

Increasing Access to Selective High Schools through Place-Based Affirmative Action: Unintended Consequences[†]

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We investigate whether elite Chicago public high schools differentially benefit high-achieving students from more and less affluent neighborhoods. Chicago’s place-based affirmative action policy allocates seats based on achievement and neighborhood socioeconomic status (SES). Using regression discontinuity design (RDD), we find that these schools do not raise test scores overall, but students are generally more positive about their high school experiences. For students from low-SES neighborhoods, we estimate negative effects on grades and the probability of attending a selective college. We present suggestive evidence that these findings for students from low-SES neighborhoods are driven by the negative effect of relative achievement ranking. (JEL H75, I21, I24, I28, R23)

In this paper, we investigate whether offering low-income students with strong prior academic records an education at elite public high schools can improve these students’ educational outcomes and high school experiences. Understanding the potential heterogeneity in school effects for students from low- and high-income families is particularly important as the test score gap between low-income students and their more affluent counterparts has widened in the last 50 years (Reardon 2011). The fact that low-income students often attend lower-quality public schools than their high-income peers (Rouse and Barrow 2006, Barrow and Schanzenbach 2012) may contribute to the differences in achievement levels of low- and high-income students. Thus, increasing access to high-quality public schools for low-income

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students may be a lever for closing the achievement gap by providing equitable educational opportunities for students who have fewer economic resources at home.

Affirmative action admissions policies acknowledge that access to high-quality schooling opportunities may not be equitable. The goal of these policies is to increase the probability that historically disadvantaged groups gain admission to elite schools, particularly at the university level. At the same time, there is an extensive literature that attempts to assess whether these typically race-based policies at higher education institutions actually hurt long-run outcomes for the intended beneficiaries by admitting students whose academic preparation is significantly below that of their classmates, commonly known as “mismatch.” See Arcidiacono and Lovenheim (2016) for a recent review. In Chicago Public Schools (CPS), admission to selective high schools is determined by a combination of prior academic performance and family income as proxied by the socioeconomic status (SES) of the student’s residential neighborhood (i.e., place-based affirmative action). This policy explicitly reserves seats for students from low-SES neighborhoods. We use this variation in admissions criteria to determine if selective public schools benefit students from low-SES neighborhoods relative to students living in high-SES neighborhoods.

If selective public schools matter more for low-income students than for high-income students, then we would expect to find larger positive effects of attending a selective public school for low-SES students, which could help close achievement gaps by family income. Our results do not support this hypothesis, however. We find that selective high school admission does not raise test scores, regardless of neighborhood SES, although students admitted to selective high schools may be somewhat more likely to enroll in a postsecondary institution in the fall following high school graduation and are more positive about their high school experiences in terms of peer relationships and personal safety. At the same time, selective high school admission has a negative effect on grade point average (GPA) which is larger for students from low-SES neighborhoods than for students from high-SES neighborhoods. Because there is a strong relationship between SES and achievement, we believe this result may be driven by relative ranking within school, and we provide suggestive evidence that this is the case. These differential GPA effects may also explain why we find that students from low-SES neighborhoods who are admitted to a selective high school are less likely to attend a selective college than students from low-SES neighborhoods who just miss the admissions cutoff. This last result is particularly troubling if college selectivity translates into different rates of college completion and/or different labor market trajectories. Combined with the positive effects of selective schools on high school experiences, one policy consideration may be that school districts should focus on improving climate in all high schools rather than investing in selective schools that serve a relatively small share of the student population.

Our contribution is to use the different admission margins generated by the CPS policy and RDD to estimate potential heterogeneous effects of attending a selective school on a broad set of outcomes. Ours is not the first paper to estimate the effects of selective public schools on student outcomes. Studies using data from Boston and New York City (NYC) elite exam schools also use RDD and

find no effect of attending selective schools on either student test scores or college going (Abdulkadiroğlu, Angrist, and Pathak 2014; Dobbie and Fryer 2014). In earlier work on the subsample of students enrolling in NYC public high schools, Dobbie and Fryer (2011) find that students take more rigorous coursework and have a higher probability of graduating with a more advanced high school diploma. These benefits, however, do not translate into positive effects on college outcomes. In the United Kingdom, research also finds no impact of selective high school attendance on test scores but suggestive evidence that they increase the probability of enrolling in a university (Clark 2010). In contrast, research using data from countries where secondary school assignment system-wide is based on prior achievement (Romania and Trinidad and Tobago) finds positive impacts on later test score outcomes (Kirabo Jackson 2010, Pop-Eleches and Urquiola 2013).

One reason that past research has found little evidence that US selective high schools improve student outcomes may be because the admissions systems in the cities previously studied take only the very highest-achieving students, who are often more advantaged than the typical student in the district. In other words, these programs may select the students who would thrive academically no matter what school they attended. This raises questions about the generalizability of the results to students at other points in the achievement distribution and may mask heterogeneous effects for different student populations. A key distinction of our study is the ability to use the CPS admissions policy to estimate the effects of attending a selective school separately for students from low- and high-SES neighborhoods.

Access to a high-achieving peer group may be more beneficial to high-performing students from low-SES neighborhoods, who might otherwise attend schools with comparatively disadvantaged peers. On the other hand, there could be negative effects related to mismatch. A primary difference in the admissions policies in the mismatch literature and in CPS is the degree to which admissions criteria are transparent. When Chicago students admitted to a selective high school decide whether to enroll, they know their application score, the rules governing the admissions process, and the cutoff scores at every selective high school. In contrast, the admissions process at the postsecondary level is much less explicit, and students are not good at identifying their ranking relative to peers (Arcidiacono et al. 2011).

The evidence is mixed on whether access to higher-performing peers in selective primary and secondary school settings differentially improves test scores by student race or income. Card and Giuliano (2016) find large effects of gifted programming on student achievement, particularly for black and Latino students. Shi (2020) studies a selective two-year residential STEM high school in North Carolina and finds that low-income students who are admitted score higher on the SAT math and verbal tests and apply to selective colleges at higher rates compared with low-income students below the admission cutoff. In contrast, Shi (2020) finds negative effects of admission on SAT math scores for students coming from higher-achieving high schools or high schools with higher shares of honors and Advanced Placement (AP) courses. Bui, Craig, and Imberman (2014) find no positive effect of gifted programming on student achievement overall or for race or income subgroups, although they find negative effects on grades and relative ranking for students just above the cutoff for admission to the gifted program.

Additional research that looks at other outcomes provides evidence that students' grades and pass rates tend to be lower in classrooms with higher-achieving peers compared with students with similar test scores in classrooms with lower-achieving peers (Farkas, Sheehan, and Grobe 1990; Kelly 2008; Nomi and Allensworth 2009). If grades contain information about relative performance, students in academic settings with higher-achieving peers will appear weaker academically, which then could translate into lower grades. On average, students from low-SES neighborhoods are lower in the achievement distribution. As a result, their grades may be more likely to suffer from attending a selective school than grades for students from high-SES neighborhoods.

The remainder of the paper has the following structure. We describe in more detail the goals of selective public schooling and the admission policy of CPS. Then, we provide an overview of the data, sample, and methodology for estimating the effects of selective schooling on students. Next, we show the estimated effects of selective schooling on academic outcomes and high school experiences both overall and separately by neighborhood SES. Finally, we discuss some implications about the role of relative ranking on GPA, which may translate into differential access to selective colleges as well as considerations for the role of selective schooling in public school systems.

I. Selective High Schools in Chicago

Chicago has a long-standing history of offering many school choices to families, including most recently an expansion of charter schools and selective enrollment schools.¹ The first selective enrollment high school (SEHS) in Chicago was created in 1997. As of the 2013–2014 school year, there were ten SEHSs. These schools are quite different on a number of dimensions from those typically attended by CPS ninth-graders. Table 1 shows characteristics of SEHSs and non-SEHSs, weighted by the number of students who attend them. SEHSs have higher average ACT test scores than the non-SEHSs (24 compared to 17), higher 5-year high school graduation rates (90 percent compared to 63 percent), and higher rates of college going among high school graduates (84 percent compared to 57 percent). Student and teacher reports suggest different schooling environments as well. For example, student reports of community support for the typical SEHS are 1.2 standard deviations above the mean compared to 0.1 standard deviations above the mean at the typical non-SEHS.² (See online Appendix Table 1 for a description of the survey measures.)

¹Cullen, Jacob, and Levitt (2006) explore high school choice in Chicago. Specifically, they look at the effects of winning a lottery at an oversubscribed Chicago public high school in the early 2000s. They disaggregate effects by the performance level of the high school and find no effects of attending high-performing high schools on traditional academic outcomes such as test scores, course performance, or high school graduation, although they do find that students who win lotteries are lower ranked in their high schools than those who do not. Students who win lotteries to attend high-performing schools also report being less likely to get in trouble at school or be arrested. In this paper, we examine the effects of selective schools on student outcomes. These schools serve the highest-performing students in the district and are much higher-performing than those studied previously in Chicago.

²School survey measures are standardized at the school year level. Schools with relatively negative student responses about their school tend to have low enrollment. Because the values reported in the table are weighted by enrollment, the averages reported for non-SEHSs and SEHSs are generally both above (or both below) the mean.

TABLE 1—MEANS OF AVERAGE SCHOOL CHARACTERISTICS FOR SELECTIVE ENROLLMENT HIGH SCHOOLS AND NONSELECTIVE ENROLLMENT HIGH SCHOOLS (STANDARD DEVIATIONS IN PARENTHESES)

School-level characteristic	Attends an SEHS	Does not attend an SEHS
Average ACT composite score	24.2 (2.7)	16.8 (1.9)
Percent of students enrolled in AP classes	36.2 (11.1)	12.9 (7.7)
Five-year cohort graduation rates	90.2 (6.6)	62.8 (14.0)
Percent of grads enrolling in college	83.7 (3.3)	56.8 (14.2)
Percent of students receiving an out-of-school suspension	4.6 (6.1)	23.0 (15.6)
Herfindahl-Hirschman index of racial concentration	0.406 (0.201)	0.684 (0.234)
Percent male	42.8 (3.0)	50.5 (9.5)
Percent of students with an IEP	6.5 (2.4)	14.4 (6.8)
Percent of students eligible for free/reduced-price lunch	59.0 (16.8)	87.8 (11.8)
Average student report of parental support	0.844 (0.690)	-0.176 (0.998)
Average student report of community support	1.212 (1.479)	0.052 (0.922)
Teacher satisfaction with CPS	0.706 (0.721)	-0.037 (1.081)

Notes: Means are weighted by ninth grade student enrollment such that schools enrolling more students receive more weight and reflect school-level characteristics for the year the student is enrolled in eighth grade. Attendance at an SEHS is determined based on CPS master file records of where the student is enrolled in ninth grade. The five-year cohort graduation rate reflects the percent of first-time ninth grade students graduating high school as of five years after first-time ninth grade enrollment. Verified transfers out of the district are excluded from this calculation. Survey measures are standardized at the school-year level. See online Appendix Table 1 for descriptions of the survey measures. We use data for school years 2010–2011, 2011–2012, 2012–2013, and 2013–2014, except as noted. School-level college enrollment rates and survey data are not available for the 2010 cohort. School-level discipline data are unavailable for the 2010 and 2011 cohorts. Five-year cohort graduation rates, college enrollment rates, and average ACT test scores are missing for recently opened schools. Additionally, charter schools do not report school-level transcript and discipline measures.

