PEABODY JOURNAL OF EDUCATION, 84: 130–149, 2009

ISSN: 0161-956X print / 1532-7930 online
DOI: 10.1080/01619560902810104

Routledge
Taylor & Francis Group

The Effects of Public School Choice on Those Left Behind: Evidence from Durham, North Carolina

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Using student-level data from Durham, North Carolina, we examine the potential impact of school choice programs on the peer environments of students who remain in their geographically assigned schools. We examine whether the likelihood of opting out of one's geographically assigned school differs across groups and compare the actual peer composition in neighborhood schools to what the peer composition in those schools would be under a counterfactual scenario in which all students attend their geographically assigned schools. We find that many advantaged students have used school choice programs in Durham to opt out of assigned schools with concentrations of disadvantaged students and to attend schools with higher achieving students. Comparisons of actual peer compositions with the counterfactual scenario indicate only small differences in peer composition for nonchoosers on average. More substantial differences in peer environment emerge, however, for students in schools with concentrations of disadvantaged students and schools located near choice schools attractive to high achievers. The results suggest that expansions of parental choice may have significant adverse effects on the peer environments of a particularly vulnerable group of students.

INTRODUCTION

Scholars and policymakers have long worried that programs designed to increase parents' choices of schools for their children might increase the isolation of disadvantaged students. Two separate hypotheses underlie this concern. The first is that high-achieving students with educationally involved parents are more likely to take advantage of expanded school choices than disadvantaged students with less active parents, with the result being higher concentrations of the most motivated and able students in some schools. The second related hypothesis is that these more advantaged students are especially likely to opt out of schools with large concentrations of

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disadvantaged students and low levels of achievement. As a result, students who remain in such schools will experience especially detrimental changes in their peer environment.

A relatively large literature examines the characteristics of students who take advantage of choice. These studies suggest that across a wide variety of choice programs and contexts, advantaged students opt out of their assigned public school at significantly higher rates than disadvantaged students. Far fewer studies compare students who opt out to the students in the specific schools they would have attended under more restrictive policy regimes. As a result it is difficult to quantify the effects that choice programs might have on the peer environments of schools with concentrations of disadvantaged students.

In this study we use data from Durham, North Carolina, to examine how school choice policies affect the peer environments of students who remain in their assigned public schools. Durham is typical of many countywide Southern school districts and offers several different school choice programs. We use data on elementary and middle school students, including information on home addresses, to examine who uses the Durham choice programs to opt out of their assigned school and to compare the peer composition of specific schools to what the peer composition of those schools would be if all students attended their assigned public school.

The article is organized as follows. Section 2 reviews the results of empirical studies related to our research question. Section 3 describes the school choice policies in Durham and the data we use. Section 4 presents our analysis and findings, and Section 5 concludes.

LITERATURE REVIEW

Several studies examine the characteristics of students who opt out of public schools for private schools (Epple, Figlio, & Romano, 2004; Fairlee, 2006; Figlio & Stone, 2001; Long & Toma, 1988; Lankford, Lee, & Wyckoff, 1995). These studies universally find that student ability, family income, and parent education are each positively correlated with the decision to attend private school. Several of these studies also find that White students are much more likely to enroll in private schools in metropolitan areas with large concentrations of Black students and that students generally are less likely to choose private schools in areas where the average level of achievement in public schools is higher. These results suggest private schools tend to cream skim, particularly in areas with concentrations of disadvantaged students.

Other studies examine the characteristics of students who use vouchers to attend private schools. Hsieh and Urquiola (2003) focused on the nationwide voucher program in Chile and showed that wealthier families with higher education are much more likely to use vouchers to attend private schools. The most prominent voucher programs in the United States differ from that in Chile, however, by limiting eligibility to lower income families, restricting the ability of participating schools to select students, and/or prohibiting schools from charging tuition in excess of the voucher amounts. Evaluations of the voucher program in Milwaukee, which includes all of these restrictive provisions, find that together they can eliminate correlation between voucher use and income (Chakrabarti, 2006; Witte, 2000). Nonetheless, these studies find that parents with higher levels of education and involvement in their child's education are more likely to take advantage of vouchers. Studies of voucher programs in Cleveland, New York City, Dayton, and Washington, DC, also find that parents who have higher levels of education are more likely to use

vouchers (Campbell, West, & Peterson, 2005; Howell, 2004; Howell & Peterson, 2002; Metcalf, West, Legan, Paul, & Boone, 2003).

For a number of reasons, the studies of private school students and voucher users provide only limited information on how school choice policies are likely to affect the peer environments of nonchoosers. First, programs to expand parental choice options are designed to change the set of students who are able to take advantage of alternative school options. Thus, information on which students choose private schools may not provide a good indication of who will opt out of their assigned school under programs to expand school choice. Second, determining the effects of school choice on the peer environments of nonchoosers requires information on the schools that private school students or voucher users would most likely have attended in the absence of other options. Because this information is difficult to obtain, none of the studies of private school choice or voucher programs quantify the effects of choice options on the peer composition of specific schools. Third, the leading voucher programs in the United States restrict the number of voucher recipients to no more than 15% of the public school population (Campbell et al., 2005). In many places, much larger proportions of students use public school choice programs to opt out of their assigned school.

Public school choice programs include magnet schools, charter schools, intra- and interdistrict open choice, and controlled choice. In contrast to publicly funded voucher programs that have been adopted in only a small number of places, some combination of public school choice programs are provided in most urban school districts in the nation. Studies of such programs provide some, but still limited, evidence of the effects of public school choice on the peer composition of students whose parents do not take advantage of expanded choice.

