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Pathways to an Elite Education: Application, Admission, and Matriculation to New York City's Specialized High Schools

Working Paper

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Abstract

New York City's elite public specialized high schools have a long history of offering a rigorous college preparatory education to the City's most academically talented students. Though immensely popular and highly selective, their policy of admitting students on the basis of a single entrance exam has been heavily criticized. Many argue, for example, that the policy inhibits diversity at the schools, which are predominately Asian, White, and male. In this paper, we provide a descriptive analysis of the "pipeline" from middle school to matriculation at a specialized high school, identifying group-level differences in rates of application, admission, and enrollment unexplained by measures of prior achievement. These differences serve to highlight points of intervention to improve access for under-represented groups. We also look at the role of middle schools in the pipeline, examining the distribution of offers across middle schools and testing for middle school effects on application and admission. Finally, we simulate the effects of alternative admissions rules on the composition of students at the specialized high schools.

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1. Introduction

New York City's specialized high schools have a long history of offering a rigorous, college preparatory public education to the City's most academically talented students. Stuyvesant High School, the most well-known, was founded in 1904. Over the next 35 years, two more high schools opened that eventually joined Stuyvesant as the City's most selective (The Bronx High School of Science and Brooklyn Technical High School). Unlike other high schools in the City, these schools—along with five others—admit students based solely on their performance on the Specialized High School Admissions Test (SHSAT). In a typical year, about 25,000 8th graders take the SHSAT (roughly 1 in 6 from private schools), and 5,000 are offered a specialized high school seat. Admitted students represent only 6 percent of the 80,000 or more 8th graders who apply to NYC public high schools each year.

While there is weak evidence that already high-achieving students have better outcomes having attended an elite high school (Abdulkadiroğlu, Angrist, & Pathak, 2014; Dobbie & Fryer, 2014), the high demand for entry to these schools has drawn intense scrutiny to who attends them. Many have argued, for example, that the SHSAT rewards intense test preparation and inhibits diversity at the schools, which are predominately Asian (64 percent at the three largest, oldest, and most elite schools), White (22 percent) and male (57 percent).[1] Others contend that the City has not gone far enough to ensure advanced students at all middle schools are competitive for admission (ACORN, 1996). In 2012, a coalition of educational and civil rights groups filed a complaint with the U.S. Department of Education claiming that exclusive use of the SHSAT is racially discriminatory (Hewitt et al., 2013).[2] Supporters of the test, on the other hand, point to its objectivity and emphasis on higher-order skills. The SHSAT receives especially strong support from immigrant families, who often view the specialized high schools as an affordable gateway to educational and professional success.

While the SHSAT is the single deciding factor for admission, less is known about the roles application behavior, prior academic preparation, student preferences, and middle school context play in shaping admissions to the specialized high schools. In this paper, we provide a descriptive analysis of the "pipeline" from middle school to matriculation at a specialized high school in NYC, highlighting potential points of intervention to improve access for under-represented groups. In doing so, we address three major questions:

(1) Conditional on prior achievement, are there differences in student propensities to apply, be admitted, and to matriculate to the specialized high schools that lead to an over- or under-representation of students by gender, race/ethnicity, educational need, and/or neighborhood?
(2) To what extent do applicants and admitted students originate from the same set of middle schools? Are there "school effects" on students' propensity to apply and be admitted, conditional on achievement and proximity, which could reflect differences in school supports for specialized high school admissions, such as course offerings or test preparation?
(3) How might admissions criteria based on academic performance measures other than the SHSAT alter the composition of specialized high schools, if at all?

Drawing on individual-level data for nine cohorts of 8th graders participating in high school admissions between 2004-05 and 2012-13, we address each of the above questions. For question (1), we use sequential logit models to identify group-level differences in application, admission, and matriculation not explained by prior achievement on State tests (the strongest predictor of admission outside the SHSAT). Conditional on a flexible function of math and ELA scores, we find girls, Black, and Latino applicants are substantially less likely to receive admissions offers than their male and White counterparts, while Asian applicants are much more likely to receive an offer. These differences are necessarily due to differences in SHSAT performance not captured by State test scores and other achievement predictors (such as attendance and grades). SHSAT performance, however, is not the sole explanation for the gender and race imbalance in the elite high schools. We observe that girls are overall less likely than boys to apply to the specialized schools—which tend to be math and science oriented—and are less likely to accept an offer having received one. Conditional on prior achievement, low-income students are also less likely to apply. Asian students, on the other hand, are substantially more likely than all other racial and ethnic groups to apply, at every level of prior achievement, and are more likely to accept an offer if extended one.

For question (2), we first construct Lorenz curves for the distribution of applicants and admitted students across middle schools. Roughly half of all public school students offered a seat in the specialized high schools in 2013 attended one of only 24 middle schools (4.5 percent of all middle schools in the City); 85 percent attended one of 88 schools (16 percent of all middle schools).[3] To assess whether this imbalance is due to sorting of high-achieving students or middle school

influences on application and admission, we estimate middle school "effects," defined as school average differences in the likelihood of application or admission, conditional on students' achievement and other characteristics. We find only modest effects on application, and little to no effects on admission, suggesting the concentration of specialized high school admissions in a small number of middle schools is due largely to sorting.

Finally, for question (3) we simulate alternative admissions rules that use State test scores, grades, and attendance as admissions criteria in lieu of the SHSAT. Variants of these rules have been proposed by opponents of the single test policy in NYC, or are used in other selective high schools in the U.S. (Finn & Hockett, 2012; Hewitt et al., 2013). We find that awarding admission based on these alternative criteria would have little effect on the average baseline achievement of specialized high school students—at least by these measures—but would have large effects on their demographics. A much greater fraction of female applicants would receive offers than under the current policy, fewer Asian students would be admitted, and a modestly higher fraction of White and Latino students would receive offers (though Asian and White students would still be significantly over-represented). The alternative criteria would do little to reduce the concentration of offers to a minority of middle schools, and would not appreciably increase the number of offers extended to Black students. Admissions rules that set aside seats for high-achieving students in every middle school—such as a "Top 10 percent" rule—would have a large impact on diversity, but at the cost of reducing the average achievement of incoming students.

In the next section, we provide a brief overview and history of specialized high schools in NYC, and describe the admissions process. In section 3 we describe mechanisms by which applications and admissions to the specialized schools may in theory be associated with or influenced by student characteristics and middle school context. Section 4 describes our data sources and empirical methods, while sections 5-7 present our results. We conclude with a brief discussion of policy implications in section 8.

2. Background: Specialized High Schools in New York City

There are currently eight specialized high schools in New York City (Table 1) that base admissions on the SHSAT. Stuyvesant High School, The Bronx High School of Science ("Bronx Science"), and Brooklyn Technical High School ("Brooklyn Tech") are the oldest, largest, and most well-known. (We refer to these later as the "big

3"). The remaining five are smaller, and four are relatively new, having opened since 2002. A ninth school, the Fiorello H. LaGuardia High School of Music & Art and Performing Arts, does not use an admissions test, but instead requires students to submit an audition or portfolio.[4]

Admission to the specialized schools is based strictly on the SHSAT, which students can choose to take in the fall of 8th grade.[5] On exam day, applicants submit a ranking of their preferred specialized high schools, up to a total of eight. SHSAT scores are sorted from highest to lowest and students are assigned, in order, to the highest-ranked school on their list with seats available (Abdulkadiroğlu et al., 2014; Dobbie & Fryer, 2014; NYC DOE, 2014). Accordingly, cut scores for admission vary by school and year depending on the distribution of scores in that year, student preferences, and the number of seats. Cut scores are not made public, but there is a well-known hierarchy of selectivity, with Stuyvesant requiring the highest SHSAT score, followed by Bronx Science and Brooklyn Tech (Abdulkadiroğlu et al., 2014; Feinman, 2008).

Specialized high school admissions are separate from, but run concurrently with, traditional high school choice. In that process, all rising 8th graders provide a list of up to 12 high schools they would like to attend, ranked in order of preference. A centralized mechanism matches applicants to schools, taking into account preferences, space, admissions priorities (such as geography), and schools' rankings of students (for screened and audition schools) (Abdulkadiroğlu, Pathak, & Roth, 2009; Bloom et al., 2010; Corcoran & Levin, 2011). Students who apply to exam-based schools and/or LaGuardia High School also participate in the traditional choice process.[6] Admissions offers are extended in the spring, at which point students offered a seat in one of the test-based specialized high schools (and/or LaGuardia) decide whether to accept or reject the offer. A student may reject the offer, for example, if they decide their main high school choice match is preferable to their specialized school offer, or if they decide to enroll in a private school. Detailed data on offers and acceptance rates during our study period are provided in section 5 and the appendix.

The SHSAT is the product of a 1972 State law, the Hecht-Calandra Act, which sought to bring greater equity and transparency to admissions.[7] Its use, however, has been challenged by advocates and debated for years in local media (Hammack, 2010). For example, two 1990s reports entitled *Secret Apartheid* and *Secret Apartheid II* claimed that specialized high school admissions perpetuated a *de facto* racially

segregated school system by admitting mostly White and Asian students from a small number of the City's middle schools (ACORN, 1996, 1997). Those reports called for greater supports at the middle school level to help poor and minority students prepare for the admissions test. More recently, the NAACP Legal Defense Fund and others filed a complaint with the U.S. Department of Education, stating the exclusive use of the SHSAT for specialized high school admissions is racially discriminatory (Hewitt et al., 2013). Whatever the merits of these arguments, there is little question the elite high schools in NYC lack the gender, racial and ethnic diversity of the district as a whole. For example, in 2013-14, enrollment at the three largest schools was 59 percent male, 86 percent Asian and White, and only 5 percent Black and 6 percent Latino. By comparison, 9th graders Citywide were 26 percent Asian and White, 32 percent Black, 41 percent Latino, and 51 percent male. At Stuyvesant High School in 2013-14, only 33 of the school's 3,292 students were Black.[8]

While a specialized high school admissions offer is highly coveted, there is mixed evidence as to whether attending an elite school has measurable educational benefits for already high-achieving students. The most rigorous estimates of the return to attending an elite high school in NYC are provided by Abdulkadiroğlu et al. (2014) and Dobbie & Fryer (2014), who used a regression discontinuity design to contrast outcomes of students just above and below the cutoff score for admission. At least for students on the margin, they found little to no effect of receiving an offer to attend an exam school on AP or State test scores, PSAT or SAT participation or performance, or college enrollment, graduation, or quality. These findings recall Dale & Krueger (2002), who found modest returns to attending an elite college, suggesting most of the achievement differences observed between graduates of elite and less-selective institutions reflected self-selection.[9] We put aside the question of whether elite high schools have value-added for already high-achieving students beyond their next best alternative, and proceed on the basis that these schools provide an educational good that many students in NYC and their families value.

3. Theory: Factors Affecting Application, Admission, and Matriculation to the Specialized High Schools

Our empirical analysis follows students as they move through the pipeline from middle school to enrollment in a specialized high school. As described in section 2, this pipeline includes several key milestones: the decision to apply to a specialized school (i.e., taking the SHSAT), the awarding of an admissions offer, the decision to

accept or reject an offer, and enrollment in 9th grade. We refer to the decision to accept an offer of admission as "matriculation." Although there is some attrition between acceptance and enrollment in the fall of 9th grade, nearly all students who accept their offer enroll in their offered school.