Whether SEHSs look better on these indicators because they are higher-quality schools or because they admit students who are already high performing is explored further in this paper; regardless, SEHSs can safely be characterized as different from other schools in the district.

Admission to SEHSs is based on student achievement, although to uphold a 1980 court-ordered desegregation consent decree, selective enrollment (and magnet) schools used race-based admissions policies until 2009. In 2009, a United States federal court lifted the consent decree, which resulted in CPS removing race as an admissions factor. Concerns were raised that if seats were awarded based solely on student achievement, the selective schools would primarily serve students from affluent families and neighborhoods and undo the racial diversity of the schools that was achieved under the consent decree. In response, CPS immediately established a new admissions policy to ensure that the selective high schools would

continue to be relatively diverse. Beginning with applications for enrollment in fall 2010, neighborhood characteristics were used in the application process for the first time, explicitly reserving seats separately for students from low- and high-SES neighborhoods.

One argument to support a policy aimed at increasing the access of high-performing, low-SES students to selective schools is that students from low-SES neighborhoods might otherwise attend low-performing schools with low graduation rates. In fact, in our data, we see evidence of differential access to higher-performing schools by SES, even among high achievers. Specifically, if we look at how high schools rank nationally in terms of test score growth, 44 percent of high-achieving students living in low-SES neighborhoods in Chicago attend a high school that is below the twentieth percentile. In contrast, only 21 percent of high-achieving students living in high-SES neighborhoods in Chicago attend a high school below the twentieth percentile.³ This discrepancy perhaps points to inequitable access to high-quality high schools even for high-achieving students, providing rationale for the district's admission policy.

CPS assigns each Chicago census tract to one of four SES "tiers" based on six factors. Five come from census data—median family income, adult educational attainment, percent of homes that are owner-occupied, percent of single-parent households, and percent of the population speaking a language other than English. The sixth factor reflects neighborhood school performance. Tier 1 neighborhoods, the lowest-SES neighborhoods, are clustered on the west and south sides of the city, while the north-side neighborhoods are primarily tier 4, the highest-SES neighborhoods. The SEHSs are located throughout the city. See online Appendix Figure 1 for a map of census tract tiers and the SEHS locations.

Each applicant receives an application score of up to 900 points based on test scores and grades. Final grades in seventh grade core courses (math, English, science, and social studies), seventh grade standardized test scores, and the test score from a selective enrollment entrance exam each account for a maximum of 300 points. In order to be eligible for admission, students must have an application score of 650 or above. Every year, after the allocation of students is determined, cutoff scores for each high school and neighborhood tier are published on the CPS website. Students do not know the cutoff scores prior to applying, as students with the highest scores are admitted up until the point that there are no more seats available. The cutoff for any given year depends on all students' rankings of selective high schools and their individual application scores. Figure 1 shows the distribution of centered application

³High-achieving students scored one standard deviation above average on their combined reading and math score in eighth grade. Low neighborhood SES refers to the bottom quartile of student-weighted census block groups on the UChicago Consortium measure of social status based on census measures of education and employment in managerial and professional positions. High neighborhood SES refers to the top quartile of student-weighted census block groups using this measure of social status. We use data on students enrolled in ninth grade in fall 2010, 2011, and 2012 and publicly available data on high school national growth percentiles from 2014 for students taking the Educational Planning and Assessment System (EPAS) EXPLORE in grade 9 and the PLAN in grade 10. These students were admitted to high school after the district adopted neighborhood SES as part of the admissions policy. The share of students from low-income neighborhoods attending a selective high school increased from 12 percent in 2002 (under the race-based admissions policy) to 19 percent in 2016 (under the SES-based admissions policy). See Barrow and Sartain (2017).

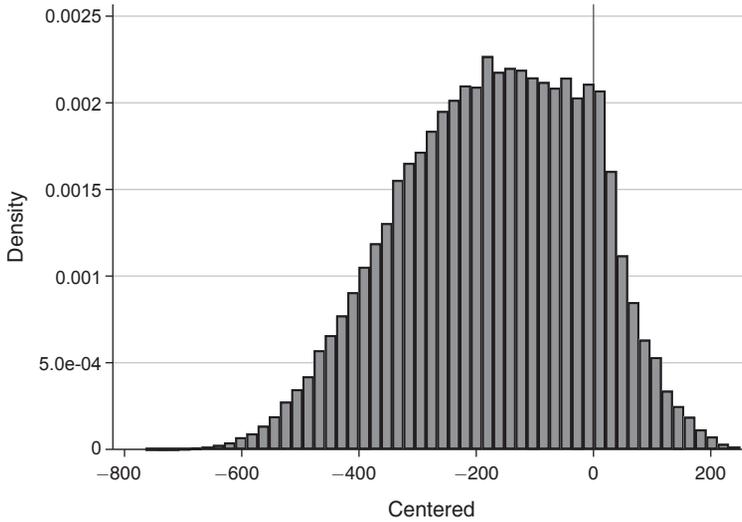


FIGURE 1. DISTRIBUTION OF CENTERED APPLICATION SCORES

Notes: Student application scores are centered using the published tier and the cohort-specific cutoff score for admission at each high school to which a student applied. Students with a centered score of zero or higher receive an offer to an SEHS.

scores for all SEHS applicants entering ninth grade in fall 2010 through fall 2013. Scores are centered using the relevant published cutoff score for admission at each high school to which a student applied with a vertical line at zero.⁴ Students with a centered score of zero or greater receive an offer to an SEHS; those with centered scores less than zero do not. The excess mass right at the admission discontinuity is driven by the fact that there is a bunching of students at the very top of the raw application score distribution rather than manipulation of the application scores. If we drop the very top application scores above 895, we find no evidence of manipulation at the cutoff.⁵

Students are able to rank up to six selective schools through a centralized application process. The first 30 percent of available seats in each school are assigned based on academic performance (open seats), and the remaining 70 percent of seats in each selective high school are divided equally among students in the four SES tiers (tier seats). The assignment mechanism is a serial dictatorship with students ranked according to their application score and assigned seats in the order they are ranked. Each applicant is awarded an offer from the highest-ranked school on their application for which an open or tier seat is still available. Open seats at each school are filled before tier seats. If all tier seats are filled for a student's neighborhood tier at all of the schools to which she applied, no offer is given. The district then moves on to the next highest-ranked student on the list. This process continues until all available seats have been filled or no qualifying applicants remain.

⁴There is a separate admissions process for students with identified disabilities, so we do not include these students.

⁵ p -value = 0.795 using the manipulation test proposed by Cattaneo, Jansson, and Ma (2018).

Each year, CPS makes admissions offers to each SEHS using the rules described above and publicly posts a table of cutoff scores by school for open seats and tier seats. We define a student as having received an offer to attend an SEHS if she scores above the published admissions cutoff score for her neighborhood tier for any school to which she applied in the year of her application.

II. Data Description and Analytic Sample

A. Data Description

We use CPS SEHS application data, which include a record for each student, his/her ranking of up to six selective high schools, overall application score, the scores for the three component parts, neighborhood tier, and ultimate admission status. We also use publicly available tier cutoff scores for each SEHS in each year in order to identify which students are offered an SEHS seat. (See online Appendix Table 2 for the cutoff scores for tier seats by tier, school, and application cohort.) We link the application data to longitudinal CPS administrative data as well as UChicago Consortium annual survey data on student experiences. Specifically, to measure the impact of admission to an SEHS on traditional academic student outcomes, we use the following data sources.

Enrollment Data.—CPS enrollment records link individual students to the school they attend in a given semester and year. We use these data to construct an indicator for whether or not a student graduates from a CPS high school in four years after initial enrollment in ninth grade. Note that if a student transfers out of CPS during high school, that student receives a zero for this indicator. Students who drop out of high school are also coded as a zero. These data also include student residence data at the census block group level. We calculate distance from the centroid of a student's residential census block group to the centroid of the census block group of the high school they attend. Distance is presented in miles.

Test Score Data.—CPS students take standardized tests in the spring of grades 3–8. From these data, we make use of a predicted grade 8 test score from UChicago Consortium in order to calculate an incoming class percentile rank for each student in the high school they attend.⁶ During the period we study, all CPS high school students took the ACT EPAS series of tests: EXPLORE, PLAN, and ACT. We standardize the EXPLORE and PLAN scores to have a mean of zero and standard deviation of one within cohort and test.⁷ For the ACT, we make use of the

⁶The predicted test score comes from a three-level hierarchical linear model, with a measurement model at level 1 taking into account the standard error associated with any single test score and test scores nested within year (level 2) and students (level 3). The model additionally controls for the student's age (and square term) at the time of the test, cumulative number of times the student was retained, cumulative number of times the student skipped a grade, the school, and the student's cohort.

⁷CPS switched from a fall test administration to a spring test administration for the EXPLORE and PLAN, so we use the fall PLAN given to tenth grade students or the spring EXPLORE given to ninth grade students, depending on the cohort.

published national means and standard deviations by test component for high school graduates.⁸

Grades and Transcript Data.—These data provide detailed course-taking information for each student, including a list of courses in which the student enrolls, the grades they receive, and an indicator for whether the course is an honors or AP-level course. From these data, we use GPA for grades 9 and 11 and construct an indicator for whether a student takes any honors or AP classes in ninth grade.

