90	8***	93	11***
Notified of disruptive behavior	87	6***	89	10***
Speak to classes about jobs	43	9***	46	13***
Participate in instruction	62	12***	66	18***
Parent nights	92	5***	93	7***
Regular parent-teacher conferences	93	3*	94	5*
Receive notes from teacher	88	9***	91	13***
Receive newsletter	82	15***	86	22***
N	816–31	...	569–764	...

Source: Authors' calculations.
a. See table 12-1, note a, for interpretation of table.

group were more likely to say that their homework was graded and returned to them "always or most of the time," but only about 40 percent of the private school students gave this response.

Parental Involvement and Communication with Schools

Private school parents report more extensive communication and involvement with their children's schools. The data presented in table 12-3 indicate that a higher percentage of parents of students in private schools reported that they were more informed about student grades halfway through the grading period, were notified the first time their children were sent to the office for disruptive behavior, spoke to classes about their jobs, participated in instruction, were at schools that held more open houses or back-to-school nights, received notes from teachers about their children, received a school newsletter, and were informed by school when their children were absent and had more frequent parent-teacher conferences.

The largest differences in parental involvement and school communication practices involve parents receiving newsletters, participating in instruction, receiving notes from teachers, and speaking about their jobs.

For example, about 90 percent of the private school parents reported receiving notes from teachers, as compared with just over three-fourths of the parents in the control group.

Continuing in the Program

It is generally thought that students do better if they remain in the same school throughout the school year and from one year to the next. Does school choice destabilize a child's educational experience? In his evaluation of the Milwaukee school choice program, John Witte expressed concern at the high rate of attrition from private schools.[16] A number of critics of school choice have raised questions about the readiness of private schools to expel students who do not "fit in."[17] But other studies have found that private school students from low-income families are more likely to remain in the same school throughout the school year and from one year to the next.[18] The SCSF pilot program provides an opportunity to examine this question. In general, our findings indicate that school choice does not disrupt the education of low-income students.

Table 12-4 reports program effects on students changing school during the school year. A very high percentage of all students in the study reportedly remained in the same school for the entire year, much higher than is typical of inner-city minority children.[19] No differences in school mobility rates are apparent between children in private schools and the control group: 95 percent of both groups reported that their children had remained in the same school throughout the school year.[20] Similarly, suspension rates were much the same for both groups: 7 percent of the parents in the control group and 4 percent of the private school parents reported that their children had been suspended.

Those who did change schools were asked to list their reasons. Among both groups, answers were fairly evenly distributed across the variety of alternatives provided in the questionnaire. The most frequently mentioned

16. Witte (1991).

17. See, for example, Murphy, Nelson, and Rosenberg (1997).

18. See Greene, Howell, and Peterson (1998).

19. Witte, Bailey, and Thorn (1992, pp. 19–20).

20. These percentages may underestimate the actual rates of school mobility for both groups. The families that did not attend the follow-up sessions are probably more likely to have moved, making it more difficult for evaluation staff to locate them. If so, their children would be more likely to have changed schools.

Table 12-4. *Effects of the SCSF Program on Changing School during the School Year*[a]
Percent

Parent report	Scholarship offered	Scholarship offer effect	Attends private school	Private school effect
Child suspended for disciplinary reasons	4	–2	4	–3
Child attended same school throughout school year	95	0	95	0
Reasons for changing school[b]				
Moved away	2	–1	1	–1
School quality	1	0	0	0
Too expensive	1	1**	2	2**
Suspended or expelled	0	0	0	0
Prefer public school	0	–1	0	–1
Inconvenient location	0	0	0	0
Prefer private school	0	0	0	0
N	832–42	...	783–86	...

Source: Authors' calculations.
a. See table 12-1, note a, for interpretation of table.
b. Denominator includes responses of parents of both those who stay and those who leave.

were that the school was too expensive or that the family had moved away. No other reason was given by more than 1 percent of parents. School quality was cited by four scholarship parents and seven members of the control group. Seven scholarship parents and four members of the control group said that expense was a factor. Only three scholarship users and two members of the control group said that their child had been expelled or suspended. In short, school mobility was very low and virtually identical for both those in private and public schools. Expulsion was a trivial factor, affecting less than 1 percent of each group.

Table 12-5 reports program effects on students' plans for the following year. According to their parents, scholarship recipients are more likely to attend the same school next year than are members of the control group. Of the families in private schools, 84 percent said they expected their child to be back at the same school the following year, as compared with 67 percent of the control group.