Here we briefly describe factors that in theory may affect a student's movement through this pipeline. In a narrow sense, applying to a NYC specialized high school is relatively costless; students simply sign up for the SHSAT and give up 2.5 hours on a weekend in October for the test. A competitive score will, for most, require advance preparation, which can significantly increase the explicit and implicit cost of applying. Students who perceive a low likelihood of admission may not find it worthwhile to make this investment, though in practice disincentives to apply appear low, as almost a third of all rising 8th graders take the SHSAT. Curricular appeal may play an important role in the decision to apply, as the three largest specialized high schools (Stuyvesant, Brooklyn Tech, and Bronx Science) have a traditionally strong math and science curriculum. To the extent girls are more resistant, on average, to attending schools with a math and science orientation, they may be less likely to apply (e.g., Buser et al., 2014; Legewie & DiPrete, 2014; Schneeweis & Zweimüller, 2012). Proximity may also influence application: high-achieving students may be unwilling to apply to a specialized school if attending would require a long commute.[10]

Conditional on applying, offers of admission are a deterministic function of SHSAT performance. Therefore, observed associations at the offer stage must be attributable to differences in SHSAT scores.[11] Math and ELA achievement as measured on the State tests are strong predictors of admission, and thus strongly associated with SHSAT performance, but the SHSAT may be sensitive to higher-order skills the State test is not. Group-level differences in admission conditioned on test scores may therefore reflect differences in these higher-order skills. The scoring of the SHSAT has been claimed by some to advantage students with exceptionally high ability in one content area, such as mathematics, over students with very high ability in both content areas (Feinman, 2008). If true, this may influence group differences in admission (as well as test-taking strategies). Students' own effort to prepare for the SHSAT will influence their likelihood of admission, and these efforts may be aided by the resources available to them at home or at school.[12]

At the acceptance stage, students decide whether to accept or reject their specialized school offer or opt for a different (public or private) school. In theory, students will have only ranked specialized schools they are interested in attending, but in practice may rank all eight of the schools, given there is no cost to doing so (they can always turn down an offer). Students applying to specialized schools must also participate in traditional high school choice, and upon receiving a specialized high school offer may find they prefer their traditional school match. (This is more likely when the offer is not from one of the "big 3"). Until 2014, the traditional matching process had a provision for students scoring in the top 2 percent of the 7th grade ELA distribution, guaranteeing admission to an "educational option" school of their choice (non-specialized schools that sometimes have highly-regarded honors programs), provided they designate it as their first choice. Students who met this criterion were therefore more likely to have an attractive alternative and turn down their offer.

Finally, middle schools can influence the propensity to apply and be admitted through any of the above channels. For example, schools vary in resources devoted to counseling or preparing students to take the SHSAT. In some middle schools—such as those with an honors or gifted program—the curriculum may be better aligned with the SHSAT than in others. Schools can create a culture of high expectations and aspirations to attend the specialized schools, and peer behavior may influence students' likelihood of applying (Lauen, 2007; Langenkamp, 2009).

Factors like those described in this section influence the composition of students at each stage of the specialized high school pipeline, and are plausible explanations for differences we observe in section 5. The next section describes the data we employ, and our empirical approach.

4. Data and Empirical Approach

Our analysis focuses on nine cohorts of 8th graders who participated in high school admissions between 2004-05 and 2012-13, about 80,000 students per year. We rely primarily on High School Admissions Process (HSAPS) data provided by the NYC Department of Education, which reports whether or not a student applied to a specialized high school (i.e., took the SHSAT), whether he or she was offered a seat (and to which school, through 2010-11)[13], and whether or not the offer of admission was accepted. This data also includes students' ranked and matched schools from the traditional choice process, their final assignment, and other basic student information. Importantly, we do not observe individual SHSAT scores, nor do we

observe students' rankings of the specialized high schools. An offer of admission to specialized high school *S* simply means that a student's SHSAT score was above the minimum cutoff for *S*, and that this school was the highest-ranked one they qualified for that had not already been filled by students with higher scores.

Using anonymous identifiers, we linked HSAPS data to administrative data on students' background and academic history. This includes 7th and 8th grade scores on the New York State tests in math and ELA, race/ethnicity, gender, age, eligibility for free or reduced price meals (an indicator of poverty), English language learner (ELL) status, country of birth and immigration year, 7th and 8th grade attendance rates, days late in 7th grade, 8th grade course grades (2009 only), special education status, and geocoded residential address. From administrative data we also have the student's middle school of record (called the "feeder," since not all apply from traditional middle schools), the student's enrollment status and school in 9th grade (if a public school), and descriptive characteristics for their middle and high school of record (if public).

Our baseline sample consists of 728,677 rising 8th graders (shown in Table 2). In our initial overview of specialized high school applications, admissions, and matriculations, we begin with all students participating in high school admissions from both public and non-public feeder schools. However, because test scores and background characteristics are unavailable for most private school students, the greater part of our analysis focuses on applicants from public schools, who represent more than 90 percent of applicants in the baseline sample (N=659,464).

Given the above data on public school applicants, section 5 shows how the composition of applicants and admitted students evolves at each stage of the pipeline. These statistics are suggestive of populations who may be over- or under-represented at each step. However, as they characterize an increasingly high-achieving population of students, they do not go far toward disentangling group differences in application and admission from group differences in achievement. Toward that end, we estimate sequential logistic regression models for application, admission, and matriculation to a specialized high school. Each model is estimated conditional on having reached a given stage. For example, our admissions model applies only to students who applied (took the SHSAT), and our model for matriculation pertains only to students who received offers to attend a specialized high school. These models take the form:

$$(1) \quad \Pr(AP_{it}=1) = f(\boldsymbol{X}_{it}'\beta + \eta_t + g(ELA_{it}) + h(math_{it}))$$

$$(2) \quad \Pr(OF_{it}=1 \mid AP_{it}=1) = f(\boldsymbol{X}_{it}'\gamma + \eta_t + g(ELA_{it}) + h(math_{it}))$$

$$(3) \quad \Pr(AC_{it}=1 \mid OF_{it}=1) = f(\boldsymbol{X}_{it}'\delta + \eta_t + g(ELA_{it}) + h(math_{it}))$$

where AP_{it}, OF_{it}, and AC_{it} are binary outcomes equal to 1 if student i applied to a specialized high school, was offered admission, and accepted, respectively, and equal to zero otherwise. We also estimate a version of (2) for offers to the "big 3" schools. The probability of each event is assumed to depend on $\boldsymbol{X}$, a vector of student characteristics (such as gender, race/ethnicity, and borough of residence), a cubic function of the student's ELA and math scores (g and h), which allow for nonlinearity in the relationship between achievement on the State test and these outcomes, and a cohort effect η_t. In models (1) and (2) we include in $\boldsymbol{X}$ a measure of travel time via public transportation from i's middle school to the nearest "big 3" specialized high school. For students offered admission, we estimate a variant of (3) that controls for travel time to the *offered* school. For ease of interpretation, we report average marginal effects (AMEs) for the explanatory variables, rather than logit coefficients (reported in the appendix). The AME for a variable x_k is the average of the estimated marginal effect for x_k across all students, fixing the values of other covariates at their actual values.

Section 6 examines variability across middle schools in the propensity to apply and be admitted to a specialized high school. We first look at the distribution of applicants and admitted students across middle schools to assess the extent of concentration. We then estimate feeder school effects via linear probability model (LPM) versions of our models (1)-(3), with random or fixed school effects. These models use the same controls as (1)-(3), but (in the case of random effects models) add indicators for the 32 geographic school districts to better capture differences in proximity to the specialized high schools.

Our approach to simulating the effects of alternative admissions criteria is described in section 7.

5. The Pipeline: An Overview of Admissions to NYC's Specialized High Schools

Table 2 provides an overview of applications and admissions to the City's specialized high schools. Several things are worth noting. First, nearly a third of all 8th graders in the baseline sample (31.8 percent) applied to a specialized school during the 2005 to 2013 period. This amounts to roughly 25,000 per year. Second, of those who

apply, approximately 19 percent receive an offer of admission. The largest of the specialized high schools—Brooklyn Tech, Stuyvesant, and Bronx Science—together accounted for 78 percent of all offers. Third, not all students who receive an offer matriculate in that school. Indeed, only 72 percent did so during this period. Rates of acceptance vary by school (panel B), ranging from a high of 87 percent (Stuyvesant) to a low of 21 percent (Brooklyn Latin). Finally, private school students are over-represented among specialized school applicants and offers (14.5 and 16.3 percent, respectively, compared with 9.5 percent of the baseline sample), but are only moderately over-represented among matriculants (11.2 percent).[14] Although not shown in this table, most students who accept their offer enroll in their accepted school in 9th grade, doing so about 96 percent of the time. Taken together, exam school students represent a select subset of rising 9th graders. During this period, offers were extended to only 6.2 percent of the baseline (or just 5.7 percent of 8th graders in public schools), and only 4.4 percent of the baseline accepted an offer and enrolled in their offered school (about 3,600 students per year).

Table 3 reports descriptive statistics for public school students at various stages of the pipeline. In this table, the first column describes all public school students in the baseline; the second describes applicants to specialized high schools; the third and fourth describe students receiving offers; and the fifth describes matriculants. The fourth column—offers to the "big 3" specialized schools—uses only data through 2010.

There are notable, if unsurprising, differences in the composition of students at each stage. For example, specialized school applicants scored significantly higher on State tests than the baseline—on average, about 0.66 standard deviations (s.d.) in ELA and 0.74 s.d. in math. Students receiving a specialized school offer scored higher still—about 1.5 s.d. in ELA and 1.7 s.d. in math, on average. Close to 26 percent of admitted students scored in the top 2 percent of the ELA exam, which—until a recent law change—granted them priority admission to an educational option school in the traditional high school matching process.

Specialized high school applicants as a group tend to be more female than the baseline (50.8 percent vs. 49.1 percent), but admissions and acceptances far less so (45.6 percent and 42.3 percent, respectively). Compared to the baseline, White and Asian students are over-represented among applicants, offers, and admissions. For example, Asian students make up 14.2 percent of the baseline, but represent

29.3 percent of applicants, 54.2 percent of offers, and 60.0 percent of matriculants. Blacks and Latinos make up a combined 71.7 percent of the baseline, but only 16.1 percent of specialized school offers. Queens residents are disproportionately represented among applicants, offers, and acceptances, while Bronx residents are significantly under-represented. Applicants and admitted students are more economically advantaged and have fewer special educational needs than the baseline. Still, 32.6 percent of offers went to students eligible for free meals (58.6 percent of the baseline was eligible for free meals). As might be expected, only a small share of ELL and special education students took the SHSAT, and even fewer were offered a seat in a specialized school.

