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The Effect of Centralized-Admission School Lotteries on Between-School Segregation: Evidence from 300 Largest School Districts in the United States

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Abstract

This study examines how centralized-admission school lotteries affect between-school racial and ethnic segregation in the largest U.S. public school districts. Using original nationwide panel data and a difference-in-differences design with staggered adoption, the research analyzes effects on school composition, intergroup exposure, and distribution evenness. The findings reveal that centralized-admission lotteries led to increased White student enrollment in district schools and modest improvements in intergroup exposure. Black-White exposure rose by 1.6 percentage points and student of color-White exposure by 1.8 points. However, White students experienced reduced exposure to all racial and ethnic groups, with similar patterns for Black, Asian, and other students of color. While centralized lotteries modestly redistribute students, they do not significantly reduce overall segregation, challenging assumptions about equity-promoting reforms. These results underscore the need for complementary policies including weighted lottery designs, transportation subsidies, and targeted adoption to address the structural roots of school segregation.

Keywords: School Segregation; Centralized-Admission Lotteries; School Choice; Student Assignment; Racial and Ethnic Diversity.

JEL: I24, I28, J15, H75

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Introduction

Despite a decades-long trajectory of school desegregation across the US following judicial decisions and their enforcement, school segregation remains entrenched, limiting student opportunities and social cohesion (Taylor & Frankenberg, 2021; Yoon & Lubienski, 2025). Waning political and judicial resolve – reflected in the *Milliken v. Bradley (1974)* and *Parents Involved v. Seattle (2007)* decisions – along with expansion of charter schools and choice programs has even contributed to K-12 school racial resegregation (Wells et al., 2019). Studies consistently show that increases in school racial, ethnic, or income-based segregation are associated with rising educational inequality, adverse long-term outcomes such as crime and poor health, incidences of racial and social discrimination, and deterioration in intergroup relations and prosocial behavior (Altonji & Mansfield, 2011; Billings et al., 2014; Goosby & Walsemann, 2012; Johnson, 2011; Rao, 2019; Reardon et al., 2019; Sampson, 2008). Where students of color are isolated in segregated schools, they tend to encounter lower per-pupil spending, larger class sizes, and deficiencies in school infrastructure (Condron & Roscigno, 2003; Darling-Hammond, 2013; Mickelson et al., 2013). Alternatively, increases in school integration and diversity are associated with higher student achievement and better health in adulthood (Guryan, 2004; Schneider et al., 2022).

Centralized-admission lotteries are increasingly becoming a popular policy instrument by large urban districts to reduce barriers to school admission for all families (Monarrez & Chien, 2021; Neilson, 2024; Sartain et al., 2022). These systems assign students to available seats at participating schools and on waitlists at higher-ranked schools according to a randomly generated number and school-designated preferences (Glazerman & Dotter, 2017). Centralized-admission lotteries limit the ability of school personnel to selectively admit students as they shift these

enrollment decisions from schools to a districtwide structure which uses an algorithm to distribute students into schools (Hesla, 2018). By unifying enrollment procedures, rather than deferring to school-specific enrollment practices, these systems aim to improve the fairness, transparency, and efficiency of student placement in schools (Babah, 2020; Ekmecki & Yenmez, 2019; Honey & Carrasco, 2023; Lincove & Valant, 2024). However, in practice, it is unclear whether and to what extent centralized-admission lottery systems influence or reduce segregation, especially as these systems have emerged across a fragmented policy landscape, complicating data analysis efforts.

The current study evaluates the impact of unified lotteries on segregation in terms of race and ethnicity across the 300 largest U.S. school districts. Using a difference-in-differences framework with staggered adoption, this paper estimates the impact of centralized-admission lotteries on racial and ethnic segregation within districts, focusing on changes in proportion, exposure, and across schools distribution of students in the 300 largest U.S. school districts. We find that the implementation of lotteries led to a 2.0 percentage point (pp) increase in the proportion of White students enrolled in schools within treated districts, and to modest but statistically significant shifts in peer exposure across schools. Black-White exposure increased by 1.6 pp, and student of color–White exposure by 1.8 pp, while White students became less exposed to non-White peers, with declines of 2.0 pp in exposure to Black students, 2.2 pp to Asian students, and 1.8 pp to students of color overall. Despite these changes in average composition and peer exposure, we find no effect on the dissimilarity index, indicating that centralized lotteries did not affect how evenly students from different groups were distributed across schools within districts. Results are robust across specifications, samples, and event-study estimators. By documenting how these systems contribute to modest shifts in student exposure and patterns of segregation in

terms of racial and ethnic distribution, this study complicates narratives that centralized admission lotteries may expand equitable access to schools for marginalized students.