Table 12-5. *Effects of the SCSF Program on Plans for Next School Year*[a]
Percent

Parent report	Scholarship offered	Scholarship offer effect	Attends private school	Private school effect
Child will attend same school				
next year	80	12***	84	17***
Reasons for changing school[b]				
School quality	5	–2	5	–2
Moving	5	–2	5	–1
Graduating	3	–11***	2	–12***
Prefer (other) private school	2	0	1	0
Inconvenient location	2	0	1	–1
Too expensive	2	1**	2	1**
Want to keep all children in				
same school	1	0	1	0
Asked not to return	0	0	0	0
Prefer public school	0	0*	0	0
N	823	...	768	...

Source: Authors' calculations.

a. See table 12-1, note a, for interpretation of table.

b. In these calculations, denominator includes both those who stay and those who leave.

Approximately 5 percent of scholarship parents said that they were changing schools because they did not find the quality of the school acceptable, and another 5 percent said that they were planning to move. The next most frequently mentioned reasons for changing school, given by less than 2 percent of scholarship parents, were expense and an inconvenient location. Less than one percent of all scholarship users said that their school had asked them "not to return."

The situation was much the same for the control group. Thirty-one percent of parents in the control group did not expect their children to be attending the same school next year. However, 14 percent of the parents in the control group said this was because their child was graduating—presumably from elementary to middle school. This institutional break is found in public schools but not in most private schools in New York. If these families are put to one side, the percentage of those in the control group who say that they are thinking of changing schools is about 19 per-

cent, only slightly more than the 14 percent of scholarship parents who expected their child to change school (for reasons other than graduation). Seven percent of all families in the control group said that they were moving because the quality of their school was not acceptable. Less than 1 percent of the control group said that their children had been asked not to return to their current school.

Test Performance

Most previous school choice experiments have not conformed to the classic randomized experiment. Privately funded programs in Indianapolis, San Antonio, and Milwaukee admitted students on a first come, first served basis. In the state-funded program in Cleveland, scholarship winners were initially selected by means of a lottery, but eventually all applicants were offered a scholarship. In Milwaukee, vouchers were awarded by a lottery if schools were oversubscribed; however, the lottery was not conducted by the evaluation team and data collection was incomplete.[21] The evaluation of the SCSF program provides an improved opportunity to estimate the test score effects of a scholarship program.

Table 12-6 reports the average impact of a scholarship on a student's test scores in reading and mathematics for all students, for students in each of grades two through five, and, to increase the stability of the results, for fourth and fifth graders combined. Because baseline test scores were not collected from applicants then in kindergarten, we do not report first grade results. The estimated impact after one year of attending a private school on all students in grades two through five is small in both reading and mathematics: less than 2 percentile points in each subject, a statistically insignificant effect.

This picture changes when one examines the results by grade level. The effects of attending a private school for one year on students' math scores in grades two, four, and five are, respectively, 5 percentile points, 7 percentile points, and 5 percentile points. The effects on reading for the same grades are, respectively, 4 percentile points, 1 percentile point, and 6 percentile points. The impacts on math scores are statistically significant for all three grades; for reading, they are significant in fifth grade only. For third grade, the effects in math and reading are –3 and –2 points, respectively;

21. Results from these evaluations are reported in Peterson and Hassel (1998).

Table 12-6. *Effects of the SCSF Program on Test Scores*[a]
Percentiles

Test and grade level	Scholarship offered	Scholarship offer effect	Attends private school	Private school effect	Sample size
Math					
Grade 2	20.3	3.6* (2.1)	21.5	5.3* (3.6)	371
Grade 3	20.2	−1.9 (2.3)	20.7	−2.4 (2.9)	396
Grade 4	30.5	4.8*** (2.3)	32.3	6.6*** (3.3)	395
Grade 5	29.0	3.9* (2.5)	29.4	5.1* (3.2)	294
Grades 4 and 5	29.9	4.2*** (1.7)	31.1	5.6*** (2.3)	689
All grades	24.6	1.2 (1.2)	25.3	1.6 (1.6)	1,456
Reading					
Grade 2	26.0	2.9 (2.4)	26.4	4.2 (3.6)	371
Grade 3	22.2	−2.4 (1.6)	23.0	−3.1 (2.1)	396
Grade 4	28.1	0.6 (1.7)	28.9	0.9 (2.5)	395
Grade 5	26.6	4.4*** (1.8)	26.9	5.8*** (2.4)	294
Grades 4 and 5	27.4	2.5** (1.3)	28.2	3.4** (1.8)	689
All grades	25.6	1.1** (1.0)	26.3	1.5 (1.4)	1,456

Source: Authors' calculations.
a. Measure is score on Iowa Tests of Basic Skills. Scores have been adjusted for students who either were "held back" or "skipped" a year in school. Weighted values are reported. For interpretation of first through fourth columns, see table 12-1, note a. Statistical significance at the 0.1 level (one-tailed test) is denoted by *; at the 0.05 level (one-tailed test), by **; and at the 0.01 level (one-tailed test) by ***. Bootstrapped standard errors are shown in parentheses. Conventional tests of significance yield the same results.