Table 3 also shows the high concentration of immigrant students in NYC public schools, and in particular the specialized high schools. Almost one in five (18 percent) at each stage of the admissions process were recent immigrants. Among the baseline population, the largest immigrant groups were from the Caribbean (5.9 percent of the student population), Central/South America (4.3 percent), and China/Far East Asia (2.3 percent). Caribbean and Latin American immigrants were under-represented among applicants and offers, while immigrants from China/Far East Asia, South Asia, and Eastern Europe/former Soviet Union represent increasingly large shares of applications, offers, and matriculants. For instance, Chinese and other Far East Asian immigrants made up 2.3 percent of the baseline, but 7.9 percent of matriculants. Remarkably, 28.1 percent of students offered a seat in a specialized high school spoke Chinese at home.[15]

Figure 1 provides a closer look at the 8th grade math and ELA achievement of specialized high school applicants and admitted students in 2013 (both scores are normalized to mean zero s.d. one using all 8th grade test takers). Panel A shows the percent of students at each score that applied or were admitted to the specialized schools, while panel B shows the resulting score distributions for applicants and admitted students. Application and admission rates increase non-linearly with math and ELA scores, and (notably) not all admitted students had exceptional scores on the 8th grade tests, especially in ELA. A non-trivial fraction of high-achieving students (15-20 percent of students scoring more than 1 s.d. above average on State tests) did not take the SHSAT at all.

Compositional differences in applicants, admitted students, and matriculants reflect an increasingly high-achieving population, and not necessarily group differences in the propensity to apply to specialized schools or to be admitted. To identify factors

associated with progression through the specialized school pipeline, we estimated the sequential logit models described in section 4. The AMEs from these models are in Table 4, interpreted as the change in the predicted probability of the outcome for the average student given a marginal change in the explanatory variable, holding other predictors constant (or in the case of a binary predictor, the change in probability associated with being in the specified group rather than the omitted category).

Table 4 shows that ELA and math achievement in 8th grade are both strong predictors of application and admission to the specialized schools, though a one-unit difference in math performance is associated with a larger change than a one-unit difference in ELA performance. Conditional on middle school achievement, we also observe interesting differences across groups in the likelihood of application, admission, and matriculation to a specialized school. (All of the differences described are statistically significant at the 1 percent level or better). For instance, Brooklyn residents (the omitted category) were more likely to apply to an exam school, relative to residents of the other boroughs, and somewhat more likely to be admitted than Queens, Staten Island, and Bronx residents, but less likely than Manhattan residents. Upon admission, students in Manhattan and Queens were significantly less likely to matriculate than those in other boroughs, by 5-11 percentage points, perhaps reflecting the quality of their nearby alternatives (public and private).

The gender gap in specialized high school attendance begins at application, and grows at the offer and matriculation stages. Conditional on middle school achievement, girls were about 3 percentage points less likely to sit for the SHSAT, 7 points less likely to be admitted having taken the SHSAT (6.1 points for the "big 3") and were a substantial 10.8 percentage points less likely to matriculate when admitted.

With respect to race/ethnicity, we find Black students were more likely to apply to the specialized high schools, conditional on their middle school achievement (a 2.9 percentage point difference), and were more likely to accept an offer if extended one (by 8.8 points). However, Black applicants were less likely to be admitted (by 6.3 points—on a baseline of 19 percent—or 6.0 points for the "big 3"). The admissions gap for Latino students was similar, although they were less likely to apply than similar White students, by about 3.1 points. Finally, for a given level of prior achievement, Asian students were substantially more likely to apply to the

specialized high schools—by 16.6 percentage points—and were much more likely to accept an offer when given one (by 20 points). Among applicants, Asian students were more likely to score high enough on the SHSAT for admission than similar Whites, by 5-6 percentage points.

A look at AMEs for other predictors in Table 4 reveals a few other notable patterns. Students in charter middle schools were much more likely to apply to the specialized high schools (by 6.4 points) but were less likely to be admitted (or matriculate) conditional on applying. Conditional on middle school achievement, low-income students (those eligible for free meals or who attended a universal free meals school) were less likely to take the SHSAT and to be admitted having done so. They were, however, more likely to matriculate when given an offer. Student behaviors such as attendance and tardiness are associated with application and admission in expected directions. Travel distance to the nearest specialized high school had a weak but statistically significant negative effect on application, but was not a strong deterrent to acceptance among admitted students.[16]

Finally, we note that students who scored in the top 2 percent of the 7th grade ELA exam—and were therefore eligible for guaranteed admission to their first choice educational option program—were indeed less likely to matriculate to a specialized high school when given an offer. In Table A-4, we examine the most common destinations for the one in four students who did not accept their specialized high school offer. Of public school students who turned down an offer during this period, 12 percent ended the process with no assignment (suggesting they enrolled in a private school or public school outside of NYC), 12 percent accepted an offer at LaGuardia High School, and roughly 50 percent opted to attend one of 15 other highly-regarded high schools in the City, most prominently Townsend Harris in Queens (15 percent), and Beacon (5.8 percent) and Bard (5.6 percent) Early College High Schools in Manhattan.[17]

In the next section, we take a closer look at the public middle schools from which students apply.

6. Middle Schools and Specialized High School Admissions

A chief concern of the *Secret Apartheid* reports of the 1990s (ACORN, 1996, 1997) was that students admitted to specialized high schools were disproportionately drawn from a small number of the City's middle schools. For the most part this remains true, a reflection of the uneven distribution of high-achieving students

across NYC middle schools. For Figure 2, we used our baseline population to produce a Lorenz-type curve showing the distribution of applicants and admitted students across public feeder schools. The curve plots the cumulative percent of students in a group (e.g., applicants) on the *y* axis that come from a given *x* percent of feeders (on the *x* axis), after sorting schools in descending order by their number of students in that group. If schools were identical in size, a diagonal (45-degree) line would indicate a perfectly even distribution of students across schools. Because feeder schools vary in size, the baseline Lorenz curve serves as a benchmark for an even distribution, rather than the diagonal.[18]

The topmost curves in Figure 2 show the distribution of students admitted to specialized high schools in 2013. From the top panel we see 53 percent of students admitted originated from only 5 percent of the City's middle schools.[19] By comparison, the largest 5 percent of middle schools enrolled about 20 percent of the baseline. Eighty-three percent of admitted students originated from only 15 percent of middle schools, and nearly half of all middle schools sent few if any students to the exam schools. The distribution of *applicants* (those taking the SHSAT) is more even: 5 percent of middle schools comprise about 26 percent of applicants, and 15 percent of feeders accounted for 53 percent of applications. Though not shown here, we looked for changes over time in the concentration of applicants and admitted students between 2005 and 2013; the Lorenz curves in these years were nearly identical. If anything, the distribution of admitted students was more concentrated in 2013 than in earlier years.

The bottom panel in Figure 2 repeats this analysis for residential zip codes, to see whether the concentration observed in the top panel of Figure 1 is a function of residential sorting by ability. Here the distribution of applicants and admitted students is much less concentrated. This is in part due to the smaller number of zip codes than feeders. That said, sorting by academic ability across middle schools appears more pervasive in NYC than sorting by ability across residential neighborhoods.

A closer look at the middle schools feeding the specialized high schools reveals a large majority of admitted students were already attending highly selective middle school programs. Among offers to students in the top 30 sending schools (which account for 56 percent of offers), 58 percent attended Citywide or district-based gifted and talented programs that require a test for admission, and another 29

percent attended middle schools that screen applicants based on test scores or other criteria. Only 12 percent were from unscreened programs (all located in Queens).

As a more formal test for middle school effects, we estimated LPM versions of the logistic models in Table 4 that include (alternately) fixed or random feeder school effects.[20] For each model (application, admission, admission to a "big 3," matriculation) we can reject the null hypothesis that school fixed effects are jointly zero ($p<0.001$). However, with the possible exception of the application decision, the size of these effects is not large. We used a random effects specification to estimate the between-school variance component (which would be overstated by fixed effects due to sampling variation). We find a one s.d. difference in feeder school effects to be associated with a 9 percentage point difference in the propensity to apply to the specialized high schools, implying similar students attending different schools have meaningful differences in application rates. School effects on admission are smaller, however. Here a one s.d. difference in feeder school effects is associated with a 2.1 point difference in admission rates. This is a large difference, but driven by earlier years of admissions; the estimate for more recent years is close to zero. We find the s.d. of feeder school effects on admission to the "big 3" schools, and on offer acceptance, to be near zero.

In sum, if there are middle school effects on specialized school admissions, they appear to operate on the application margin rather than SHSAT performance. After conditioning on State test scores and other student characteristics, there is little additional systematic variation in admission rates across middle schools. Of course, if middle schools affect specialized high school admissions through achievement itself, these findings will understate the importance of middle schools in the pipeline.

7. Simulating the Effects of Alternative Admissions Criteria

Our descriptive look at the admissions process suggests that not all of the demographic imbalance in NYC specialized high schools is attributable to the SHSAT. Some groups, including girls, Latinos, and low-income students, are less likely to sit for the SHSAT than their prior academic achievement would predict, and in the case of girls, are less likely to accept a specialized school offer when given one. Asian students, on the other hand, are much more likely to apply and to accept an offered seat. These differences are of second order importance for diversity, however, next to the SHSAT itself, where the biggest effect on demographics is observed.

Critics of the SHSAT as the sole factor in admission have argued that more holistic criteria—like those used in some other highly selective U.S. high schools—would increase access to and diversity in the City's specialized high schools (Finn & Hockett, 2012; Hewitt et al., 2013). We simulated how the composition of students in the specialized high schools would change, if at all, under alternative admissions policies using our student-level data on applicants. We necessarily restrict the analysis to the 2009 applications cycle, the only year for which we have data on course grades (an oft-proposed admissions criteria).

Among the many admissions rules that one might propose, we considered the seven described in Table 5. All use some formulaic combination of State test scores, course grades, and attendance to extend admissions offers. Rule 6 goes further and forces proportional representation by borough,[21] while rule 7 gives priority to students whose average test scores and math and English course grades are among the top 10 percent in their middle school. For each simulation we fix the number of public school students admitted to its actual value in 2009 (4,324, about 6 percent of the baseline, and 18.7 percent of applicants). Only *applicants*—those who expressed an active interest in attending a specialized school—were considered for admission, though one could apply the same rules to the baseline population to award eligibility.

Table 6 summarizes the simulations, showing how the composition of students admitted to specialized high schools would differ under these alternative rules. For comparison, the first column provides descriptive statistics for the students actually extended an offer in 2009. (These are comparable to those in Table 3 for all cohorts). Under most alternative rules, the average ELA and math scores of admitted students would be at least as high as the average of those actually admitted in 2009. This is largely by construction, since all of the alternative rules rank students at least in part by math and ELA scores. Average course grades and attendance rates under the alternative rules are also as high as (or higher than) those observed among actual admitted students in 2009. The alternative rules do, however, significantly alter the gender and racial/ethnic mix of admitted students. When a combination of State test scores, grades, and attendance is used in place of the SHSAT, a significantly higher fraction of offers would be extended to girls (an increase of 9 to 13 points under rules 1-6). In fact, the gender gap would shift dramatically in favor of girls with the use of grades and State tests. At the same time, the fraction of offers extended to Asian students would drop 4 to 13 points,

and the fraction extended to Whites would rise 2 to 4 points. (Asians and Whites would remain over-represented among offers, relative to baseline). The fraction of offers to Black and Latino students would rise modestly in Rules 1-6 (0-4 and 3-11 points, respectively), though they would remain significantly under-represented. In fact, under Rules 2-5, the percent of offers extended to Black students would decline from current levels.

