Does School Choice Attract Students to Urban Public Schools?

Evidence from over 1,000 Randomized Lotteries*

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Abstract

School choice programs are an increasingly popular strategy employed by urban school districts seeking to attract and retain high ability and middle class students in the public school system. To test the effectiveness of this strategy, we utilize detailed administrative data from the Chicago Public Schools (CPS) that includes over 1,000 lotteries determining admission to magnet programs and schools. Those who win a lottery are on average six percentage points more likely to enroll in CPS the following year. The impact of winning a lottery is increasing in the competitiveness of the lottery and average achievement at the school. The effects are much larger for White students, those currently not attending CPS, and those not admitted to any other sought after schools.

I. Introduction

Beginning in the1960's, large urban public school systems experienced an exodus of middle and upper income students and Whites (Clotfelter, 1979). This trend, driven by both residential and school sector choice, has not reversed and has led to a striking concentration of poor and minority students (Clotfelter, 2001). In the 1999-2000 school year, nearly 70 percent of students attending the ten largest urban school districts were eligible for free or reduced-price lunch. And, Whites accounted for just 13.4 percent of students enrolled in these ten public school districts, in spite of the fact that Whites comprised an average of 43.3 percent of city residents in these same cities.[1]

The disproportionate representation of poor and minority students in public school systems raises a number of concerns. First, to the extent that peer effects are an important input into the education production function, those students who remain behind in the public schools may suffer. There may also be indirect benefits to integration that are sacrificed.[2] Second, the loss of more advantaged student residents to the private sector can reduce voter support for public schools (Barzel, 1973). There is evidence that racial and ethnic mismatch between recipients of public expenditures and those who are taxed to pay for them reduces the level of public goods provided (Luttmer, 2001; Poterba, 1998). Finally, from the perspective of city government, migration of high-income residents to suburbs due to low quality city schools potentially lowers property values and reduces the city tax base. Given that a significant share of school funding is raised locally, the declining tax base has potentially pernicious effects on city educational expenditures.

[1] This calculation excludes mixed urban/suburban districts. The ten districts included are New York City, Los Angeles Unified, Chicago, Houston, Philadelphia, Detroit, Dallas, San Diego, Baltimore, and Milwaukee. In only one of the ten largest urban school districts (San Diego) did minorities comprise less than 80 percent of enrollment. These data are based on a statistical report from the National Center for Education Statistics (Young, 2000).

One of the primary responses of urban school districts to these issues has been to institute parental/student choice within the district, while creating specialized schools and programs designed to appeal to high income and high ability students. In this paper, we examine the degree to which the creation of magnets in the Chicago Public Schools (CPS) has succeeded in its goal of retaining talented students. CPS has been one of the most aggressive school districts in the country in instituting magnet schools. Since 1980, when the district became subject to a desegregation consent decree, the number of magnet schools and schools offering magnet programs has grown to over 240 at the elementary level and over 40 at the high school level. Over one third of students attend schools other than their default neighborhood school.

To answer the question of whether the system of school choice keeps students in the CPS, we exploit the fact that admission to many of the schools in the system is done by lottery. Interested students submit an application, and if the school is oversubscribed, slots are allocated randomly. With the cooperation of the school district, we have been able to assemble a unique data set that contains the universe of student applications to schools and programs for the school years 2000-2001 and 2001-2002 (more than 180,000 student applications). The data include the lottery outcome for each of those applications, information on where the student actually enrolls, and detailed student information including demographics, school performance, and census tract of residence. In total, we have more than 1,000 separate, independently performed lotteries that provide the identifying variation for our analysis.

The fact that these lotteries induce true randomization provides many advantages. First, the analysis we present can be extremely simple, based on comparisons of means. In principle and in practice, controlling for other characteristics will have little impact on any conclusions drawn. Second, because of the randomization, we are immune to many of the standard empirical

[2] See Poterba (1996) for a general discussion of the justification for public provision of education.

concerns that arise. For instance, sample selection in terms of which students choose to apply to a particular school will not bias our estimates, since among the applicants to a given school, those who win or lose the lottery will on average have the same characteristics. Nor will missing or incomplete data on student applications to other schools create a problem, as long as the data are complete with respect to a particular lottery. Finally, because we have the luxury so many separate randomizations, we are able to estimate a much richer set of parameter estimates than would be possible with just a single lottery. For instance, we can estimate the impact of winning a lottery on enrolling in CPS the next year as a function of the characteristics of the particular program.

We find that those who win a lottery are on average six percentage points more likely to enroll in CPS the following year. For students not enrolled in the CPS at the time of the application, the effect is 12.5 percentage points, suggesting that magnet schools play a larger role in attracting students than in retaining them. The impact of winning a lottery is increasing in the competitiveness of the lottery and average achievement at the school. The effects are much larger for White students and those not admitted to any other sought after schools.

An important caveat to interpreting our results is that we are only able to estimate the partial equilibrium effect of the choice program on enrollment across sectors. This may over- or under-state what the effect would be if initial residential location and school quality were treated as endogenous. For example, if the introduction of a choice program increases the quality of certain public schools, then one might imagine that selection to these schools would have a larger effect on enrollment. If choice increased the quality of all public schools, then selection to a lottery school may have a smaller effect on public school enrollment since the alternative public option may still dominate the private option.

The remainder of the paper is structured as follows. Section II presents a brief literature review. Section III describes our estimation strategy capitalizing on the lottery randomizations. Section IV provides background on magnet schools in CPS, the lotteries, and the administrative data we have obtained. Section V presents the empirical findings. Section VI, which is more speculative, extends the analysis beyond the simple parameter estimates to conjecture about the overall impact that the presence of magnet schools may have on the composition of CPS. Section VII concludes.

II. Literature Review

There is a well-developed literature broadly analyzing factors affecting families' residential and schooling choices. Since introducing more public school options alters the characteristics of a student's choice set, studies that consider how these characteristics affect enrollment choice provide indirect evidence on how the CPS system might be expected to affect enrollment patterns. However, a much smaller set of studies has directly considered the role of the degree of public school choice.

Two of the relevant empirical papers are based on the traditional system of Tiebout-style school choice. Martinez-Vasquez and Seaman (1985) and Figlio and Stone (2001) find that more school districts per SMSA and per county, respectively, reduce rates of private school enrollment. The former study also finds that within district choice, as measured by the number of schools per district, is negatively associated with the rate of private school enrollment. The latter study finds that the negative response to public sector concentration is strongest for high-income students and students with highly educated parents.

We are aware of only one study that considers non-traditional public school choice from this perspective, and this descriptive study also analyzes the CPS.[3] Allensworth and Rosenkranz (2000) find that leave rates for high-achieving students between 7th and 9th grade (excluding dropouts) fell from 27% in 1995 to 17% in 1999, at the same time leave rates dropped by only 1 percentage point for below average students. There is some evidence that this was tied to the openings of magnets targeted specifically to high-achieving students at the high school level. For example, the timing of the decline in leave rates from the CPS across regions within Chicago corresponds to the relative timing of openings of the new selective high schools. These authors also find that the trend toward decreased numbers of students enrolling in CPS high schools from private schools appeared to be slightly stemmed by the introduction of the new schools. The question that we are able to convincingly answer is more partial equilibrium, since we hold the pattern of choices that exists constant when asking how gaining access to a sought after public school affects the choice to remain in the CPS.

III. Empirical Strategy

The key difficulty with identifying the causal impact of magnet school availability on a student's decision of whether to remain in the school district is the correlation between program participation and unobservable student characteristics. When a randomized lottery is used to determine which students can attend a particular magnet school, estimation of the causal effect of being admitted to that school is straightforward. Define y_i to equal one if student *i* enrolls in CPS, and zero otherwise. Let W_{ij} be an indicator that reflects student *i*'s outcome in lottery *j*,

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[3] Note that any study that has estimated the effect of lottery selection into a public choice school of some form on achievement has to have addressed this question to determine whether attrition from the sample through exit from the system could bias the results.

with $W_{ij} = 1$ if student *i* enters the lottery and wins, and $W_{ij} = 0$ if the student enters the lottery and loses. Let X_i and μ_i respectively represent observable and unobservable characteristics of student *i*. Finally, define δ_j to be the impact that being able to attend school *j* has on the students who enter the lottery.

