

The Demand for High School Programs in New York City

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In many parts of the country, students are admitted to high school simply on the basis of residential neighborhood or attendance zone; there is no effort, anxiety, or uncertainty for students or schools. In other places, students have choices of theme-based or magnet schools, or they may have options for intra-district or cross-district transfers to schools they prefer over their own neighborhood schools. But nowhere in the country is the high school application process more complicated than in New York City.

Over the past twenty years, the number of public high schools in New York has grown from about 120 schools to over 400, and the number of discrete programs to which students can apply exceeds 600. Each year, more than 80,000 eighth-graders from public and private schools apply for entry into a public high school program. The application process takes the better part of a year, beginning with open houses, auditions, and entrance examinations; it concludes when student appeals are decided and schools' final enrollment rosters are created. The application process is anchored in a simultaneous queueing process: students list schools in their own order of preference; schools rank order applicants according to their stated or unstated criteria; and a complex computer algorithm is used to match students to schools. (The process is similar to the one used to match medical school students to residency placements.)

In the mid-1980s, when options for students were much more limited and the system was not computerized, the application process was lengthy and complicated, and in 1984, more than a third of the 91,000 students who applied for high school placements were not admitted to any of the schools they selected. A report at that time found that six separate offices of the Board of Education were involved in the process, which cost more than \$2.5 million at the central level alone. Middle school guidance counselors did not understand the process; criteria for admissions were unclear; and families had no access to information on the chances of acceptance at different schools (Educational Priorities Panel, 1985). A parallel report found that programs could determine on their own what selection model to use (screened, unscreened, or educational option); schools did not publicize their selection criteria and often were pressured to admit particular students; students from minority areas were accepted to choice programs at lower rates than white students; and demand far outweighed supply, with an average acceptance rate of 22.29% (Advocates for Children of New York, 1985).

Times have changed, and by all accounts, today's high school admissions process is more efficient and more effective. This past year, for example, 71% of applicants were admitted to one of their top three choices, and over 90 percent of students were granted entry into one of the programs they had chosen. But this greater efficiency is only part of the story, as it doesn't explain *why* students apply to the schools they nominate in the admissions process, nor why schools select particular students for admission. We do not know why some high school programs and schools are in high demand and others are not. Nor do we know how students with similar demographic or academic profiles cluster in terms of their own preferences or their desirability in the view of different high schools.

We don't know exactly what schools might do to attract a student clientele that is more representative of the population of high school students in New York City, nor do we know what student characteristics matter most to different kinds of schools. We do not know exactly how families and students use information in making decisions about what schools to apply to, or, for that matter, how schools use information about students.

These issues have important implications for students, for high school staff, and for the system as a whole. In a context where increased choice has been adopted as a strategy for improving the overall quality of high schools and for ensuring that all students have fair access to a good education, everyone needs good information in order to participate effectively in the process. Students should be able to know whether their chances of being admitted to different kinds of schools are enhanced or reduced by virtue of their backgrounds and prior school performance. Schools should be able to know whether they are attracting a student clientele that is well qualified and/or reflective of the city's diversity, and they should be able to ascertain whether their application results are similar to those of peer schools. They should be able to know what information students and their families draw upon in making application decisions, and how to make themselves attractive to prospective applicants. The system as a whole should be able to monitor where the strong and weak spots in the admissions process are, and why. By better understanding how students and their families use information in the high school admissions process, the Office of Student Enrollment might improve its outreach efforts to families and guidance counselors. As the Department of Education continues to expand educational options in the city, it might benefit from understanding families' preferences for different types of schooling.

The Development of Public School Choice

Public school choice originated in the early days of school desegregation. The idea was that school districts could encourage more racial/ethnic balance across schools and stem "white flight" from the system as a whole if parents were offered the choice of enrolling their students into high quality magnet schools. School choice had other origins as well, as education vouchers were introduced and championed by free market economists, libertarians, and others who favored the idea of parents being able to spend the government's money for education at their own choice of school, public or private, for their children.

Over time, public school choice also was embraced by another set of advocates as a mechanism to stimulate school improvement. Using the economic imagery of the market, the logic was that parents would vote with their feet, and the competition among schools would improve the system overall. Enabling families to choose high quality schools easily (instead of by moving to another town or neighborhood) would be an efficient way to introduce an important incentive for both schools and families (Coleman, 1992). It would have another effect, changing the ostensible clientele for public schools from all possible students (because public schools are open to anyone) to a more particular clientele (the students who would apply to and attend each particular school), creating a tighter connection between service providers and their customer/clients, and thus providing incentives to schools to try to serve their own clienteles more effectively (Lubienski, 2005).

New York's District 4 in East Harlem, under the leadership of Anthony Alvarado, was an early innovator in choice options at the middle school level. The effort resulted in the creation of a number of exemplary schools, and student achievement in District 4 rose from the lowest of all community districts to the solid middle of the pack within a decade; student acceptance to selective and private high schools also rose (Domanico, 1989). Over the past two decades, market models and competitive incentives have also been used to stimulate change in other public services and industries, and they have also been used in education in many other countries (Lubienski, 2005).

Most recently, school choice has been one of the features of the federal No Child Left Behind legislation. No Child Left Behind requires that parents be given the opportunity to transfer their children to another school in their public school district if their school failed to meet benchmarks of adequate yearly progress (AYP) two years in a row. This provision is intended to create incentives for failing schools to promote higher achievement or face losing their students, and thus their *raison d'être*. At the same time, the right to transfer from a failing school is held to improve a child's chances for an adequate education.

Some skeptics believe that, for at least some school choice advocates, the rationale of competition and school improvement masks a more fundamental interest in increasing opportunities for students to attend private and parochial schools funded through public sources. In this view, public school choice is part of a broader set of initiatives, including the expansion of charter schools and the use of publicly-funded education vouchers that may be used to attend both public and private schools (Henig, 1995).

A recurring question is whether choice plans would help or harm the students and families that are the most disadvantaged and most in need of better schooling. Apart from the debates about whether school choice plans would improve the instructional programs and other services offered by schools, and why, researchers have wondered whether parents can and would choose the best schools for their students (e.g., Bast & Walberg, 2004), and whether the system would provide adequate information to parents to make informed choices (e.g., Van Dunk & Dickman, 2002). These are fundamental questions about whether the processes of applying, choosing, and being chosen can be efficient and equitable for all families in the system.

Astin (1992) articulated one potential flaw in the logic of the market metaphor: unlike private enterprises, which can grow to accommodate demand, public schools cannot easily do that. Instead, they could become more selective, concentrating the very best students in a limited number of schools, and thus actually increasing social stratification in the system. In this vein, West (2006) found that in England, when secondary schools were responsible for handling their own admissions, they were more likely to act in their own self-interest by "creaming" the most talented students.

Another flaw, according to Astin, is that the free market supposedly works best when the public has access to "perfect information" about their choices. Providing the public with such information about schools would be expensive and there would be concerns as to the quality and relevance of the information. As Astin noted, advertising processes are typically designed to sell products, not necessarily to inform consumers, and it would be risky for schools to adopt an advertising approach. Although some argue that in public choice decision areas, the public can often use information shortcuts, such

as the visual cues provided by the physical condition of a school, as a substitute for more “encyclopedic knowledge” (Schneider et al., 1999), most analysts seem to assume that parents need access to thorough, high-quality information in order to make good school choices for their children, and express concerns that such information might be in short supply in most contexts (e.g., Hill, 2005).