Perhaps surprisingly, rules 1-6 have little to no effect on the concentration of specialized high school offers in a minority of feeder schools (as was seen in Figure 2). The bottom two rows of Table 6 report the number of middle schools that comprise the first 50 and 85 percent of offers, after sorting schools in descending order by the number of offers. Of rules 1-6, only rule 1 would reduce the concentration of offers (slightly). The others *increase* the clustering of offers into a smaller number of middle schools. Even rule 6, which enforces borough proportionality, retains a high level of concentration. Rule 7 (the "top 10 percent" rule) has the most dramatic effect on the concentration and demographics of specialized high school offers. When giving admissions priority to applicants in the top 10 percent of each middle school, the racial/ethnic distribution would be much closer to baseline, and a higher fraction of offers would be extended to low-income students. This assignment rule comes, however, at the cost of lower average math and ELA scores, especially relative to rules 1-6.

These simulations only approximate the potential effect of alternative rules on the composition of specialized high schools, for several reasons. First, they do not address the general equilibrium implications of a rule change. We took the applicant pool and its prior performance (e.g., test scores and grades) as given; it is likely both would change under a new policy. A new rule would affect the composition of students who apply, and incentives for applicants to shift their emphasis away from SHSAT preparation and toward course grades and State tests. Second, our simulations omit private school students, who comprise a meaningful share of applicants but lack the performance measures used in these rules. (Many public school applicants also lack data on these measures, highlighting a potential barrier to implementation). Third, (for obvious reasons) our simulations do not consider qualitative admissions criteria often proposed, such as recommendations, essays, or interviews. Finally, they are uninformative about unmeasured qualities of students, such as higher-order thinking skills or the ability to succeed in a competitive admissions process, that the SHSAT is intended to measure. To the extent the

SHSAT is sensitive to skills that existing performance measures are not, our simulations ignore an important dimension of selectivity. More evidence is needed on this question.

8. Discussion

This paper provides a descriptive look at the pipeline from NYC public middle schools to matriculation at the City's elite specialized high schools. A remarkably high percentage of 8th graders aspire to attend one of these schools, and sit for the entrance exam, but only a small fraction is admitted. A comparison of mean characteristics confirms admitted students are a highly select population on multiple dimensions, including State test scores and course grades. They are a somewhat more advantaged group than the wider population, although nearly a third are eligible for free meals, and almost one in five was born outside of the United States.

The SHSAT does appear to be a barrier to diversity in the specialized schools. Among similar applicants with the same measured performance on State tests of math and ELA, girls, Black, Latino, and low-income students are significantly less likely to score high enough on the SHSAT to receive an offer of admission. Asian and White students are substantially more likely to receive an offer. Simulated policies that offer admission on the basis of measures other than the SHSAT, such as State test scores, grades, and attendance, suggest many more girls and Latinos (as well as Whites) would be admitted under these alternative policies. They would not, however, appreciably increase the share of offers given to Black or low-income students, nor reduce the high concentration of offers in a small number of middle schools.

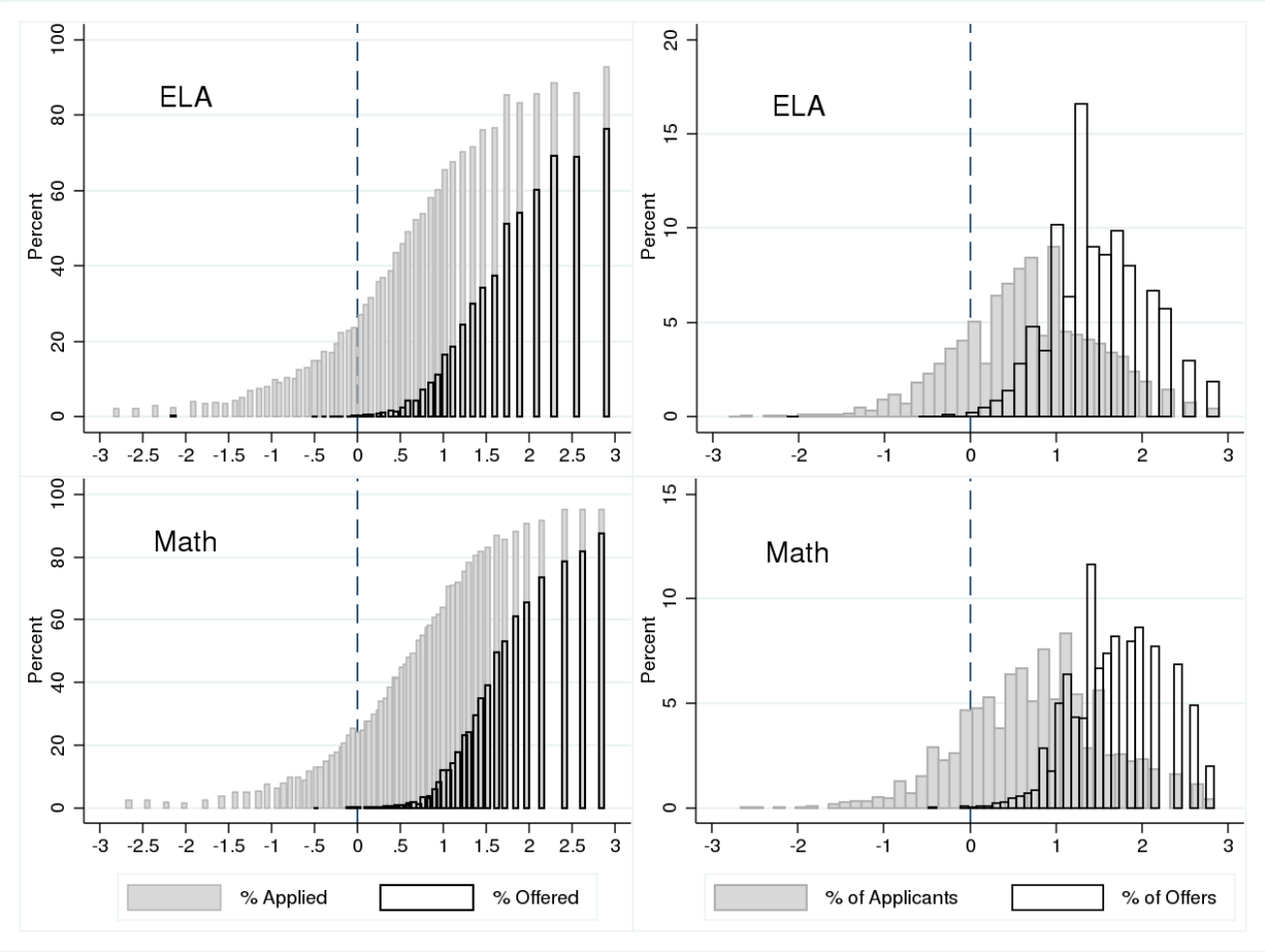
Our findings offer several important lessons. First, measures of academic performance other than the SHSAT are strong predictors of current admission to the specialized high schools. Admissions policies that rely on State test scores and course grades would admit many of the same students currently admitted, and would continue to yield a class far from demographically representative of NYC's 8th graders. Behavioral responses to any new admissions rule would likely limit its impact even further. Second, while measures such as test scores, grades, and attendance are strongly predictive of current admission, there are large group differences that remain unexplained. This suggests the SHSAT plays a powerful role above and beyond these other measures. The difference may be higher-order skills that are not adequately captured in other achievement measures, or simply

differences in test preparation. This remains an important open question for future research.

Finally, we identified several potential points of intervention to improve access to the specialized high schools for under-represented groups. First, a non-trivial share of high-achieving students does not sit for the SHSAT at all. This may reflect a lack of interest, a lack of resources for test preparation, or a poor understanding of their odds of admission. We found a significant middle school effect on the propensity to apply for the specialized schools, suggesting schools may influence this behavior. Second, female, Latino, and low-income students are less likely to apply for admission than their prior achievement would predict, and girls are much less likely to accept an offer when extended one. The latter may again reflect preferences, but given the prominent role specialized schools play in STEM education in NYC, a better understanding of this phenomenon is needed. Lastly, echoing the *Secret Apartheid* studies of the 1990s, we find that students admitted to the exam schools originate from a remarkably small number of the City's middle schools. This result appears more than anything to be a reflection of the highly uneven distribution of high-achieving students across schools.

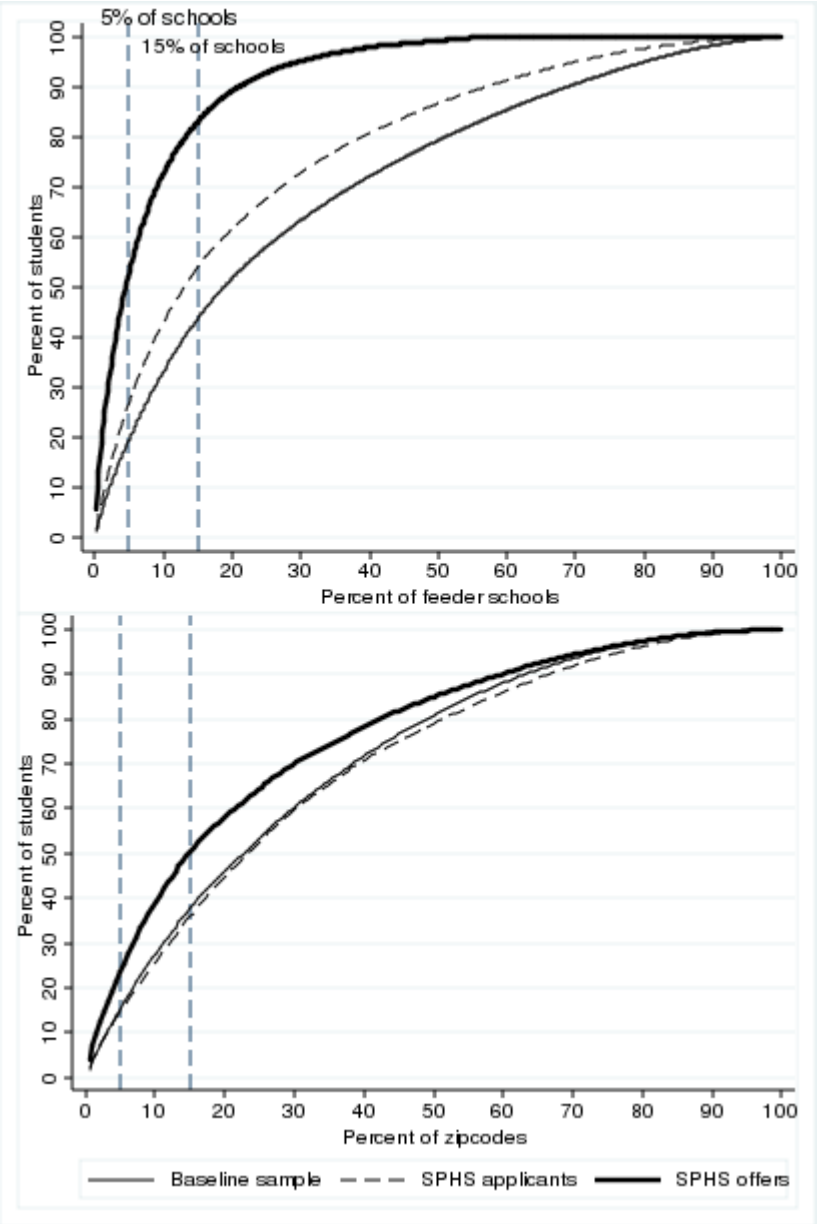
Figure 1: Percent Applying and Receiving Offers to Specialized High Schools by 8th Grade Test Scores, and Test Score Distributions of Applicants and Offers, Students Entering 9th Grade in 2013

A. Percent applying and receiving offers **B. Test score distribution of applicants and offers**



Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.
Note: Figure only includes students who were enrolled in a NYC public school in 8th grade.