Initially introduced as a way to desegregate schools, magnet school programs may now be the most prevalent form of school choice in the United States. Studies in several different cities report that parents who choose to enroll their children in magnet schools have higher levels of education and in some cases higher levels of income than parents who send their children to their assigned school (Archbald, 1996; Citizen's Commission on Civil Rights, 1997; Martinez, Godwin, & Kemerers, 1996). In a study similar to ours, Saporito (2003) analyzed the enrollment patterns of students across 21 Philadelphia high schools. He found that nonpoor students from high-poverty areas and who are assigned to schools with below-average test scores are the most likely group to opt for magnets. However, he also finds that the magnet school program had only a small effect on the level of income segregation across Philadelphia high schools. Using a nationwide sample, Archbald (2004) compared levels of income segregation in districts with magnet schools to similar districts without magnet schools and does not find any association between magnet school programs and income segregation. However, even in cases where a magnet school program has little effect on district-wide measures of economic segregation, it may have substantial effects on the peer environment of particular schools. Thus, neither the Saporito (2003) nor the Archbald (2004) study provides a complete picture.

Charter schools have been subject to intense scrutiny in recent years, but little of this research has carefully examined the effect of charter school programs on the peer composition of nearby public schools. Moreover, the available evidence generates mixed results. Booker, Zimmer, and Buddin (2005) followed samples of charter school students in Texas and in California who were observed in a regular public school a year earlier. In Texas, charter school students come from regular public schools with below-average achievement and were scoring substantially lower than their peers in those schools. Considering the strong preference it has given to authorizing charter

schools for at-risk students, however, the Texas charter school program might be exceptional. Their findings for California are more mixed. Although charter school students have lower test scores overall than their peers in the schools they previously attended, White students who select into charter schools tend to be higher achieving than the peers in the schools they left behind. Evidence from North Carolina indicates that college educated parents are more likely to enroll their children in charter schools (Bifulco & Ladd, 2007).

Two recent studies provide valuable information on intradistrict open choice programs. Cullen, Jacob, and Levitt (2005) examined enrollment patterns across Chicago high schools where more than half the students opt out of their assigned neighborhood school. They reported that 74% of students in the top quartile on eighth-grade achievement tests opt out of their assigned school, and more than two thirds of those who opt out attend schools with high achievement levels. In comparison, only 37% of students in the bottom quartile opt out of their assigned school and the majority of those opt for public schools that have below-average levels of achievement. They also find that controlling for eighth-grade achievement levels, students whose parents have some college and who are more involved in their education are more likely to opt out, as are students who report higher grades, fewer changes of residence, and higher expectations for graduation on a survey administered in eighth grade. These results suggest that choice has led to extensive sorting by educational motivation and advantage in Chicago, but the study does not quantify the effects on the peer environments of those who do not opt out of their assigned school. Hastings, Kane, and Staiger (2006) studied an open choice program in Charlotte and found that parents of high-achieving students are much more likely to choose schools with high achievement levels and to send their children to a school far from their home than parents of low and moderate achieving students. Simulations based on such a distribution of preferences suggest that open choice substantially increases stratification by ability across schools relative to a neighborhood assignment plan.

In sum, the evidence suggests that many forms of school choice generate greater concentrations of advantaged or high-achieving students in some schools. Most markedly, studies in many different contexts find that parents with higher levels of education are more likely to opt out of their assigned or neighborhood public school.[1] However, because most studies are unable to identify the schools choice students would have attended under alternative student assignment policies, effects on the peer composition of nonchoosers are much less clear.

DATA

Our analysis uses data on elementary and middle school students in Durham, North Carolina, from the 2002–2003 school year. The Durham Public School district is a countywide school system that serves approximately 32,000 students in 46 schools. The district is typical of the more than 50 countywide Southern districts that serve a core city within a metropolitan area, and the results of the analyses that follow are most readily generalizable to these districts. Compared to these other Southern districts, Durham has slightly fewer students, a somewhat higher percentage of

[1]In addition to the U.S. studies just cited, studies of school choice policies in Scotland, England, France, the Netherlands, and New Zealand also find that students from advantaged backgrounds are more able to take advantage of expanded choice opportunities (Ambler, 1994; Fiske & Ladd, 2000; Willms & Echols, 1992).

minority students, but a relatively low percentage of students eligible for free lunch.[2] Unlike many other urban districts in the South, the Durham Public Schools have never been subject to a federal desegregation court order. Nonetheless, for a number of years the district used race conscious student assignment policies to promote racial balance. Since 1999, however, all student assignment decisions have been race blind.

The district relies primarily on contiguous, geographic attendance zones to determine student school assignments. There are 21 elementary school and 6 middle school zones. As is the case in many urban districts across the country, however, layered on top of the district's geographic assignment plan are several programs that allow students to opt out of their assigned school to attend another public school. These programs include a long-standing policy that allows transfers between zoned schools for any reason and requires approval of any requested transfer provided space is available at the requested school and the student has an acceptable record of attendance and behavior; a magnet school program, established in the early 1990s, that during 2002–03 included six elementary and two middle magnet schools that offer educational programs and enrichment opportunities designed around a specific theme; three elementary and two middle schools that operate on a year-round calendar, which divides the year into 9 week quarters with a 3-week break between each quarter;[3] and charter schools that are authorized and governed independently of the Durham Public Schools, including nine charter schools located in Durham that served students in Grades 3 through 8 during 2002–03.[4] Each of these programs is by application only, and if there are more applications than seats available, admissions are determined by lottery.[5]

The data for our analyses are drawn from two administrative sources: the North Carolina Department of Public Instruction's End of Grade (EOG) test files and Durham Public School's student transportation files. The EOG files contain a record for every public school student in Grades 3 through 8, including charter school students and students without test scores. In addition to information on test scores, the EOG files indicate what school the student attended, the student's race/ethnicity and the highest level of education obtained by the student's parents. The transportation files include an address for every student for which the district is responsible for providing transportation. These files were linked together and made available to us by the North Carolina Education Research Data Center. In addition, we obtained school attendance zone boundary files from the County of Durham that allow us to place individual addresses into school attendance zones.

[2]A total of 55 county districts in the South serve a core city. Data from the 2002–03 Common Core of Data indicate that the median size of these districts is 40,514 and together they serve more than 3.5 million students. Among these districts, Durham ranks at the 80th percentile in percentage Black, the 75th percentile in percentage Hispanic, the 24th percentile in percentage White, and the 38th percentile in percentage free-lunch eligible.