Astin’s predictions now seem to have come true, at least in some settings. Lubienski (2005) reviewed evidence about the consequences of the “marketization” of public education and found that while the incentive structure underlying many choice plans was intended to result in improved instruction, in fact schools respond by doing other things:

In particular, many educational organizations engage to a remarkable and somewhat unexpected degree in marketing and other promotional activities having to do with symbolic management of a school’s image rather than substantive changes in its educational processes. (p. 465)

Lubienski found that in Michigan, with an aggressive policy permitting interdistrict transfers and a rapid growth in charter schools, districts were spending considerable funds on marketing, ranging from \$100,000 to well over \$1 million per year. Even more, districts adopted many innovations in areas like marketing while not innovating in instruction. Moreover, these expenditures tended to fall most heavily on weaker school systems (and perhaps weaker schools).

How Parents Choose Schools

Neild (2005) notes that although school choice potentially depends heavily on parent management of the process, there is little research on the kinds of information parents seek, how they make sense of the information, and then how they negotiate the process. She interviewed parents of eighth graders in Philadelphia and found that family participation in the voluntary choice plan in the city varied considerably by neighborhood, with less participation in areas with well-regarded zoned high schools and more participation in areas where the zoned high school was seen as problematic. In the neighborhood where she conducted her research, 84% of the eighth graders participated in the process. Neild found that most of the 19 parents she interviewed were very clear about wanting their children to not attend the neighborhood school. They were very eager for information about other schools, but they were given little high-quality information about school performance or chances of admission. Similar to New York, they received a booklet listing all of the high schools with brief descriptions written by each school. Unlike New York, the booklets had no information about graduation rates, student achievement, teacher characteristics, or the percentage of student applicants admitted to the school. Lacking this, their social networks became a prime source of information. But as other researchers have documented (e.g., Smrekar & Goldring, 1999; Useem, 1992), the social networks of more advantaged families are often richer in information. In Neild’s study, parents who had contact with people with firsthand knowledge of the school system tended to have the most detailed information about the schools, and these were parents who were most likely to have finished college. The parents told Neild that they or their student liked a school because of things like its

theme, its location near their home, its safety and orderliness, or that other students seemed hard working, but they generally knew little about the curriculum or about student outcomes. Moreover, although parent management seemed to have an impact at various stages of the process, it had limited impact at the point where schools were choosing their students. Thus, Neild concluded that for children who were not high achievers, the availability of choice was largely illusory.

There is ample evidence that parents from low-income or marginalized racial/ethnic backgrounds care deeply about their children's education and engage in considerable activity to ensure good placements for their children (e.g., Schneider & Buckley, 2005; Cooper, 2005; Kleitz et al., 2000). But there are social class differences, not only in how parents gain access to information but also in the factors they consider. Moore and Davenport (1990) found that parents often knew very little about the academic considerations or logistical requirements of choosing schools, and parents with less education and/or non-native English speakers had even more difficulty.

One main concern is whether and how parents use information about school demographics in their decision making. Saporito and Lareau (1999) found that the school selection process is fundamentally different for families from different racial groups. They studied how parents of eighth graders in Philadelphia decided to apply to be transferred to another neighborhood high school (this process was separate from the district's process for applying to a magnet school). They found that white students deliberately avoid black schools, and only after that do they look at other considerations. Saporito and Lareau examined school-level predictors of the percentage of total white applications in the district that the school received, and then the total percentage for the blacks. For white applicants, the percentage of students who were African American was by far the strongest predictor of how many white applicants the school received; other characteristics of the neighborhood, academic program, distance from the student's home, or student performance were simply not important. The parents seemed to make school choice decisions in two stages, first using demographics to exclude some schools, and only thereafter considering other factors.

For African American families, however, the proportion of Black students in the school was simply not important in predicting the proportion of total applicants from black students that were received. Black parents appeared to try to avoid schools with higher levels of poverty, not schools with high concentrations of Black students.

Similarly, using survey data from the Philadelphia area, Goyette, Freely and Farrie (2006) studied parental perceptions of school quality and found that as the proportion of African Americans in a school increased, perceptions of quality decreased, irrespective of actual indicators of school quality. There is a ceiling to this effect, suggesting that when a school experienced high growth in its African American student population, parental perceptions of quality were probably low to begin with and did not change much.

Other evidence on the role of race in school choice comes from Henig's (1995) study of parents' requests for student transfers into an array of magnet schools in Montgomery County, Maryland. Henig looked at the racial patterns of transfer requests in light of magnet elementary school characteristics in 1985, and found that both black and white parents requested transfers into schools where their children would not be racially or socioeconomically isolated. The net effect of these choice patterns was that

white students were drawn toward more affluent schools, and black students toward schools in lower income neighborhoods. Henig concluded that parents' decisions were "racially influenced," not "racially determined" or based on racist sentiments. That is, in the absence of other information on which to base their choice, parents opted to reduce the likelihood of social isolation for their children. What mattered in this district was the central office's willingness to help to regulate the racial distribution of students, denying about fifteen percent of the transfer requests because they would have worsened racial balances and limiting the expansion of the magnet program so that these schools would continue to draw from across the demographic spread of the district.

Schneider and Buckley (2002) described two concerns about information use and school choice: first, that many parents will fail to choose schools for their children based on relevant information about school quality, and second, that certain types of parents (especially low-income and less-educated parents) would tend to choose the wrong schools for the wrong reasons. They addressed these concerns in a novel study, by examining the kinds of information parents utilize through Internet searches, to see what parents really use as they make school choices. Schneider and Buckley studied parental search patterns of a website designed to provide information about Washington, DC, schools, one very similar to InsideSchools.org in New York. Not surprisingly, most users of the system were well-educated. They tended to access information about the demographic composition of the schools, and their locations, most frequently. Queries about demographics were actually higher among the better-educated parents. Information about student performance was also accessed frequently, and information about teacher quality was accessed less frequently.

This brief discussion of prior research indicates that parental demand for particular schools may depend upon a number of factors that include school performance, thus lending some support to the hypothesis that parents will vote with their feet and avoid failing schools. However, the evidence also suggests that there are valid concerns about whether school choice plans will increase the racial/ethnic separation of students, because parents tend to weigh demographic information about schools heavily and to make choice decisions that will not create social isolation for their children. Parents seem to have differential access to good information about schools: they do seem to use different kinds of information about schools, and demographic information is very important to some parents. In short, we have learned something about why parents seem to be attracted to certain schools and how they utilize information to make their decisions and choices.

In this paper, we utilize information that is currently in the public domain to explore what characteristics about schools seem to generate more or less demand for the schools on the part of eighth graders and their families in New York City. We look at information about schools that is relatively easily available to families and examine how this information is related to the number of applications a school receives (relative to the number of students the school can accept). While we cannot draw conclusions about the actual decision processes parents use, or the information they consider most important, we can make some inferences about the characteristics of schools that are associated with being highly sought-after or not popular at all. This analysis should teach us something about the factors that are most important to parents, which may assist schools as they try to understand how best to present themselves to potential applicants.

Data and Methods

We draw information from three sources. First, we use the annual directory of high schools, published by the New York City Department of Education, to gather information on characteristics of schools and programs. The directory, the size of a large residential telephone directory, is laid out in an appealing way, and makes a great deal of information accessible to eighth-grade students and their families. It lists each school with seats available for the coming school year, and provides information both about the school as a whole and about each of the programs offered by the school. School-level information includes the school's location; any restrictions or preferences regarding which students are eligible to attend the school; a brief statement titled "in their own words"; a listing of specialized services and programs, including programs for special education students and English language learners; extracurricular activities and sports teams; and other important information, such as whether the school has a school uniform policy. Each program is listed separately, indicating its curricular theme, the method by which the program selects students, the number of seats available in the preceding year, and the total number of applications the program received in the preceding year.