National Student Clearinghouse Data.—For CPS graduates, CPS obtains matched data reflecting where a graduate is enrolled in college in the fall following high school graduation. We use these data for the oldest cohorts of students to identify whether and where a student enrolls in college, and we use Barron’s college selectivity rating categories to define whether the college attended is among the more competitive to get into. We use the same definition of “selective” as Hoxby and Avery (2013), which defines selective as any college described by Barron’s as “Very Competitive Plus” (selectivity rank of 1, 2, 3, or 4).⁹ For CPS students, examples of typical selective colleges attended include University of Illinois at Urbana-Champaign, Loyola University of Chicago, University of Michigan, and Illinois Institute of Technology. Examples of typical nonselective colleges include the City Colleges of Chicago, University of Illinois at Chicago, and Northeastern Illinois University.

Survey Data.—UChicago Consortium conducts district-wide surveys of all high school students and teachers every spring. We link these data to administrative data about the student, so we can compare the responses of students admitted to SEHSs to the counterfactual students. Survey items are used to construct measures of school climate, including course quality, personal safety, and relationships with teachers and peers. Online Appendix Tables 1 and 3 list the survey measures and their component items for those measures that we use in this paper. When the student-level responses are used to characterize overall school climate (Tables 1 and 3), we aggregate them to the school level and then standardize across schools by year. When survey responses are used as outcomes (Tables 5 and 6), we standardize them within cohort at the student level for all first-time ninth-graders in CPS. Eighty-one percent of our analytical sample has data for at least one survey measure, with most measures having response rates between 75 and 80 percent. We find no differences in response rates by admission to an SEHS overall or by neighborhood tier.

⁸Test score distribution information comes from “National Distributions of Cumulative Percents for ACT Test Scores: ACT-Tested High School Graduates from 2014, 2015, and 2016.” http://www.act.org/content/dam/act/unsecured/documents/Multiple_Choice_STEM_Ranks2016.pdf (accessed July 17, 2017).

⁹Leonhardt, David. 2013. “What Makes a College ‘Selective’—and Why It Matters.” *New York Times*, April 4. <http://economix.blogs.nytimes.com/2013/04/04/what-makes-a-college-selective-and-why-it-matters/> (accessed November 1, 2016).

B. Student Characteristics

For the 2010–2011 through 2013–2014 school years, there were 96,391 first-time grade 9 students.¹⁰ Of these, 43,838 students completed SEHS applications. We restrict the sample to students who completed an SEHS application, and we only observe outcome variables for students who enrolled in CPS in grade 9. This means we lose two types of applicants from the estimation sample: grade 8 CPS students who applied to an SEHS but left the district for grade 9 (8.5 percent of applicants) and non-CPS grade 8 students who applied to an SEHS but did not enroll in CPS in grade 9 (7.0 percent of applicants).¹¹ In order to assess how student attrition may affect our estimates, we use student application information to predict standardized ACT scores and compare the predicted scores for students who do not enroll in CPS for ninth grade to predicted scores for students who do (see online Appendix Figure 2).¹² To the left and right of the cutoff, tier 1 students who do not enroll in CPS generally have higher predicted ACT scores than students enrolled in CPS, but the differences between those who enroll and those who do not are roughly equal on both sides. This pattern of “balanced” attrition suggests that our RDD estimates of the effect of admission on student academic outcomes for tier 1 students will not be biased by attrition. In contrast, tier 4 students who exit CPS seem to have higher predicted scores to the left of the cutoff, but to the right of the cutoff, students who leave CPS have very similar predicted scores to those who enroll in CPS. This pattern would likely bias our estimates in favor of finding positive effects on academic outcomes for tier 4 students. We have also used inverse probability weighting to correct for selection on observable characteristics, and our main conclusions are unchanged. Given our investigations, we believe that attrition is unlikely to be driving our results, although it is something to keep in mind when considering our estimates.

Table 2 shows mean characteristics for all CPS students enrolled for the first time in grade 9 (column 1), the subset of those students who completed applications for an SEHS (column 2), and the subsample of students whose application score is within 0.5 standard deviations of the lowest admissions cutoff among the SEHSs to which they applied (column 3). As one might expect, applicant students

¹⁰These numbers and the numbers shown in all tables except Table 1 exclude students with Individualized Education Plans (IEPs) (i.e., special education students), which make up 5 percent of applicants overall. The SEHS admission process functions differently for special education students, so we do not include them in the analysis.

¹¹Within 0.5 standard deviations of the centered application score, 8.5 percent of applicants are CPS students who exit CPS for grade 9, and 9.6 percent of applicants are from outside of CPS in grade 8 but do not enroll in CPS for grade 9. During this time period, 13 to 14 percent of eighth graders overall exited CPS for ninth grade, and 11 to 12 percent entered CPS in ninth grade (Barrow and Sartain 2017). Attrition can be a threat to valid estimation in our RDD approach. Overall, we find that within 0.5 standard deviations of the cutoff score, 7 percent of admitted students leave CPS before grade 9 compared to 11 percent of nonadmitted students. The likelihood of leaving the district, conditional on not being admitted to an SEHS, is higher for tier 4 students than for students from tiers 1–3 (16 percent of tier 4 students who are not admitted to an SEHS leave CPS compared with 9 percent of students from the other tiers). Tier 4 students who are admitted to an SEHS are also more likely to exit the district (8 percent of tier 4 students compared with 6 percent of students from other tiers).

¹²We predict standardized ACT scores by regressing observed ACT scores on points from the three application components (SEHS exam, seventh grade exam, and grades); indicators for whether a student is black/African American, Latino, male, eligible for free or reduced-price lunch, and attended assigned elementary school; as well as fixed effects for tier, cohort, and elementary school. All students entering CPS in ninth grade are coded as not being enrolled in their assigned elementary school and given an indicator for missing their eighth grade school identifier. The adjusted R^2 is 0.73.

TABLE 2—STUDENT CHARACTERISTICS BY APPLICATION STATUS AND TIER

Student characteristics	All students (1)	All applicants (2)	Sample within 0.5 standard deviations of the cutoff				
			All tiers (3)	Tier 1 (lowest SES) (4)	Tier 2 (5)	Tier 3 (6)	Tier 4 (highest SES) (7)
African American	0.43	0.38	0.31	0.45	0.35	0.32	0.19
Latino	0.43	0.43	0.41	0.50	0.52	0.41	0.26
White	0.08	0.11	0.16	0.02	0.04	0.13	0.38
Asian	0.04	0.06	0.08	0.02	0.06	0.11	0.10
Male	0.48	0.43	0.40	0.38	0.38	0.41	0.41
Free/reduced-price lunch	0.85	0.79	0.71	0.90	0.85	0.76	0.43
Attends assigned elementary school	0.67	0.59	0.57	0.51	0.53	0.57	0.64
Grade 7 ISAT math percentile	68.06 (22.19)	79.29 (14.85)	86.79 (10.12)	83.65 (10.49)	85.50 (10.12)	87.30 (9.86)	89.80 (9.13)
Grade 7 GPA	2.49 (1.01)	2.99 (0.84)	3.44 (0.52)	3.32 (0.54)	3.39 (0.53)	3.45 (0.51)	3.58 (0.49)
Application score (maximum of 900)	n/a	622.3 (163.3)	730.4 (88.1)	676.6 (64.8)	706.5 (73.35)	734.8 (80.3)	781.0 (90.9)
Eligible for admission to an SEHS based on total points	n/a	0.45	0.79	0.63	0.75	0.84	0.89
Cutoff-based admission	n/a	0.30	0.51	0.46	0.47	0.49	0.58
Enrolled in an SEHS in grade 9	0.12	0.26	0.41	0.36	0.35	0.39	0.50
Number of students	96,391	43,838	17,812	3,542	4,102	4,893	5,275

Notes: “All students” (column 1) includes all CPS students enrolled for the first time in grade 9, excluding all students with an Individualized Education Program. “All applicants” (column 2) includes only the subset who also completed an SEHS application. The sample in columns 3 through 7 further limits the students to those with a centered score within one-half standard deviation of the cutoff. “Cutoff-based admission” is an indicator for the student being offered a seat at an SEHS based on the published cutoff scores. Students are defined as “enrolled in an SEHS in grade 9” if they are enrolled in one of the SEHSs, regardless of whether they are specifically in the SEHS program.

are positively selected on academic achievement when compared with nonapplicant students, both in terms of test scores and GPA in seventh grade. Applicants are also more likely to have engaged in school choice prior to high school, with 59 percent attending their assigned neighborhood elementary school compared with 67 percent of students overall. Applicant students are more likely to be white or Asian, somewhat less likely to be African American or Latino, less likely to qualify for free/reduced-price lunch, and less likely to be male than nonapplicant students. Only 45 percent of applicants met the eligibility threshold of 650 application points, while 30 percent scored above the cutoff for admission at 1 of the schools to which they applied, and many of those eligible enrolled in an SEHS. In other words, the hurdle for many students is attaining an application score of 650.

In Table 2, we also compare the characteristics of applicant students (column 2) to a subsample (column 3) that further limits students to those scoring relatively close to the admissions cutoff score: within 0.5 standard deviations of the cutoff score. This limitation drops many students whose application scores lie well below the eligibility cutoff for admission. Not surprisingly, this 0.5 standard deviation sample is higher achieving than the application sample. Seventh grade math test score percentiles for this sample are about 20 percentile points higher than all students and 8 percentile points higher than all applicants. Grade 7 GPA is also considerably higher for the 0.5 standard deviation sample, about 1 GPA point higher than all students and about 0.5 GPA points higher than all applicants. Again, this sample

is less likely to be African American, more likely to be white or Asian, less likely to qualify for free or reduced-price school lunch, and less likely to be male.

Throughout this paper, we focus on comparisons of impacts for tier 1 applicants (from the lowest-SES neighborhoods) with impacts for tier 4 applicants (from the highest-SES neighborhoods). Characteristic means for students in the 0.5 standard deviation sample from each tier are shown in columns 4 through 7. While race is not used to determine neighborhood tier, the percent African American or Latino generally declines monotonically with neighborhood tier. Nearly all of tier 1 students are African American or Latino, and 4 percent are white or Asian, while 45 percent of tier 4 students are African American or Latino, and 48 percent are white or Asian. Tier 4 students are also more likely to have attended their neighborhood elementary school than tier 1 students (64 percent compared with 51 percent), suggesting that CPS elementary schools in high-SES neighborhoods are perceived as being more desirable. Students from tier 4 neighborhoods tend to be relatively higher performing compared with students from tier 1 neighborhoods—their seventh grade math test scores are about 6 percentile points higher, their seventh grade GPAs are about one-quarter of a letter grade higher (0.26 GPA points), and their average application scores are over 100 points higher. We note, however, that students in the tier 1 0.5 standard deviation sample are much higher performing than the typical CPS student.