Policy Background

Proponents of school choice programs have long argued that breaking the link between neighborhood residence and school assignment can reduce segregation (Betts, 2009; Chubb & Moe, 1990; Howell & Peterson, 2006). However, empirical studies across geographic and policy contexts largely show the opposite: that choice programs tend to maintain or intensify racial, ethnic, socioeconomic segregation between schools (Archbald & Hurwitz, 2017; Clotfelter et al. 2021; Frankenberg et al., 2011; Garcia, 2008; Kotok et al., 2017; Marcotte & Dalane, 2019; Monarrez et al., 2022; Wilson & Bridge, 2019). This stratification is driven by complex interactions among several mechanisms related to choosers and the supply of available schools (Zancajo & Bonal, 2022) including self-selection and outgroup avoidance (Bifulco et al., 2009; Billingham & Hunt, 2016; Denice & Gross, 2016; Fiel, 2013; Hailey, 2022; Iceland & Sharp, 2013).

Additional factors contributing to segregation include school based exclusionary practices such as cream-skimming through test scores, unlawful parent or student screening, and misrepresentation of services (Bergman & McFarlin, 2018; Carrasco et al., 2017; Epple & Romano, 2008; MacLeod & Urquiola, 2015; Waitoller, 2025); inequitable access to information shaped by social networks and district communication (Bader et al., 2019; Elacqua et al., 2024; Houston & Henig, 2023; Kafka, 2022; Sattin-Bajaj & Roda, 2020); and logistical barriers related to school transportation and location (Burdick-Will et al., 2013; Denice & Gross, 2016; Valant & Lincove, 2023). Moreover, prior patterns of residential segregation, which accounts for most

school segregation in the U.S. (Monarrez, 2023), intersect with these conditions. Even when systems are meant to reduce segregation, middle- and upper-income families leverage time, knowledge, and additional resources to gain access to preferred schools (Altenhofen et al., 2016; Calarco, 2018; Sattin-Bajaj & Roda, 2020). Such workarounds exemplify the way "whites adapt by finding new avenues of exclusion" (Fiel, 2013, p. 831) when historically marginalized students gain better access to desirable schools. Together, these findings indicate that when choice systems are not deliberately structured to promote integration, they risk reproducing existing inequalities (Roda & Wells, 2013). Accordingly, some scholars argue that policy innovations are needed to disrupt or reverse the segregative effects of choice and charter policy expansion (Burgess et al., 2020; Greaves, 2024).

Attending to these concerns, a growing number of school districts in the U.S. have enacted systemwide admission lotteries[1] to place students and their families on equal footing by creating centralized information hubs and enrollment procedures that randomly assign students to seats when schools are oversubscribed (Hesla, 2018). These systems tend to share three key features. First, where operating, all or most schools in the district participate. Second, they entail a centralized application in which a student's caregiver ranks a list of preferred schools among all available options in the district. Finally, these systems use a computerized algorithm to randomly assign students to schools after accounting for families' ranked requests, seat availability, and school- or district-specific priorities (e.g., sibling or neighborhood preference).[2] We include

[1] Districts have historically adopted school lotteries when the number of applicants to a program or cluster of schools exceeds the number of open seats. For instance, families may opt into magnet schools, language immersion programs, or selective admissions high schools if they meet school requirements and space is available. While these lotteries may apply to one or more schools, they are distinct from centralized lottery systems that include most of the distric's schools and may be the first step for families to initiate enrollment or a school transfer.

[2] Many districts use a deferred-acceptance algorithm (also called the Gale-Shapley algorithm) that places a student at a ranked school and waitlists them at other schools in order of their ranking until they complete school admissions; this mechanism is viewed as strategy proof because it does not reward applicants for ranking some schools more highly nor does it factor families' randomly assigned numbers differently across schools (Abdulkadiroğlu et al., 2015;

lotteries that operate as the primary enrollment mechanism and those that are used to facilitate transfers if those systems align with elements of our definition.