Figure 2: Feeder School and Zip Code Representation Among Specialized High School Applicants and Admitted Students, Students Entering 9th Grade in 2013



Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.

Notes: excludes special education, home school, and alternative feeder schools. Inlcudes a total of 536 feeder schools and 178 zip codes with at least one student in the baseline sample in 2013.

Table 1: Specialized High Schools in NYC

	Year Founded	Fall 2014 Enrollment	Number of Students Who Ranked the School for Fall 2014	Percent of Students Who Ranked the School for Fall 2014	Number of Offers Made for Fall 2014
Stuyvesant High School	1904	3,292	23,408	83.6	952
Brooklyn Technical High School	1922	5,458	23,371	83.5	1,845
The Bronx High School of Science	1938	3,037	19,635	70.1	968
Staten Island Technical High School	1988[a]	1,235	15,196	54.3	344
High School of American Studies at Lehman College	2002	387	16,706	59.7	165
High School for Math, Science, and Engineering at City College	2002	456	19,067	68.1	188
Queens High School for the Sciences at York College	2002	419	16,859	60.2	151
The Brooklyn Latin School	2006	592	16,675	59.6	484
LaGuardia High School of Music & Art and Performing Arts	1936	2,730	14,943	--	1,970

Sources: Fall 2014 enrollment is from the 2014-15 Directory of New York City Public High Schools. Counts of students ranking each specialized high school are taken from the *2014-15 Specialized High Schools Student Handbook* (NYC DOE, 2014) and include 8th and 9th grade test takers. The approximate percentage of students ranking the school is based on total number of 28,000 students taking the SHSAT, as reported in NYC DOE (2014).

Notes: The LaGuardia High School of Music & Art and Performing Arts was formed after the 1961 merger of The High School of Music & Art (founded in 1936) and the High School of the Performing Arts (founded in 1947). [a] Staten Island Technical High School obtained specialized high school status in 2005.

Table 2: Specialized High School Applications and Admissions

A. Baseline sample, applications, offers, and acceptances, students entering 9th grade from 2005-2013

	N (2005-2013)	Percent Attending Private 8th Grade School	Percent of Baseline	Percent of Applicants	Percent of Offered
Baseline sample	728,677	9.5	100.0	-	-
Applied to SPHS	231,974	14.5	**31.8**	100.0	-
Offered a SPHS	44,830	16.3	6.2	**19.3**	100.0
Offered a "big 3" SPHS[a]	22,566	15.8	4.6	**15.0**	77.9
Accepted SPHS offer	32,262	11.2	4.4	13.9	**72.0**

B. Offers from specialized high schools, and offer acceptance rates, students entering 9th grade from 2005-2010

	N (2005-2010)	Percent of All Offers	Percent of Offers Accepted
Brooklyn Tech	10,750	37.1	69.6
Bronx Science	6,048	20.9	76.1
Stuyvesant	5,768	19.9	87.2
Brooklyn Latin	1,629	5.6	21.4
Staten Island Tech	1,548	5.3	85.6
City College	1,174	4.1	59.9
Bronx Lehman	1,055	3.6	54.3
Queens York	984	3.4	62.0
Total	28,956	100	71.4

Source: Authors' calculations using High School Admissions Process (HSAPS) data provided by the NYCDOE.

Notes: See data appendix for definitions, and Tables A-1 and A-2 for detailed counts by year. [a] The identity of the offered specialized high schools is not reported after 2010, therefore this row and all rows in panel B only include students who entered 9th grade from the 2005-2006 school year to the 2010-2011 school year.

Table 3: Descriptive Statistics–8th Grade Public School Students Applying to NYC High Schools, Students Entering 9th Grade from 2005-2013

	Baseline	Applied to SPHS	Offered a SPHS	Offered a "Big 3"[a]	Accepted SPHS offer
Borough of residence					
Brooklyn	31.6	35.5	32.3	36.9	34.2
Manhattan	11.5	11.5	16.3	15.1	14.7
Queens	27.5	30.7	38.9	41.0	38.1
Staten Island	6.2	5.9	6.5	2.4	6.8
Bronx	23.2	16.4	6.1	4.6	6.2
Charter middle	1.2	2.1	0.9	0.4	0.8
ELA z-score (8th grade)	0.007	0.662	1.541	1.609	1.517
Math z-score (8th grade)	0.006	0.742	1.662	1.761	1.693
Top 2% in ELA (7th grade)	2.8	7.8	25.9	29.2	24.5
Female	49.1	50.8	45.6	45.1	42.3
Asian	14.2	29.3	54.2	58.2	60.0
Black	31.9	27.2	7.4	7.0	7.2
Latino	39.7	24.8	8.7	7.1	8.0
White	13.4	18.0	29.1	27.5	24.4
Special education	15.9	4.2	1.2	0.9	1.1
English language learner	12.0	3.5	0.4	0.3	0.4
Immigrant	17.6	17.2	16.9	15.9	18.2
China/Far East Asia origin	2.3	3.7	7.1	7.0	7.9
Chinese spoken at home	5.3	12.5	28.1	31.8	32.3
English spoken at home	56.6	54.4	43.7	39.1	38.4
Free lunch eligible	58.6	47.9	32.6	31.6	35.5
Reduced price lunch	7.1	9.6	10.5	11.5	11.2
Universal free meal school	28.6	26.9	21.4	21.9	21.5
Attendance rate (7th grade)	92.1	95.8	97.5	97.3	97.6
Age	14.1	13.9	13.8	13.8	13.8
Absent >30 days	8.6	1.9	0.3	0.4	0.4
Late >30 days	15.1	6.8	1.6	1.6	1.8
Number of traditional choices[b]	7.1	7.4	6.0	5.9	6.0
Travel time to closest "big 3"	41.8	42.7	46.8	46.8	46.8
Travel time to offered	-	-	52.4	54.8	51.5
N	659,464	198,349	37,532	18,995	28,658

Source: Authors' calculations using High School Admissions Process (HSAPS) data provided by the NYCDOE. See appendix for description of the baseline sample. Includes only students who applied from a NYC public school.

Notes: [a] The identity of the offered SPHS is not reported in the data after 2010, therefore the "offered a big 3" column only includes students who entered 9th grade from the 2005-2006 school year to the 2010-2011 school year. [b] Refers to the number of schools ranked on the student's main high school admissions form (not the specialized high schools).

Table 4: Average Marginal Effects from Logistic Regression Models for Application, Admission, and Offer Acceptance, Students Entering 9th Grade from 2005-2013

	Applied to SPHS		Offered a SPHS		Offered a SPHS ("Big 3)		Accepted SPHS offer	
Travel time to closest "big 3"	-0.0007	***	0.0002	***	0.0002	***	0.0002	
	(0.0000)		(0.0000)		(0.0001)		(0.0002)	
Manhattan	-0.0146	***	0.0553	***	0.0154	***	-0.0519	***
	(0.0017)		(0.0024)		(0.0029)		(0.0063)	
Queens	-0.0613	***	-0.0288	***	-0.0477	***	-0.1120	***
	(0.0015)		(0.0020)		(0.0024)		(0.0067)	
Staten Island	-0.0645	***	-0.0446	***	-0.1391	***	0.0242	**
	(0.0022)		(0.0028)		(0.0026)		(0.0081)	
Bronx	-0.0055	***	-0.0141	***	-0.0577	***	-0.0102	
	(0.0014)		(0.0026)		(0.0032)		(0.0086)	
Charter middle	0.0643	***	-0.0276	***	-0.0194	*	-0.0747	*
	(0.0047)		(0.0068)		(0.0094)		(0.0296)	
Female	-0.0270	***	-0.0696	***	-0.0608	***	-0.1083	***
	(0.0010)		(0.0013)		(0.0016)		(0.0044)	
Black	0.0291	***	-0.0634	***	-0.0595	***	0.0878	***
	(0.0017)		(0.0023)		(0.0026)		(0.0102)	
Latino	-0.0311	***	-0.0681	***	-0.0632	***	0.0424	***
	(0.0016)		(0.0022)		(0.0026)		(0.0098)	
Asian	0.1663	***	0.0508	***	0.0566	***	0.1990	***
	(0.0020)		(0.0020)		(0.0024)		(0.0062)	
Special education	-0.0512	***	0.0207	***	-0.0035		-0.0041	
	(0.0019)		(0.0060)		(0.0078)		(0.0192)	
English Language learner	-0.0783	***	-0.0553	***	-0.0556	***	-0.0662	
	(0.0023)		(0.0075)		(0.0093)		(0.0470)	
Recent immigrant	0.0023		-0.0070	***	-0.0046	*	0.0448	***
	(0.0014)		(0.0018)		(0.0022)		(0.0057)	

Continued on next page.

Table 4 Continued: Average marginal effects from logistic regression models for application, admission, and offer acceptance, 2005-2013

	Applied to SPHS		Offered a SPHS		Offered a SPHS ("Big 3")		Accepted SPHS offer	
Free lunch eligible	-0.0290	***	-0.0340	***	-0.0257	***	0.0502	***
	(0.0011)		(0.0015)		(0.0018)		(0.0051)	
Reduced price lunch	0.0000		-0.0198	***	-0.0131	***	0.0331	***
	(0.0019)		(0.0022)		(0.0025)		(0.0071)	
Universal free meal school	-0.0123	***	-0.0340	***	-0.0259	***	0.0217	***
	(0.0011)		(0.0016)		(0.0019)		(0.0053)	
Absent 30+ days	-0.0231	***	-0.0251	**	-0.0040		0.1109	***
	(0.0029)		(0.0091)		(0.0108)		(0.0305)	
Absent 20-30 days	-0.0270	***	-0.0163	***	-0.0139	*	0.0296	
	(0.0019)		(0.0048)		(0.0056)		(0.0175)	
Late 30+ days	-0.0176	***	-0.0087	*	-0.0038		0.0952	***
	(0.0016)		(0.0043)		(0.0053)		(0.0143)	
Attendance rate	0.0069	***	0.0007	**	0.0010	***	-0.0008	
	(0.0001)		(0.0002)		(0.0002)		(0.0007)	
Age	-0.0343	***	-0.0138	***	-0.0120	***	-0.0334	***
	(0.0010)		(0.0019)		(0.0022)		(0.0064)	
Top 2% ELA	0.0695	***	0.0898	***	0.0720	***	-0.0196	***
	(0.0034)		(0.0023)		(0.0025)		(0.0050)	
ELA z-score	0.0903	***	0.1042	***	0.0807	***	-0.003	
	(0.0008)		(0.001)		(0.0011)		(0.0034)	
Math z-score	0.1275	***	0.1354	***	0.1017	***	0.0454	***
	(0.0008)		(0.001)		(0.0011)		(0.0037)	
N	608,124		192,264		124,231		36,901	
Mean of dep. var.	0.316		0.192		0.151		0.765	
Pseudo R2	0.318		0.473		0.447		0.084	
Log-likelihood	-258715.94		-49502.393		-29210.836		-18444.86	

Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.