III. Regression Discontinuity and Counterfactual Description

A. Regression Discontinuity Approach

We estimate the effect of attending an SEHS for students coming from different SES backgrounds. Admissions cutoffs for each school, tier, and year are generated based on student preferences, the number of seats at a particular school, and the student's application score. As long as a student lists at least one school on their application for which their score exceeds the ex post cutoff for their neighborhood tier, the student should be offered a seat at an SEHS. If a student's application score exceeds the relevant tier ex post cutoff for more than one school on her application, her own preference ranking will determine at which school she is offered a seat. In order to estimate the effect of being admitted to any SEHS, we center students' application scores around the school on their application with the lowest cutoff score, whether or not the school is the lowest-ranked school on their application. For students who are not admitted to any SEHS, this school will be the school to which they came closest to receiving an offer.¹³

We implement an RDD, using the various cutoffs based on neighborhood tiers as the exogenous source of variation to identify the "intent-to-treat" (ITT) estimate of the effect of attending an SEHS for students from each SES neighborhood tier. The

¹³ Overall, this centers about 40 percent of the 0.5 standard deviation sample around the cutoff for a school that was the student's first or second choice. Tier 1 students are somewhat less likely to be centered around a school ranked first or second (37 percent), and tier 4 students are somewhat more likely to be centered around one of their top two ranked schools (47 percent).

running variable in this case is the centered application score, and the main identifying assumption is that within neighborhood tier and cohort, students with application scores just below the cutoff provide a good comparison group for those with application scores just above the cutoff. Further, because students cannot precisely manipulate their application score around the threshold, we assume acceptance to an SEHS for students near the cutoff is as good as random.

Because of the allocation of seats by neighborhood tier, we have four cutoff points for each of CPS's ten selective high schools in each year. Using the RDD approach, we estimate both an overall ITT effect of being admitted to a selective high school as well as separate ITT effects for students from each neighborhood tier using local linear regression.

More formally, we define the centered application score (X_{icjt}) for student i in cohort c applying to school j and living in a tier t neighborhood as the individual student's application score minus the relevant cutoff score (based on school, cohort, and neighborhood tier). The equation for the overall effect of admission to a selective high school can be expressed as follows:

$$(1) \quad Y_{icjt} = \beta_0 + \delta SE_{icjt} + \beta_1 X_{icjt} + \beta_2 X_{icjt} \times SE_{icjt} + \phi_{cjt} + \varepsilon_{icjt},$$

where Y_{icjt} is the outcome of interest, X_{icjt} is the centered application score, SE_{icjt} is an indicator for whether student i scored above the cutoff at school j , ϕ_{cjt} is a cohort-school-neighborhood tier fixed effect, and ε_{icjt} is the individual error term. The slope may differ on either side of the cutoff. δ is our parameter of interest to be estimated and represents the impact of being offered a seat at an SEHS on the outcome of interest.

In order to investigate heterogeneity by neighborhood tier, we interact everything with neighborhood tier, and our estimation equation is the following:

$$(2) \quad Y_{icjt} = \sum_{t=1}^4 [\beta_{0t} tier_t + \delta_t tier_t \times SE_{icjt} + \beta_{1t} tier_t \times X_{icjt} + \beta_{2t} tier_t \times X_{icjt} \times SE_{icjt}] + \phi_{cjt} + \varepsilon_{icjt},$$

where $tier_t$ are neighborhood tier fixed effects which have been fully interacted with the running variable, the indicators for being offered a selective enrollment seat, and the interaction of the running variable with the SE_{icjt} indicator. Our parameters of interest are the δ_t , and we test whether the estimates differ for students from tier 1 and tier 4 neighborhoods.

We estimate one common mean square error-optimal bandwidth for each outcome and tier using the sharp robust RDD estimator developed by Calonico, Cattaneo, and Titiunik (2014). The effect of admission to an SEHS is estimated with local linear regression, a uniform kernel, and including the cohort-school-tier fixed effects as covariate controls.¹⁴

¹⁴Following Pei et al. (2018), we use their proposed mean squared error estimation to select order and do not find evidence of improvement with higher-order polynomials.

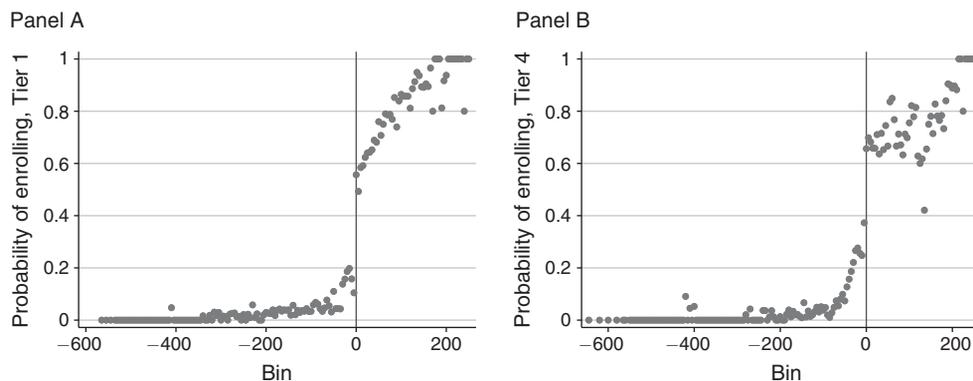


FIGURE 2. PROBABILITY OF ENROLLING IN AN SEHS GIVEN CENTERED APPLICATION SCORE, TIERS 1 AND 4

Notes: Both panels plot the share of students enrolled in an SEHS by five-point centered application point bins. Students are centered around the school on their application with the lowest cutoff score for their cohort and year, whether or not the school is the lowest-ranked school on their application. For students who are not admitted to any SEHS, this school will be the school to which they came closest to receiving an offer. The left-hand-side panel limits the sample to students living in tier 1 neighborhoods; the right-hand-side panel limits the sample to students living in tier 4 neighborhoods.

In order to produce unbiased estimates of the effect of being offered a seat at a selective high school, RDD relies on the assumption that assignment of students to selective high schools at the cutoff score is as good as random (Lee and Lemieux 2010). The extent to which students are able to manipulate their application score, thus changing their admissions status, poses a threat to this key assumption. It may be the case that individual components of the admissions score—particularly grades—are vulnerable to manipulation. For example, a teacher may assign a higher grade to a student than the student earned if the teacher knows the student is likely to apply to a selective school. Ultimately, however, the application score consists of pieces that are less subject to manipulation, namely standardized test scores. As mentioned earlier, students do not know the cutoff scores prior to applying. The cutoff for any given year depends on all students' rankings of selective high schools and their individual application scores. We show the smoothness of pretreatment covariates through the application score cutoff in online Appendix Figures 3A–3C, and we test for discontinuities in the baseline characteristics—race, sex, free-lunch status, and an indicator for attending one's assigned elementary school—using seemingly unrelated regression and the 0.5 standard deviation sample. These results overall and separately by tier are presented in online Appendix Table 4. We find no statistically significant discontinuities in our baseline characteristics for either tier 1 or tier 4 students, and our estimates are very similar if we include them as control variables.¹⁵

Figure 2 presents the probability of enrolling in an SEHS in grade 9 as a function of the centered application score for each tier. Twenty to 30 percent of students with application scores just below zero are enrolled at an SEHS in grade 9, based on the administrative records. At zero, roughly 60 percent of students are enrolled

¹⁵We find evidence of a discontinuity in sex for students living in tier 3 neighborhoods.

in an SEHS in grade 9. Across tiers, the parametric first-stage estimate of the effect of being offered a seat on the probability of actually enrolling in an SEHS is 0.33 (using the 0.5 standard deviation sample). The tier-by-tier first-stage estimates vary slightly, with tier 1 at 0.41 and tier 4 at 0.31.¹⁶

B. *Characterizing the Counterfactual High School Experience*

Like selective high schools in Boston and NYC, SEHSs in Chicago differ from the other public high schools on many observable characteristics (as described earlier in Table 1). We estimate the impact of SEHS admission on the characteristics of the high school attended based on the equation (2) specification using school-level data at the student level. In Table 3, we present the estimates for students from low- and high-SES neighborhoods (columns 2 and 4) along with the *p*-value for the test that the impacts are statistically different (column 5). For tiers 1 and 4, we also present the predicted mean and standard error of the high school characteristic at the left limit of the cutoff (columns 1 and 3). The characteristics listed in this table are the same as in Table 1, although here we restrict contrasts to the 0.5 standard deviation sample. The purpose of Table 3 is to compare high school characteristics for admitted and nonadmitted students from tier 1 neighborhoods and also for their counterparts from higher-SES, tier 4, neighborhoods.

Overall, the Table 3 estimates suggest that tier 1 and tier 4 students who are not admitted to an SEHS attend somewhat different high schools such that counterfactual schools for tier 4 students look “more desirable” on several dimensions than the counterfactual schools attended by tier 1 students. As a result, the effect of being admitted to an SEHS on average characteristics of high school attended are larger in magnitude for tier 1 students than for tier 4 students. For example, the average ACT composite score at the typical high school attended by tier 1 students who are not admitted to an SEHS is 18.5 (column 1) compared with an average of 20.9 for tier 4 students who are not admitted to an SEHS (column 3). Being admitted to an SEHS raises the average ACT composite score at the high school attended by a statistically significant 1.5 points for students from tier 1 neighborhoods (column 2). The impact estimate for tier 4 students is 0.9 (column 4); however, we cannot reject that the tier 1 and tier 4

¹⁶Enrollment below the cutoff occurs for a few reasons. Students below the cutoff may enroll in SEHSs as part of the No Child Left Behind (NCLB) choice program or under “principal discretion.” It is also the case that some of these students may be enrolled in a program at the SEHS building that is not part of the selective enrollment program or have entered the SEHS program through an Academic Center (AC) program for seventh and eighth grade students in the SEHS. Twenty-two percent of students who were enrolled in a SEHS but scored below the cutoff in the 2013–2014 cohort were offered a seat under principal discretion (PD). During our sample period, both South Shore and Westinghouse offered Career and Technical Education (CTE) programs, and South Shore also housed an International Baccalaureate (IB) program. These additional programs have achievement-based admission requirements but do not use the selective admissions exam. Sixty-nine percent of the 2013–2014 cohort who fell below the cutoff but are enrolled in a SEHS in grade 9 (excluding students offered a seat under PD) are enrolled at one of these two schools. Lane Tech, Lindblom, and Whitney Young each offered AC programs for students in seventh and eighth grades, giving them a ninth grade seat in the respective SEHS program automatically. These students may have applied to attend a different SEHS and missed the cutoff at the applicant school but stayed in the SEHS that was home to their AC. Fourteen percent of the 2013–2014 cohort who fell below the cutoff but are enrolled in a SEHS in grade 9 (excluding students offered a seat under PD) are enrolled in one of these three ACs in eighth grade. Finally, CPS appears to have made subsequent round offers after publishing the cutoff scores, particularly in the first two years of the neighborhood tier quota system (corresponding to the first two cohorts in our data).