Second, using annual school reports compiled by the New York City Department of Education, we gather aggregate data on the racial and socioeconomic backgrounds of students attending the schools in which programs are located, as well as data on students' academic performance. These data are reasonably accessible to parents via the Department of Education's website or the webpages of individual schools. Third, from the New York City Police Department, we use information about the neighborhood context, specifically, crime rates in the precinct in which the school is located. We have obtained information spanning five years, and we will be reporting some trends over time utilizing these longitudinal data, but for most of our analyses we focus on the most recent year, in which eighth-graders submitted their high school applications, listing their program choices, in December of 2006, initial matches were announced in early 2007, and the students entered high school in September, 2007.

The Schools and Programs

High school applicants in New York City have many options to consider. There are nine specialized high schools, eight of which require a competitive score on the Specialized High Schools Admissions Test (SHSAT), and one of which (LaGuardia High School) requires an audition. Some school programs are screened, which means that selection is based on a student's previous record of academic performance or other criteria such as an application essay. Other programs are unscreened, with priority often given to students who participate in an orientation session, but theoretically without regard for a student's prior academic record. Many high schools offer multiple programs that address particular curricular themes, and a small number of schools contain only zoned academic comprehensive programs, which means that any student living in a specific geographical area near the school may attend.

For the present analysis, we have eliminated two groups of schools from consideration: the eight specialized exam high schools, which each receive upwards of 25,000 applicants per year (because all students who take the SHSAT are essentially applying to all specialized high schools), and the zoned comprehensive schools, because in essence no students apply to those schools, but instead are assigned by virtue of

location. (We do include LaGuardia's special programs in the arts, as students apply specifically to each of these programs.) We also do not consider entrance into charter high schools, nor other schools serving specialized populations, such as schools serving newcomers to the United States; schools dedicated to teaching students who have limited prior exposure to English; and "transfer schools," which are alternative schools enrolling students who transfer from other high schools.

New York City high school programs rely on three methods of selecting students. Some programs admit students based on a screening method that looks at a student's seventh-grade academic record; others, typically in the performing or visual arts, screen students on the basis of an audition. Programs relying on the educational option method select half of their incoming students on the basis of their academic record, while drawing the other half of their students randomly from applicants to the program. Unscreened programs rely solely on a computer to randomly select students from applicants; limited unscreened programs also rely on a random selection from among applicants who have demonstrated an interest in the program by attending a school's information session. Information on the selection method is reported in the annual high school directory.

Some high schools in the city are "zoned," which means that they admit students who live nearby, whether or not they have applied to the school. All of the high schools in Staten Island, and some of those in the Bronx, Brooklyn, and Queens, have a comprehensive zoned program, and many schools with comprehensive zoned programs have specialized theme programs as well. Because students do not typically apply directly to zoned programs, and there are no publicly-reported statistics on the number of applications to such programs, we do not consider them further.

Over the past four years, the number of high school programs has expanded considerably. Eighth-graders starting high school in 2004 had 463 programs to choose from; but just three years later, eighth-graders could apply to 595 programs, an increase of 28%. Over the same period, the total number of seats available increased from 57,335 to 59,772, a more modest rise of 4%. Figure 1 shows the growth in programs by program selection method from 2004 to 2007. From 2004 to 2005, there was a sharp increase in the number of screened and unscreened programs, coupled with a slight decline in the number of educational options programs. Since then, there has been continued growth in the number of unscreened programs, whereas the number of screened and educational options program has remained relatively stable. Thus, much of the growth in the number of programs can be attributed to an increase in unscreened programs.

As the number of programs has expanded, the average size of a program has fallen from an average of 124 seats in 2004 to 100 seats in 2007, primarily because of an influx of new, smaller programs. Figure 2 shows the average number of seats per program for each program selection method, for the years 2004 to 2007. Strikingly, the average number of seats per program fell sharply from 2004 to 2005, for each of the three program selection methods. Since 2005, the average number of seats per program has remained relatively stable. We see, therefore, that in the year of greatest program growth, the average number of seats per program fell, which is consistent with an influx of new programs that were smaller than those that preceded them. In 2007, about one-quarter of all programs had 50 or fewer seats available for entering ninth-graders. A second quarter of the programs had 51 to 90 seats to fill. The third quarter of programs offered 91 to 120

seats to incoming ninth-graders, and the top quarter of programs had more than 120 seats available.

Because the number of programs has grown over time, and the total number of eighth-grade students has remained relatively stable, the total number of student nominations is now spread over a larger number of programs. Consequently, the average number of applications per program has fallen quite a bit. This is shown in Figure 3, which displays the average number of applications per program from 2004 to 2007, for each of the three program selection methods. Over this period, the average number of applications has fallen considerably for each of the three program selection methods. The decrease of 42% in the average number of applications received by unscreened programs is the steepest decline, but overall the average number of applications per program fell by 30%.

Accompanying this decline is evidence that students' applications are now being distributed more evenly across the programs that are available to students. In 2004, the standard deviation of the number of applications per program, a measure of how much variation in applications there is from one program to the next, was 1323. The standard deviation in 2007 had fallen to 993, a decline of 25%. To be sure, a standard deviation of 993 still reflects a considerable amount of variation across programs in the number of applications received. Some programs are wildly popular, and get thousands of applications for a handful of seats. Others get fewer applications than the number of seats available.

We are especially interested in the ratio of the number of applications a program receives to the number of seats available in that program. A program that receives a very high number of applications for each available seat is in great demand, and many of the eighth-graders who seek admission to such programs will be disappointed. In contrast, a program with a low number of applications for each available seat is not in great demand. Each eighth-grader who applies to such programs is competing with very few peers for entry.

Overall, the average number of applications per seat has fallen from 13.6 in 2004 to 10.6 in 2007, a 22% decline. Programs with 50 or fewer seats are in higher demand than larger programs; in 2007, these small programs received about 16 applications per available seat, whereas programs with more than 50 seats available averaged about 9 applications per available seat. There was a sharp decline from 2004 to 2007 in the percentage of high-demand programs receiving 15 or more applications for each available seat. The decline in the percentage of high-demand programs also implies that applications are distributed more evenly across programs in 2007 than they were in 2004.

Figure 4 displays the distribution of demand for the 595 high school programs in 2007, defined as the ratio of applications to available seats for each program. The distribution is skewed, as a small number of programs have very high demand, ranging up to 151 applications for each seat. Twelve programs received more than 40 applications for each available seat. Conversely, one program received fewer than one application for each available seat, and a total of 15 programs received less than two applications for each seat. For purposes of the multivariate analysis reported next, we took the log of the ratio of applications to seats, which reduces the influence of the small number of unusually high values in the distribution of demand. Figure 5 displays this transformed distribution, which looks approximately like a symmetric bell curve.

Multivariate Analysis of Program Demand

In this section, we examine the program-level and school-level characteristics that predict which programs are in high demand, and which are not. The analytic approach is a series of multiple regression equations predicting the log of the ratio of total applications to available seats in 2007, which we refer to as log program demand. The order in which variables are entered into the equations roughly corresponds to our beliefs about the process by which students and their families select the programs to which they apply. But we do not have a well-developed theory of which features of a program students and parents attend to first, and thus we recognize that the order in which variables are entered is somewhat arbitrary.¹

We begin with basic geography, which consists of the borough in which a program is located, and the crime rate of the neighborhood in which the program is situated. In step 2, we add program characteristics, including the curricular theme of the program; whether the school in which a program is situated also has a continuation version of the program that is intended to channel eighth-graders already in the school directly into that program; and whether the program is a bilingual version of another program offered by that school. Step 3 adds measures of academic performance and reputation, including the percentage of students in the school who achieved a score of 65 or higher on the Regents Math A exam in 2005; the percentage of students in the school who achieved a score of 65 or higher on the Regents English exam in 2005; the school's attendance rate in 2005; whether the school was designated as a School Under Registration Review (SURR) by the state of New York, a label assigned to poorly-performing schools; whether the school had been identified as "noteworthy" in 2007 by insideschools.org, a well-known guide to New York City public schools; and the number of Advanced Placement courses offered by the school.