Notes: Standard errors reported in parentheses. *** = p < 0.001; ** = p < 0.01; * = p < 0.05. Logit coefficients omitted for ease of presentation (reported in Table A-5). The ELA and math *z*-scores enter the logistic model as a cubic function. The AMEs reported above are the average effect of a marginal change in the ELA or math score on the outcome, across all students, and thus reflect the quadratic and cubic terms.

Table 5: Simulated Alternative Admissions Rules

Rule 1	Applicants are ranked by the average of their 7th grade math and ELA *z*-scores, and admitted in order, beginning with the highest average, until all seats are filled. (7th grade scores are the most recent available at the time of application).
Rule 2	Applicants are ranked by the average of their 7th grade math and ELA *z*-scores, and their 7th grade math and English grades (also *z*-scores), and admitted in order, beginning with the highest average, until all seats are filled.
Rule 3	The same as Rule 2, except that course grades are *weighted*, with honors/ accelerated classes weighted by a factor of 1.25 prior to standardization. Students are admitted in order, beginning with the highest average, until all seats are filled.
Rule 4	Applicants are ranked by the average of their 7th grade math and ELA *z*-scores, and their 7th grade math, English, social studies, and science grades (also *z*-scores), and admitted in order, beginning with the highest average, until all seats are filled. As in Rule 3, honors courses are given additional weight.
Rule 5	The same as Rule 3, but the student's *z*-score for 7th grade attendance is also included in the average. Students are admitted in order, beginning with the highest average, until all seats are filled.
Rule 6	The same as Rule 3, but *proportional representation* by borough is enforced (Brooklyn 31.8%, Manhattan 11.3%, Queens 27.6%, Staten Island 6.1%, and Bronx 23.3%, mirroring the distribution of applicants). Within borough students are admitted in order, beginning with the highest average, until all seats are filled.
Rule 7	"*Top 10%*" Rule: all students in the top 10% of their feeder school by the measure in Rule 3 are eligible for admission. If the number of eligible applicants exceeds the number of available seats, eligible (top 10%) students are admitted in order, beginning with the highest average, until all seats are filled.

Notes: In the event of ties at the threshold for admission, students at the threshold are offered seats at random. (In practice, ties only occur under Rule 1).

Table 6: Mean Characteristics of Students Offered Specialized High School Seat Under Alternative Admissions Rules

	Actual Offers for Fall 2009	Rule 1	Rule 2	Rule 3	Rule 4	Rule 5	Rule 6	Rule 7
ELA *z*-score (grade 7)	1.413	1.711	1.586	1.493	1.357	1.489	1.466	1.386
Math *z*-score (grade 7)	1.696	1.926	1.866	1.742	1.584	1.745	1.672	1.574
Math grade (0-100)	93.1	93.2	95.1	94.1	93.6	94.2	93.5	93.4
English grade (0-100)	91.3	92.1	94.1	93.3	93.0	93.4	92.5	92.1
Attendance rate	97.7	97.5	97.7	97.6	97.5	98.0	97.5	97.2
Female	46.1	55.4	59.3	57.4	56.9	57.6	58.9	60.2
Asian	53.6	44.7	47.1	47.1	47.6	49.2	40.9	37.7
Black	7.6	9.7	7.8	7.1	6.4	7.0	11.1	20.4
Latino	9.4	13.7	12.5	12.9	13.5	12.4	20.1	21.8
White	29.2	31.6	32.4	32.7	32.3	31.2	27.5	19.8
Free lunch eligible	30.6	30.3	30.5	30.6	31.3	31.1	35.2	42.6
Received an offer in 2009	100.0	62.2	61.3	56.2	51.0	57.1	52.8	42.3
Received a "big 3" offer in 2009	75.7	49.2	48.4	44.3	39.5	45.1	41.9	32.4
Number of schools representing 50% of offers	23	27	24	18	16	18	22	57
Number of schools representing 85% of offers	81	94	81	54	43	55	82	117

Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.

Notes: Only students that applied for specialized high school admission (took the SHSAT) are included in admissions simulations. See Table 5 for descriptions of each admissions rule.

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Endnotes

[1] Authors' calculations using student-level data from the NYC Department of Education for 2013-14.

[2] See also "Charges of Bias in Admission Test Policy at Eight Elite Public High Schools," *The New York Times,* September 29, 2012, p. A28. This complaint is currently under review.

[3] As we will show later, this pattern is not due to variability in school size.

[4] 14,943 students applied for admission to LaGuardia for 2014-15, and approximately 970 were admitted (NYC DOE, 2014). Our analysis is restricted to the exam-based schools, and thus LaGuardia applications are not included in our analysis. However, we briefly examine enrollment in LaGuardia as a potential outcome for students who do not accept their specialized high school offer.

[5] 9th graders may also take the SHSAT for 10th grade admission. In this paper, we focus only on 8th grade applicants.

[6] According to the *Specialized High School Student Handbook* (NYC DOE, 2014) students must complete a traditional high school application in order to receive their SHSAT or LaGuardia audition results. This policy is intended to prevent students from betting entirely on admission to a specialized school.

[7] The SHSAT is intended to test for high-level ability and logical reasoning skills, and consists of 95 multiple-choice questions—45 for verbal ability and 50 for mathematics.

[8] This fact was captured in a prominent 2012 article in the *New York Times* that profiled the experience of an African-American girl enrolled at Stuyvesant High School, "To Be Black at Stuyvesant High," *The New York Times,* February 25, 2012, p. MB1. Diversity at the specialized high schools has declined markedly over the past 20 years as the schools have become more competitive (Hewitt et al., 2013).

[9] Related studies include: Clark (2010), who finds no effects of attending a selective high school in the U.K. on test scores, but positive effects on course-taking and university enrollment; Berkowitz & Hoekstra (2011), who find a positive effect of attending a single elite private high school on the selectivity of college attended, and Jackson (2010), who finds large effects of attending a selective high school in Trinidad and Tobago on exam performance. Lucas & Mbiti (2014) find no impact of admission to highly selective secondary schools in Kenya.

[10] For example, by public transportation it would take nearly two hours one way to travel from Staten Island to Bronx Science, and 1.5 hours to travel from Riverdale in the Bronx to Brooklyn Tech.

[11] Strictly speaking, to receive an offer of admission a student must score sufficiently high on the SHSAT to qualify for one of the schools on their ranked list. It is possible for a student to score high enough to qualify for *one of* the specialized high schools, but not high enough to qualify for one on their list. A student in this case would not receive an offer.

[12] The district offers a free Specialized High School Institute (SHSI) to low-income 6th graders with sufficiently high attendance and 5th grade test scores. This 22-month program involves more than 100 meetings during the

summer and on Saturdays at 18 locations throughout the City. Though there has not yet been a formal evaluation of the SHSI, those who choose to take advantage of its intense preparation plausibly increase their chances of admission.

[13] After 2010 we only know the identity of the offered school if the student ultimately enrolled in it.

[14] The proportion of private school students as a share of the baseline sample has been falling (from 10.7 percent in 2005 to 7.9 percent in 2013) and of specialized high school admissions offers (from 17.1 percent in 2005 to 13.2 percent).

[15] Detailed statistics on country of origin and language spoken at home are provided in Table A-3.

[16] In a version of model (3) that includes travel time to the offered school as a predictor, we find a one standard deviation increase in travel time for students receiving an offer (19.7 minutes) is associated with a 2.4 percentage point reduction in the likelihood of accepting the offer ($p<0.001$). Because the identity of the offered school is known only for 2005-2010, we exclude the travel time predictor from the model in Table 4.

[17] In a version of model (3) that includes offers from LaGuardia High School as a predictor of offer acceptance, we find that an offer from LaGuardia has a substantial (23.1 percentage point) negative effect on the likelihood a student accepts their specialized high school offer ($p<0.001$).

[18] In other words, if specialized high school applicants and admitted students were distributed across middle schools in the same way as the baseline population, their curves would look the same as the baseline. In addition to enrollment differences across feeder schools, differences in the propensity to move to the private sector for high school will affect the shape of the baseline Lorenz curve. (Students who intend to move to private schools and do not begin the public high school admission process are not included in our baseline sample).

[19] In 2013, 45 percent of all specialized high school offers to public school students went to students in only 20 middle schools (out of a total of 536 feeder schools in the baseline sample).

[20] Coefficients from the LPM versions of our Table 4 models are provided in Table A-6.

[21] This is similar to a proposal made to the City Council in 2014. See "Crowd Defends Elite HS Admissions," *Queens Chronicle,* June 26, 2014.

Data Appendices and Additional Figures & tables

Data Appendix

Baseline sample

Includes any student who:

(1) Applied to a NYC public high school from a public or private middle school;
(2) Completed the choice process with a high school program assignment; or
(3) Completed at least the main round of high school choice (R1 or R2, depending on the year); or
(4) Is flagged as having applied to a specialized high school.

This is a broadly-defined population that includes students who completed the high school choice process, whether or not they started the process late (criteria 1); students who opted out of the process midway through, but only after receiving a main round match (criteria 2); and students who applied to a specialized high school, whether or not they completed the process (criteria 3). This broad definition represents the population of students that could have applied to a specialized high school (or did), and/or participated in the public school choice process at all.

Those meeting criteria (1) and (3) are straightforward to identify in the data. To determine whether students met criteria (2) we used the following information:

(1) For students entering 9th grade from 2005-2009: the student is coded as having a match in R1 (the specialized round) or R2 (the main round);
(2) For students entering 9th grade in 2010 or 2011: has any program code assigned as a R1 or R2 match. The use of the program code is necessary as the match variables are incorrect or missing;
(3) For students entering 9th grade in 2012: has any program code assigned as a R1 match. In 2012, the specialized round was discontinued and R1 was the main round;
(4) For students entering 9th grade in 2013: the student is coded as having a match in R1 or has any program code assigned as a R1 match.

Applied to SPHS

Includes any student flagged as having applied. This variable appears to be consistently defined over time. We identified roughly 110-165 cases per year for the school years beginning between 2005-2008 in which a student received a SPHS offer, but was not flagged as an applicant. We imputed a "Y" in these cases.