TABLE 3—ESTIMATED EFFECT OF ADMISSION TO A SELECTIVE ENROLLMENT HIGH SCHOOL ON AVERAGE SCHOOL CHARACTERISTICS OF SCHOOL ATTENDED FOR TIERS 1 AND 4 (STANDARD ERRORS IN PARENTHESES)

School-level characteristic	Tier 1 (lowest SES)		Tier 4 (highest SES)		<i>p</i> -value for test of equality of impact estimates
	Mean (1)	Impact estimates (2)	Mean (3)	Impact estimates (4)	
Average ACT composite score	18.456 (0.163)	1.499 (0.361)	20.860 (0.094)	0.935 (0.278)	0.282
Percent of students enrolled in AP classes	18.967 (0.435)	4.890 (0.766)	23.691 (0.461)	3.894 (1.222)	0.418
Five-year cohort graduation rates	71.895 (0.857)	7.114 (1.724)	78.893 (0.299)	4.129 (0.976)	0.117
Percent of grads enrolling in college	62.824 (0.997)	8.245 (2.064)	72.049 (0.389)	4.076 (0.359)	0.067
Percent of students receiving an out-of-school suspension	19.341 (0.787)	−7.335 (2.141)	11.245 (0.351)	−4.562 (0.469)	0.192
Herfindahl-Hirschman index of racial concentration	0.627 (0.009)	−0.016 (0.036)	0.395 (0.010)	0.010 (0.017)	0.498
Percent male	47.062 (0.151)	−2.067 (0.495)	47.201 (0.180)	−1.109 (0.268)	0.056
Percent of students with an IEP	10.751 (0.229)	−2.028 (0.604)	9.156 (0.238)	−1.455 (0.371)	0.307
Percent of students eligible for free or reduced-price lunch	83.180 (0.646)	−3.540 (1.961)	66.899 (0.586)	−1.157 (2.189)	0.521
Average student report of parental support	0.134 (0.090)	0.139 (0.104)	0.090 (0.043)	0.182 (0.122)	0.745
Average student report of community support	−0.021 (0.055)	0.008 (0.177)	1.168 (0.063)	0.003 (0.086)	0.981
Teacher satisfaction with CPS	0.001 (0.042)	0.279 (0.032)	0.022 (0.137)	0.312 (0.142)	0.843

Notes: A student's application score is centered around the cutoff for the school on their application with the lowest cutoff score. The sample is limited to students with centered application scores within 0.5 standard deviations of zero. Estimating equations include an indicator for scoring above the admission cutoff, the centered application score, interactions between the admission indicator and the centered application score, as well as application school-by-cohort-by-tier fixed effects. We obtain estimates by tier from a single regression with control variables fully interacted with tier indicators. The sample includes only applicants with complete applications who were enrolled in CPS in grade 9. Students are first-time ninth graders in 2010–2011, 2011–2012, 2012–2013, and 2013–2014. Standard errors for the impact estimates are clustered at the application school level. We report means and standard errors (based on the delta method) using the margins command from Stata estimated at the left limit of the cutoff. The five-year cohort graduation rate reflects the percent of first-time ninth grade students graduating high school as of five years after first-time ninth grade enrollment. Verified transfers out of the district are excluded from this calculation. Survey measures are standardized at the school-year level. See online Appendix Table 1 for descriptions of the survey measures. School-level college enrollment rates and survey data are not available for the 2010 cohort. School-level discipline data are unavailable for the 2010 and 2011 cohorts. Five-year cohort graduation rates, college enrollment rates, and average ACT test scores are missing for recently opened schools. Additionally, charter schools do not report school-level transcript and discipline measures.

impact estimates are the same (p -value = 0.28, column 5). Similarly, the counterfactual high schools attended by tier 1 students have smaller shares of students enrolled in AP classes, lower high school graduation rates, lower shares of graduates enrolling in college, and higher shares of students receiving out-of-school suspensions than the

counterfactual high schools attended by tier 4 students. Again, while we cannot reject equality of impacts for tier 1 and tier 4 students, the point estimates for tier 1 students are larger in absolute value than those for tier 4 students. Finally, there are several school-level characteristics on which admission to an SEHS has no impact for either tier 1 or tier 4 students. Namely, admission to an SEHS has no effect on the percent of students eligible for free or reduced-price school lunch, average student report of parental support, or the average student report of community support.

Although school-level characteristics reflect a combination of school quality and peer characteristics, we believe that this analysis suggests that low-SES students who are not admitted to an SEHS may be attending lower-quality alternatives than the high-SES students who are not admitted to an SEHS.

IV. Results

A. Academic Performance

In Table 4, we present nonparametric estimates of the effect of attending an SEHS on outcomes reflecting measures of academic performance.¹⁷ Each column represents a different outcome measure, and for each outcome, the first row (counterfactual mean) contains the predicted outcome variable mean at the left limit of the threshold. Subsequent rows present overall estimates (the “all tiers estimate” row) and standard errors and number of observations. Below that, rows represent counterfactual means, estimates, and standard errors allowing for the impact of attending an SEHS to vary by neighborhood SES (rows “tier 1 estimate” through “tier 4 estimate”). Last, we include the p -value for the test that the impact estimate for tier 1 (lowest-neighborhood SES) equals the impact estimate for tier 4 (highest-neighborhood SES) followed by the number of student observations used in the estimation allowing the impact to vary by tier.

We find no evidence that SEHSs raise test scores overall; the point estimates corresponding to these estimates are small and negative (see columns 1 and 2 of Table 4). For the ACT test (which is given to all eleventh graders in CPS), a 0.02 standard deviation reduction in test score translates into a reduction of roughly one-tenth of a point. In a recent econometric methods paper on RDD in a serial dictatorship setting, Abdulkadiroğlu et al. (2017) use one cohort of SEHS applicants in Chicago and also find generally negative point estimates on test scores, although none are statistically different from zero; they do not examine any other outcomes. In Figure 3A, we present graphical evidence allowing the impact of SEHS admission on test scores to differ by neighborhood tier. See also columns 1 and 2 in Table 4. Once again, we find no evidence that SEHSs raise student test scores, and we cannot reject that the point estimates for students from tier 1 and tier 4 neighborhoods are equal.

¹⁷In addition to our preferred specification, we have estimated numerous alternative specifications for robustness. Specifically, we (i) include higher-order polynomial terms of the running variable in the model, (ii) include controls for pretreatment characteristics, and (iii) include controls for eighth grade (elementary) school fixed effects. Our estimates are qualitatively similar across these specifications. Results from robustness checks are available upon request.

TABLE 4—ESTIMATES OF THE EFFECTS OF ADMISSION TO AN SEHS ON ACADEMIC OUTCOMES

	Standardized test score (PLAN) (grade 9) (1)	Standardized test score (ACT) (grade 11) (2)	Incoming class rank (3)	GPA (grade 9) (4)	GPA (grade 11) (5)	High school graduation (4-year rate) (6)	Enroll in any post- secondary institution the fall after graduation (7)	Enroll in any selective college the fall after graduation (8)
Counterfactual mean	0.987	0.336	71.405	3.034	2.773	0.955	0.823	0.250
All tiers estimate	-0.026 (0.023)	-0.023 (0.015)	-11.147 (2.293)	-0.123 (0.026)	-0.081 (0.057)	-0.004 (0.005)	0.025 (0.011)	-0.037 (0.015)
Observations	7,170	7,730	8,542	10,409	8,452	12,536	6,053	5,998
Counterfactual mean	0.656	0.040	73.636	2.948	2.780	0.950	0.753	0.169
Tier 1 estimate (Lowest SES)	0.017 (0.035)	-0.044 (0.032)	-16.895 (3.279)	-0.288 (0.065)	-0.239 (0.101)	-0.014 (0.014)	0.039 (0.038)	-0.060 (0.025)
Counterfactual mean	0.847	0.183	72.580	2.928	2.731	0.935	0.796	0.227
Tier 2 estimate	-0.041 (0.052)	-0.045 (0.047)	-11.046 (4.902)	-0.118 (0.086)	-0.141 (0.050)	0.014 (0.009)	0.002 (0.046)	-0.094 (0.060)
Counterfactual mean	0.934	0.352	70.944	2.991	2.761	0.956	0.817	0.245
Tier 3 estimate	0.049 (0.044)	-0.038 (0.029)	-10.174 (4.358)	-0.051 (0.035)	-0.054 (0.102)	-0.017 (0.012)	0.043 (0.032)	-0.022 (0.055)
Counterfactual mean	1.324	0.689	69.548	3.234	2.820	0.959	0.897	0.334
Tier 4 estimate (Highest SES)	-0.058 (0.053)	-0.049 (0.038)	-9.625 (1.024)	-0.092 (0.044)	-0.001 (0.058)	0.011 (0.011)	0.002 (0.017)	-0.014 (0.039)
<i>p</i> -value: Tier 1 = Tier 4	0.339	0.922	0.103	0.095	0.125	0.182	0.397	0.262
Observations	8,028	8,042	8,329	9,078	6,824	10,403	6,582	6,449

Notes: All estimates are from local linear regression specifications. A student's application score is centered around the cutoff for the school on their application with the lowest cutoff score. We limit the bandwidth using a single, mean square error-optimal bandwidth selector developed by Calonico et al. (2017) and control for tier by school by cohort fixed effects. Optimal bandwidths are chosen separately overall and for each tier for the estimates by tier. Standard errors for the impact estimates are in parentheses and clustered at the application school level. We report means using the margins command from Stata estimated at the left limit of the cutoff. Incoming class rank is the percentile rank for each student in the high school they attend based on a predicted eighth grade test score. We define "selective" as any college described by *Barron's* as "Very Competitive Plus" (selectivity rank of 1, 2, 3, or 4). Leonhardt, David. 2013. "What Makes a College 'Selective'—and Why It Matters." *New York Times*, April 4. <http://economix.blogs.nytimes.com/2013/04/04/what-makes-a-college-selective-and-why-it-matters/>. This is the same definition used by Hoxby and Avery (2012).