Step 4 adds the demographic composition of the school, including the percent of the enrolled students who are Asian; the percent who are Black; the percent who are Hispanic; the percent of enrolled students who are identified as Limited English Proficient (LEP); and the percent of students eligible for free or reduced-price lunch, a measure of socioeconomic status. The program's selection method is added in step 5. This includes whether admission priority is granted to students based on their borough or neighborhood, and whether the program selects students using the screened, educational options, or unscreened methods.

Other school and program characteristics are added in step 6. Here we consider whether the school has a school uniform policy; the school's total enrollment in 2005; the percent capacity in 2005, which is a measure of how crowded a school is; the total number of programs offered by the school; the number of schools at the school's physical site; whether the school has a zoned program that is open to anyone who lives in the zoned area; and the number of major PSAL boys' and girls' sports offered.

1. We analyze only the 394 programs for which we have complete data. We have not adjusted for the fact that programs are nested within schools, and hence that some schools have multiple programs that are represented in our sample. A possible consequence is an underestimation of the standard errors in the regression equation.

Finally, in step 7 we examine the previous year's demand for the program – that is, the log of the ratio of total applications to seats available in 2006.

The regression results are reported in Tables 1 and 2. For convenience, we focus on Table 2, which displays the standardized regression results.² The entries in this table show both the statistical and practical significance of the observed effects. Statistical significance refers to whether the regression results might have been obtained by chance if a variable really is unrelated to the log of program demand. The presence of one or more asterisks next to a coefficient indicates that it is highly unlikely that the effect is due to chance; hence, we say that the effect is statistically significant. The practical significance of an effect refers to its relative magnitude – that is, the size of the effect on the log of program demand. The relative size of the coefficients in Table 2 is a guide to their practical significance, with larger absolute values representing larger effects, and numbers close to zero representing smaller effects. As a rough rule of thumb, we interpret standardized regression coefficients with an absolute value of .1 or less as small effects; coefficients with an absolute value of .2 or higher as moderate effects; and coefficients with an absolute value of .5 or larger as large effects.

Step 1 of Table 2 contrasts the demand for programs in Manhattan with the demand in the Bronx, Brooklyn, Queens, and Staten Island. In general, the results indicate that Manhattan programs are in greater demand than programs in other boroughs, although the difference between Manhattan and the Bronx is not statistically significant. Programs in Staten Island are, on average, in lower demand than programs in the other boroughs.

Figure 5 shows that the typical Manhattan program receives about 14 applications for each available seat, whereas programs in the Bronx, Brooklyn and Queens all receive about 10 applications per seat.³ Programs in Staten Island, the one borough that still relies heavily on zoned high schools, receive about seven applications for each available seat.

Independent of borough, programs in neighborhoods with higher crime rates are in slightly lower demand than programs in neighborhoods with lower reported crime rates. Overall, these geographic factors are not powerful predictors of which programs are in high demand, and which are not. The adjusted R^2 , a measure of the overall predictive power of the regression equation which ranges from 0 to 1, is .035, a very small number. Only 3.5% of the variation in demand from one program to the next can be accounted for by geographic factors.

One of the hallmarks of the expansion of high school programs in New York City has been the institution of curricular themes. Each program is classified into one of 18 different thematic categories, including business, performing arts, engineering, and even travel and tourism. Schools and programs use these themes to establish their distinctiveness, and they strive to attract students whose interests are consonant with the themes. In our analysis, themes are grouped into six categories: arts; business; ; law and health; ; humanities and interdisciplinary; other (which includes JROTC, teaching, and travel and tourism); and science, math, engineering, and technology (labeled SMET).

² Table 1, which reports unstandardized coefficients, also is of interest; when the dependent variable is logged, the coefficients can be interpreted as an effect on a percent change in the outcome variable.

³ Figure 5 is not adjusted for neighborhood crime rates, and for ease of interpretation displays the average ratio of applications of seats, not the log of this ratio.

Step 2 adds the program's curricular theme, as well as whether there are parallel programs in the same school (i.e., a continuation program for continuing eighth-graders, or whether a given program is a bilingual version of another program located in the same school).

Our analysis indicates that there are no themes that are more popular than other themes; put differently, the differing themes are in roughly equal demand by students and their families. Moreover, the presence of parallel programs in the school does not systematically reduce the demand for a particular program. Since none of these program characteristics is a reliable predictor of program demand, adding them to the equation does not increase our ability to explain why some programs are more popular than others. In fact, the adjusted R^2 declines to .025, which tells us that we have added a set of variables that do not increase the predictive power of the equation.

In step 3, we add measures of school academic performance and reputation. The addition of these measures raises the adjusted R^2 from .025 to .322, indicating that the demand for high school programs in New York City is highly responsive to variation in the academic performance of the school in which a program is situated. Two of the six academic performance and reputation measures are statistically significant: the school attendance rate in 2005, and the percentage of students in the school scoring 65 or higher on the Regents Math A exam in 2005. Table 2 shows that the standardized effect of attendance rate on log program demand is a whopping .526. Put differently, each increase of one percent in the school's attendance rate increases program demand by about 6%. This implies that a program in a school with a 90% attendance rate will have 43% greater demand than a similar program in a school with an 83% attendance rate.

Other school performance and reputation measures are not statistically significant, including the number of Advanced Placement courses offered by the school and whether the school was identified either as a SURR school in 2005 or a "Hemphill school" in 2007 – our term for a school identified as noteworthy by Insideschools.org, a site founded by author Clara Hemphill. To be sure, the various academic performance and reputation measures "hang together," in the sense that schools with higher test scores tend to have higher attendance and offer more advanced placement courses, and SURR and "Hemphill" schools are so designated in large part due to their academic performance. Perhaps most puzzling here is the negative effect of the percent passing the Regents English exam in 2005 on log program demand. Although the effect is not statistically significant, the direction of the effect is counterintuitive, as we expect that programs in schools with higher test scores will be in higher, not lower, demand. Moreover, in two subsequent equations, this negative effect of the percentage of students passing the Regents English exam does attain statistical significance. We have no simple interpretation of this pattern, and urge readers not to take these findings at face value.

There are two other changes of note when academic performance is taken into account. First, the demand for programs in Brooklyn no longer is significantly lower than the demand for programs in Manhattan. Second, the neighborhood crime rate is no longer a statistically significant predictor of log program demand. We initially suspected that the demand for Brooklyn programs might be lower than the demand for Manhattan programs because school-level academic performance in Brooklyn is, on average, lower in Brooklyn than in Manhattan, and academic performance is a strong predictor of program demand. There is some support for this explanation, as English Regents

performance and attendance are both higher in the Manhattan schools in the sample than in the Brooklyn schools; but Math Regents performance is higher in Brooklyn than in Manhattan. Attendance is significantly lower in high-crime neighborhoods, which we believe explains why the neighborhood crime rate is no longer relevant once attendance and other measures of academic performance are taken into account.

We added school demographic factors in step 4, including the school's racial/ethnic composition, the percentage of students who were eligible for free or reduced-price lunch and the percentage who were Limited English Proficient (LEP). Overall, these demographic factors add a small amount of predictive power to the equation, as the adjusted R^2 increases from .322 to .347. With other school and program factors controlled, the demand is lower for programs in schools with higher concentrations of Black students and for programs in schools with higher concentrations of Limited English Proficient students. Table 1 indicates that the demand for a program will be 16% lower if it is in a school that is 50% Black than if the same program were located in a school that is 30% Black. Similarly, Table 1 shows that program demand is 21% lower if it is in a school that has 20% LEP students than if the same program were in a school with 10% LEP students. These findings indicate that students and their families pay attention to the racial and ethnic characteristics of a school's student body, even after the school's academic performance is taken into account. The fact that New York City students and families shy away from schools with high concentrations of Black students is disappointing, but not unprecedented in the literature on race and school choice. Although the concentration of Hispanic students was not a significant predictor of demand, the concentration of LEP students is, and the two are strongly associated in our sample ($r=.50$).