[3]The three elementary year-round schools and one of the middle school year-round schools each have a regular attendance zone similar to those for other zoned schools. However, students in those zones who do not want a year-round calendar are guaranteed admission at a neighboring school. The remaining seats in the year-round schools are available by application. One of the two year-round middle schools does not have a regular attendance zone and all admissions are by application.

[4]The North Carolina charter school program was established in 1996 and the nine charter schools in Durham were first opened between 1997–98 and 2001–02.

[5]Transfers under the transfer policy are granted on a first come, first served basis, and for admission to four of the elementary magnet schools, priority is given to students who reside in a small walk zone surrounding the schools. In all four of these magnets most of the seats go to students outside these small walk-zones.

Two issues in assembling these data are worth noting. First, because the Durham Public School district does not provide transportation for charter school students, we do not have addresses for the majority of charter school students residing in Durham during the years they attended charter schools. We do have current year addresses for students who transferred into a charter school during the school year. In addition, because we have transportation files for multiple years between 1997–98 and 2005–06, we have addresses for charter school students who are observed at some point in other Durham public schools. Most of the charter school students between Grades 6 and 8 during the 2002–03 school year had aged out of their charter school and transferred to a regular Durham public high school by 2005–06, and many of those that did not are observed in a Durham elementary school in earlier grades not served by their charter school. Thus, we were able to obtain addresses for 70% of charter school students in Grades 6 through 8. Because younger students are less likely to have aged out of their charter school by 2005–06, we have address data for only 45% of charter school students in Grades 3 through 5. The possibility that some charter school students might have moved between the year we observe their addresses and the year they enrolled in a charter school introduces some measurement error into our analysis, but the error is likely to be small.

Second, one of the year-round schools, representing about one third of the middle school students who have chosen the year-round option, is housed in the same building as a traditional, zoned middle school. The student test score files do not distinguish students who attend the year-round school housed in this building from the students in the traditional program. To distinguish these two groups, we assume that any student in that school who does not live in the attendance zone for the traditional, zoned school is in the year-round program and that all other students in the building are in the traditional program. This process results in an assignment of approximately the correct total number of students to each school. Undoubtedly, however, some students are misclassified. For purposes of computing a student's average peer characteristics, we treat the two schools as one.

Table 1 presents summary information on the students in our study. Students in alternative schools are excluded from this table and all subsequent analyses.[6] The first and third columns provide information on all students in Grades 3 to 5 and Grades 6 to 8 in the EOG files. Approximately 60% of both elementary and middle school students attend their assigned school. Forty percent of elementary school students opt out of their assigned school—12.4% choose a magnet school, 15.8% transfer to another zoned school, 6.2% opt for a year-round school, and 5.8% choose a charter school. Among middle school students, 14.2% choose one of the two magnet schools, 10.4% transfer to another zoned school, 10.4% choose one of the two year-round schools, and 5.2% attend a charter school. The lower portions of the table show that approximately 60% of students are Black, 25 to 28% are White, and 7 to 9% are Hispanic. More than 38% of elementary school students and 48% of middle school students have a parent with a college degree.

The second and last columns describe the sample of students for whom we have address data. Overall, we have addresses for 96.6% of the students in Grades 3 through 8 in 2002–03, although this percentage is lower for charter schools, particularly at the elementary school level. All the

[6]Alternative schools include a school at the Duke Medical Center for students experiencing long-term hospital stays, and a school for students with behavioral or other issues. Assignment of these students is based neither on geographic assignment zones nor on parental decisions.

TABLE 1
Summary Information on Durham Students, 2002–03

	Grade 3–5		Grades 6–8	
	All Students	Students With Address Data	All Students	Students With Address Data
Enrollment				
Total no.	8,049	7,715	7,421	7,204
In assigned school	4,813	4,747	4,298	4,236
In a magnet school	997	991	1,024	1,019
Tranferred to regular school[a]	1,274	1,274	747	747
Transferred to year-round school	495	492	751	742
In a charter school	465	211	377	261
In an alternative school	5	0	224	199
Race/Ethnicity				
% Black	60.5	60.1	60.9	60.7
% White	25.2	25.4	27.8	28.1
% Hispanic	8.9	9.1	6.8	6.7
% Multiracial	2.7	2.8	2.5	2.5
% Asian	2.3	2.4	1.8	1.8
% Native American	0.3	0.3	0.2	0.2
Parents' education				
% Less than high school	8.3	8.3	6.5	6.2
% High school	53.4	53.5	45.6	45.8
% Two-year college	12.1	11.9	14.5	14.3
% Four-year college	26.2	26.3	33.5	33.7
Achievement level				
Average achievement	−0.20	−0.19	−0.28	−0.27
% Inconsistent mastery	23.5	23.0	32.1	31.6
% Consistent mastery	47.8	47.8	42.2	42.3
% Superior mastery	28.6	29.2	25.7	26.1

[a]Students who attend a zoned school other than the one to which they are assigned. Only students with address data could be identified as transfers.

analyses that follow are conducted using the set of students for whom we have address data and exclude students attending alternative schools.[7] This sample includes 7,715 students in Grades 3 to 5 and 7,204 students in Grades 6 to 8.

ANALYSIS AND RESULTS

The concern that choice programs will increase the isolation of disadvantaged students rests on the hypothesis that advantaged students are more likely than disadvantaged students to use choice programs to opt out of their assigned public school, particularly when advantaged students are

[7]Charter school students are more likely than other Durham students to have college educated parents, and thus excluding some charter school students from the analysis may lead to understatements of the extent to which school choice increases the isolation of disadvantaged students in assigned schools.

assigned to schools with concentrations of disadvantaged students and low levels of achievement. We test this hypothesis by comparing the characteristics of students who opt out of their assigned school with students who do not. We present both raw comparisons and multivariate analyses that compare the likelihood that different types of students will opt out controlling for where the student lives and characteristics of their assigned school.