Centralized-admission lottery systems have the potential to advance desegregation in urban districts with school choice programs since by definition, they offer equal chances to all applicants through randomized enrollment and reduce barriers to school admission for underserved families. Since students have the same chance of gaining admission to their preferred schools, these systems may reduce between-school segregation by limiting unsanctioned screening processes like cream-skimming (Epple & Romano, 2008; Honey & Carrasco, 2023). Moreover, in school districts that are already largely segregated in terms of student race, ethnicity, or social class, centralized-admission lotteries may help desegregate schools since students have the same chance of gaining admission to overenrolled schools.

Thus far, descriptive analyses, single-district quasi-experimental studies, and research in international contexts have indicated little to no significant impact of centralized lotteries on segregation (Kutscher et al., 2023; Monarrez & Chien, 2021). The Urban Institute conducted a study of segregation and school boundaries in the 100 most populous U.S. districts by comparing the years 2003, when districts may not have had centralized lotteries, and 2018, when lotteries were presumably operational, and found no significant effect of these systems on rates of segregation (Monarrez & Chien, 2021). In a more localized study, Saltmarsh and Lagos (2024) compared trends in racial-ethnic segregation before and after the enactment of Washington, D.C.'s system. Using an interrupted time series analysis, they found segregation trends continued citywide after the adoption of this system, though schools located in wealthier and lower-income

Fack et al., 2019; Glazerman & Dotter, 2017). Other districts use alternative algorithms, like the Boston Mechanism, which allocates students to schools with seat availability that they have ranked highest prior to assigning students who ranked the school as a lesser priority. Furthermore, our definition includes other sorting mechanisms involving computer programs or noncomputerized systems that randomize participants' chances of obtaining a desired outcome.

wards showed significant annual increases in racial segregation. Alternatively, in their analysis of certain New Orleans, LA schools, Lincove and Valant (2024) found that the unified enrollment system was associated with a slow process of schoolwide integration that occurred mainly in entry grades of schools with large proportions of White students. As our study draws a more robust (nationwide) data set and include dates related to the staggered rollout of these systems, it minimizes the impact of other confounding factors that could potentially distort results, such as gentrification.

Additional studies have examined school composition and rates of segregation as a function of a centralized admission in international contexts such as Chile, where market-based education reforms and centralized enrollment are advanced (Oyarzun et al., 2024). Drawing on the phased rollout of the new centralized school admission system (SAS) in Chile, Honey & Carrasco (2023) carried out a natural experiment to show modest increases of low-income students in previously selective and desirable schools and minimal effects on segregation after the adoption of the lottery mechanism. In their analysis of segregation in the first five years following the enactment of this system, Kutscher et al. (2023) used a difference in differences estimation to document increases by socioeconomic status (SES) in districts with higher levels of residential segregation. They attribute these changes to migration of high-SES students to private schools, as part of Chile's universal voucher system. Additional studies reveal low SES families' choices contribute to the modest impact that the SAS had on socioeconomic integration between schools at the pre-K level (Elacqua & Kutscher, 2023). The foregoing studies extend literature on the linkages between choice and segregation, though additional evidence is needed to determine how these enrollment mechanisms influence segregation and equitable student access to schools.

Building on this extant literature, this study makes two key contributions to literature on urban education, segregation, and education policy: i) it provides a new nationwide data set detailing which of the largest districts have school choice policies and centralized-admission lotteries and when the latter systems were implemented and ii) capitalizes on information about the staggered rollout of these student assignment mechanisms to identify the causal effects of these systems on between-school segregation. Thus, results here test the theory of choice, segregation, and centralized admission lotteries by being the first to offer causal evidence on the relationship between these factors in the U.S. Specifically, our study is guided by the research question – What is the effect of centralized admission lotteries on between-school income and racial-ethnic segregation?

Data and Methods

Primary Data Collection

This study draws on a novel, original panel dataset assembled from multiple primary sources, covering the 300 largest U.S. school districts between 2000 and 2022. The dataset integrates multiple administrative and archival sources and systematically documents whether and when each district implemented a centralized admission lottery system.

Developing an Operational Definition of Centralized Admission Lotteries

We began our data collection by establishing an operational definition of a centralized admission lottery and a consistent approach to identifying the year of adoption. The definition was refined iteratively as we encountered variation across districts. A system qualified as a *centralized admission lottery* if it met four criteria: (i) Scope and participation: at least 50 percent of schools in the district participate in the centralized application process; (ii) Unification: applications are

submitted through a single, districtwide platform rather than through individual schools or programs; (iii) Multiple school ranking: applicants are required to rank more than one preferred school; and (iv) Randomization: student assignment involves random allocation, excluding systems that screen students based on academic, behavioral, or attendance records. Districts were excluded if centralized processes applied only to subsets such as magnet programs, transfers, or pre-K levels, or if randomization occurred only after a prior screening stage.