Because lottery outcomes are randomly assigned, winners and losers of a particular lottery have the same set of background characteristics on average:

$$E[X_i \mid W_{ij} = 1] = E[X_i \mid W_{ij} = 0] \text{ and } E[\mu_i \mid W_{ij} = 1] = E[\mu_i \mid W_{ij} = 0].$$

Consequently, a simple difference of mean enrollment rates between students who win and lose lottery *j* provides a consistent estimate of δ_j, or,

$$E[y_i \mid W_{ij} = 1] = E[y_i \mid W_{ij} = 0] = \delta_j. \qquad (1)$$

One can also condition on observable student characteristics X_i in constructing the estimate:

$$E[y_i \mid W_{ij} = 1, X_i] = E[y_i \mid W_{ij} = 0, X_i] = \delta_j. \qquad (2)$$

In large samples, the estimated δ_j's will be the same with and without conditioning on observables. In small samples such as ours, controlling for observable characteristics will correct for any imbalances that arise on these dimensions in a particular draw. Importantly, note that the parameter estimate is consistent even if a highly select group of students enter a lottery, or we are missing background information on students or information about what other schools a student may have applied to or been accepted to. As long as we know which students entered this lottery, whether they won or lost the lottery, and whether they enrolled in CPS, the absence of any other information is irrelevant to the consistency of the estimate.

In the presence of *J* independently conducted lotteries, we will generate *J* different estimates δ_j that capture the marginal impact of being admitted to the school represented by lottery *j* on the enrollment decisions of the set of students who entered the lottery. Unfortunately, because of the relatively small number of students involved in any particular lottery (the median lottery in the sample involves 35 applicants, 6 of whom win the lottery and are eligible to attend the school), the standard errors on the individual δ_j's are too large to make these estimates individually useful. Thus, in practice it is necessary to pool information across lotteries. Letting σ_j^2 denote the variance of the estimate of δ_j, then for whatever subset *K* of lotteries being considered, the average estimated impact of being allowed to attend the schools represented by those lotteries is:

$$\hat{\delta}_K = \Delta_K{}' \Sigma_K \ ,$$

where $\hat{\delta}_K$ is the point estimate, Δ_K is a *K*x1 vector of the subset of the estimated δ_j's and Σ_K is a *K*x1 vector of weights, with weights given by $W_j = \dfrac{w_j}{\sum_J w_j}$ where $w_j = \dfrac{1}{\hat{\sigma}_j}$. Because each of the lotteries is conducted independently, the standard error associated with $\hat{\delta}_K$ can be derived directly from the σ_j^2's since the covariances across lotteries is zero.

There are many different subsets of lotteries that may be of interest to analyze. For instance, winning a lottery may have differential impacts on student enrollment as a function of a how competitive admission to a school is, the quality of peers at the school, the student's grade, the type of school, etc. In addition, since all of the lotteries we examine are done separately by race and gender, one can estimate the relative responsiveness of Blacks versus Whites or Hispanics, or of White males relative to Black females.

The approach described above cannot, however, be used to separately estimate differential responses of students as a function of characteristics that vary within a lottery. For instance, one cannot compare $\hat{\delta}_K$'s for middle income and low income students in this manner because the coefficient estimated is identified at the level of the lottery, not of the individual student. Because students non-randomly select into lotteries and win probabilities vary across lotteries, one cannot simply take a weighted average of estimated coefficients across students involved in the lotteries.

Nonetheless, it is possible to estimate these desired parameters in a slightly different manner. Let x_i represent a particular observable characteristic of students that takes on a finite set of values—for example, whether a student lives in a high, medium, or low income census tract or how many other schools in CPS that the student applied to granted that student admission. Then, by comparing outcomes within lotteries for only the set of students who have identical values of x_i, one can estimate the impact of winning the lottery on that sub-group of students. More formally, define $\hat{\delta}_{jz}$ as the estimated impact of winning lottery j for students with $x_i = z$. Then, as was the case for the lottery as a whole, a simple difference of means for the subset of students with that specific characteristic that win and lose the lottery provides a consistent estimate.

$$E[y_i \mid W_{ij} = 1, x_i = z] = E[y_i \mid W_{ij} = 0, x_i = z] = \delta_{jz}\,. \qquad (3)$$

Equation (3) is identical to equation (1), except that the means of the enrollment rates are conditional on a student having the value z for characteristic x_i.

Following the same logic as earlier, it is possible to aggregate these coefficients estimated from one particular lottery across many lotteries. For instance, one can estimate the average effect of winning a lottery conditional on factors such as a student not being admitted to any other magnet programs in CPS, applying to more than five magnet programs, living in a high income census tract, or living close to a catholic school. Because we have so many lotteries available to us, it is possible to estimate an extremely rich set of parameters, something that is often not possible with typical applications of randomized experiments in the social sciences.

IV. Background on School Choice Program in Chicago

School choice was first instituted in Chicago in response to a 1980 desegregation consent decree with the federal government. The goal of the consent decree was to create schools whose racial composition roughly matched the racial composition of the school system.[4] Since that time, the size and scope of school choice has expanded dramatically. Currently, each student is assigned to a neighborhood school, but can apply for admission to any of the variety of schools and programs, including separate magnet schools, magnet programs within general schools, and career academies.[5] Overall, the number of elementary students taking advantage of school choice has remained relatively constant over the past seven years. In 2000, 29 percent of all elementary students in CPS attended a school other than that to which they were initially assigned. For high school students, the overall numbers exercising choice has changed little, although the number attending selective high schools has increased substantially since 1998 when a number of new college preparatory schools were opened.

In order to attend a school other than the neighborhood school the student is automatically assigned based on place of residence, a student must submit an application in the spring of the preceding year. A student does not need to be currently enrolled in CPS in order to submit an application, and there is no restriction placed on the number of applications an individual student can submit. In most cases, if the number of applicants exceeds the number of available positions, randomized lotteries are used to determine the allocation of spots. For a

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4 At the time, twenty percent of CPS students were White. Now, the fraction White is 10 percent.

5 The precise definitions of these various programs are described in Appendix A.

limited number of programs, typically the most selective, admission is based on criteria such as test scores, and lotteries are not used.

For programs using lotteries, there are explicit rules governing the way in which the lotteries are conducted. Schools first conduct special lotteries for siblings of current students ("sibling lotteries") and for students who live nearby ("proximity lotteries"). Up to 45% of new seats can be reserved for siblings (although typically the actual fraction of siblings is far below this cutoff) and up to 30% of new seats can be reserved for neighborhood students.[6] All other students are entered in a general lottery for remaining slots. Because of desegregation goals and variation in the number of available slots at different grade levels, separate lotteries are conducted for each gender x race x grade combination. In addition, there are also special proximity lotteries for students who live within a specified distance from the school.

Working with the CPS, we have obtained detailed administrative data on all applications to magnet programs by students in the Spring of 2000 and the Spring of 2001. The application data include the name, race, gender, guardian, date of birth, grade, and home address of each applicant, as well as the program a student is applying to, whether that application was part of a lottery, and if so, the lottery outcome. For students enrolled in CPS at the time the application is submitted, we also have a unique student ID number, which can be linked to a rich set of information about the student's performance in CPS. For students outside the system, there is no unique identifier. For these students, distinguishing whether two applications with minor discrepancies represent the same student (with some typographical errors) or two different students, is not trivial. To resolve this issue, we employ a sophisticated algorithm for

[6] The relevant neighborhoods for elementary and high schools have radii of 1.5 miles and 2.5 miles, respectively. Also, prior to the general lottery, principals can hand select students for up to 5% of seats. However, few principals exercise this option.

probabilistic matching (Citro, Moffitt, and Ver Ploeg 2001).[7] We use this same procedure to match any of these students who ultimately do enroll in the CPS to the administrative records.