Next, we try to quantify the potential effect of choice programs on the peer environments of students who remain in their assigned public school, that is, those left behind. Specifically, we compare the actual peer environments of students who remain in their assigned school to what the peer environments for those students would look like if all children attended their assigned school. As we explain, such a comparison does not tell us the effect of school choice policies on the peer environment of nonchoosers, as the term "effect" is typically understood, but does provide insight into the potential of expanded school choice programs to alter peer environments.

Who Opts Out?

Table 2 examines the percentages of various groups of students who opt out of their assigned school. The first column reports the percentages of all students in each group who opt out. The second column indicates the percentages that opt out among those who live in an attendance zone with low levels of achievement. These are zones with mean EOG test scores at least one fourth of a standard deviation below the statewide mean and represent one third of the attendance zones at both the elementary and middle school levels. The third column indicates the percentage that opt out to attend a high achievement school. High achievement schools are those with average EOG test scores above the statewide mean. High achievement elementary schools include two of the three year-round schools and seven of the 18 zoned schools that follow a traditional calendar. At the middle school level this group includes the two magnet schools, one of the year-round schools, and one of the zoned schools. No charter schools are included among the high achievement schools.

The first column shows that the percentages of students in Grades 3 to 5 who opt out of their assigned school do not differ significantly by level of parent education, and the percentage of low-achieving students who opt out is higher than the percentage of high-achieving students. In Grades 6 to 8, in contrast, a higher percentage of students with college educated parents opt out of their assigned school, and high achievers are more likely to opt out than low achievers.

The marked differences between who opts out in the elementary school grades and who opts out in the middle school grades may reflect the composition of attendance zones. Because the district is divided into 21 elementary school attendance zones, but only 6 middle school zones, elementary schools draw from much smaller, more homogeneous areas than middle schools. As a result, the composition of student populations varies more widely across elementary school zones than across middle school zones. Among the elementary school zones, three have less than 20% of students with college educated parents, whereas three have higher than 60%. At the middle school level, the percentage of students with college educated parents only ranges from 42 to 54%. Consequently, advantaged parents can more readily access schools with concentrations of advantaged parents and high levels of achievement through residential location, and thus have less reason to use choice programs to opt out of their assigned school at the elementary school level than at the middle school level. The residential location decisions of disadvantaged families,

TABLE 2
Percentage of Students in Who Opt Out of Their Assigned School, by Student Characteristics, 2002–03

	Total	From Low Achievement Zone[a]	To High Achievement School[b]
Grades 3–5			
Parents' education			
Less than high school	35.4	39.7*	2.4*
High school	38.7	47.8	9.1
Two-year college	42.1	54.3*	14.7*
Four-year college	37.2	55.7*	21.1*
Student achievement			
Inconsistent Mastery	43.9*	49.2	6.7*
Consistent Mastery	38.4	46.6	12.1
Superior Performance	33.0*	53.4*	17.5*
Grades 6–8			
Parents' education			
Less than high school	35.1	37.5	14.0*
High school	35.3	36.6	20.8
Two-year college	43.9*	47.8*	26.3*
Four-year college	44.0*	53.6*	34.2*
Student achievement			
Inconsistent mastery	36.1*	33.7*	16.4*
Consistent mastery	39.1	45.8	27.0
Superior performance	44.0*	54.4*	36.6*

Note. EOG = End of Grade.

[a]Low-achievement zones are attendance zones with mean EOG scores at least one fourth of a standard deviation below the statewide mean. [b]High achievement schools are schools with mean EOG scores above the statewide mean.

*Significantly different from the high school percentage for parent education variables and from consistent mastery percentage for student achievement variables in two-tailed t test at .05 level.

however, are typically more constrained, and thus, they are less able than advantaged families to access their most desired elementary school through choice of residence.

The second column of Table 2 focuses on students residing in low-achievement attendance zones. Among students in this group, children of college educated parents are significantly more likely to opt out of their assigned school than children of high school graduates, and the latter are more likely to opt out than children of high school dropouts. Also, among students residing in low-achievement attendance zones, high achievers are significantly more likely to opt out than lower achievers. These patterns appear in both the elementary and middle school grades but appear more strongly among the older students. The third column of Table 2 indicates that both elementary and middle school students whose parents have a 4-year college degree are substantially more likely than students whose parents have a high school diploma, or less, to opt out of their assigned school for a high achievement school. Also, high achieving students are more than twice as likely as low-achieving students to opt out for high achievement schools.

Multivariate Analysis of Who Opts Out

Other factors in addition to the level of disadvantage in the assigned school might account for differences in the likelihood of opting out between groups. In particular, studies have shown that distance from home is an important factor for parents in choosing a school (Bifulco & Ladd, 2007; Cullen et al., 2005; Hastings et al., 2006). We expect that the greater the distance between a student's home and her assigned school, the more likely the student will be to opt out. Also, students with parents who value high achievement will be more likely to opt out of their assigned school if they live closer to a high achievement alternative.

To compare the propensities of different groups to opt out of their assigned school controlling for the composition of the attendance zone in which they reside and the location of their homes relative to different schooling options we estimated linear probability models using an indicator of whether a student opted out of their assigned school as the dependent variable. Specifically, we model the decision to opt out as a function of student characteristics, the composition of the attendance zone in which the student resides, the distance of the student's residence to his or her assigned school, and the distance of the student's residence to the nearest high achievement school.

The percentage of students with college educated parents is highly correlated with the percentage of low achievers in an attendance zone. With only 21 elementary and 6 middle school attendance zones, it is not possible to separate the effects of these different aspects of peer composition on the decision to opt out. Instead, we use a composite measure of the extent to which the students in an attendance zone are from disadvantaged groups. This disadvantage index is a simple average of the percentage of students whose parents do not have a college degree and the percentage of students achieving inconsistent reading mastery.