Identifying Districts with Centralized Admission Lotteries and Their Implementation Years

We then identified the 300 largest U.S. school districts by total student enrollment and then determined whether each district met the definitional criteria above by systematically reviewing district websites, policy documents, enrollment guides, parent manuals, official reports, and archived school board minutes. When information was incomplete or ambiguous, we directly contacted enrollment or school choice offices by phone and email, often requiring multiple exchanges with district staff. Each district's classification was verified using at least one official or publicly documented source. We used a similar strategy to determine when centralized lottery was introduced in each district. In many cases, these efforts required formal public records requests, 18 in total, submitted primarily to obtain confirmation of implementation dates. The research team triangulated across multiple sources to validate each year, flagging as missing those cases in which a precise date could not be verified through any available evidence.

The resulting dataset provides the most comprehensive documentation to date of centralized admission lotteries across large U.S. districts. Out of the 300 districts analyzed, 71 were identified as having implemented a centralized admission lottery, with implementation years verified through at least one documented source. The dataset thus offers a novel foundation for

examining the evolution and potential impacts of centralized lottery systems on school segregation and student sorting.

Segregation Indices

We then derived district- and school-level measures on segregation used in our analysis from the CCD. The primary outcomes are three measures of racial and ethnic segregation computed at the district-year level: group composition, exposure, and dissimilarity. *Composition* is measured as the share of students in each district identifying with a given racial or ethnic identity. Although not a segregation metric itself, composition is essential for interpreting the levels and trends of the other two measures.

The second measure, *exposure*, captures the average racial and ethnic composition of the schools attended by students of a given group. This index reflects the probability that a randomly selected student from group A attends a school with students from group B, weighted by the group A population. It is sensitive to both the diversity of individual schools and the extent to which students of different backgrounds attend the same schools. Exposure values range from 0 (complete isolation) to 1 (complete integration), and are calculated for relevant group pairs. It is important to note that exposure is asymmetric because it is calculated from the perspective of a specific group, and values such as Black-to-White and White-to-Black exposure can differ substantially due to differences in each group's size and distribution.

The third measure is the *dissimilarity index*, which quantifies how unevenly students from different racial or ethnic groups are distributed across schools in a district. It is defined as the proportion of students from one group that would need to move to a different school for the group's distribution to match that of the comparison group. This index ranges from 0 (no segregation) to 1 (complete segregation) and is computed annually for each district and group pair. Dissimilarity

differs from exposure because it reflects the degree of uneven sorting across schools, rather than peer composition, making it a useful complement for interpreting how structural sorting and student interactions may diverge.

All segregation indices are calculated consistently over time and across districts, using school enrollment as population counts. Together, these measures capture different dimensions of racial sorting within school systems and provide a comprehensive view of how patterns of segregation evolve in response to district-level policy changes.

In addition to these outcomes, we constructed several covariates from the CCD to describe district characteristics at baseline and to include as controls in regression analyses. These include total district enrollment, the number of schools, the shares of charter and magnet schools, and total district population.

Sample Descriptives

The timing of the implementations of centralized-admission lotteries varied across districts and is summarized in Figure 1. Out of the 300 largest U.S. school districts in the sample, 71 had implemented centralized admission lotteries on or before 2022. Table 1 compares baseline characteristics for districts that implemented centralized-admission lotteries and those that did not. At baseline, lottery districts were, on average, larger, with an average enrollment of 88,942 students compared to 42,844 in non-lottery districts ($p < 0.001$). The average number of schools per district was more than twice as high in lottery districts (128.7 vs. 57.2; $p < 0.001$).

The share of charter schools at baseline was higher in lottery districts (3% vs. 1%; $p < 0.001$), while the share of magnet schools was similar across both groups (4% on both; $p = 0.96$). Lottery districts also served larger total populations (611,000 vs. 264,000; $p < 0.001$). Districts with centralized lotteries also exhibited somewhat higher levels of school-aged poverty at baseline.

On average, 20% of children aged 5 to 17 in these districts lived below the poverty line, compared to 15% in non-lottery districts ($p < 0.001$), suggesting modest but statistically significant differences in socioeconomic context.