Offered a SPHS

Includes any student flagged as having received a specialized high school offer. This variable appears to be consistently defined over time.

Offers to "big 3" schools are identified as any students flagged as having received an offer and it is known they were offered a "big 3" SPHS (Stuyvesant, Bronx Science, or Brooklyn Tech). The identity of the offered school is only reported from 2005-2010.

In the schools years beginning in 2011-2013, it is known if a student was finalized to a "big 3" SPHS—indicating that they accepted an offer—but we do not observe the identity of school offers that were not accepted. Between 2005 and 2008, roughly 73 percent of students offered a "big 3" SPHS were finalized there (accepted). Therefore, using the number finalized underestimates the number of offers by about 27%.

The high school program codes for the "big 3" SPHS are: M89S (Stuyvesant), K89S (Brooklyn Tech), and X89S (Bronx Science).

Accepted a SPHS

To determine whether students accepted a SPHS offer, we used the following information:

(1) For students beginning 9th grade in 2005-2009: students were flagged as accepting their SPHS offer;
(2) For students beginning 9th grade in 2010-2013: students' final matched program was one of the eight specialized high schools (or one of the "big 3", when counting only acceptances to a "big 3" SPHS).

For students beginning 9th grade from 2005 to 2009, nearly 100% of all students flagged as accepting their SPHS offer were finalized to one of the eight specialized high schools. Therefore using the number finalized (as in 2010-2013) should be a close approximation to the actual number of acceptances.

The high school program codes for the other five SPHS are K00S (Brooklyn Latin), M00S (HS for Math, Science, and Engineering at City College), Q00S (Queens HS for the Sciences at York College), R89S (Staten Island Tech), and X00S (HS for American Studies at Lehman College).

Matriculated to an offered SPHS

To determine whether a student matriculated to (enrolled in) their offered SPHS, we used the following information:

(1) For students beginning 9th grade in 2005-2010 (when the identity of the offered SPHS is known): students were enrolled in October of 9th grade in their offered SPHS;
(2) For students beginning 9th grade in 2011-2012 (when the identity of the offered SPHS is not known): students were offered a SPHS, and were enrolled in a SPHS in October of 9th grade.

As of this version of the paper, data on the 9th grade enrollment for the 2013 cohort was not yet available.

Private school student share

In Table 2 we calculate the percent of each group that are private school applicants. The private school applicant variable seems consistently defined in the data, with the overall number of private applicants declining over time, but with no major fluctuations. In 2005 and 2006 private school applicants were not successfully matched to their 9th grade public school enrollment status. Therefore, to calculate the percent private among matriculants, we used only data from 2007-2012.

Course grades

Data on student grades were available for students in the 2009 cohort only. Among public school students in the baseline sample, 80.7% had non-missing grades in all four subjects (math, English, social studies and science), and 87.5% had non-missing grades in at least three subjects. 85% were not missing math or English. Among specialized high school *applicants*—those used in our simulations in section 7—86.6% had non-missing grades in all four subjects; 92.1% had non-missing grades in at least three subjects; and 91.3% had non-missing grades for math and English.

We calculated *z*-scores for each subject grade using the full population of public school students observed in 2009. The first set of *z*-scores uses unweighted grades, which range from 0-100. A second set of *z*-scores uses weighted grades, in which the original mark (0-100) is increased by a factor of 1.25 if the class is designated as "honors" or "accelerated." From each set of *z*-scores we calculated averages over the four subjects; when grades were missing in a particular subject, the average was taken over the remaining subject(s).

Table A-1: Baseline Sample and Applications to, Offers from, and Acceptances of Offers from Specialized High Schools, Students Entering 9th Grade from 2005–2013

	2005	2006	2007	2008	2009	2010	2011	2012	2013	All years	% Private
Baseline sample	84,659	84,612	83,145	81,149	80,918	78,939	78,166	78,531	78,558	728,677	9.5
Applied to SPHS	21,391	24,722	24,561	25,968	26,770	26,839	27,771	27,339	26,613	231,974	14.5
% of baseline	25.3	29.2	29.5	32.0	33.1	34.0	35.5	34.8	33.9	31.8	-
Offered a SPHS	4,086	4,697	4,768	5,158	5,004	5,243	5,354	5,310	5,210	44,830	16.3
% of applied	19.1	19.0	19.4	19.9	18.7	19.5	19.3	19.4	19.6	19.3	-
% of baseline	4.8	5.6	5.7	6.4	6.2	6.6	6.8	6.8	6.6	6.2	-
Offered a "big 3"	3,554	3,758	3,807	3,898	3,695	3,854	-	-	-	22,566	15.8
% of applied	16.6	15.2	15.5	15.0	13.8	14.4	-	-	-	15.0	-
% of baseline	4.2	4.4	4.6	4.8	4.6	4.9	-	-	-	4.6	-
Accepted SPHS offer	2,914	3,382	3,328	3,602	3,648	3,800	3,858	3,872	3,858	32,262	11.2
% of offered	71.3	72.0	69.8	69.8	72.9	72.5	72.1	72.9	74.0	72.0	-
% of applied	13.6	13.7	13.5	13.9	13.6	14.2	13.9	14.2	14.5	13.9	-
% of baseline	3.4	4.0	4.0	4.4	4.5	4.8	4.9	4.9	4.9	4.4	-

Source: Authors' calculations using High School Admissions Process (HSAPS) data provided by the NYC Department of Education.

Notes: Not all students in the HSAPS data fully participated in (or completed) the choice process. Our baseline sample includes students who (1) completed the choice process, as indicated by having a final high school assignment, or (2) did not complete the choice process but were given a high school match in the main round of choice (indicating that they were active in the system long enough to receive a match in the first round, but may have then decided to opt out early), or (3) did not complete the choice process or receive a main round match, but did apply to a specialized high school. The identity of the offered SPHS is not reported in the data after 2010, therefore "offered a big 3" counts use only 2005-2010 data.

Table A-2: Offers from specialized high schools and offer acceptance rates, Students Entering 9th Grade from 2005–2010

	Brooklyn Tech	Bronx Science	Stuy-vesant	Brooklyn Latin	S.I. Tech	City College	Bronx Lehman	Queens-York	All SPHS
2005	1,712	883	959	-	-	215	165	152	4,086
2006	1,777	997	984	-	356	229	190	164	4,697
2007	1,754	1,083	970	170	254	208	177	152	4,768
2008	1,833	1,072	993	427	276	177	180	200	5,158
2009	1,818	970	907	495	318	167	165	164	5,004
2010	1,856	1,043	955	537	344	178	178	152	5,243
2005–2010	10,750	6,048	5,768	1,629	1,548	1,174	1,055	984	28,956
Percent of all offers (2005–2010)	37.1	20.9	19.9	5.6	5.3	4.1	3.6	3.4	100.0
Percent of offers accepted	69.6	76.1	87.2	21.4	85.6	59.9	54.3	62.0	71.4

Source: Authors' calculations using High School Admissions Process (HSAPS) data provided by the NYC Department of Education.

Notes: The identity of the offered SPHS is not reported in the data after 2010. Total offer count shown above (28,956) equals the sum of offers from 2005 through 2010 reported in Table A-1.

Table A-3: Language Spoken at Home and Country of Origin, Public School Students Applying to NYC High Schools, Students Entering 9th Grade from 2005-2013

	Baseline Sample	Applied to SPHS	Offered a SPHS	Offered a "Big 3"[a]	Accepted SPHS offer
Language spoken at home (%)					
English	56.6	54.4	43.7	39.1	38.4
Spanish	26.7	14.9	4.4	3.8	4.2
Chinese	5.3	12.5	28.1	31.8	32.3
Russian	1.6	2.9	4.9	5.6	5.1
Bengali	1.5	3.7	5.9	5.9	6.9
Korean	0.8	1.9	4.1	4.8	4.2
Other	7.5	9.7	8.9	9.0	8.9
Country of origin (%)					
Caribbean	5.9	3.2	0.7	0.6	0.7
Central / South America	4.3	2.8	1.1	0.8	1.0
China / Far East Asia	2.3	3.7	7.1	7.0	7.9
South Asia	1.8	3.1	3.3	2.9	3.7
Eastern Europe/former USSR	1.1	1.7	2.3	2.4	2.4
Other non-U.S.	2.3	2.7	2.6	2.2	2.6
U.S.	82.3	82.8	82.9	84.1	81.7

Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.

Notes: See data appendix for description of the baseline sample. This table includes the subset of students who applied from a NYC public school. [a] The identity of the offered SPHS is not reported in the data after 2010, therefore the "offered a big 3" column uses only 2005-2010 data.

Table A-4: Most Common Destinations for Public School Students Declining Specialized High School Offers, Students Entering 9th Grade from 2005-2013

High School	Borough	Programs	Count	Percent
Townsend Harris	Queens	Q37J	1,353	15.2
LaGuardia	Manhattan	M80J, M80L, M80M, M80N	1,080	12.2
Beacon High School	Manhattan	M71A	515	5.8
Bard High School Early College	Manhattan	M51A	495	5.6
Midwood High School	Brooklyn	K26K, K26J	364	4.1
Benjamin H. Cardozo High School	Queens	Q16J, Q16Z	326	3.7
Eleanor Roosevelt High School	Manhattan	M21A	236	2.7
Leon M. Goldstein High School for the Sciences	Brooklyn	K76A	230	2.6
Bard High School Early College Queens	Queens	Q74B	220	2.5
NYC Lab School for Collaborative Studies	Manhattan	M74A	181	2.0
New Explorations into Science, Technology and Math High School	Manhattan	M29A	163	1.8
Millennium High School	Manhattan	M25A	135	1.5
Edward R. Murrow High School	Brooklyn	K57A	107	1.2
Bayside High School SMART program (discontinued)	Queens	Q12Q	107	1.2
Baruch College Campus High School	Manhattan	M87A	89	1.0
Francis Lewis High School	Queens	Q20K	88	1.0
No assignment/private school			1,078	12.1
Other			2,107	23.8

Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.

Notes: Based on a total of 8,874 public school students who declined a specialized high school offer between 2005 and 2013. "No Assignment" means the student was not assigned to any public high school program in NYC at the end of the choice process. They may have enrolled in a private school or a public school outside of NYC.