The results of these estimations are presented in the first and third columns of Table 3. At both the elementary and middle school levels, Black students are more likely than White students to opt out of their assigned schools, a finding consistent with some other studies (Brunner, Imazeki, & Ross, 2006; Campbell et al., 2005). One possible explanation is that constraints on their residential choices make Black families less happy with their assigned schools than White families who are more able to move to the attendance zone of the school they most prefer. Note, however, that Hispanic students are considerably less likely than Black students to opt out of their assigned schools despite the fact that their residential choices may also be constrained. Bifulco, Cobb, and Bell (2008) reported a similar finding that Hispanic students are less likely to participate in interdistrict choice programs in Connecticut. These findings suggest that the choice process might differ considerably for Hispanics than for other groups.

Conditional on attendance zone composition and the location of the student's home, students with college educated parents are significantly more likely to opt out of their assigned schools than other students. In both the elementary and middle school grades, students with college educated parents are about 10 percentage points more likely to opt out than students whose parents are not college educated, a finding that consistently appears in the literature. At the elementary school level, low- and high-performing students are equally likely to opt out of their assigned schools, a result that is at odds with other studies which indicate that higher achieving students are more likely to opt out. At the middle school level, however, we do find that high-achieving

TABLE 3
The Relationship Between Student Characteristics, Attendance Zone Characteristics, and the Decision to Opt Out

	Grades 3–5		Grades 6–8	
	1	2	3	4
Black	Omitted	Omitted	Omitted	Omitted
White	−0.065*	−0.056	−0.069**	−0.062**
	(0.034)	(0.035)	(0.027)	(0.027)
Hispanic	−0.168**	−0.165**	−0.093**	−0.089**
	(0.040)	(0.038)	(0.035)	(0.035)
Other	−0.069*	−0.062*	−0.041	−0.039
	(0.034)	(0.034)	(0.050)	(0.050)
College-educated parent	0.101**	−0.131	0.096**	−0.352
	(0.040)	(0.115)	(0.031)	(0.177)
Inconsistent reading mastery	0.023	0.025	−0.059	−0.059
	(0.015)	(0.015)	(0.047)	(0.046)
Consistent reading mastery	Omitted	Omitted	Omitted	Omitted
Superior reading performance	−0.006	−0.004	0.090**	0.094**
	(0.020)	(0.020)	(0.026)	(0.026)
Zone Disadvantage index[a]	1.133**	0.956**	1.729**	1.212
	(0.129)	(0.133)	(0.556)	(0.610)
Zone Disadvantage × College-Educated Parent		0.472*		1.078**
		(0.245)		(0.437)
Distance from assigned school	0.063**	0.063**	−0.006	−0.005
	(0.009)	(0.008)	(0.013)	(0.013)
Distance to nearest high-achievement school	−0.046**	−0.056**	−0.028**	−0.028**
	(0.007)	(0.009)	(0.007)	(0.009)
Distance to High-Achievement School × College-Educated Parent		0.020		−0.002
		(0.013)		(0.012)
No. of observations	7,411	7,411	6,955	6,955

Note. Coefficient estimates are from Ordinary Least Squares estimation of linear probability model. An indicator of choice to opt out is the dependent variable. Robust standard errors adjusted for clustering by assigned attendance zone in parentheses.

[a]Average of percentage of parents with no college and percentage students showing inconsistent mastery in reading in the attendance zone to which the student is assigned.

*Statistically significant at .10 level. **Statistically significant at .05 level.

students are considerably more likely to opt out of their assigned school than low-achieving students.[8]

Among both elementary and middle school students, the level of disadvantage in the assigned attendance zone significantly influences the likelihood of opting out. At the elementary school level, a 10-point increase in the zone disadvantage index increases the likelihood the student will opt out by approximately 11 percentage points. At the middle school level, a 10-point increase

[8]In the analyses presented here, average performance on statewide reading tests are used as the measure of school achievement. Alternative estimates that used more complicated criteria of low, medium, and high performance based on math and reading test scores generate similar results.

in the disadvantage index increases the likelihood a student will opt out by approximately 17 percentage points.

According to Table 3, distance between home and school also affects the decision to opt out, especially for elementary school students. An elementary school student who lives 1 mile farther away from her assigned school is 6.3 percentage points more likely to opt out, and living 1 mile further away from a high-achievement school decreases the likelihood of opting out by 4.6 percentage points. Distance from the assigned school does not influence the decision to opt out at the middle school level. Although living closer to a high-achievement school does significantly increase the chances a middle school student will opt out, the effect is only half as large as it is for elementary school students.

These patterns related to distances between home and school have clear implications for the student compositions of schools. To the extent that distance between home and their child's school is an important consideration for parents of younger students, schools of choice at the elementary level are likely to draw most of their students from nearby neighborhoods. As a result, the ability of choice schools to integrate students from distant neighborhoods will be limited and choice schools will affect the student composition primarily of schools serving nearby neighborhoods. Because the distance between home and school appears less important for parents of older children, schools of choice at the middle and high school level may have more potential to attract students from distant neighborhoods and, consequently, may have larger effects on stratification across schools.

In the second and fourth columns of Table 3 we allow the influence of disadvantage in the attendance zone where the student lives and the distance from a high achievement school on the likelihood of opting out to differ for parents with different levels of education. At both the elementary and middle school levels, the influence of zone disadvantage on the decision to opt out is significantly stronger for students with college educated parents than other parents. The influence of distance from a high-achievement school does not vary by parent education level.