Table 12-7. *Effects of School Choice and Class Size Reduction on Test Scores*
Standard deviations

Program and grade level	Effect of being offered scholarship		Effect of attending private school		Effect of smaller class	
	Math	Reading	Math	Reading	Math	Reading
New York scholarship[a]						
Grades 4 and 5	0.15	0.11	0.22	0.16	. . .	. . .
Tennessee class size[b]						
Grade 1 (S)	. . .	. . .	. . .	. . .	0.32	0.30
Grade 1 (T)	. . .	. . .	. . .	. . .	0.15	0.25

Source: Authors' calculations; Mosteller (1995).
a. Measure is score on Iowa Tests of Basic Skills in reading and math.
b. Measures are Stanford Achievement Test (S) and Tennessee Basic Skills First Test (T).

the math results are not statistically significant. We do not know why results differ for grade three.

The results for fourth and fifth grade students combined are worthy of special attention because they are based on a larger number of observations, and thus are more stable. For these students, the effect of attending a private school is 6 points for math and 3 points for reading.

Effect Sizes

The magnitude of the effects of attending a private school can be assessed by comparing them with the results of the evaluation of another randomized experiment: Tennessee's Project STAR. As discussed by Frederick Mosteller in chapter 6 above, this program reduced average class sizes from approximately twenty-five students to fifteen. Table 12-7 presents results from the interventions in New York and Tennessee in terms of effect sizes; that is, effects expressed in standard deviations. In this way, one can compare the sizes of programmatic effects on different outcomes, even though raw measures differ.

In the case of the class size evaluation in Tennessee, no statistically significant effects were identified for students beyond the first grade. Among first graders, effect sizes vary between 0.15 and 0.32 standard deviation, as

shown in table 12-7. Of these effects Mosteller observes, "Although effect sizes of the magnitude of 0.1, 0.2, or 0.3 may not seem to be impressive gains for a single individual, for a population they can be quite substantial." He also notes that "an increase of one-fourth of a standard deviation can amount to a considerable gain in performance."[22] The Congress has apparently been persuaded by the effect sizes observed in Tennessee. In 1998, after extensive policy deliberations in which the Tennessee evaluation was frequently mentioned, the Congress enacted legislation authorizing an expenditure of more than $1 billion for the purpose of reducing the size of elementary school classes across the country.

The fourth and fifth grade effect sizes observed in our evaluation of the scholarship program in New York do not differ materially from the first grade effects observed in Tennessee, the largest effects observed in that evaluation. As can be seen in table 12-7, for grades four and five combined, the effects of using a scholarship to attend a private school on reading and math achievement were, on average, about 0.16 standard deviation for reading and 0.24 standard deviation for math. These are not much different from the first grade effects found in the Tennessee study, where observed effect sizes varied between 0.15 and 0.32 standard deviation. In short, substantial private school effects on test scores of fourth and fifth grade students were observed after just one year in the program.

The Tennessee class size study finds that initial gains are sustained in subsequent years, but it does not find any incremental gains after the first year. It will be interesting to see whether the gains observed in the first year of New York's school choice program are sustained or enlarged in subsequent years. The evaluation is scheduled to continue for at least two more years.

Conclusion

Until now, there has not been a well-implemented randomized experiment on school choice, and as a result high-quality information about the effects of such programs has been limited. We find that low-income New York City students in grades four and five who attend private schools score higher in math and reading tests after one year than do students in the control group. In addition, parents report that the climate in the schools at-

22. Mosteller (1995, pp. 119–20). On the effects of reductions in class size, see also chapter 6 by Mosteller and chapter 7 by Eric Hanushek in this volume.

tended by scholarship recipients is, on average, better than that in the schools attended by the control group—for example, there were fewer disruptive events, there was more communication between school and parents, and teachers required students to complete more homework.

Although the effects are promising, it remains to be seen whether they will continue and grow. If gains are observed over the next couple of years, and if the results from these scholarship recipients can be generalized to all disadvantaged inner city students, then school choice may constitute a mechanism that will help achieve equality of educational opportunity. Further research needs to be done to assess the long-term effects and the systemic impact of school choice initiatives. Evaluations of systemic impact should address questions such as how private and parochial schools respond to the resulting increase in demand, how public schools respond when large numbers of students chose to leave, and what happens to the students who choose to remain in the public schools.

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