Table A-5: Logistic Regression Models for Application, Admission, and Offer Acceptance, Students Entering 9th Grade from 2005-2013 (Logit Coefficients)

	Applied to SPHS	Offered a SPHS	Offered a "Big 3"	Accepted SPHS Offer
Travel time to closest "big 3"	-0.005***	0.002***	0.003***	0.001
	(0.000)	(0.001)	(0.001)	(0.001)
Manhattan	-0.104***	0.634***	0.183***	-0.340***
	(0.012)	(0.027)	(0.034)	(0.040)
Queens	-0.453***	-0.360***	-0.620***	-0.680***
	(0.011)	(0.025)	(0.032)	(0.041)
Staten Island	-0.479***	-0.570***	-2.374***	0.181**
	(0.017)	(0.037)	(0.062)	(0.063)
Bronx	-0.039***	-0.172***	-0.764***	-0.071
	(0.010)	(0.032)	(0.046)	(0.060)
Charter middle school	0.449***	-0.352***	-0.273*	-0.421**
	(0.032)	(0.090)	(0.138)	(0.155)
Female	-0.196***	-0.859***	-0.826***	-0.653***
	(0.007)	(0.017)	(0.022)	(0.027)
Black	0.201***	-0.795***	-0.870***	0.436***
	(0.012)	(0.030)	(0.040)	(0.053)
Latino	-0.226***	-0.863***	-0.937***	0.203***
	(0.012)	(0.029)	(0.040)	(0.048)
Asian	1.076***	0.545***	0.650***	1.150***
	(0.013)	(0.022)	(0.029)	(0.034)
Other race	0.304***	-0.263*	-0.288	-0.053
	(0.044)	(0.103)	(0.179)	(0.149)
Special education	-0.382***	0.249***	-0.047	-0.025
	(0.014)	(0.071)	(0.107)	(0.116)
English language learner	-0.600***	-0.738***	-0.852***	-0.376
	(0.018)	(0.109)	(0.165)	(0.249)
Recent immigrant	0.016	-0.087***	-0.063*	0.286***
	(0.010)	(0.022)	(0.030)	(0.038)
Free lunch eligible	-0.208***	-0.420***	-0.352***	0.315***
	(0.008)	(0.019)	(0.025)	(0.033)
Reduced price lunch eligible	0	-0.249***	-0.182***	0.210***
	(0.014)	(0.028)	(0.036)	(0.047)
Absent 20-30 days	-0.199***	-0.205***	-0.194*	0.189
	(0.015)	(0.061)	(0.080)	(0.117)

Continued on next page.

Table A-5 Continued: Logistic Regression Models for Application, Admission, and Offer Acceptance, Students Entering 9th Grade from 2005-2013 (Logit Coefficients)

	Applied to SPHS	Offered a SPHS	Offered a "Big 3"	Accepted SPHS Offer
UFM school	-0.090***	-0.426***	-0.360***	0.135***
	(0.008)	(0.020)	(0.027)	(0.034)
Absent 30+ days	-0.171***	-0.319**	-0.054	0.836**
	(0.022)	(0.120)	(0.148)	(0.298)
Late 30+ days	-0.129***	-0.109*	-0.052	0.686***
	(0.012)	(0.055)	(0.073)	(0.125)
Attendance rate	0.050***	0.008**	0.013***	-0.005
	(0.001)	(0.003)	(0.003)	(0.004)
Age	-0.249***	-0.171***	-0.163***	-0.205***
	(0.007)	(0.023)	(0.030)	(0.039)
Top 2% ELA	0.481***	0.998***	0.878***	-0.118***
	(0.022)	(0.024)	(0.028)	(0.030)
ELA z-score	0.706***	2.380***	2.116***	-0.005
	(0.007)	(0.048)	(0.070)	(0.082)
ELA z-score^2	-0.052***	-0.552***	-0.483***	-0.01
	(0.003)	(0.025)	(0.039)	(0.035)
ELA z-score^3	-0.010***	0.040***	0.033***	0.002
	(0.000)	(0.003)	(0.006)	(0.004)
Math z-score	0.954***	3.685***	3.828***	0.360*
	(0.008)	(0.103)	(0.140)	(0.170)
Math z-score^2	0.027***	-0.878***	-1.098***	0.003
	(0.003)	(0.063)	(0.082)	(0.096)
Math z-score^3	-0.024***	0.060***	0.108***	-0.01
	(0.001)	(0.012)	(0.015)	(0.017)
2006.cohort	0.225***	-0.006	-0.136***	-0.013
	(0.015)	(0.037)	(0.038)	(0.060)
2007.cohort	0.186***	0.035	-0.121**	-0.098
	(0.015)	(0.036)	(0.037)	(0.059)
2008.cohort	0.315***	0.273***	-0.035	-0.104
	(0.015)	(0.036)	(0.038)	(0.059)
2009.cohort	0.480***	0.285***	-0.034	-0.024
	(0.015)	(0.036)	(0.038)	(0.059)

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Table A-5 Continued: Logistic Regression Models for Application, Admission, and Offer Acceptance, Students Entering 9th Grade from 2005-2013 (Logit Coefficients)

	Applied to SPHS	Offered a SPHS	Offered a "Big 3"	Accepted SPHS Offer
2010.cohort	0.496***	0.528***	0.139***	-0.108
	(0.015)	(0.037)	(0.039)	(0.060)
2011.cohort	0.569***	0.533***		-0.067
	(0.015)	(0.036)		(0.058)
2012.cohort	0.496***	0.389***		-0.052
	(0.015)	(0.036)		(0.059)
2013.cohort	0.360***	0.159***		-0.039
	(0.015)	(0.036)		(0.059)
_cons	-2.024***	-4.011***	-4.377***	3.850***
	(0.131)	(0.409)	(0.534)	(0.694)
N	608124	192264	124231	36901
Mean of dep. var.	0.316	0.192	0.151	0.765
Pseudo R2	0.318	0.473	0.447	0.084
Log-likelihood	-258715.943	-49502.4	-29210.8	-18444.9

Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.

Notes: Standard errors reported in parentheses. *** = p < 0.001; ** = p < 0.01; * = p < 0.05

Table A-6: Linear Probability Models for Application, Admission, and Offer Acceptance, Students Entering 9th Grade from 2005-2013

	Applied to SPHS	Offered a SPHS	Offered a "Big 3"	Accepted SPHS Offer
Travel time to closest "big 3"	-0.001***	0.000***	0.000***	0
	(0.000)	(0.000)	(0.000)	(0.000)
Manhattan	-0.012***	0.062***	0.016***	-0.058***
	(0.002)	(0.002)	(0.003)	(0.007)
Queens	-0.068***	-0.035***	-0.054***	-0.106***
	(0.002)	(0.002)	(0.003)	(0.007)
Staten Island	-0.076***	-0.069***	-0.193***	0.037***
	(0.002)	(0.003)	(0.004)	(0.010)
Bronx	-0.009***	-0.007***	-0.038***	-0.007
	(0.001)	(0.002)	(0.003)	(0.010)
Charter middle school	0.113***	-0.038***	-0.025***	-0.080**
	(0.005)	(0.006)	(0.007)	(0.029)
Female	-0.024***	-0.069***	-0.061***	-0.108***
	(0.001)	(0.001)	(0.002)	(0.004)
Black	0.015***	-0.070***	-0.067***	0.091***
	(0.002)	(0.002)	(0.003)	(0.009)
Latino	-0.042***	-0.079***	-0.069***	0.044***
	(0.002)	(0.002)	(0.003)	(0.009)
Asian	0.184***	0.063***	0.075***	0.200***
	(0.002)	(0.002)	(0.003)	(0.006)
Other race	0.038***	-0.038***	-0.041***	-0.015
	(0.006)	(0.009)	(0.012)	(0.029)
Special education	-0.015***	0.014***	0.006	-0.002
	(0.002)	(0.004)	(0.005)	(0.020)
ELL	-0.047***	-0.038***	-0.028***	-0.054
	(0.002)	(0.004)	(0.006)	(0.039)
Recent immigrant	-0.002	-0.019***	-0.018***	0.044***
	(0.001)	(0.002)	(0.002)	(0.006)
Free lunch eligible	-0.038***	-0.038***	-0.026***	0.048***
	(0.001)	(0.002)	(0.002)	(0.005)
Reduced price lunch eligible	-0.001	-0.029***	-0.017***	0.036***
	(0.002)	(0.003)	(0.003)	(0.007)
UFM school	-0.014***	-0.041***	-0.032***	0.024***
	(0.001)	(0.002)	(0.002)	(0.006)

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Table A-6 Continued: Linear Probability Models for Application, Admission, and Offer Acceptance, Students Entering 9th Grade from 2005-2013

	Applied to SPHS	Offered a SPHS	Offered a "Big 3"	Accepted SPHS Offer
Absent 30+ days	0	0.013*	0.018**	0.119**
	(0.002)	(0.006)	(0.006)	(0.039)
Absent 20-30 days	-0.038***	-0.003	0	0.037
	(0.002)	(0.004)	(0.004)	(0.019)
Late 30+ days	-0.023***	0.010***	0.009**	0.098***
	(0.001)	(0.003)	(0.003)	(0.017)
Attendance rate	0.004***	0.001***	0.001***	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)
Age	-0.022***	-0.003*	-0.003	-0.033***
	(0.001)	(0.002)	(0.002)	(0.006)
Top 2% ELA	0.074***	0.191***	0.163***	-0.021***
	(0.003)	(0.003)	(0.003)	(0.005)
ELA z-score	0.098***	0.080***	0.067***	0.001
	(0.001)	(0.002)	(0.002)	(0.013)
ELA z-score^2	0.002***	0.037***	0.026***	-0.003
	(0.000)	(0.001)	(0.001)	(0.006)
ELA z-score^3	-0.002***	-0.007***	-0.006***	0
	(0.000)	(0.000)	(0.000)	(0.001)
Math z-score	0.144***	0.061***	0.030***	0.081**
	(0.001)	(0.002)	(0.002)	(0.029)
Math z-score^2	0.019***	0.053***	0.048***	-0.009
	(0.000)	(0.001)	(0.001)	(0.016)
Math z-score^3	-0.003***	-0.003***	-0.003***	-0.001
	(0.000)	(0.000)	(0.000)	(0.003)
2006.cohort	0.031***	-0.002	-0.013***	-0.001
	(0.002)	(0.003)	(0.003)	(0.010)
2007.cohort	0.027***	-0.002	-0.014***	-0.015
	(0.002)	(0.003)	(0.003)	(0.010)
2008.cohort	0.045***	0.014***	-0.011***	-0.017
	(0.002)	(0.003)	(0.003)	(0.010)
2009.cohort	0.067***	0.012***	-0.014***	-0.003
	(0.002)	(0.003)	(0.003)	(0.010)

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Table A-6 Continued: Linear Probability Models for Application, Admission, and Offer Acceptance, Students Entering 9th Grade from 2005-2013

	Applied to SPHS	Offered a SPHS	Offered a "Big 3"	Accepted SPHS Offer
2010.cohort	0.067***	0.024***	-0.007*	-0.017
	(0.002)	(0.003)	(0.003)	(0.010)
2011.cohort	0.081***	0.042***		-0.011
	(0.002)	(0.003)		(0.010)
2012.cohort	0.076***	0.034***		-0.008
	(0.002)	(0.003)		(0.010)
2013.cohort	0.064***	0.025***		-0.005
	(0.002)	(0.003)		(0.010)
_cons	0.282***	0.042	0.033	1.170***
	(0.015)	(0.030)	(0.034)	(0.113)
N	608124	192264	124231	36901
Mean of dep. var.	0.316	0.192	0.151	0.765

Source: Authors' calculations using High School Admissions Process (HSAPS) and other administrative data provided by the NYCDOE.

Notes: Standard errors reported in parentheses. *** = p < 0.001; ** = p < 0.01; * = p < 0.05.