The estimates in the second column of Table 3 imply that the opt-out decisions of college educated parents are much more sensitive to the level of disadvantage in the assigned school than are the choices of other parents. The estimates in Table 3 imply that students with a college educated parent are 4.4% less likely than others to opt out of the least disadvantaged elementary school in our sample but 18.0% more likely than other students to opt out of the elementary school in our sample that has the highest level of disadvantage. Students with college educated parents are only 1.8% more likely than other students to opt out of the least disadvantaged middle school but are 17.5% more likely than other students to opt out of the most disadvantaged middle school.[9]

In sum, the patterns of responses to the school choice program in Durham are similar to those that have been documented in many other contexts—compared to disadvantaged students and low achievers, advantaged students and high achievers are more likely to use choice to opt out of schools with concentrations of disadvantaged students to attend high achievement schools. In the middle school grades, students of college educated parents and higher achievers are more

[9]The elementary school in our data with the lowest disadvantage index has 70% of students with college educated parents and fewer than 7% achieving less than consistent reading mastery. The elementary school with the highest level of disadvantage has 10% of students with college educated parents and 42% of students showing less than consistent reading mastery. The ranges of disadvantage are much more narrow at the middle school level.

likely to opt out than other students, and these groups of students are much more likely to opt out of schools with concentrations of disadvantaged students and low levels of achievement. In the elementary school grades, students with college educated parents and high achievers are no more likely than others to opt out of their assigned school. However, once we control for the level of disadvantage in the assigned school, students with college educated parents are more likely to opt out. Also, students with college educated parents are more likely than other parents to opt out of schools with high levels of disadvantage and for high achievement schools.

A Counterfactual Comparison

In this section we describe the overall effect of the pattern of choices just documented on the peer environments of various groups of students and schools. Specifically, we compare peer compositions given the actual distribution of Durham students across schools to the peer compositions that would have emerged if all students had attended the school to which they were assigned. This counterfactual, in which all students attend their assigned school, is probably not what we would observe in the absence of school choice programs. About one fourth of the students in Durham choose a school other than one of the schools with geographic assignment zones. If magnet, year-round, and charter schools were not available, more zoned schools would be required, and as a result attendance zones would be drawn differently. In addition, student assignment policies influence residential choices and decisions to opt out of the public schools in favor of private schools. Thus, we might observe a different pattern of residential segregation and private school enrollment, and more families exiting Durham County for more distant exurban areas, if Durham's choice programs were removed. Nonetheless, the counterfactual comparisons presented in this section provide a good indication of the potential of choice to affect the peer composition of specific schools and groups of students.

We begin by calculating a series of exposure indices given the observed distribution of students and comparing these to the same indices under the counterfactual. An exposure index measures the extent to which one group has contact with another, and can be defined for any pair of groups. Mathematically, the exposure rate is a weighted average of the percentage of Group B in each school, where shares of Group A are used as the weights. The exposure rates can be interpreted as the percentage of students in Group B in the school of the typical member of Group A. So for instance, the exposure of low-achieving students to college educated parents is the percentage of students with college educated parents in the typical low-achieving student's school.[10] Higher values indicate more exposure to the other group. These comparisons are presented in Tables 4 and 5. The exposure rates presented in these tables are the rates for students who remain in their assigned school under the actual school choice policies in Durham.

Table 4 shows exposure to students with college-educated parents. In the elementary school grades, actual exposure to students with college-educated parents is lower than under the counterfactual for all groups of students who remain in their geographically assigned school, except for students who themselves have college-educated parents. The decreases in exposure to college-educated parents relative to the counterfactual are larger for minority students than for White

[10]Exposure of Group A to members of its own group can be interpreted as a measure of group isolation. In this case higher values represent greater isolation.

TABLE 4
Exposure to College-Educated Parents, Actual Compared to Counterfactual

	Grades 3–5		Grades 6–8	
	Actual	Counterfactual	Actual	Counterfactual
Student's race ethnicity				
Black	34.9	37.6	42.9	47.6
White	44.6	46.1	46.8	50.1
Hispanic	34.3	37.6	44.9	48.6
Parent's education				
Less than high school	30.3	34.1	44.5	48.2
High school	32.0	36.8	43.1	47.9
Two-year college degree	43.0	42.6	44.1	48.1
Four-year college degree	50.4	49.3	49.9	46.4
Student's achievement level				
Inconsistent mastery	31.9	35.6	42.8	47.3
Consistent mastery	37.0	39.8	44.1	48.5
Superior performance	44.1	45.3	46.8	50.2

Note. Actual averages are for students who remain in their assigned school and are compared to averages for these same students under the counterfactual that all students attend their assigned school.

students, for students who parents are not college educated than for students who parents do have college degrees, and for low achievers than for high achievers.

In the middle school grades, actual exposure to students with college-educated parents is lower than under the counterfactual for all groups who remain in their assigned school, including students with college-educated parents. Generally, the decreases in exposure relative to the counterfactual are larger at the middle school level than at the elementary school level. This result indicates that a relatively high percentage of students with college-educated parents opt out of their assigned middle school for magnet schools rather than for other zoned, middle schools. Across both elementary and middle school grades the largest decreases in exposure to college-educated parents is experienced by students whose parents have a high school diploma, but not a college degree—4.8 percentage points. Black and low-achieving middle school students also experience relatively large decreases in the percentage of classmates with college-educated parents.

Table 5 compares the actual peer achievement levels of students who remain in their assigned schools to what those achievement levels would be if all students attended their assigned schools. If parent education is a good indicator of a student's educational advantage, then, given the results in Table 4, we would expect to see that the actual peer achievement levels of students who remain in their assigned school are lower than under the counterfactual. Achievement levels might, of course, be influenced by the school one attends, and thus students' actual achievement likely differs from the level of achievement they would have if all students attended their assigned school. Much evidence, however, suggests that even where differences across schools have important effects on learning rates, they account for only marginal amounts of the difference in achievement levels. Thus, examining peer achievement levels helps to confirm that less exposure to college-educated parents does in fact reflect less exposure to educationally advantaged students and to the learning opportunities that might be associated with attending school with higher achieving peers.