In contrast, we see a large negative effect on incoming class rank (column 3 of Table 4). On average, at the beginning of ninth grade, students admitted to SEHSs were ranked 11 percentile points lower than the counterfactual students not admitted to an SEHS. This is, perhaps, of little surprise. Students admitted at the margin will have relatively higher-performing peers than the students who just miss the cutoff. When we allow the effect of SEHS admission to differ by neighborhood tier (Figure 3A), we estimate that the negative effect on incoming rank is larger in absolute value for tier 1 students than for tier 4 students. Tier 1 students admitted to an SEHS rank 17 percentile points lower in their high school than tier 1 students who are not admitted to an SEHS. For students from tier 4 neighborhoods, being admitted to an SEHS lowers their incoming rank by 10 percentile points (*p*-value of the difference = 0.10). There is evidence from other studies that students are aware of these rank differences. Pop-Eleches and Urquiola (2013) find that at the margin, students in Romania who are admitted to a higher-ranked high school report that

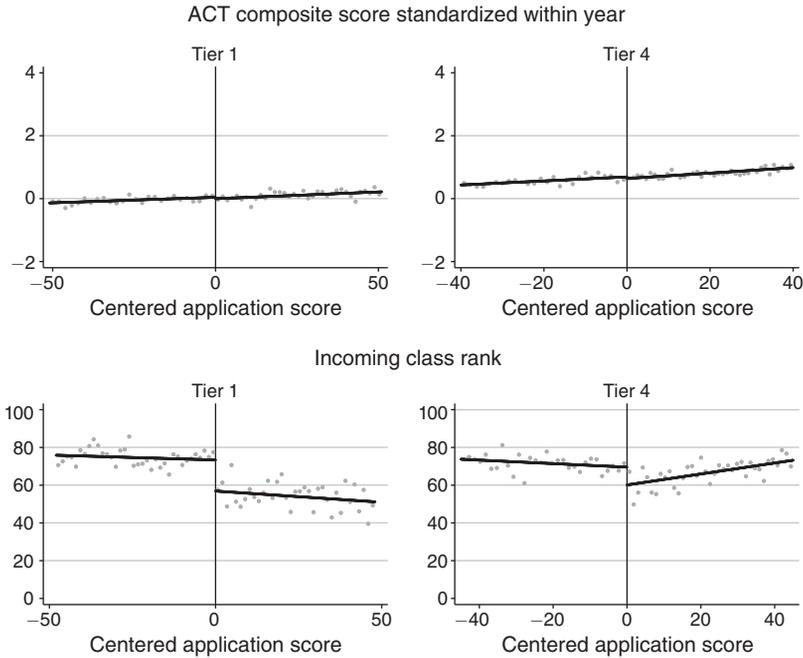


FIGURE 3A. RELATIONSHIP BETWEEN THE CENTERED APPLICATION SCORE AND SELECT OUTCOMES, TIERS 1 AND 4

Notes: In each panel, the solid lines are local linear fits; dots are within bin averages. The number of bins is allowed to differ to the right and left of the cutoff and is selected using the mimicking variance evenly-spaced method (Calonico et al. 2017). In order to match the RD estimates that include tier by school by cohort fixed effects, we adjust the dependent variable by the tier-school-cohort fixed effects before generating each figure. We limit the bandwidth using a single, mean square error-optimal bandwidth selector. The left-hand-side panels limit the sample to students living in tier 1 neighborhoods; the right-hand-side panels limit the sample to students living in tier 4 neighborhoods. Incoming class rank is the percentile rank for each student in the high school they attend based on a predicted eighth grade test score.

they have a lower rank relative to their peers than comparison students who miss the admissions cutoff.

How a student ranks in the distribution of her peers may be important for several reasons. First, if schools track students into different courses based on prior achievement, lower-ranked students may not have access to the same courses, peers, or teachers as higher-ranked students. Additionally, lower rank may translate into lower grades to the extent that grades are a relative performance measure rather than an absolute measure. Because academic achievement is correlated with SES and the admissions system in Chicago reserves seats for students from different SES tiers, this issue may be most relevant for students from low-SES neighborhoods who are on average lower-ranked in their SEHSs than students from higher-SES neighborhoods. Finally, rank may also affect how students perceive their own academic skills or ability, how teachers perceive students, or both.

Consistent with the negative effect on relative rank, we estimate negative impacts of SEHS admission on grades. Overall, students who are admitted to SEHSs have ninth grade GPAs that are on average 0.12 grade points lower than those of their counterparts who were not admitted to an SEHS. The magnitude of the negative GPA effect is larger for students from the lowest-SES neighborhoods (tier 1) than

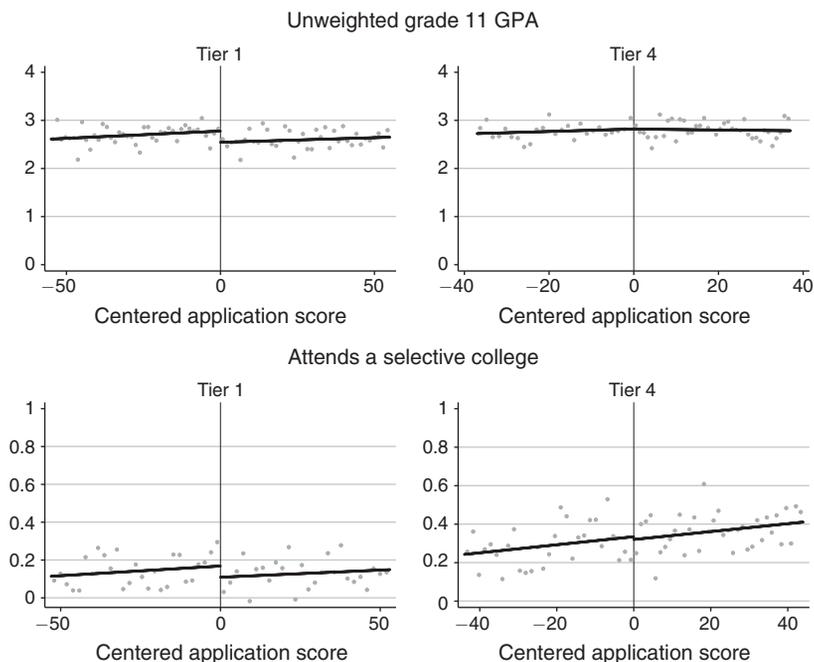


FIGURE 3B. RELATIONSHIP BETWEEN THE CENTERED APPLICATION SCORE AND SELECT OUTCOMES, TIERS 1 AND 4

Notes: See notes for Figure 3A. We define “selective” as any college described by *Barron’s* as “Very Competitive Plus” (selectivity rank of 1, 2, 3, or 4). Leonhardt, David. 2013. “What Makes a College ‘Selective’—and Why It Matters,” *New York Times*, April 4. <http://economix.blogs.nytimes.com/2013/04/04/what-makes-a-college-selective-and-why-it-matters/>. This is the same definition used by Hoxby and Avery (2012).

for students from the most affluent neighborhoods (tier 4). Students from tier 1 neighborhoods who are just admitted to an SEHS have a ninth grade GPA that is 0.29 grade points lower than that of their counterparts who are not admitted to an SEHS, while students from tier 4 neighborhoods who are admitted to an SEHS have a GPA that is only 0.09 grade points lower (p -value of the difference = 0.10). The negative effect on GPA persists through grade 11, although the effect is somewhat smaller. Overall, being admitted to an SEHS has a -0.08 effect on grade 11 cumulative GPA that is not statistically different from 0. For tier 1 students, the estimate is -0.24 , and the estimate for tier 4 students is -0.001 (see Figure 3B; p -value of the difference = 0.13).

The negative impacts on GPA do not appear to translate into negative impacts on high school graduation or college enrollment on average (see online Appendix Figure 4B and columns 6 and 7 of Table 4). Students admitted to SEHSs are no less likely to graduate from high school and are somewhat more likely to enroll in college than their counterparts who are not admitted to an SEHS. However, we estimate a statistically significant negative effect on the probability of enrolling in a selective college overall and for students from low-SES neighborhoods.¹⁸ Tier 1

¹⁸Our results are quite similar if we instead use *Barron’s* selectivity categories 1, 2, and 3 or just 1 and 2 to define selective college.

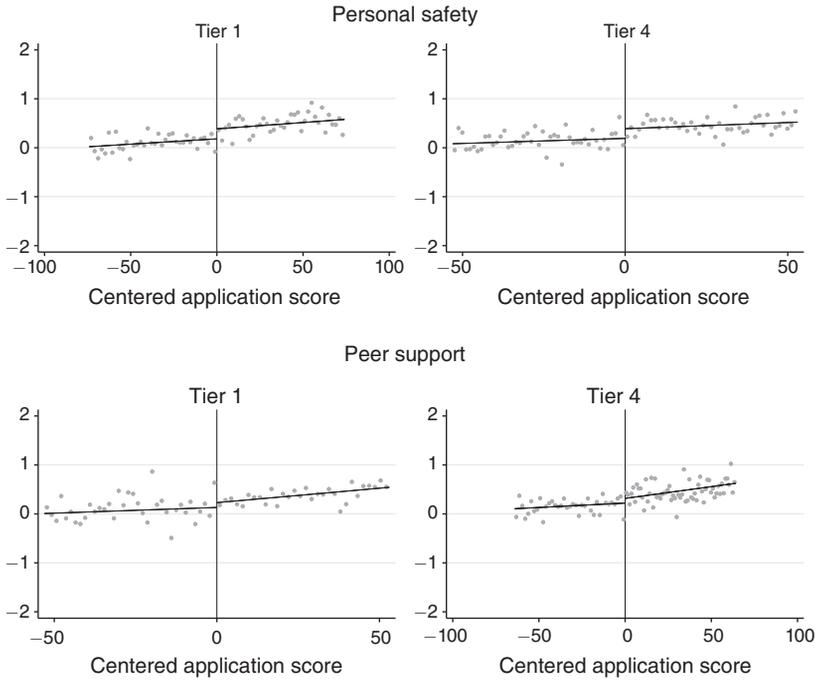


FIGURE 3C. RELATIONSHIP BETWEEN THE CENTERED APPLICATION SCORE AND SELECT OUTCOMES, TIERS 1 AND 4

Notes: See notes for Figure 3A. Survey outcomes are indices for student responses to a group of questions on a particular subject. Online Appendix Table 3 lists the survey measures and their component items for the measures above.

students admitted to an SEHS are 6 percentage points less likely to enroll in a selective college, conditional on graduating from a CPS high school, than tier 1 applicants who are not admitted to an SEHS. The point estimate for tier 4 students is also negative but smaller and less precisely estimated; as such, we cannot reject that the estimated effects for tier 1 and tier 4 students are equal (p -value = 0.26). Reasons for concern about the estimated negative impact on the probability of attending a selective college include that less selective colleges may actually cost more financially and may reduce the likelihood of completion (Hoxby and Avery 2013).