In terms of geographic distribution, centralized lotteries are observed in districts across all major U.S. regions, including the Northeast, South, Midwest, and West. While more common in large metropolitan areas, both lottery and non-lottery districts are present within each region. Finally, in terms of political leaning, for districts with lotteries, 68% leaned Democrat and 32% leaned Republican. For districts with no lotteries, 54% leaned Democrat and 46% leaned Republican, as determined by majority vote for president, based on party in 5 election cycles (2000-2020).

Empirical Strategy

Our empirical approach exploits variation in the timing of lottery implementation across districts using a difference-in-differences framework. By comparing segregation outcomes before and after policy adoption in treated districts—relative to those that adopt the policy later or never do—we estimate the intent-to-treat effect of centralized lotteries on segregation, as measured by composition, exposure, and dissimilarity indices.

Our baseline specification is given by the following two-way fixed effects model:

$$Y_{dt} = \beta Lottery_{dt} + \gamma_d + \delta_t + \varepsilon_{dt} \quad (1)$$

where denotes a segregation outcome in district d and year t is an indicator equal to 1 if a centralized-admission lottery system is in place in that district-year; γ_d indicates district fixed effects that control for time-invariant characteristics in a given district; δ_t is year fixed effects that absorb nationwide shocks that are constant at the year level; and ε_{dt} is an error term. Standard errors are clustered at the district level. We estimate this specification both with and without a

vector of baseline district characteristics, which include total district enrollment, the number of schools in the district, the share of charter and magnet schools, and total population in the district.

To examine the dynamics of treatment effects and to test the validity of the parallel trends assumption, we estimate event-study specifications in which the binary treatment indicator is replaced by a series of leads and lags relative to the year of lottery adoption. These models allow us to assess whether segregation trends begin to diverge only after implementation, as would be expected if the policy had a causal effect. The coefficients on the lead terms provide a test for differential pre-treatment trends, while the post-treatment coefficients capture the timing and persistence of the policy's effects.

Recognizing recent developments in the difference-in-differences literature, particularly in settings with staggered treatment adoption, we implement the event-study specifications using two alternative estimators that address known limitations of the two-way fixed effects model. The first is the estimator developed by Callaway and Sant'Anna (2021), which constructs group-time average treatment effects using only not-yet-treated and never-treated units as valid comparisons. The second is the Sun and Abraham (2021) estimator, which adjusts for the negative weighting and bias that can arise when treatment effects vary across groups and over time. These approaches ensure more reliable inference in the event-study context, particularly when treatment is implemented at different times across districts.

All models are estimated on a sample of 290 districts (286 with covariates at baseline, since 4 districts were created after the year 2000), which exclude 10 school districts that implemented centralized-admission lotteries before the year 2000 and, therefore, are always-treated districts. We also present separate results for the subsample of districts that have school choice policies in place (N = 251 districts in models with no covariates, and 247 in districts with covariates at

baseline). These districts[3] provide a context where centralized assignment reforms are more likely to interact with existing choice dynamics. If school choice is associated with higher baseline levels of segregation, we might expect the effects of introducing centralized lotteries to be more pronounced in this subset. By restricting the sample to districts with school choice policies in place prior to lottery implementation, we compare districts with similar assignment structures, some of which adopted centralized lotteries and some of which did not. This allows us to assess whether the introduction of centralized lotteries has a larger impact on segregation in settings where school choice mechanisms already exist.

The identifying assumption underlying this empirical strategy is that, in the absence of centralized-admission lotteries, treated and comparison districts would have experienced similar trends in segregation. We assess the credibility of this assumption by inspecting the event-study coefficients for evidence of pre-policy divergence, allowing us to produce credible estimates of the causal effect of centralized-admission lotteries on patterns of segregation in large districts.

Results

Main Results

We begin by describing our findings by examining changes in the racial and ethnic composition of enrolled students. As shown in panel A of Table 2, the introduction of lotteries is associated with a statistically significant increase in the proportion of White students enrolled in treated districts. Specifically, we estimate an increase of 2.0 pp (column 1), which remains stable when including baseline covariates (column 2) and only decreases slightly to 1.7 pp when

[3] We identified school choice districts as those that have a set of open enrollment policies, including charter schools, vouchers, homeschooling, and access to non-neighborhood public schools, that diverge from traditional residence-based school assignment. These programs aim to expand educational options for families, increase school autonomy, and promote a competitive marketplace for schools in which parents act as consumers (Harris, 2024).

restricting the sample to school choice districts (columns 3 and 4). These consistent patterns suggest that centralized lotteries slightly shifted the racial composition of school enrollments, particularly increasing White student enrollment within districts.