Step 5 adds the method by which a program selects students to the equation. Once the other school and program characteristics are taken into account, program selection methods are unrelated to program demand. The predictive power of the equation increases by a trivial amount, from .347 to .352. There is no evidence that giving geographic priority to students decreases demand, nor that screened programs are more or less popular than unscreened programs. Without taking these other school and program factors into account, screened programs are in higher demand than unscreened programs, with the demand for educational options program in between the two. But screened programs have higher Regents Math A achievement and a lower concentration of Black students, both of which we have seen to influence program demand.

In step 6, we add other school characteristics, including enrollment and capacity; the number of programs in the school, and whether the school has a zoned program; the number of schools at the physical site; whether the school has a school uniform policy; and the number of major boys' and girls' PSAL sports. (We arbitrarily defined major boys' sports as soccer, basketball, baseball and track and field, and major girls' sports as basketball, softball and track and field. Thus, for each school, the number of major boys' sports ranges from 0 to 4, whereas the number of major girls' sports ranges from 0 to 3.) Addition of these school characteristics increases the explanatory power of the equation from .352 to .376, a modest amount. Of the eight variables added in this step, only one is shown to influence program demand. The demand for programs is higher for those programs in schools that offer more major girls' sports. We do not find a similar pattern for boys' sports. Nor do we see evidence that program demand is responsive to the

presence of a school uniform policy; the number of programs in the school, or the presence of a zoned comprehensive program; or the size, crowding, or physical arrangement of the school on a multischool campus. Evidently, these factors are not important in shaping the demand for high school programs.

Finally, in step 7 we add a measure of the demand for the program in the preceding year, also logged to reduce the influence of the small number of programs with extremely high ratios of applications to available seats. The results are striking, as the previous year's demand dwarfs all other factors. In fact, with the previous year's demand taken into account, *none* of the other 34 variables we have considered remains a significant predictor of program demand. Moreover, the predictive power of the equation skyrockets, as the adjusted R^2 shoots up from .376 to .806, an extraordinarily high value. The single best predictor of the demand for a high school program in 2007 is the demand for that program in 2006, regardless of other features of the program or the school in which it is situated.

We demonstrate this stability from 2006 to 2007 in Table 3. In this table, programs are divided into four groups, based on their ratio of applications to seats in 2006: those with 4.9 or fewer applications per seat; those with 5 through 9.9 applications per seat; programs with 10 through 14.9 applications per seat; and programs with 15 or more applications per seat.

Of the 146 programs in 2006 with 4.9 or fewer applications per seat, 81% stayed in this category, and 19% moved into a higher category.⁴ Only one of these programs increased to 15 or more applications per seat in 2007, and just one more rose to 10 or more applications per seat. At the high end of program demand, of the 108 programs in 2007 with 15 or more applications per available seat, 81% remained in this category. Only two of these 108 programs fell to between five and 9.9 applications per seat, and none declined to under five applications per seat. In other words, programs that are popular in one year are likely to be equally popular the next; whereas programs that are unpopular, relative to other programs, only rarely break out of their position.

Finding that the best predictor of program demand in 2007 is program demand in 2006 draws obvious attention to the question of why some programs were in greater demand than others in 2006. We explored this question in a separate analysis and were not surprised to learn that the same dynamic was in play the previous year, with the strongest predictor of program demand in 2006 being the demand in the preceding year. It may be that at some initial point in time, the demand for a particular high school program is based on parental assessments of the programs' location, its performance record, student demographics, and other features, and that the effects of those factors carry forward each year, as prior demand is predictive of future demand. But that is only part of the story. Demand appears to take on a life of its own, and the demand for a program one year heavily influences the demand in subsequent years. It is difficult (though not impossible) for a program to escape its reputation, and this is sobering news for teachers and administrators who work hard to turn around troubled schools.

⁴ Since 4.9 or fewer is already the lowest category, it is not possible to move down from this category. Similarly, since 15 or more is the highest category, it is not possible to move up from this category.

Looking Forward

With the present public information, we are able to observe the total numbers of applications received by each public high school program in New York City. This enables us to make some conjectures about how school and program characteristics shape the demand for high school programs. But there is an important part of the story that remains shielded from view. We wish to know how the characteristics of New York City students and their families guide their choices. For example, do white, Black, Latino and Asian students apply to the same programs? Are there some programs that are especially successful in attracting a diverse pool of applicants? If so, what characteristics of the programs or the schools in which they are situated promote this desirable outcome? What determines whether a student applies to 12 students, or only nominates a smaller number of choices? Do students avoid schools that they deem to be too far away?

Addressing questions such as these – which represent just a small number of examples – is possible. But such questions can only be pursued by linking data on individual students' choices to the characteristics of the students and the characteristics of the programs to which the students apply. The data on students' choices are an integral part of the high school admissions process in New York City. All too often, though, data that are gathered for routine (but important!) administrative purposes are not thought of as potential sources of insight about how the system works.

The dramatic growth in educational options for high school students in New York City is innovative and consequential; it is important to understand how students and schools are matched in this new ecology of schooling. The more we know the details about the high school application process in New York City, the more it will be possible to evaluate whether the process is contributing to improved equity for all of the city's students, especially in terms of access to high quality schooling.

The Research Partnership for New York City Schools promises to capitalize on data that already are collected by the New York City Department of Education and other agencies, and also to gather new data that can inform pressing policy problems concerning the well-being of New York City's schoolchildren and the system that serves them. We hope that this paper provides a glimmer of the potential that the Research Partnership can offer to all who have a stake in public education in New York City.

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Figure 1. Number of Programs by Program Selection Method, 2004-2007