Table 1 presents background information on student applications and the resolution of those applications, broken down by grade. There are a total of over 180,000 applications in the data set representing 60,000 different students. More than 40 percent of the applications are submitted by eighth graders trying to gain entry to their preferred high school. A large fraction of applications are also submitted by pre-schoolers seeking kindergarten slots. Other than eighth grade, the application rates steadily decline with the age of the children. Among children who submit an application, the mean number of programs applied to is around three, but lower for high-school students. Overall, one-third of the applications are from students that are not currently enrolled in CPS. This percentage varies dramatically by grade. For instance, less than one-fourth of pre-schoolers submitting applications are in a CPS pre-school; in eighth grade, more than 90 percent of applications are from students in the system.[8] Columns 4 and 5 of Table 1 report the number of applications that are resolved by lotteries and the percent of children applying to at least one lottery. Lotteries are used to allocate slots on more than half the applications. A much greater fraction of elementary applications are decided by lotteries than high school applications for two reasons. First, there are a greater number of test-based schools at the high school level. Second, more of the applications at the high school level involve

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[7] The matching was done based on soundex names of student and guardian, birthdate, race, and gender, and was performed by Bong-Joo Lee of Chapin-Hall using a sophisticated software package (Automatch) designed for probabilistic matching. First, all application records attributable to the same student were linked using own name, guardian name, birth date, race, and gender. Then, the same method was used to link applicants that ever enrolled in the CPS to their CPS IDs in administrative enrollment files dating from 1991 through 2001. For those students who have a CPS student ID in the magnet school data in 2000, 95.66% were successfully matched to a student ID in the concurrent CPS enrollment file. Of these linked pairs, 97.25% had agreement between the CPS ID identified in the magnet data and the CPS ID identified from linking using the probability method. The results were comparable in 2001. For a detailed description of the matching process, see "Data Collection and Research Issues for Studies of Welfare Populations" in C.F. Citro, R. Moffitt, and M. Ver Ploeg, eds., Panel on Data and Methods for Measuring the Effects of Changes in Social Welfare Programs (Committee on National Statistics, 2001).

students applying to a general high school different than their neighborhood school and such schools tend not to be oversubscribed.[9] The final column shows the fraction of children selected in at least one lottery (among those applying). Roughly one-quarter to one-third of students who apply to lotteries are selected in at least one. Applicants from pre-school and eighth grade have greater success in the lotteries, because available spaces in other grades are determined by largely student mobility and transfers.

Table 2 categorizes the application data by school type. Results are presented for all applications, as well as for those applications resolved by lotteries. Each row corresponds to a cluster of grades. The entries in the table are the percent of applications within each cluster of grades that are made to the type of school named (see the appendix for a more detailed description of the school types). Within each row, the numbers sum to 100 percent.

For elementary students, there are three kinds of test-based programs (classical schools, regional gifted centers, and scholastic academies). These programs attract about 20 percent of the applications. Because they are test based, lotteries are not used. For non-test based schools, the majority of applications are made to magnet schools, but there are also substantial numbers of applications to other schools. Roughly one-third of applications are to regular magnet schools (i.e., those subject to the consent decree which mandates racial composition guidelines), about 15 percent are to other magnet schools that are not subject to desegregation requirements and the remaining 27 to 33 percent of applications are to other elementary schools. When students apply to these other schools, they generally apply to specific magnet programs within the schools.

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[8] The raw number of applications from outside the system is much higher in 8th grade than the surrounding grades, but in percentage terms the outside applications are swamped by the large number of inside applications.

[9] Students may apply to general schools for a variety of reasons—a particular school may be closer to their home than their assigned school, their friends may be attending these schools, one school may have been recommended by a teacher or counselor.

For secondary students, roughly 20 percent of applications are made to selective admission schools, which do not have lotteries. More than half of high-school applications are to general schools, with about 14 percent to magnet schools and an additional 14 percent to career academies. Career academies and many general high schools typically do not hold lotteries because they are not oversubscribed. However, because applications to general schools outnumber applications to magnet schools, 70 percent of high school applications decided by lottery involve general schools.[10]

As would be expected, students who submit applications are not random subset of those currently enrolled in CPS, as demonstrated in Table 3.[11] Because most of the applications are submitted by young students and eighth graders, we limit the sample to those groups. Although White students represent only ten percent of those attending CPS, they make up 17.7 percent of those submitting applications and 22.4 percent of students applying to test-based schools. Asians are similarly over-represented in the application pool. Hispanic elementary-school students submit relatively few applications, especially to the test-based schools. Male and female students are equally represented in the applicant pool in the early grades, but by high school girls are more likely to apply, both overall and at test-based schools.

Table 4 explores the competitiveness of lotteries for different groups of applicants. The top row of the table reports the average win percentage for various categories of students. The remaining rows of the table show the distribution of win percentages by lottery. Looking first at the sample as a whole (column 1), we see that slightly less than twenty percent of applications to lotteries are winners. In 38.3 percent of all lotteries, not a single application is accepted. In an

[10] In some cases, general schools may house specific magnet programs within them. With the data we have, we cannot easily distinguish the exact program a student is applying to. We know which children were part of the same lottery, we just do not know precisely what the lottery is for.

additional 30.7 percent of lotteries, fewer than one in ten applicants are admitted to the school. It is rare for the majority of students in a lottery to be successful, except that in almost 12 percent of lotteries all applicants are winners. White and Asian students enjoy the highest success rates (24 and 24.6 percent respectively), because desegregation quotas provide more spots available per White or Asian applicant than per Black applicant.[12] Winning percentages in secondary school lotteries (roughly one-third of applicants accepted) and pre-school lotteries (slightly less than one in five accepted) are much higher than for kindergarten to 7th grade (10-13 percent) because availability in these intermediate grades is determined largely by student mobility. Although not shown in the table due to space considerations, male and female applicants have similar success rates.

To more carefully explore the factors determining the competitiveness of a lottery, Table 5 presents regression estimates of the selectivity of lottery. In all cases, the unit of observation is a student application, although standard errors are adjusted to account for the clustering of errors within lottery. The table shows OLS estimates although Probit models were estimated when appropriate and yielded comparable results when evaluated at the mean. Columns 1 and 2 respectively examine the probability that an application was part of a lottery in which no applications were selected and in which all applications were selected. The dependent variable is column 3 is the mean selection rate. Column 4 replicates this model, but excludes all lotteries with no variation in terms of selection.

The race and grade patterns seen in Table 4 are apparent here as well. Applications by White and Asian students are about 12 percentage points more likely to be in lotteries with 100

[11] In future drafts, we will analyze the characteristics of applicants in more detail, but this requires geo-coding the applicant addresses, which we have not yet completed.

percent selection rates compared with Black applicants. Hispanic applications are 5 percentage points more likely to be part of such lotteries and Native American applications are nearly 30 percentage points more likely. Compared with applications to kindergarten, applications to high schools are 7.8 percentage points *more* likely to be in lotteries where all students were selected and 21.8 percentage points *less* likely to be in lotteries where no students were selected. However, if we look only among lotteries with some variation in selection, we see that those lotteries involving secondary students had selection rates 12.6 percent *lower* than those involving pre-schoolers. This suggests that among non-degenerate lotteries, those for spots in high school were considerably more competitive than lotteries for elementary school spots.

More interestingly, we see a strong relationship between lottery selectivity and various school level factors. Lotteries to schools with higher average achievement are more competitive while lotteries to schools with higher proportions of minority or low-income students are less competitive. Indeed, in column 4 we see that applications to schools with average achievement levels one standard deviation above the system mean are face a selection rate of 11.4 percent lower than those to schools with an average achievement level. Finally, lotteries for schools in higher income neighborhoods are more competitive than others, conditional on the average achievement, poverty level and racial composition of the school itself. This is consistent with parental/student concern for safety.