B. High School Experience

In addition to potential academic benefits, parents and students may also covet spaces in the SEHSs for the different high school experience they offer in terms of peers, teachers, and course quality. We turn to estimates of the effect of SEHS admission on these outcomes in the remaining figures and in Table 5, which is structured in the same way as Table 4.¹⁹ We characterize differences in academic experience

¹⁹Survey responses were collected during grade 9. We also replicated these findings using survey responses to the same items in grade 11. The estimates are very similar regardless of the grade at which the survey is administered. We prefer the results from grade 9 because response rates are higher in the earlier high school grades.

TABLE 5—ESTIMATES OF THE EFFECTS OF ADMISSION TO AN SEHS ON HIGH SCHOOL EXPERIENCE

	Takes any honors class (1)	Spends >10 hours on homework per week (2)	Quality of science courses (3)	Personal safety (4)	Peer relationships (5)	Teacher- student trust (6)	Sense of belonging at school (7)	Distance to high school (8)
Counterfactual mean	0.845	0.265	0.056	0.135	0.166	0.095	0.189	5.397
All tiers estimate	-0.001 (0.031)	-0.013 (0.013)	0.035 (0.038)	0.193 (0.051)	0.105 (0.039)	0.056 (0.061)	0.011 (0.084)	0.193 (0.194)
Observations	6,003	7,486	6,517	7,561	9,606	7,265	7,170	6,318
Counterfactual mean	0.755	0.213	0.067	0.186	0.128	0.195	0.189	4.524
Tier 1 estimate (Lowest SES)	-0.008 (0.054)	0.019 (0.024)	0.111 (0.111)	0.162 (0.076)	0.103 (0.051)	-0.017 (0.135)	-0.095 (0.120)	-0.156 (0.401)
Counterfactual mean	0.852	0.146	0.077	0.085	0.175	0.149	0.223	4.403
Tier 2 estimate	-0.002 (0.052)	0.079 (0.014)	0.081 (0.039)	0.182 (0.081)	0.048 (0.116)	0.039 (0.081)	-0.007 (0.110)	0.646 (0.431)
Counterfactual mean	0.867	0.288	0.104	0.113	0.140	0.042	0.116	5.220
Tier 3 estimate	0.019 (0.041)	-0.063 (0.042)	-0.074 (0.079)	0.188 (0.063)	0.128 (0.091)	0.110 (0.060)	0.036 (0.068)	0.641 (0.255)
Counterfactual mean	0.876	0.365	-0.101	0.148	0.216	0.037	0.152	6.309
Tier 4 estimate (Highest SES)	-0.007 (0.034)	-0.079 (0.044)	0.117 (0.135)	0.228 (0.044)	0.094 (0.033)	0.112 (0.098)	0.075 (0.124)	-0.191 (0.501)
<i>p</i> -value: Tier 1 = Tier 4	0.989	0.035	0.974	0.336	0.874	0.572	0.358	0.966
Observations	7,850	8,105	7,200	8,499	9,765	8,739	8,276	8,524

Notes: See notes for Table 4. “Takes any honors class” is an indicator for whether a student took any honors or AP class. Outcome variables for columns 2 through 7 are all based on student survey data. “Spends >10 hours on homework per week” is an indicator variable. The remaining survey outcomes are indices for student responses to a group of questions on a particular subject. Online Appendix Table 3 lists the survey measures and their component items for measures used in this table. Survey measures are standardized at the student level by cohort. “Quality of science courses” is based on questions regarding how often a student engaged in various activities in their science class such as writing lab reports or finding information from graphs and tables. “Personal safety” is reverse coded and based on questions related to worries about crime and violence at the school, teasing, and bullying. “Peer relationships” is based on questions about students’ agreement with statements such as most students in my school “Help each other learn” or “Treat each other with respect.” “Teacher-student trust” is based on questions about students’ agreement with statements about their teachers, such as “My teachers really care about me” and “My teachers treat me with respect.” “Sense of belonging at school” is based on questions about students’ agreement with statements such as “I feel like a real part of my school” and “I’m excited to go to school every day.” “Distance to high school” is measured in miles as the crow flies from census block group of student residence to census block group of high school attended.

as measured by whether or not a student takes honors courses, the amount of time spent on homework, and the reported quality of science courses (columns 1–3 of Table 5).²⁰ We then present results for survey measures of personal safety, peer support, teacher-student trust, and sense of belonging in the school (columns 4–7 of Table 5). Finally, results on distance to high school are presented in Table 5, column 8.

First, we look at enrollment in honors courses, reports of time spent on homework, and student reports on the quality of their science courses. Admission to an SEHS has no overall effect on the probability of taking an honors class, the

²⁰ Although we also have measures for English and math courses, the science measure was the most statistically reliable of the three. The results for English and math are similar to those for science and available on request.

probability of spending ten or more hours per week on homework, or the perceived quality of science courses. When we look at the effects by neighborhood tier, we find a statistically significant difference between tier 1 and tier 4 for the likelihood of spending ten or more hours on homework per week. Tier 1 students admitted to an SEHS are no more likely to report spending ten or more hours on homework than tier 1 students not admitted to an SEHS. In contrast, tier 4 students admitted to an SEHS are 8 percentage points less likely to report spending 10 or more hours per week on homework than their peers who were not admitted to an SEHS. This point estimate is not statistically different from zero at conventional levels, but we can reject that the tier 1 and tier 4 estimates are equal (p -value = 0.04).

Being admitted to an SEHS appears to make the most difference in the day-to-day relationships that students experience at school. The most consistent evidence we find is that students admitted to an SEHS report better relationships with peers. On average, students report a greater sense of personal safety in their school (see Figure 3C, a 0.19 standard deviation difference) and more supportive peers (a 0.11 standard deviation difference). However, students admitted to an SEHS are no more likely to report better, more trusting relationships with teachers or a greater sense of belonging at their school. For tier 1 students, we estimate a negative effect on student's sense of belonging (though it is imprecise and not statistically significant). This is consistent with the Pop-Eleches and Urquiola (2013) conclusion that Romanian students who are admitted to more selective schools know they are weaker students and feel marginalized. Looking across the student perceptions of school culture by neighborhood tier, estimates are not statistically different between tiers 1 and 4.

Finally, we look for differential effects on the distance students are traveling to school. On average, admission to an SEHS has no effect on the distance traveled to high school, and we cannot reject that the effects are the same for tier 1 and tier 4 students.

Overall, students admitted to one of the selective enrollment high schools have a better high school experience in terms of relationships with peers and their personal safety, and we do not find evidence of differential impacts on students from low- and high-SES neighborhoods. These differences in high school experiences may in part help explain why the SEHSs are so popular despite having limited, and perhaps negative, impacts on academic outcomes.

C. SES versus Relative Ranking

Assuming that the SEHSs are not lower quality than the counterfactual high schools, one explanation for the results shown in the figures and in Tables 4 and 5 is that the SEHSs are more challenging than the counterfactual high schools and that high-SES parents are able to provide more outside support for their children than either the school or low-SES parents can provide. Among the high-achieving students in this sample, we find that low-SES students are much more likely to have attended CPS elementary schools with low accountability ratings than are high-SES students (authors' calculations). Because they attended lower-performing elementary schools on average, low-SES students may get lower grades in high

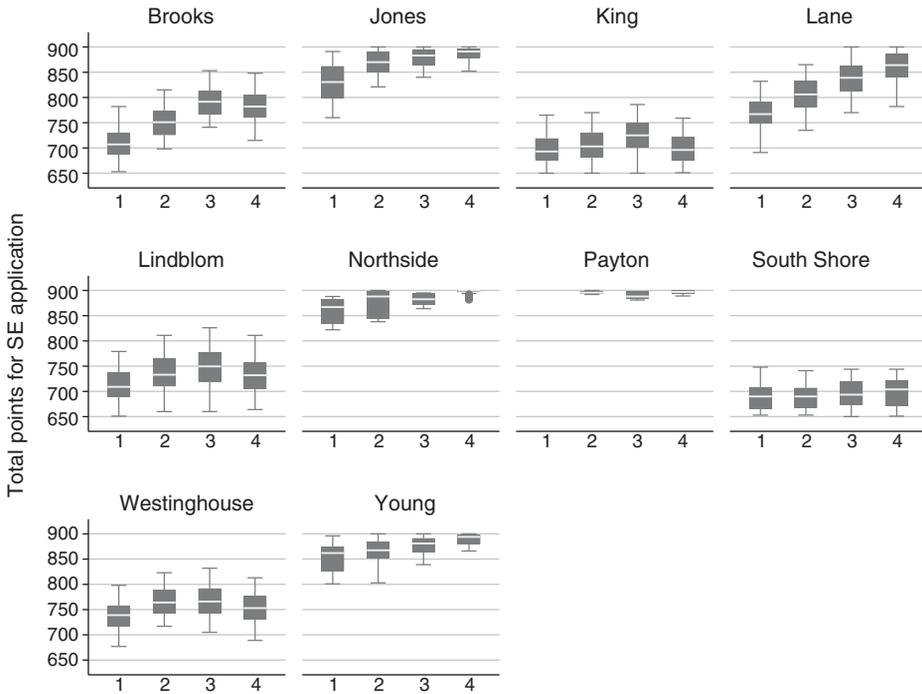


FIGURE 4. DISTRIBUTIONS OF ADMITTED STUDENT APPLICATION SCORES BY SCHOOL AND NEIGHBORHOOD TIER

Notes: The sample is limited to students with centered application scores within 0.5 standard deviations of the cutoff and greater than or equal to zero. One through four on the x-axis represent the four neighborhood tiers; the distributions are shown in terms of total application points (y-axis).

school because they are less well prepared. The results could also be explained by differences in relative ranking of tier 1 and tier 4 students as tier 1 students are more likely to be at the bottom of their class academically.