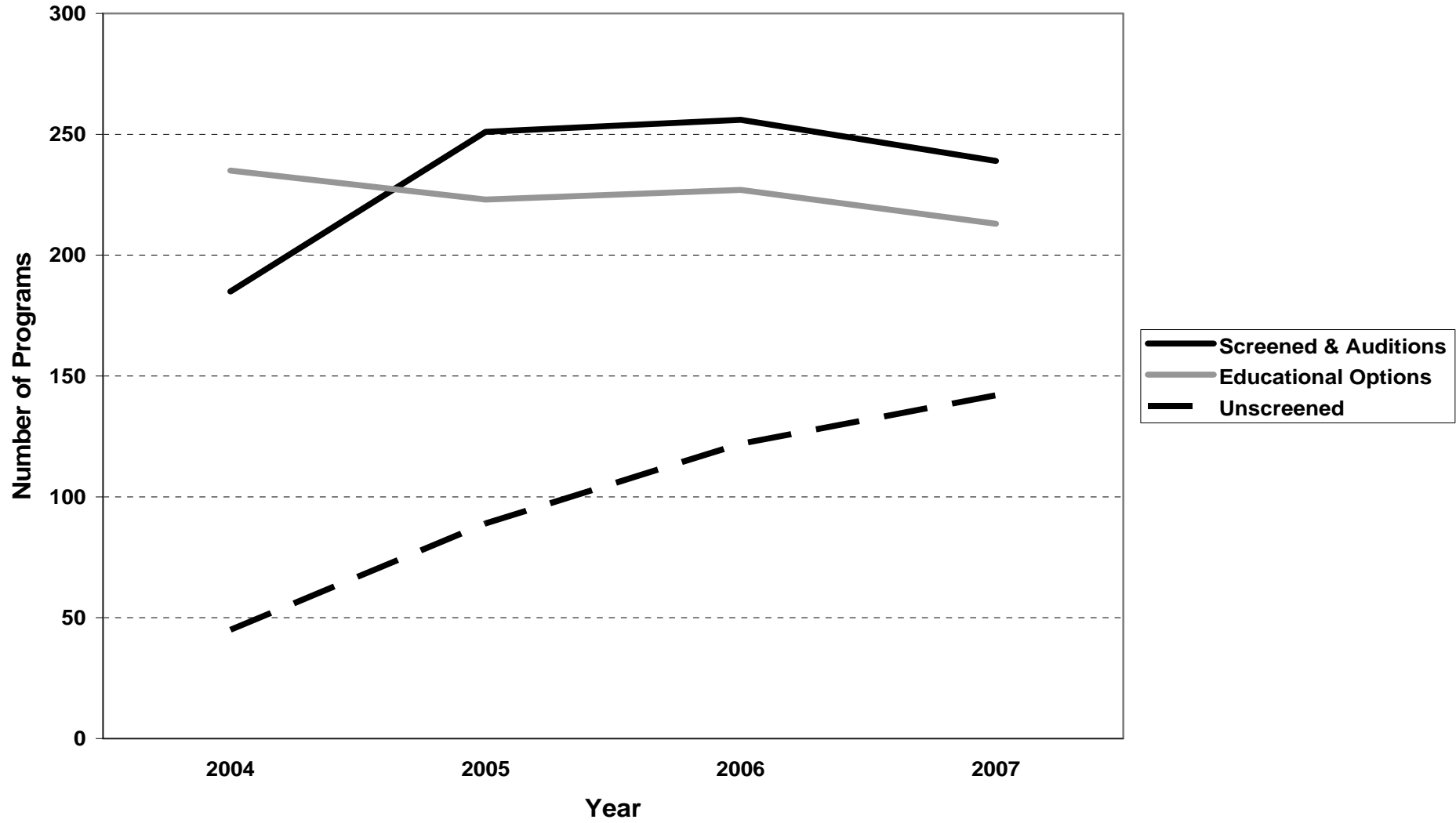


Figure 2. Average Number of Seats by Program Selection Method, 2004-2007

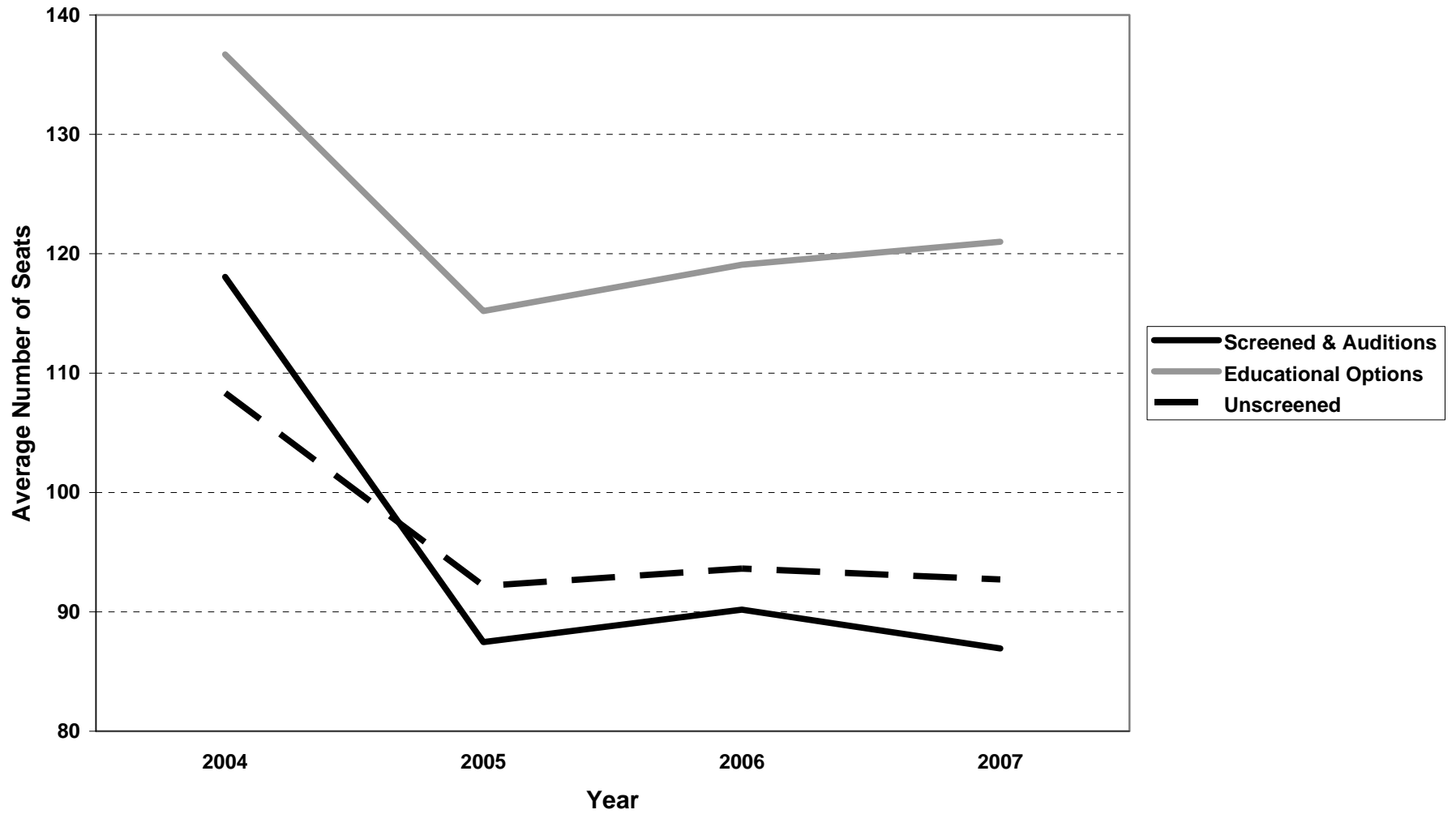


Figure 3. Average Number of Applications by Program Selection Method, 2004-2007

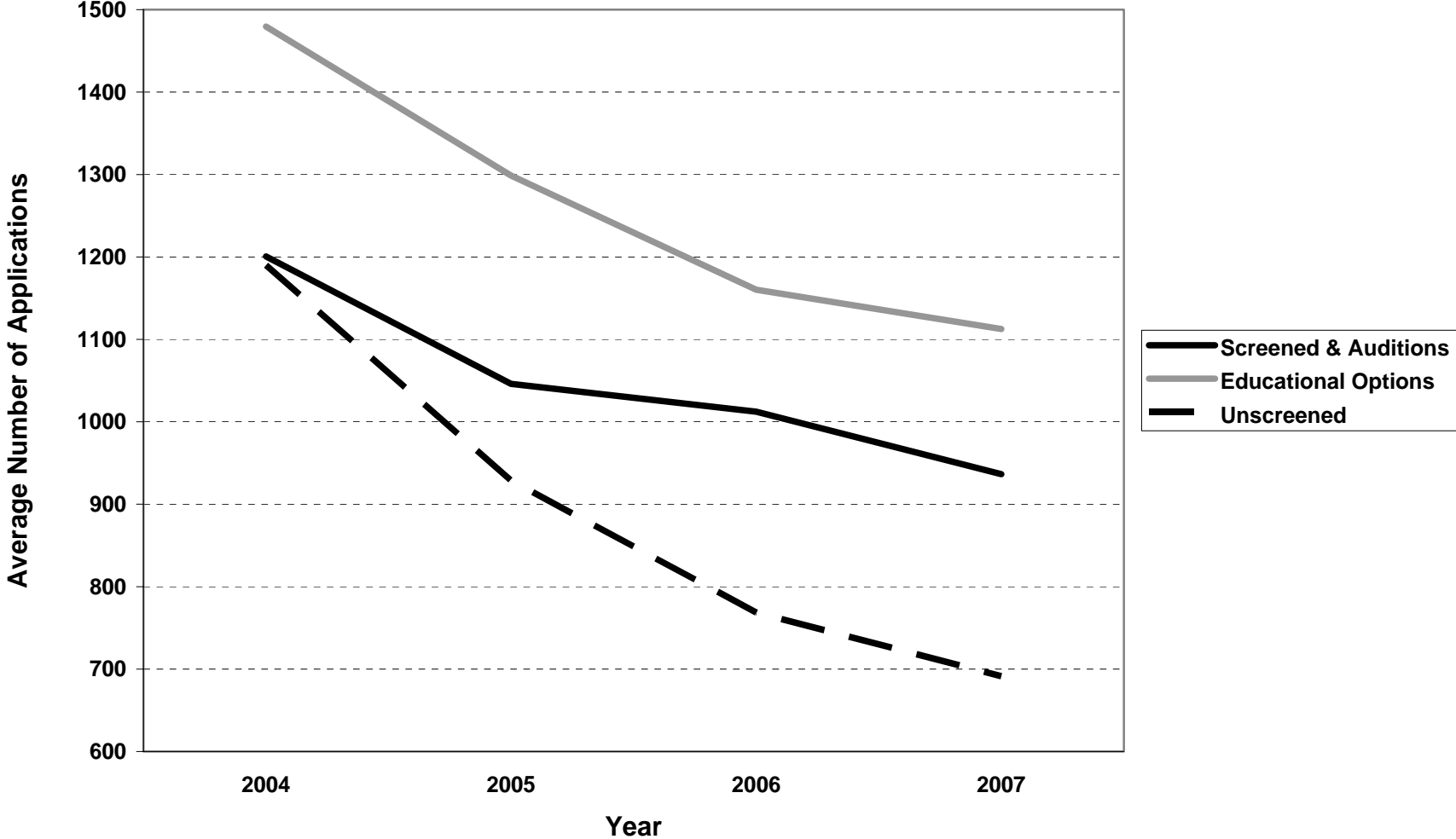


Figure 4. Distribution of Program Demand, 2007

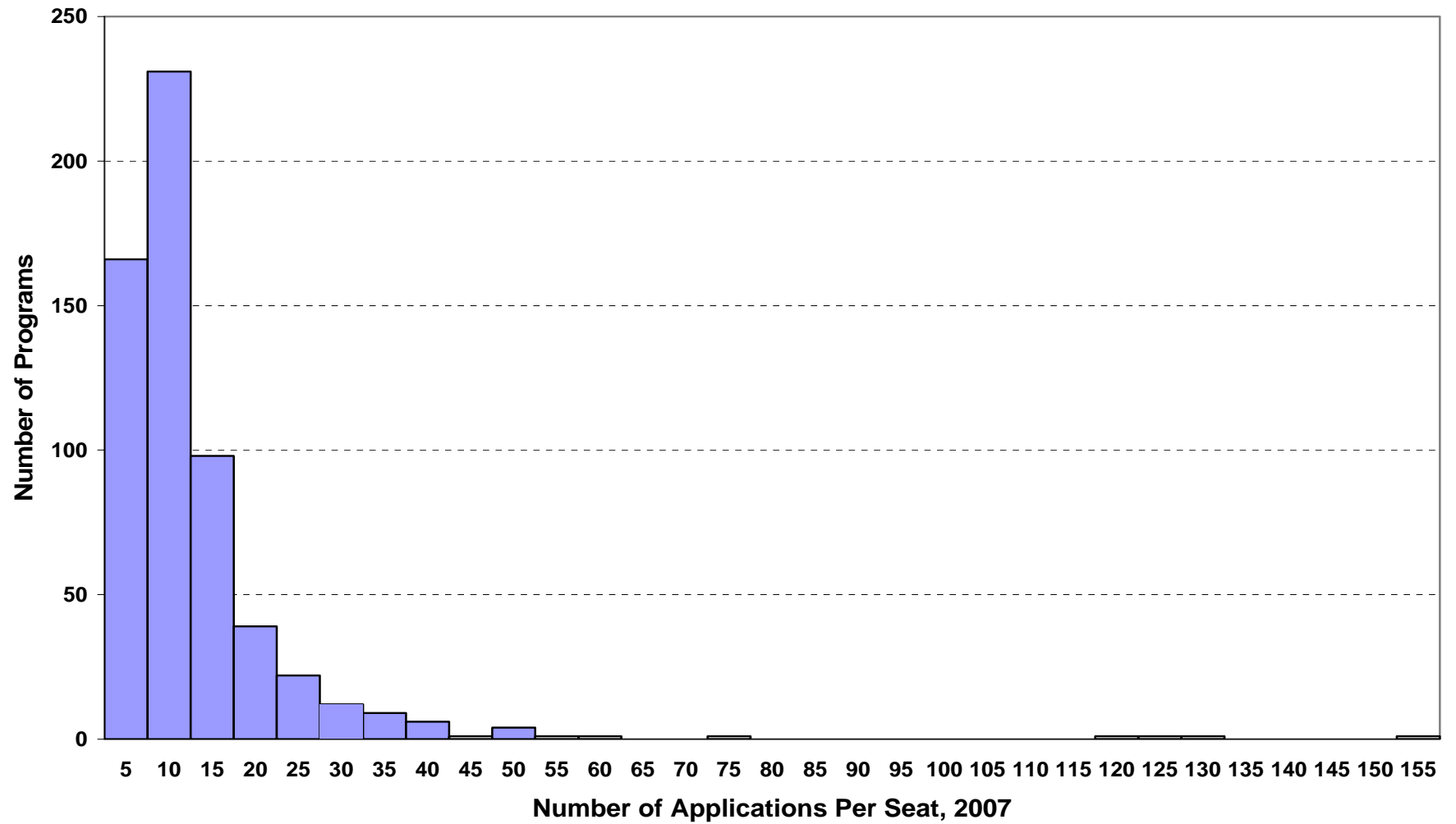


Figure 5. Log-Transformed Distribution of Program Demand, 2007

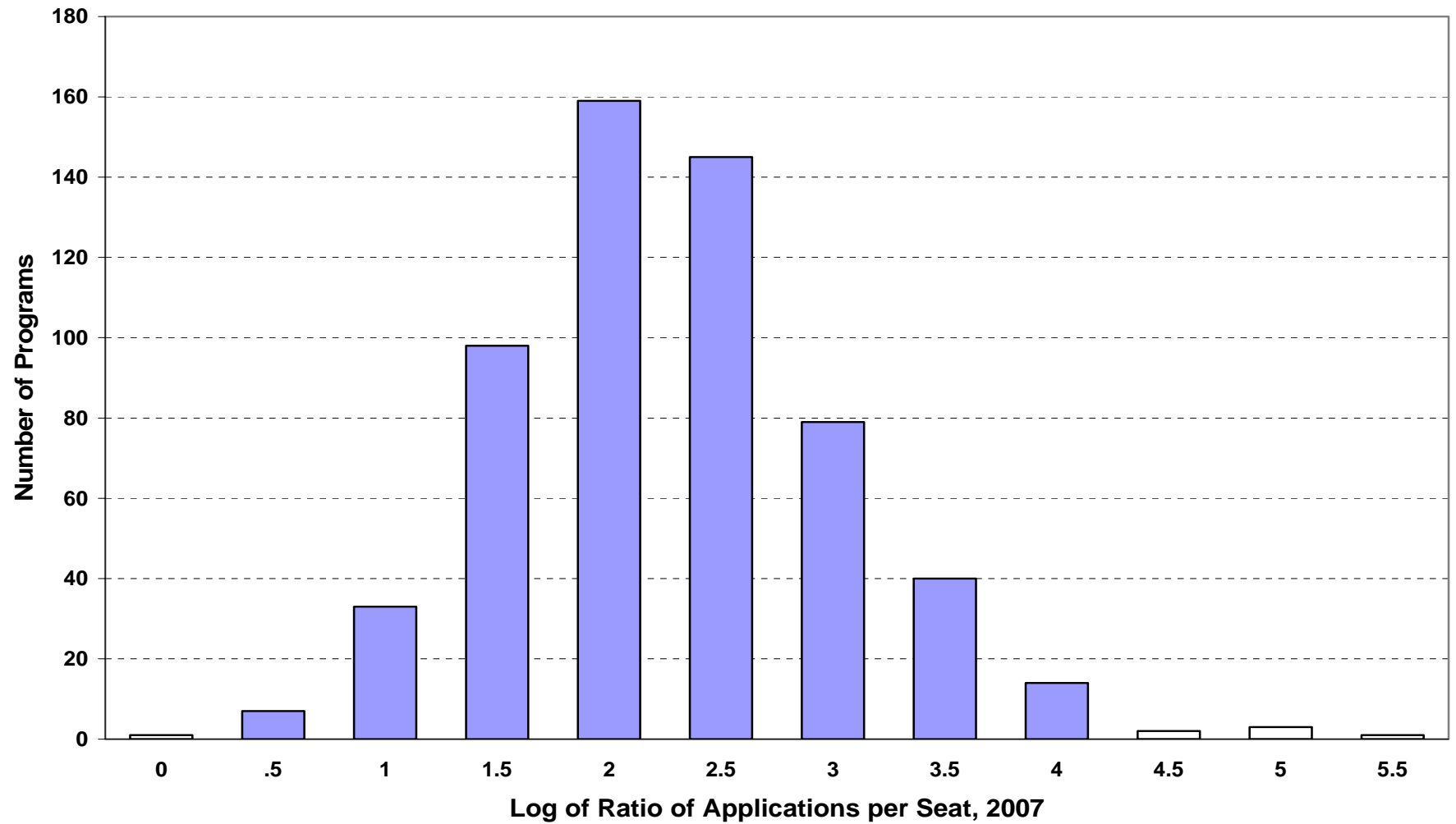


Table 1. Regression of Log Program Demand in 2007 on Program and School Characteristics: Unstandardized Coefficients

Predictor	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bronx	-.217	-.211	-.115	-.066	-.074	-.084	-.022
Brooklyn	-.266 *	-.252 *	-.098	.062	.048	.041	.026
Queens	-.351 **	-.335 **	-.284 **	-.313 **	-.298 *	-.316 *	-.100
Staten Island	-.631 ***	-.624 ***	-.860 ***	-.903 ***	-.956 ***	-.920 ***	-.077
Neighborhood Crime Rate, 2006	.000 *	.000 *	.000	.000	.000	.000	.000
Arts Theme		.076	-.118	-.147	-.136	-.105	-.093
Business Theme		.154	.056	.047	.041	.028	-.010
Law or Health Theme		.185	.063	.062	.062	.098	.028
Humanities Theme		.093	.026	.005	.010	.020	.001
SMET Theme		.030	-.044	-.099	-.086	-.072	-.077
School Has Continuation Version of Program		.174	.056	.068	.048	.019	.047
Bilingual Version of Another Program		-.258	.065	.068	.097	.094	.075
Percent Passing Regents Math A, 2005			.007 *	.007 **	.008 **	.005	.000
Percent Passing Regents English, 2005			-.004	-.005 *	-.005 *	-.004	.000
Attendance Rate, 2005			.061 ***	.051 ***	.053 ***	.046 ***	.010
SURR School, 2005			.174	.127	.137	.059	.074