Finally, Table 6 arrays students according to the number of applications submitted (rows) and number of applications accepted (columns). Note that this simple matrix does not control in any way for the types of programs a student applies to, the competitiveness of those programs, or whether an application is resolved by a lottery. As such, these results are meant only to be

[12] As a result of legal challenges, race-based quotas were eliminated for the lotteries performed in the Spring of 2002 for admission in the Fall of 2003. Those data are too new to be in our data set, but the legal change offers a

suggestive. We report both the number of students in each cell, as well as the percentage of these students who are enrolled in CPS the following year. Almost half of the students apply to a single school, and roughly one-fourth of those students are accepted. The enrollment rate in CPS for those who are rejected is 66.0 percent; for those who are accepted the number is 81.2. For students who apply to more than one school (the other rows of the table), there is always a jump between those with no acceptances and those with more than one acceptance. Moving from one acceptance to multiple acceptances, however, the pattern is less clear.

V. Empirical Results

In our empirical analysis, we utilize only the variation that comes from lottery randomizations. Table 7 outlines the steps that take us from the full set of applications to the subset of data used in the estimation. Numbers are presented for all grades combined, and separately for elementary school and high school. The top two rows of the table are simply the total number of applications and lotteries. As noted earlier, somewhat more than half of all applications are decided by lottery, although a larger percentage of elementary applications involve lotteries.[13] However, a relatively large number of lotteries are degenerate in the sense that either all the students involved are accepted or all the students involved are rejected. Since these lotteries provide no useful variation to the analysis, they are dropped from the sample. This eliminates about half of the total application and about 80 percent of the lotteries. Finally, we eliminate any lottery in which students reported to have been part of the lottery differ in race, gender, or grade. For the subset of schools that are governed by the consent decree, this should

potentially interesting source of variation for future research.

[13] It should be noted that we use the information about the resolution of applications not decided by lotteries to characterize students later in the analysis, but the identification of our parameters relies solely on the lottery outcomes.

never occur. For other schools, these may be valid lotteries, but we nonetheless err on the side of caution in removing these 200 lotteries and 11,000 applications from the sample. Thus, our final sample consists of 39,092 applications encompassing 1,126 lotteries. Over 80 percent of these lotteries are for elementary grades, but because the number of students per lottery is so much higher in the high schools (105 versus 21), the total number of applications in our final data is roughly equal across the two groups. The bottom panel of the table provides additional information about the outcomes of the lotteries. On average, there are about 35 students per lottery, of which less than 6 are selected. The median lottery, however, has only 12 applicants and two winners. The number of students assigned to wait lists is similar to the number of winners. In practice, however, it is rare to be accepted off a wait list and there is little difference in enrollment rates between students rejected and waitlisted. Therefore, in all of the analysis that follows, we combine those students on the wait list with those rejected outright.[14]

Because the analysis that follows relies heavily on the assumption that the lotteries generate true randomization, it is important to establish whether the lotteries actually appear valid. If the lotteries were conducted properly, then one would predict that the winners and losers of a given lottery, on average, will be perfectly balanced on all pre-determined characteristics. To test that prediction, we run the following regression

$$Y_{ij} = \delta(Select_{ij}) + \Gamma(Lottery) + e_{ij},$$

in which j indexes applications to the J lotteries and i corresponds to a student. The dependent variables are any background characteristic available in the data. *Select* is an indicator variable equal to one if this application wins the lottery and zero otherwise. *Lottery* is a vector of indicator variables, one for each lottery held, and is equal to one if an application is part of that

[14] We have formally examined the effect of being waitlisted in a lottery and found no significant impact on enrollment.

lottery and zero otherwise. Controlling for the lottery to which a student applied, there should be no systematic relationship between winning the lottery and any background characteristic. Thus, for valid lotteries we expect $\delta = 0$.

Table 8 presents the results from testing that prediction. At the present time, we have quite limited information on applications that are from students outside the CPS. In fact, the only information that we currently have on all applicants is age, race, gender, grade and whether or not they were enrolled in the CPS at the time of application. Because the lotteries we examine are stratified on the basis of grade, race and gender, these characteristics are not useful in testing the validity of the lottery. Thus, for most of our tests we are restricted to a comparison of winning and losing students among those already enrolled in the CPS. (We are in the process of geo-coding student addresses from the applications, which will provide census block level information for all applicants.) The first column reports the mean value for students who were not selected in the lottery. The second column presents the coefficient and standard error of β from the regression described above.

Of the seventeen background characteristics examined, in none of the cases is the difference between winners and losers significant at the 0.05 confidence level. Also, winners look slightly better than losers on some characteristics (math scores, free and reduced lunch eligibility, household income in the census tract) and slightly worse than losers on a range of other variables (reading test scores, more likely to live in foster care). Thus, there is little evidence that the lotteries were systematically biased in any particular dimension.

Figure 1 presents the first set of results corresponding to the estimated impact of winning a lottery on being enrolled in the CPS. This figure shows a kernel density plot of the distribution of the 1,126 separate $\delta's$ we estimate, one for each of the valid lotteries. These estimates are based off simple comparison of means and the density is generated weighting each estimate with the inverse of the standard error of the estimate. The distribution is single-peaked, with the median and mean estimate both around 0.06.

Because the parameter estimates emerging from single lotteries are not very precise, it is useful to aggregate the information across lotteries to find the average impact of winning a lottery by different student and/or lottery characteristics. These results are presented in Table 9. Rows of the table correspond to different subgroups of students. The first column of the table provides estimates for all students in that subgroup; the remaining columns report the impact of winning a lottery for those students who were and were not enrolled in the CPS at the time of their application. We would expect that the impact of winning a lottery to be less for those students already enrolled in the CPS, because their enrollment likely reveals something of their preferences along with the fact that there are likely greater costs involved in moving out the public school system (i.e., the child would have to adjust to a new school setting). In the first row, we see that winning a lottery increases the likelihood of enrolling in the public schools by 5.9 percentage points on average. Among students enrolled in the CPS at the time of their application, the impact is only 2.3 percentage points (less than 3 percent). However, among those students who were not enrolled in the CPS at the time of their application, winning a lottery increases the probability of enrolling in the public school system by 12.5 percentage points, given a baseline rate of 41 percent for those who do not win a lottery (i.e., a 30 percent increase).

Since the majority of applications from outside the CPS involve students applying to kindergarten or to 9th grade, one might question whether this is merely a composition effect driven by differential effects across grade levels. Rows 2-6 address this question, presenting separate estimates across grade levels. Focusing on the estimates for all applicants, we see that winning a lottery has a considerably larger impact for students applying to kindergarten than to other grades. This is consistent with the fact that students entering the school system have more flexibility in choosing a school than those who have already invested in a particular school in the CPS. Looking across to columns 2 and 3, we see that both the across grade pattern and the effect of applying from outside the CPS remain robust, although they change somewhat. Among students who were not enrolled in the CPS at the time of their application, the effect of winning a lottery has the largest impact on students applying to kindergarten and 9^{th} grade. The effect for students applying to 9^{th} grade is particularly strong—winning a lottery increase the likelihood of enrolling in the CPS by 19 percentage points, or roughly 42 percent. Among students applying from within the CPS, on the other hand, there is no statistically significant effect for students applying to grades one to nine. The point estimate for students applying to kindergarten is a modest 5.4 percentage points, but is only significant at the 10% level.

There also appear to be interesting patterns of effects by student race. Winning a lottery has twice as large an effect on enrollment rates among whites than any other group. For example, lottery selection increases enrollment rates by 11 percentage points for whites compared with roughly 5 percentage points for Blacks and Hispanics and only 3 percentage points for Asians. This difference is driven largely by students who are applying from within the CPS, suggesting that white students are capable and/or interested in leaving the public schools if they do not have a desirable option within the public system.

It is also possible to compare effects across students who were accepted to different numbers of schools. If a student had been accepted to other schools in the CPS (either through lotteries or through a selective admissions process), we would expect that winning an additional lottery would have a smaller effect on the student's likelihood of enrollment. Indeed, if a student was accepted to zero other schools, winning a lottery increases his likelihood of enrolling by 8.2 percentage points. In comparison, if the student had been accepted to at least one other school, winning the lottery only increases his or her enrollment probability by 2.6 percentage points.