TABLE 5
Average Achievement of Peers, Actual Compared to Counterfactual

	Average EOG Score of Peers		Exposure to Low Performers		Exposure to Superior Performers	
	Actual	Counterfactual	Actual	Counterfactual	Actual	Counterfactual
Grades 3–5						
Student's race ethnicity						
Black	−0.371	−0.277	34.7	31.7	22.3	25.6
White	−0.248	−0.193	30.2	29.2	26.4	28.7
Hispanic	−0.376	−0.277	35.5	32.4	23.0	26.5
Parent's education						
Less than high school	−0.378	−0.290	35.8	32.7	22.9	25.7
High school	−0.356	−0.266	34.1	31.3	22.7	25.9
Two-year college degree	−0.340	−0.263	33.7	31.2	23.4	25.9
Four-year college degree	−0.283	−0.207	31.6	29.8	25.6	28.6
Student's achievement level						
Inconsistent mastery	−0.403	−0.304	36.2	32.8	21.5	24.9
Consistent mastery	−0.322	−0.241	32.8	30.5	23.8	26.8
Superior performance	−0.249	−0.185	30.2	28.9	26.5	29.1
Grades 6–8						
Student's race ethnicity						
Black	−0.244	−0.212	24.6	23.5	26.7	28.1
White	0.022	0.017	17.2	17.3	36.8	37.0
Hispanic	−0.310	−0.259	27.2	25.5	24.1	26.5
Parent's education						
Less than high school	−0.388	−0.321	30.1	27.6	21.6	24.3
High school	−0.221	−0.178	23.9	22.7	27.6	29.4
Two-year college degree	−0.151	−0.146	21.3	21.2	29.8	30.0
Four-year college degree	0.013	−0.003	17.6	17.9	36.7	36.6
Student's achievement level						
Inconsistent mastery	−0.309	−0.256	26.8	25.2	24.4	26.5
Consistent mastery	−0.189	−0.159	23.0	22.1	28.7	30.0
Superior performance	−0.015	−0.022	18.2	18.4	35.6	35.7

Note. Actual averages are for students who remain in their assigned school and are compared to averages for these same students under the counterfactual that all students attend their assigned school.

At the elementary school level, minority students, students whose parents are not college educated, and low achievers who remain in their assigned school all have classmates with lower average levels of achievement than they would under the counterfactual. These groups generally have average peer achievement levels approximately 0.09 standard deviations lower, percentages of low achievers just more than 3 points higher, and percentages of high achievers around 3 points lower than they would under the counterfactual. In contrast, actual peer achievement levels for White students, for students whose parents have a 4-year college degree, and for high achievers are greater, on average, than the peer achievement levels would be under the counterfactual. The differences between actual and counterfactual peer achievement levels are small for these groups.

In the middle school grades, all groups of students who remain in their assigned school see lower levels of peer achievement than they would under the counterfactual, although the

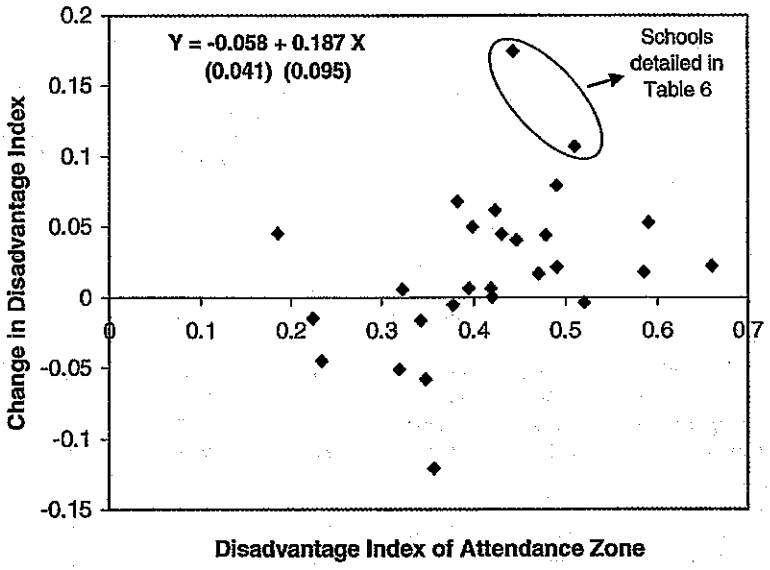

FIGURE 1 Change in Disadvantage Index.

differences between the actual and the counterfactual peer environment tend to be greater for non-White students than for White students, for students whose parents are not college educated than for college-educated parents, and for low achievers than for high achievers.

The comparisons in Tables 4 and 5 indicate that students who remain in their geographically assigned school, particularly those from disadvantaged groups, encounter schools with higher percentages of disadvantaged students and lower levels of achievement than they would if all students attended their assigned school.[11] Even for disadvantaged student groups, the differences between the average peer compositions actually observed and those that would be observed under the counterfactual are small. It is important to note, however, that Tables 4 and 5 reflect averages for each group. These averages conceal considerable variation across schools.

Figure 1 plots the distribution of changes in our index of disadvantage for each zoned school against the disadvantage index for the attendance zone assigned to that school. By change in the disadvantage index we mean the difference between the actual disadvantage index and that which would be observed if all students attended their assigned school. Here we group elementary and middle schools together. The plot reveals several things.

Changes in peer composition vary across schools. Although the index of disadvantage increases for most schools, it decreases for at least eight schools. Schools that serve attendance zones with relatively low levels of disadvantage are much more likely than schools serving attendance zones

[11] We have also compared measures of actual racial segregation with measures of racial segregation under the counterfactual. These comparisons are presented in another article that focuses more broadly on the potential effects of school choice in Durham on race and class-based segregation. These analyses indicate that actual measures of race and class-based segregation are greater than under the counterfactual that places all students in their assigned school but that differences in class-based segregation are more marked. See Bifulco, Ladd, and Ross (2009).

with higher levels of disadvantage to end up with lower percentages of disadvantaged students as a result of school choice policies.

The three schools that serve attendance zones with the highest concentrations of disadvantaged students do not show especially large increases in their disadvantage index as a result of choice. Clearly, ceiling effects are at work here. There are so few students from advantaged groups in these attendance zones that even if a large percentage of those students opt out, it results in only a small change in the overall peer composition of the schools.