"Hemphill School," 2007			-.046	-.086	-.074	-.033	.009
Number of AP Courses			.012	.009	.009	.020	.000
Percent Asian, 2005				.005	.004	.003	.000
Percent Black, 2005				-.008 *	-.008 *	-.009 **	-.003
Percent Hispanic, 2005				.001	.002	-.001	-.003
Percent LEP, 2005				-.021 **	-.024 ***	-.023 **	.002
Percent Free Lunch, 2005				.001	.001	.001	.001
Geographic Priority					.071	.058	.044
Screened Program					-.088	.075	-.034
Ed Options Program					.057	.193	-.007
School Uniform Policy						.014	.014
Total School Enrollment, 2005						.000	.000
Percent Capacity, 2005						.001	.001
Number of Programs in School						-.025	-.008
Number of Schools at Site						-.014	-.017
School Has Zoned Program						-.029	.045
Number of Major Boys' Sports						-.025	.027
Number of Major Girls' Sports						.151 *	-.008
Log of Demand, 2006							.884 ***
Adjusted R ²	.035	.025	.322	.347	.352	.376	.806

Note: *p<.05; **p<.01; ***p<.001

Table 2. Regression of Log Program Demand in 2007 on Program and School Characteristics: Standardized Coefficients

Predictor	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bronx	-.110	-.106	-.058	-.033	-.037	-.048	-.014
Brooklyn	-.154 *	-.146 *	-.056	.036	.028	.014	.009
Queens	-.192 **	-.184 **	-.156 **	-.171 **	-.163 *	-.177 *	-.057
Staten Island	-.243 ***	-.241 ***	-.331 ***	-.348 ***	-.368 ***	-.356 ***	-.031
Neighborhood Crime Rate, 2006	-.107 *	-.111 *	-.007	-.011	-.008	-.012	-.011
Arts Theme		.039	-.060	-.074	-.069	-.057	-.050
Business Theme		.065	.024	.020	.017	.008	-.007
Law or Health Theme		.089	.030	.029	.030	.041	.010
Humanities Theme		.053	.015	.003	.006	.007	-.002
SMET Theme		.016	-.024	-.054	-.047	-.043	-.044