The bottom panel of Table 8 examines the enrollment effects by school characteristic. We expect that winning a lottery to a high-achieving or highly selective school should have a larger effect than winning a lottery to a lower-achieving or less selective school. In fact, this appears true in our data. Winning a lottery in which over 50 percent of applicants are selected, or to a school that scores below the system average in terms of academic achievement, has no significant effect on enrollment. In contrast, winning a lottery to a school two standard deviations above the mean in terms of student achievement increases the likelihood of enrollment by 12.2 percentage points. Winning a lottery in which fewer than 10 percent of students are selected raises the likelihood of enrollment by 9.7 percentage points. Finally, winning a lottery to a magnet school, as opposed to a magnet program within a general school, has a larger effect on enrollment rates.

Section VI: Assessing the overall impact of school choice on the composition of Chicago Public Schools

The results of the previous section provide a rich portrayal of the dimensions along which the impact of winning lotteries influences enrollment in CPS. These point estimates alone, however, do not fully answer the question of ultimate interest: how successful has the system of school choice instituted in Chicago been in attracting and/or retaining high-ability students, middle and upper income families, and Whites to the city's public schools?

It is impossible to provide a definitive answer to that question based on the evidence in this paper for a number of reasons. First, our estimates are based only on the subset of schools in which lotteries are utilized to determine student assignments. Although the great majority of choice-based schools utilize lotteries, the highest-achieving, most highly sought after schools base admissions on test scores. For those schools, we do not have a direct estimate of how admission influences enrollment.[15] Second, all of our estimates are decidedly partial equilibrium in nature. Our analysis sheds light on the impact of winning a lottery *conditional* on the existing set of alternative options both within and outside the CPS. If the system of school choice did not exist, the degree of Tiebout sorting within Chicago would likely increase as motivated parents sought access to the best neighborhood schools. The quality of local schools may also be different. Local schools would be expected to cater more toward higher-ability students on average, since the best students would not be siphoned off to the magnet schools (Cullen, Jacob, and Levitt 2001). On the other hand, the level of competition across schools might be lower, leading to less efficient production of educational outcomes. In the absence of school choice, a richer set of private school alternatives would be expected to arise. Finally, lottery outcomes capture only the direct impact of admission to a school on a child's enrollment decision. There may also be indirect effects of having high-quality schools available. For instance, there might be option value associated with the presence of magnet schools. Even if their children never end up attending a highly selective school, parents might be more willing to start their children in CPS knowing that alternative exists if their children turn out to be academically talented.

[15] On the other hand, there is also substantial exercise of school choice by students who choose to attend local schools other than the one they were initially assigned. Such schools are rarely oversubscribed. As a consequence, no lotteries are performed. Given the fact that we find such small impacts on enrollment among students currently in CPS and for lotteries at low-achieving and general schools, we view this aspect of school choice as unlikely to have large impacts on overall enrollment.

For all of the above reasons, the calculations we make in this section are highly speculative. We regard the estimates that follow not as precise predictions of a counterfactual in the absence of school choice, but rather suggestive evidence about the directions and possible order of magnitude of the changes that might have occurred.[16] (RESULTS TO BE ADDED)

VII. Conclusions

In this paper, we exploit the unique opportunity to observe more than 1,000 lotteries to estimate the responsiveness of enrollment decisions to admission to choice-based schools in CPS. We find that winning a lottery increases the probability of enrolling in the public schools by an average of six percentage points. This effect is driven largely by students who apply from outside the CPS (i.e., most often students who are either entering school for the first time or applying from a private school in the Chicago area) that are over 12 percentage points more likely to enroll in the public schools if they win a magnet school lottery. White students are generally more responsive than other students, as are students who are not accepted into any other alternate schools. Winning a lottery to a highly selective school or a school with a high average achievement level has an effect more than double that of winning a lottery to a less selective school.

In its current form, this paper focuses on one of the oft-stated goals of school choice, namely keeping talented and middle-income students in the system. One of the limitations of the paper is that it provides partial equilibrium estimates. In future work, we plan to examine the general equilibrium effects of school choice by looking at changes in public versus private

[16] In related work that we have yet to complete, we have begun to examine the time-series evidence on the impact that opening new magnet schools has on attracting and retaining students. Allensworth and Rosenkranz (2000) discuss this issue as well.

school enrollment in Chicago during the late 1990s when a number of selective high schools opened in the CPS.

Another aspect of school choice that we do not address, however, is its impact on student achievement. Proponents of school-choice argue that it leads to better educational outcomes for high-ability students, and possibly for all students. Critics worry, on the other hand, that those students most at risk are hurt by a system of school choice.

In future research, we hope to exploit the lottery randomizations to address this issue as well. One difficulty with this strategy is precisely that winning lotteries influences the enrollment decision. Since we do not observe educational outcomes for students outside CPS, sample selection issues become important. Given that we find extremely small, statistically insignificant enrollment effects for students in grades three to eight who apply from within the CPS, achievement estimates for this sample are unlikely to be seriously biased by sample selection. In order to examine achievement effects for the remainder of our sample, we hope to obtain educational outcome measures that that are available for students outside the CPS, such as performance on test administered exams, graduation rates and college attendance information.

References

E. Allensworth and T. Rosenkranz. 2000. Access to magnet schools in Chicago. Consortium on Chicago School Research report (August).

Y. Barzel. 1973. Private schools and public school finance. *The Journal of Political Economy* 81(1): 174-186.

C. Citro, R. Moffitt, and M. Ver Ploeg, eds. 2001. Data collection and research issues for studies of welfare populations (Committee on National Statistics, Panel on data and methods for neasuring the effects of changes in social welfare programs).

C. Clotfelter. 2001. Are whites still fleeing? Racial patterns and enrollment shifts in urban public schools, 1987-1996. *Journal of Policy Analysis and Management* 20(2): 199-222.

C. Clotfelter. 1976. School desegregation, "tipping," and private school enrollment. *Journal of Human Resources* 11: 28-50.

C. Clotfelter. 1979. Urban school desegregation and declines in white enrollment: a reexamination. *Journal of Urban Economics* 6: 352-370.

D. Figlio and J. Stone. 2001. Can public policy affect private school cream skimming? *Journal of Urban Economics* 49: 240-266.

B. Hamilton and M. Macauley. 1991. The determinants and consequences of the private-public school choice. *Journal of Urban Economics* 29: 282-294.

H. Lankford and J. Wyckoff. 1992. Primary and secondary school choice among public and religious alternatives. *Economics of Education Review* 2(4): 317-337.

H. Lankford, E. S. Lee, and J. Wyckoff. 1995. An analysis of elementary and secondary school choice, *Journal of Urban Economics* 38: 236-251.

J. Long and E. Toma. 1988. The determinants of private school attendance, 1970-1980. *The Review of Economics and Statistics* 70: 351-356.

E. Luttmer. 2001. Group loyalty and the taste for redistribution. *Journal of Political Economy* 109(3): 500-528.

J. Martinez-Vazquez and B. Seaman. 1985. Private schooling and the Tiebout hypothesis. *Public Finance Quarterly* 13(3): 293-318.

T. Nechyba. 1999. A model of multiple districts and private schools: the role of mobility, targeting and private school vouchers. National Bureau of Economic Research Working Paper 7239.

J. Poterba. Government intervention in the markets for education and health care: how any why? In V. Fuchs, ed., Individual and Social Responsibility: Child Care, Education, Medical Care and Long-Term Care in America, pp. 277-304 (Chicago: University of Chicago Press, 1996).

J. Poterba. 1998. Demographic change, intergenerational linkages, and public education. *American Economic Review* 88(2): 315-20.

J. Sonstelie. 1979. Public school quality and private school enrollments, *National Tax Journal* 23: S343-S353.

J. Witte. 1998. The Milwaukee voucher experiment. Educational Evaluation and Policy Analysis

B. Young. 2000. Characteristics of the 100 largest public elementary and secondary school districts in the United States: 1998-99. (Washington, D.C.: National Center for Education Statistics).