Because student achievement and neighborhood SES are correlated, the total points needed for admission to a particular school is almost always higher for students from high-SES neighborhoods than for students from low-SES neighborhoods (see online Appendix Table 2). For example, in 2014, the total points needed to receive an offer at Jones was roughly 100 points higher for tier 4 students than for tier 1 students. This relationship makes it difficult to discern whether differences in treatment effect estimates between tier 1 and tier 4 students are driven by differences in neighborhood SES or differences in incoming ability as measured by prior achievement. In Figure 4, we show the distribution of total application scores by SES tier for each high school. We limit the sample of students to those who are within 0.5 standard deviations of the cutoff and who are admitted to an SEHS based on the published cutoff scores. For a school such as Lane Tech (the largest SEHS in terms of total enrollment), one can see that the distribution shifts up with neighborhood SES tier, with considerable differences in the application scores for students from low- and high-SES neighborhoods. For other schools, like South Shore, the relationship is pretty constant across tiers.

To understand more about the effects of relative ranking, we limit the sample to students living in low-income households as measured by qualifying for free/reduced-price lunch (FRPL).²¹ Because neighborhood SES is a proxy for individual circumstances, even in tier 4 neighborhoods 43 percent of students qualify for FRPL. We believe that limiting the sample in this way improves our ability to isolate the effects of relative ranking from the effects of family resources.²²

Tier 1 FRPL students are low-income students who face lower admission cutoffs and are, therefore, relatively lower achieving compared to tier 4 FRPL students with higher achievement. In Table 6, we present estimates for select outcomes limiting the sample to FRPL students. Across the tiers, the estimates are quite similar. Low-income students facing higher admissions thresholds do no better when admitted to an SEHS than their counterparts who just miss the admissions cutoff, and low-income students facing lower admissions thresholds are made worse off in terms of GPA and the probability of enrolling in a selective college. Like the overall sample, the negative effects on relative ranking of being admitted to an SEHS are larger for students facing the lower admissions thresholds than students facing the higher thresholds. These results provide suggestive evidence that the differences in estimated effects are being driven by the impacts on relative rank rather than a story about parental resources. Of course, we cannot rule out a resource story, as low-income families in tier 4 neighborhoods are likely somewhat different, including potentially being higher income than low-income families living in tier 1 neighborhoods.

V. Discussion and Conclusion

Selective enrollment high schools command a lot of attention—they generally serve the most academically successful students, the seats are in high demand, and they are often hailed as the best schools in the system. These schools also receive criticism for serving student bodies that are much less racially diverse than the districts in which they are situated. The affirmative action admissions policy in Chicago, reserving seats for students from low-SES neighborhoods, makes selective schools more racially diverse than many other high schools in the city. This admissions policy also allows us to look at separate effects for students from different SES backgrounds. We find no evidence that SEHSs are raising test scores more for students from the most disadvantaged neighborhoods than for students from the most advantaged neighborhoods.

But test scores are only one outcome. SEHSs have a positive effect on students' perceptions of the high school experience. When it comes to relationships with students, SEHS students are more positive than their counterparts in non-SEHSs. SEHS

²¹ Students whose family income is between 130 percent and 185 percent of the federal poverty line qualify for reduced-price lunch, and those whose families make less than 130 percent of the poverty line qualify for free lunch. The distributions of application scores by tier for students eligible for FRPL look very similar to Figure 4.

²² Alternatively, if we limit the estimation sample to schools and cohorts for which the difference in cutoff scores between tiers 1 and 4 is no more than 10 points, we estimate negative impacts on eleventh grade GPA and the probability of attending a very competitive college for both tier 1 and tier 4 students, although not all estimates are statistically different from 0. The negative effects on class percentile rank are relatively similar: -12 percentile points for tier 1 students and -15 percentile points for tier 4 students. See online Appendix Table 5.

TABLE 6—ESTIMATES OF THE EFFECT OF ADMISSION TO AN SEHS ON SELECT OUTCOMES: FREE OR REDUCED-PRICE LUNCH SAMPLE

	Standardized test score (ACT) (grade 11) (1)	Incoming class rank (2)	GPA (grade 11) (3)	Enroll in a selective college the fall after graduation (4)	Personal safety (5)	Peer relationships (6)
Counterfactual mean	0.209	73.362	2.791	0.209	0.098	0.137
All tiers estimate	-0.044 (0.017)	-12.292 (3.228)	-0.121 (0.062)	-0.045 (0.020)	0.220 (0.038)	0.133 (0.041)
Observations	6,794	6,386	5,866	4,569	4,079	4,774
Counterfactual mean	0.020	74.956	2.787	0.132	0.146	0.189
Tier 1 estimate (Lowest SES)	-0.036 (0.032)	-17.369 (2.802)	-0.221 (0.075)	-0.037 (0.021)	0.203 (0.077)	0.055 (0.041)
Counterfactual mean	0.182	75.057	2.758	0.208	0.113	0.161
Tier 2 estimate	-0.072 (0.047)	-12.597 (5.452)	-0.142 (0.062)	-0.075 (0.055)	0.127 (0.074)	0.062 (0.161)
Counterfactual mean	0.271	72.178	2.789	0.243	0.055	0.077
Tier 3 estimate	-0.017 (0.021)	-9.938 (5.072)	-0.040 (0.099)	-0.037 (0.042)	0.168 (0.050)	0.139 (0.114)
Counterfactual mean	0.364	70.859	2.885	0.265	0.091	0.121
Tier 4 estimate (Highest SES)	-0.0005 (0.057)	-9.705 (1.143)	-0.101 (0.093)	-0.016 (0.082)	0.382 (0.146)	0.318 (0.182)
<i>p</i> -value: Tier 1 = Tier 4	0.463	0.026	0.131	0.829	0.087	0.214
Observations	6,753	6,441	5,617	5,083	5,862	6,075

Notes: See notes for Tables 4 and 5. Sample is limited to the subset of students who were eligible for FRPL in eighth grade. We use ninth grade FRPL status for students who enter CPS in ninth grade.

students are more likely to say that students get along well and treat each other with respect. Students in SEHSs also report a greater sense of personal safety; namely, they are less likely to worry about crime, violence, and bullying at school. Perhaps it is these factors that make SEHSs highly desirable to students and families more so than the potential to improve test scores. Regardless, these results combined with potentially adverse effects on academic achievement suggest that districts may want to focus on ways to improve school environment at all schools rather than investing in additional selective high schools.

High school GPA affects both college admissions and college scholarship eligibility, and we find negative effects of being admitted to an SEHS on GPA. This effect is primarily driven by the large negative impact on GPA for students from more disadvantaged neighborhoods. Why do SEHSs lower GPAs for students from low-SES neighborhoods while having little effect on test scores? We think it is likely because grades are a relative measure and students admitted from the lowest-SES neighborhoods are, on average, the lowest-achieving students in selective schools. It could also reflect something about school practices, such as biases in grading or lack of academic supports for students who need them. Ultimately, the negative impacts on GPA may explain the result that admission to an SEHS reduces the probability that a student from a low-SES neighborhood attends a selective college, a finding that is particularly troubling.

Our data on college selectivity are based on where students enroll in college. We do not have information about where students apply or where they get in. As a result, we cannot determine whether the difference in the effect of SEHSs on the probability of enrolling in a selective college is driven by differences in where students are admitted to college, where they apply, or where they ultimately decide to enroll. For marginal students admitted to SEHSs from the lowest-SES neighborhoods, their average grade 11 GPA—the GPA used on college applications—is around 2.50, which may be close to a cutoff for admissions or scholarship eligibility. If that is the case, these students may not be admitted to selective colleges, or they may become ineligible for merit-based scholarships, which are likely especially important for these students. Further, there is a push for colleges to rely less on test scores and weigh other measures, such as grades, more heavily. This “test-optional” movement may have the unintended consequence of penalizing students such as those admitted to SEHSs from low-SES neighborhoods: otherwise qualified students with relatively lower grades. In addition, we do not know how counseling resources at high schools are allocated or if counselors are encouraging relatively lower-performing students to apply to a different set of colleges than relatively higher-performing students. At the same time, students from lower-SES neighborhoods may rely more heavily on college counselors at high schools for advising.

Whether or not historically disadvantaged students can benefit from high-performing school environments has received national attention. In the US Supreme Court case *Fisher v. University of Texas* challenging the University’s use of race in admissions decisions for students outside of the top 10 percent of their high school class, Justice Scalia speculated that affirmative action admission policies might result in some minority students gaining access to colleges that are too rigorous for their level of preparation or previous academic successes. The tier system in CPS puts into place admissions quotas based on students’ neighborhood SES, which result in affirmative action in high school admissions by neighborhood context. We do not believe that it is the case that students from low-SES neighborhoods cannot do well in elite public school programs. In fact, there is no evidence of reduced learning, as measured by test scores, for students from low-SES neighborhoods. On a less objective measure of academic performance—grades—students from low-SES neighborhoods do not perform as well, which may in turn explain why they are less likely to attend selective colleges. The findings in this paper may be consistent with mismatch between students from low-SES neighborhoods and selective high schools. Arcidiacono et al. (2011) argues that a necessary condition for mismatch to occur is that the selective institutions possess private information which if revealed would change a student’s choice about where to enroll in school. There is much less scope for CPS to possess private information, given the transparency of the admissions process; however, it may be the case that parents and students do not fully understand how relative ranking translates into GPA and, potentially, selective college enrollment. That said, academic outcomes are only one dimension of the high school experience, and parents and students may be selecting on other dimensions as well. Without understanding more about even longer-run outcomes or what might be driving the selective college enrollment result, it is difficult to assess the extent to which this is a mismatch story.

One could conclude from these results that CPS should do away with SEHSs because they have no impacts on student achievement outcomes and yet they increase uncertainty and stress for parents and children, attract high-achieving students away from other high school programs, and require the district to administer entrance exams and operate an admissions system. At the same time, these schools serve the additional goal of creating more diverse schools than generally arise in a neighborhood school system. It may also be the case that high-achieving students from low-SES neighborhoods benefit from access to the social capital generated by parents and communities that have more economic and social resources to support schools. Another potential benefit of offering selective schools as part of a portfolio of high school options is that SEHSs may attract or retain families who would otherwise leave the district for private schools or suburban districts. Retaining families could ultimately benefit districts in terms of financial and nonfinancial resources by increasing the tax base and the social capital of families with children in the public schools. How families respond to the various schooling options they face is an important area for further study and one that should certainly be investigated as it relates to selective schools.

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