School Has Continuation Version of Program		.034	.011	.013	.009	.004	.009
Bilingual Version of Another Program		-.038	.009	.010	.014	.012	.010
Percent Passing Regents Math A, 2005			.183 *	.190 **	.201 **	.123	-.013
Percent Passing Regents English, 2005			-.113	-.133 *	-.132 *	-.114	.000
Attendance Rate, 2005			.526 ***	.440 ***	.455 ***	.399 ***	.095
SURR School, 2005			.054	.040	.043	.016	.021
"Hemphill School," 2007			-.027	-.050	-.044	-.016	.007
Number of AP Courses			.074	.055	.058	.122	-.001
Percent Asian, 2005				.072	.057	.040	-.009
Percent Black, 2005				-.214 *	-.217 *	-.255 **	-.084
Percent Hispanic, 2005				.039	.043	-.031	-.083
Percent LEP, 2005				-.210 **	-.235 ***	-.233 **	.024
Percent Free Lunch, 2005				.030	.026	.050	.023
Geographic Priority					.046	.036	.028
Screened Program					-.057	.049	-.022
Ed Options Program					.037	.128	-.003
School Uniform Policy						.064	.008
Total School Enrollment, 2005						-.130	-.011
Percent Capacity, 2005						.109	.042
Number of Programs in School						-.100	-.031
Number of Schools at Site						-.017	-.022
School Has Zoned Program						-.014	.027
Number of Major Boys' Sports						-.044	.040
Number of Major Girls' Sports						.199 *	-.008
Log of Demand, 2006							.849 ***
Adjusted R ²	.035	.025	.322	.347	.352	.376	.806

Note: *p<.05; **p<.01; ***p<.001

Table 3. Stability in Program Demand from 2006 to 2007

2007 Status	2006 RATIO OF APPLICATIONS TO SEATS			
	4.9 or less	5 to 9.9	10 to 14.9	15 or more
Went down one or more categories	0%	14%	31%	19%
Stayed in the same category	81%	79%	61%	81%
Went up one or more categories	19%	7%	8%	0%
Total	100%	100%	100%	100%