Table 1: Distribution of applications

Current Grade	Number of applications	Mean number of applications per child	Percent of applications from children not enrolled in the CPS	Percent of applications involving lottery	Percent of children involved in 1+ lotteries	Fraction of children selected in 1+ lottery (conditional on applying)
Preschool	33,842	3.3	76.3	75.4	82.0	38.3
K - 2nd Grade	37,551	3.5	48.2	71.0	77.8	20.3
3rd - 7th Grades	28,927	3.0	31.2	68.4	67.0	24.1
8th Grade	79,329	2.6	9.1	37.2	59.2	41.5
9th - 11th Grades	1,564	1.8	17.3	30.3	37.0	36.2
Total	181,213	2.9	33.3	56.1	67.1	33.9

Notes:

Table 2: Distribution of applications by school type

	Elementary students						Secondary Students				
	Selective Admission		Non-Selective Admission				Selective Admission		Non-Selective Admission		
Current Grade	Classical school	Regional gifted centers	Academic Centers	Regular Magnets	Magnet wo/ desegreg. Req.	Other	College Prep	Military Academies	Magnet	General	Career Academ y
	All applications (n=181,213)										
PK-2nd	13.1	7.7	0.0	36.1	16.1	26.9	0.0	0.0	0.0	0.0	0.0
3rd-7th	7.3	7.2	6.0	31.5	15.5	32.6	0.0	0.0	0.0	0.0	0.0
8th-12th	0.0	0.0	0.0	0.0	0.0	0.0	18.1	0.5	13.6	53.9	13.9
	Applications involving lotteries (n=101,499)										
PK-2nd	0.0	0.0	0.0	47.6	20.9	31.6	0.0	0.0	0.0	0.0	0.0
3rd-7th	0.0	0.0	0.0	43.9	21.9	34.3	0.0	0.0	0.0	0.0	0.0
8th-12th	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	70.1	0.9

Notes: The category other elementary schools includes IB Prep Schools. The category regular elementary magnet includes schools with and without attendance area boundaries. The cells show the percent of applications to a particular type of school. The columns sum across to 100 percent.

Table 3: Who applies to CPS magnet schools/programs?

	Elementary Students			Secondary Students		
Student Characteristic	1^{st} Grade Students in CPS in 2000	All applicants to K-2	Applicants to at least 1 selective school (K-2)	9^{th} Grade Students in CPS in 2000	All applicants to 9^{th} Grade	Applicants to at least 1 selective school (9^{th})
Student Demographics						
White	0.089	0.177	0.224	0.104	0.126	0.176
Black	0.527	0.540	0.563	0.536	0.518	0.488
Hispanic	0.355	0.200	0.119	0.323	0.301	0.259
Asian	0.028	0.075	0.087	0.036	0.052	0.073
Male	0.516	0.494	0.490	0.515	0.435	0.422
Female	0.484	0.506	0.510	0.485	0.565	0.578

Notes: Unit of observation is the applicant. (student*year). Cells show the fraction of students.

Table 4: How competitive are the lotteries for different groups of students?

	All students	Black Students	Hispanic Students	White Students	Asian Students	Pre-School	Kindergarten-2nd Grade	3rd – 7th Grade	8th –12th Grade
Average Selection Rate	0.193	0.169	0.220	0.240	0.246	0.184	0.104	0.125	0.324
Distribution of Selection Rates (% of applications in various selectivity categories)									
0%	38.3	41.6	29.5	33.8	43.0	26.0	63.4	68.1	6.5
1-9%	30.7	31.2	32.2	29.9	24.6	38.6	21.4	14.0	43.5
10-19%	6.6	6.1	8.3	6.9	4.4	9.7	2.8	2.4	10.0
20-29%	4.5	3.9	7.3	4.2	2.4	6.6	1.9	2.1	6.7
30-39%	3.0	3.0	4.0	2.1	1.9	3.2	1.0	1.8	5.4
40-49%	1.1	0.9	1.6	1.1	0.5	1.7	0.5	0.6	1.4
50-59%	1.2	0.9	0.8	2.8	1.9	1.7	1.1	0.8	1.0
60-69%	1.3	1.0	1.2	2.2	2.1	2.1	0.6	0.4	1.7
70-79%	0.5	0.3	0.6	1.0	1.6	0.8	0.1	0.4	0.6
80-89%	0.8	0.7	0.4	1.5	1.2	0.8	0.5	0.4	1.3
90-99%	0.3	0.1	0.7	0.9	0.2	0.1	0.4	0.1	0.7
100%	11.8	10.4	13.3	13.7	16.3	8.6	6.4	9.0	21.3

Notes: Includes lotteries with valid lottery codes and uses only applications with outcome codes of S, R or W. Includes lotteries with race-sex-grade variation and lotteries with fewer than. All statistics are application weighted.

Table 5: What makes a lottery selective?

Independent Variable	Lottery in which no applications were selected	Lottery in which all applications were selected	% of applications selected in the lottery	% of applications selected in the lottery (excluding cases with no variation)
	Dependent Variables			
White	-0.053	0.116	0.161	0.118
	(0.027)	(0.017)	(0.019)	(0.021)
Asian	0.035	0.126	0.148	0.115
	(0.043)	(0.021)	(0.022)	(0.027)
Hispanic	-0.016	0.050	0.059	0.041
	(0.036)	(0.026)	(0.024)	(0.018)
Native American	0.022	0.296	0.293	0.139
	(0.013)	(0.042)	(0.039)	(0.026)
Male	0.009	0.004	0.009	0.015
	(0.013)	(0.010)	(0.011)	(0.012)
K-2nd Grade	0.372	-0.006	-0.064	-0.019
	(0.031)	(0.011)	(0.012)	(0.013)
3rd – 7th Grades	0.415	0.018	-0.046	0.005
	(0.030)	(0.012)	(0.013)	(0.016)
8th – 11th Grades	-0.218	0.078	0.063	-0.126
	(0.044)	(0.036)	(0.036)	(0.022)
% students in the school eligible for free lunch	0.005	0.004	0.004	0.000
	(0.002)	(0.001)	(0.001)	(0.001)
Average test score in the school (mean zero, sd=1)	0.084	-0.156	-0.179	-0.130
	(0.044)	(0.029)	(0.027)	(0.022)
Average test score squared	-0.011	0.080	0.077	0.016
	(0.009)	(0.012)	(0.011)	(0.007)
% Black and Hispanic students in the school	-0.003	0.002	0.003	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Log of median family income in the school's census block group	-0.019	0.034	0.038	-0.046
	(0.026)	(0.023)	(0.020)	(0.019)
Number of observations	99,340	99,340	99,340	49,113
R-squared	0.310	0.207	0.277	0.267

Notes: All are OLS estimates. Probits evaluated at the mean yield comparable results. Standard errors account for clustering of errors within lotteries. Unit of observation is student*year.

Table 6: The number of observations and the probability of enrollment by the number of schools applied to and the number of schools accepted to

Number of schools applied to	Number of schools accepted to						
	0	1	2	3	4	5+	Total
1	20,857	7,508					28,365
	0.660	0.812					0.700
2	7,086	3,731	705				11,522
	0.714	0.842	0.879				0.766
3	3,880	2,556	933	113			7,482
	0.730	0.841	0.883	0.912			0.790
4	2,175	1,611	832	218	35		4,871
	0.703	0.837	0.869	0.872	0.886		0.784
5	1,292	963	600	226	62	6	3,149
	0.685	0.818	0.890	0.872	0.919	0.833	0.783
6	767	564	401	193	71	16	2,012
	0.647	0.789	0.873	0.860	0.915	0.938	0.764
7	473	352	248	150	65	24	1,312
	0.607	0.793	0.827	0.827	0.831	0.792	0.738
8	274	244	168	105	50	21	862
	0.544	0.754	0.792	0.790	0.920	0.810	0.710
9	201	162	97	72	48	36	616
	0.627	0.691	0.701	0.819	0.896	0.861	0.713
10+	349	363	303	250	159	312	1,736
	0.550	0.667	0.653	0.704	0.635	0.718	0.653
Total	37,354	18,054	4,287	1,327	490	415	61,927
	0.678	0.819	0.853	0.827	0.810	0.749	0.736

Notes: The unit of observation is the student.