Even with these ceiling effects, a bivariate regression shows a statistically significant, positive relationship between the change in the disadvantage index and the disadvantage index of a school's attendance zone. In other words, students in areas with substantial concentrations of disadvantaged students whose parents are unable or unwilling to take advantage of expanded school choice opportunities tend to see the largest declines in exposure to advantaged peers as a result of school choice policies.

Two elementary schools (circled in Figure 1) show especially large changes in peer composition as a result of school choice policies. Details on the student composition of the attendance zones served by these two schools, as well as the changes in peer composition resulting from school choice, are detailed in Table 6. The changes in peer composition for these schools are substantial. The two schools show the percentage White drop from around 18% to less than 5% and the percentage college educated drop from 35.7 to 8.7% and from 25.5 to 12.5%. Both schools also see a substantial drop in peer achievement levels, including a reduction in the percentage of high-achieving students by nearly half. These examples show that even when the effects on average measures of peer composition are small, school choice policies can result in substantial changes in the peer environment of specific schools.

Both these schools, as well as others that see relatively large differences between the actual and the counterfactual levels of disadvantage, fit a similar profile. They each serve an attendance zone with below-average percentages of White students, students with college-educated parents, and high-achieving students, but with enough students from these groups that their exodus in response to choice opportunities results in substantial changes in the school's peer composition. Elementary School #1, in Table 6, also has a Montessori magnet school that is popular to many

TABLE 6
Schools with Largest Change in Student Composition

	Elementary School #1	Elementary School #2
% White in zone	18.1	17.8
Change in % White	−13.9	−14.9
% college-educated parents in zone	35.7	25.5
Change in % college-educated parents	−27.0	−13.0
Average EOG score in zone	−0.132	−0.330
Change in average EOG score	−0.389	−0.291
% inconsistent mastery in zone	24.3	27.6
Change in % inconsistentent mastery	11.4	4.2
% superior performance in zone	29.7	23.7
Change in % superior performance	−14.3	−11.6

White, college-educated parents, located with the schools attendance zone. As a result, it loses an exceptionally large percentage of its high achieving students.[12]

The nonchoosers whose peer environments are changed the most by the choices of other students are not those who live in the most racially and economically isolated areas. These latter students would find themselves in schools with high concentrations of disadvantaged students whether or not parental choice policies are in place. Rather the students who see the largest changes as the result of school choice policies are those who live in attendance zones with substantial concentrations of disadvantaged students, but some share of advantaged students as well. The closer these zones are to choice schools that are attractive to high achieving students, the larger the effects of choice on peer achievement levels.

It is quite possible that parents of advantaged students would, in the absence of the parental choice programs offered by Durham, use residential choice to leave these attendance zones. Thus, we cannot conclude that Durham's choice programs have made the peer environment for students in these schools worse. Rather we interpret the results in Table 6 as upper bound estimates of the potential effect of parent choice programs on peer environments and believe they are sufficiently large to warrant further investigation.

CONCLUSION

In keeping with prior research, we find that advantaged students, specifically students whose parents have a college education, are more likely to opt out of their assigned schools. We also find that students with college-educated parents are most likely to opt out of schools with concentrations of disadvantaged students to attend schools with high levels of achievement. As a result, many neighborhood schools are left with fewer educationally advantaged students than under a counterfactual condition that places all students in their geographically assigned school. Schools with concentrations of disadvantaged students and schools located near choice schools attractive to high achievers show the largest difference between their actual student composition and that observed under the counterfactual condition.

Several considerations limit the conclusions we can draw from these findings. First, one might question our ability to generalize findings from Durham. A persistent theme in the literature on school choice is that differences between who opts out and who remains behind depend heavily on context. Characteristics of neighborhood public schools and the local community, key features of school choice policies, the type of programs offered at alternative schools, the accessibility of information on school quality, and idiosyncratic historical and cultural factors can all influence the choices made by different groups of students (Figlio & Stone, 2001; Fuller, Elmore, & Orfield, 1996). Our finding that distance between home and school is an important factor in parents' choice of school for their children suggests that the effects of expanded parental choice are also likely to depend on the location of the available schooling options. Nonetheless, the student assignment policies in Durham, which overlay neighborhood assignment zones with several different school choice programs, are typical of the policies in many urban areas. Also, our findings concerning what type of students opt out of their assigned school, which schools lose the most students, and

[12]This effect is exacerbated by the fact that students who live in the immediate vicinity of the magnet school are given preference in the admission process.

which types of schools educationally advantaged students tend to choose, are consistent with findings from settings as diverse as Chicago, Philadelphia, Charlotte, Cincinnati, San Antonio, Milwaukee, Cleveland, Scotland, and New Zealand.

More telling, questions can be raised about our counterfactual comparisons. School choice programs can influence how district officials draw attendance zone boundaries, parent choices about whether to keep their child in public schools, and patterns of residential location. Consequently, the peer environments students would encounter if all students attended their assigned school cannot be interpreted as the peer environments they would face in the absence of school choice policies. It is possible that if Durham's school choice programs were eliminated, patterns of sorting similar to those documented here would reemerge as educationally advantaged families opt for private schools and move to areas associated with desirable schools. Thus, it is best to interpret the results of our analyses as estimates of the potential rather than the actual effects of public school choice policies on the peer environments of nonchoosers.

Finally, it is not clear what effects different peer environments have on the academic achievement and other important outcomes of individual students. Emerging evidence suggests that the most beneficial peer environment for a student depends on his or her background and ability level (Hoxby & Weingarth, 2005). Nonetheless, it is widely agreed that schools characterized by excessive concentrations of educationally disadvantaged students often have detrimental effects on student achievement. Any policies that result in more of those types of schools should cause concern among policymakers.

Students who are assigned to poor performing schools and whose parents are unable or unwilling to take advantage of expanded school choice opportunities are an especially vulnerable population. The results of our analyses suggest that any benefits of expanded school choice that accrue to those able to take advantage of it might come at the expense of poorer learning environments for those left behind.

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