Table 7: Descriptive statistics on the lotteries

	All Grades		Elementary Grades		Secondary Grades	
	Applications	Lotteries	Applications	Lotteries	Applications	Lotteries
Total	181,490	5,370	100,320	4,971	81,170	399
Decided by lottery	101,499	---	71,779	---	29,720	---
Plus lottery has both winners and losers	50,610	1,329	29,158	1,134	21,452	195
Plus lotteries with a single race, sex and grade	39,092	1,126	19,941	944	19,151	182
Size of Lottery (mean/median)						
Number of participants	34.7 / 12		21.2 / 10		105.2 / 44	
Number of selections	5.6 / 2		3.6 / 2		15.8 / 9	
Number of waitlists	4.7 / 3		5.6 / 4		0 / 0	
Number of rejections	24.5 / 2		12.0 / 0		89.4 / 26	

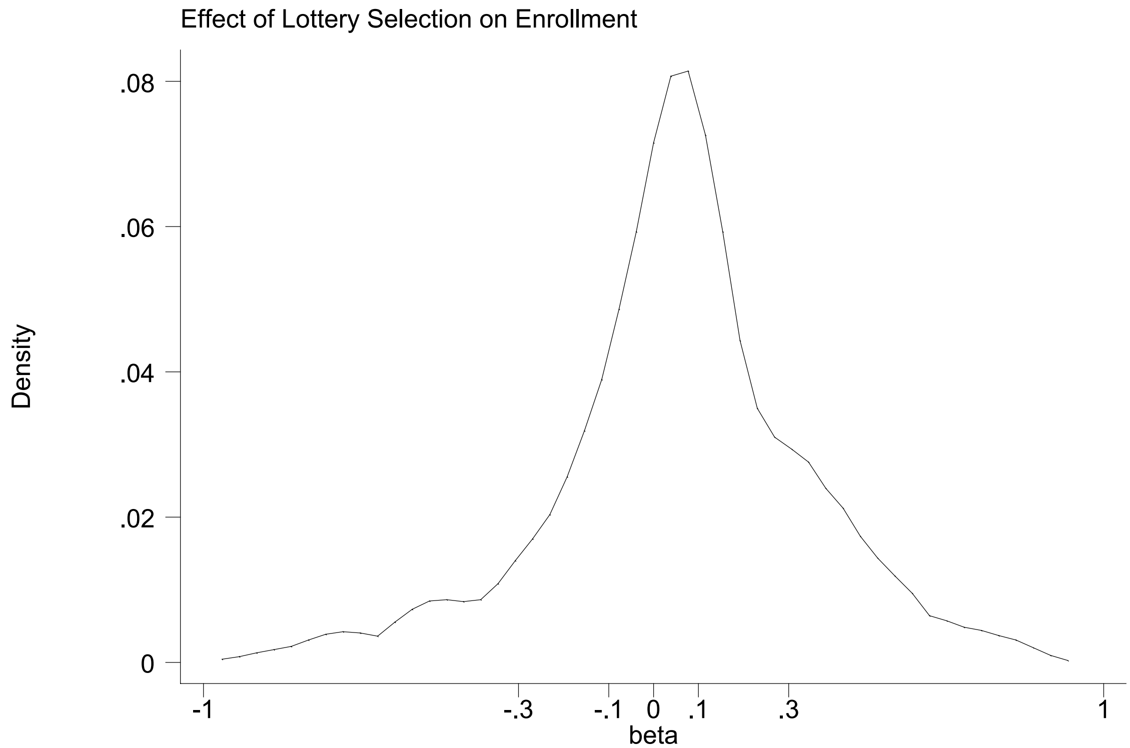
Notes: Size of the lottery is determined using the lottery as the unit of observation.

Table 8: Testing the Validity of the Randomizations

Dependent Variable	Mean of students not selected in a lottery (s.d.)	Difference between those selected and not selected (s.e.)
Student Characteristics		
Enrolled in CPS at time of application	0.630 (0.483)	-0.009 (0.006)
Math test score last year	-0.249 (1.289)	0.011 (0.029)
Reading test score last year	-0.342 (1.640)	-0.021 (0.037)
Attending neighborhood school	0.562 (0.496)	-0.005 (0.015)
In foster care	0.025 (0.157)	0.002 (0.003)
Relative is guardian	0.168 (0.373)	0.012 (0.007)
Free lunch	0.344 (0.475)	-0.002 (0.006)
Reduced lunch	0.0460 (0.208)	-0.001 (0.004)
Special education	0.106 (0.308)	0.000 (0.005)
Bilingual	0.198 (0.398)	-0.004 (0.005)
Age	9.226 (4.355)	-0.017 (0.010)
Home Census Tract Characteristic		
Median HH Income	24,370 (8,151)	282 (159)
% owns home	0.397 (0.213)	0.007 (0.004)
% female-headed HH	0.358 (0.216)	-0.007 (0.003)
% managers/professionals	0.185 (0.093)	0.001 (0.002)
% not working	0.375 (0.104)	-0.003 (0.002)
% below poverty	0.223 (0.0168)	-0.005 (0.003)

Notes: Estimates for the following variables are only based on those students who were enrolled in the CPS at the time of their application: math test score, reading test score, foster care, guardian, free/reduced lunch, bilingual, and special education.

Figure 1: The effect of lottery selection on enrollment in the CPS



Note: Weighted using the inverse standard error of the estimates. No controls. Sample size is 1,126.

Table 9: The Estimated Impact of Winning a Lottery on Enrolling in the CPS

	Sample		
Subgroup	**All applicants**	**Enrolled in CPS at time of application**	**Not enrolled in CPS at time of application**
All Students	0.059	0.023	0.125
	(0.009)	(0.009)	(0.016)
By Student Characteristics			
Applying to kindergarten	0.088	0.054	0.109
	(0.018)	(0.031)	(0.022)
Applying to 1st or 2nd grade	0.053	-0.005	0.089
	(0.025)	(0.028)	(0.039)
Applying to 3rd – 7th grades	0.025	0.022	0.056
	(0.028)	(0.032)	(0.072)
Applying to 8th grade	0.024	0.016	0.190
	(0.011)	(0.009)	(0.053)
Applying to 9th – 11th grades	0.051	0.039	---
	(0.048)	(0.053)	---
Black	0.051	0.023	0.121
	(0.012)	(0.012)	(0.022)
White	0.113	0.073	0.144
	(0.023)	(0.034)	(0.032)
Hispanic	0.053	0.017	0.131
	(0.019)	(0.017)	(0.039)
Asian	0.032	-0.021	0.095
	(0.037)	(0.025)	(0.068)
Male	0.064	0.028	0.119
	(0.014)	(0.013)	(0.024)
Female	0.055	0.020	0.131
	(0.012)	(0.012)	(0.022)
Accepted to no other schools	0.082 (0.010)	0.030 (0.009)	0.187 (0.018)
Accepted to 1+ other schools	0.026 (0.010)	0.015 (0.008)	0.052 (0.021)

Table 9 (continued): The Estimated Impact of Winning a Lottery on Enrolling in the CPS

	Sample		
Subgroup	**All applicants**	**Enrolled in CPS at time of application**	**Not enrolled in CPS at time of application**
By School Characteristics			
Highly selective lottery: <10% selected in the lottery	0.097 (0.018)	0.038 (0.012)	0.195 (0.030)
High-moderate selective lottery: 10-50% selected in the lottery	0.068 (0.017)	0.029 (0.017)	0.134 (0.029)
Low-moderate selective lottery: 25-50% selected in the lottery	0.048 (0.018)	0.015 (0.018)	0.105 (0.032)
Least selective lottery: >50% selected in the lottery	0.017 (0.023)	0.003 (0.029)	0.038 (0.042)
High school achievement: > 2 s.d. above the system average	0.122 (0.026)	0.087 (0.031)	0.187 (0.032)
High-moderate school achievement: 1 – 2 s.d. above the system average	0.083 (0.021)	0.027 (0.023)	0.145 (0.033)
Low-moderate school achievement: 0 – 1 s.d. above the system average	0.052 (0.014)	0.009 (0.014)	0.107 (0.026)
Low school achievement: Below the system average	0.020 (0.018)	0.028 (0.015)	0.051 (0.043)
Magnet elementary school	0.089 (0.013)	0.029 (0.015)	0.144 (0.017)
General elementary school	0.041 (0.017)	0.018 (0.018)	0.052 (0.025)
Magnet high school	0.074 (0.019)	0.034 (0.010)	0.119 (0.014)
General high school	0.019 (0.009)	0.016 (0.006)	0.115 (0.013)

Notes: The estimates are weighted using the inverse of the standard error.

Table A1: CPS Elementary (grades K-8) Schools and Programs in 2000 and 2001

School Name	Unit Number	CPS Rank	Grades	Orientation	Year Opened
Regular magnets subject to the consent decree (admission by computerized lottery)					
Beasley Academic Magnet Center[1]	6660[1]	93	1-8	Math & Science	1980
Black Magnet School	7860	93	K-8	Math & Science	1980
Disney Magnet School	8000	82	K-8	Arts	1980
Franklin Fine Arts Center	3420	90	K-8	Arts	1980
Gallistel Language Academy[2]	3490[2]		K-8	Fr/Sp	
Goodlow Magnet School[2]	3290[2]		K-6	Math & Science	
Inter-American Magnet School	4890	87	K-8	Language	1980
Jackson Language Academy	4690	97	K-8	Fr/It/Jap/Russ/Sp	1990
Kanoon Magnet School[2]	3370[2]		K-8	Language	
LaSalle Language Academy	4420	98	K-8	Fr/Ger/It/Sp	1980
Murray Language Academy	5030	97	K-8	Fr/Jap/Sp	1980
Newberry Math & Science Acad.	5080	95	K-8	Math & Science	1980
Pershing Magnet School	5400	84	K-8	Humanities	1980
Randolph Magnet School[2]	3550[2]		K-6	Int'l CPS Scholars	
Sabin Magnet School	7790	67	K-8	Spanish	1980
Sayre Language Academy	5720	83	K-8	Fr/Grk/It/Sp	1980
Sheridan Math & Science Acad.	4920	98	K-8	Math & Science	1980
Turner-Drew Language Academy	3110	86	K-8	Fr/Russ/Sp	1980
Vanderpoel Magnet for Humanities	6250	85	K-8	Humanities/Arts	1980
Regular magnets not subject to the consent decree (admission by computerized lottery)					
Burnside Scholastic Academy	2520	82	K-8	Scholastic Acad.	1980
Ericson Scholastic Academy	3240	24	K-8	Scholastic Acad.	1980
Galileo Scholastic Academy	4160	86	K-8	Math & Science	1991
Gunsaulus Scholastic Academy	3690	93	K-8	Scholastic Acad.	1980
Hawthorne Scholastic Academy	3830	97	K-8	German	1980
Jensen Scholastic Academy	6920	55	K-8	Math & Science	1980
Owen Scholastic Academy	5240	93	K-8	Scholastic	1980

Saucedo Scholastic Academy	4250	70	K-8	Acad. Math & Science	1980
Stone Scholastic Academy	6070	86	K-8	Scholastic Acad.	1980
Thorp Scholastic Academy	6190	95	K-8	Scholastic Acad.	1980
Classical schools (require admissions testing)					
Decatur Classical School	2990	100	K-6	Liberal Arts	
McDade Classical School	4750	98	K-6	Liberal Arts	
Poe Classical School	5460	99	K-6	Liberal Arts	
Skinner Classical School	5940	99	K-8	Liberal Arts	
Academic centers (require admissions testing)					
Kenwood Academy[3]	1710[3]		7-12	Advanced	
Morgan Park[3]	1490[3]		7-12	Advanced	
Taft[3]	1580[3]		7-12	Advanced	
Whitney Young[3]	1810[3]		7-12	Advanced	
Regional Gifted Centers (require admissions testing)					
Beaubien Elementary School[3]	2240[3]		1-8	Gifted Program	
Bell Elementary School[3]	2270[3]		1-8	Gifted Program	
Edison Regional Gifted Center	2220	99	K-8	Gifted Program	1980
Greeley Elementary School[3]	2730[3]		5-8	LEP Gifted Prog.	
Keller Regional Gifted Center	4960	99	1-8	Gifted Program	1980
Lenart Regional Gifted Center	7240	99	1-8	Gifted Program	1990
Orozco Community Academy[3]	7610[3]		1-8	LEP Gifted Prog.	
Pritzker Elementary School[3]	6460[3]		1-8	Gifted Program	
Pulaski Community Academy[3]	5520[3]		1-8	*LEP Gifted Prog.*	
International Baccalaureate Prep Programs (require admissions testing)					
Lincoln Elementary School[3]	4480[3]		K-8	Gifted 6-8th graders	
Ogden Elementary School[3]	5150[3]		K-8	Gifted 6-8th graders	

Notes: Programs that are combined into the "other" category are the numerous magnet cluster programs, the IB Middle Years programs, and the voluntary transfer programs. The data on year opened appear to be for the Spring of the relevant year (e.g. 2000 refers to school year 1999-2000); we should double check this is true for the bold entries. An entry of "1980" means the school existed at the time the consent decree was signed.

[1] These magnet schools have fixed attendance areas.

[2] Beasley also offers a regional gifted center program.
[3] These are programs within larger schools.

Table A2: CPS Secondary (grades 9-12) Schools and Programs in 2000 and 2001

School Name	Unit Number	CPS Rank	Grades	Orientation	Year Opened
Lottery magnets (admission by computerized lottery)					
Chicago HS for Agric. Sciences	1790		9-12	Agriculture	1980
Curie Metropolitan High School	1820		9-12	Fine & Perf. Arts	
Von Steuben Metro. Science Center	1610		9-12	Math & Science	1980
Selective enrollment high schools (require admissions testing)					
King College Prep High School[1]	1760[1]		7-12	Region 4	2002
Jones Academic Magnet HS[2]	1060[2]		9-12	Region 3	1999
Lane Technical HS	1440		9-12	Draws from northside	1980
Lindblom College Prep HS[3]	1450[3]		9-12	Region 5	2000
Northside College Prep HS	1740		9-12	Region 1	2000
Southside College Prep HS[4]	1500[4]		9-12	Region 6	1998
Walter Payton College Prep HS	1090		9-12	Region 2	2001
Whitney Young Magnet HS	1810		7-12	Draws from the entire city	1980
Career academies					
Calumet Academy HS	1250		9-12	Career Clusters	
Chicago Vocational HS	1010		9-12	Career Clusters	
Dunbar Vocational HS	1030		9-12	Career Clusters	
Farragut Career Academy	1300		9-12	Career Clusters	
Flower Vocational HS	1040		9-12	Career Clusters	
Manley Career Academy	1460		9-12	Career Clusters	
Prosser Career Academy	1070		9-12	Career Clusters	
Richards Career Academy	1110		9-12	Career Clusters	
Simeon Career Academy	1150		9-12	Career Clusters	
Tilden HS	1590		9-12	Career Clusters	
Westinghouse Career Academy	1160		9-12	Career Clusters	
Military Academies					
Carver Military Academy	1850		9-12	JROTC Program	2001
Chicago Military Ac. (Bronzeville)	1800		9-12	JROTC Program	2000

Notes: The data on year opened appear to be for the Spring of the relevant year (e.g. 2000 refers to school year 1999-2000); we should double check this is true for the bold entries. An entry of "1980" means the school existed at the time the consent decree was signed.

[1] King is still not a college preparatory high school and is a regular high school. It is now scheduled to become one in 2002-03.

[2] Jones was a regular high school before becoming a regional college preparatory high school.

[3] Lindblom became a regional college preparatory school in 2000, but was a selective high school before then as well.

[4] Name changed to Gwendolyn Brooks.