Next, we examine how these compositional changes affected intergroup exposure across schools. Panel B shows that non-White students became more exposed to White students following the introduction of lotteries. For instance, Black-White exposure increased by 1.6 pp, and student of color–White exposure rose by 1.8 pp (column 2). At the same time, White students experienced reduced exposure to peers of all groups, including a 2.0 pp decline in exposure to Black students, a 2.2 pp decline to Asian students, and a 1.8 pp decline to students of color overall. These statistically significant changes suggest a modest redistribution of peer environments across schools within districts: non-White students gained more access to racially diverse schools, while White students became slightly more concentrated in less diverse ones.

We then assess whether these changes translated into broader shifts in the evenness of student distribution across schools using the dissimilarity index. Based on the theory of change that motivates centralized admission lotteries – namely, that removing administrative barriers in the assignment process should facilitate more equitable access to schools – we would expect to observe reductions in segregation. Yet, as shown in panel C of Table 2, we find no statistically significant effect on the dissimilarity index. This null result is consistent across specifications and subsamples. The absence of effects on this key within-district measure suggests that lotteries did not meaningfully alter how evenly students from different racial and ethnic groups are distributed across schools. In other words, despite some shifts in composition and peer exposure, overall segregation levels within districts remained essentially unchanged.

Finally, these findings are robust to the inclusion of baseline covariates (columns 2 and 4) and are consistent across both the full sample of districts and the subsample of school choice districts. This reinforces the conclusion that centralized admission lotteries produced modest but systematic changes in school composition and exposure, without affecting broader patterns of school segregation within districts.

Event-Study Specification

To assess the plausibility of the staggered parallel trends assumption underlying our difference-in-differences estimates, we estimate event study specifications that trace dynamic treatment effects relative to the year of lottery implementation. Figures 2, 3, and 4 report event study coefficients for our three main outcomes: group composition across schools (Figure 2), intergroup exposure across schools (Figure 3), and evenness in the distribution of students across schools within districts as measured by the dissimilarity index (Figure 4).

Each figure displays results from three estimators commonly used in the staggered adoption setting: the standard two-way fixed effects (TWFE) model, the Callaway and Sant'Anna (2021) estimator, and the Sun and Abraham (2021) estimator. Across all outcomes and panels, point estimates from the three estimators are for the most part closely aligned, providing reassurance about the robustness of the results. Standard errors tend to be smaller under the Callaway and Sant'Anna estimator in the pre-treatment period, enhancing precision when assessing pre-trends.

Figure 2 disaggregates the composition outcome into four panels showing changes in the proportion of Asian, Black, Hispanic, and White students across schools. In all panels, pre-treatment coefficients are flat and statistically indistinguishable from zero, lending support to the parallel trends assumption. After implementation, the proportion of White students increases

steadily, with statistically significant effects emerging around year 3. In contrast, the proportion of Asian students shows a modest downward trend in post-treatment years. There are no meaningful changes for Black or Hispanic students, whose shares remain stable throughout the event window.

Figure 3 shows dynamic treatment effects for eight intergroup exposure measures, each capturing changes in how students from different racial and ethnic groups are distributed across schools. Pre-treatment trends are flat across all panels. Post-treatment, non-White students experience increases in exposure to White peers, with upward trends beginning around year 2 or 3. In contrast, several exposure measures involving White students decline following implementation. Notably, White-Asian, White-Black, and White–student of color exposure all exhibit negative trends beginning shortly after treatment. These patterns suggest that the increase in cross-group exposure for students of color is accompanied by growing concentration of White students into less diverse schools within districts. The overall alignment across estimators strengthens the interpretation of these changes as effects of the reform.

Figure 4 presents results for the dissimilarity index, across four panels corresponding to Asian-White, Black-White, Hispanic-White, and student of color-White comparisons. Estimates in all panels remain close to zero throughout the event window, and confidence intervals are wide. No statistically significant post-treatment changes are detected under any estimator. This reinforces the conclusion that centralized lotteries did not affect the evenness with which students from different groups are distributed across schools within districts. Despite changes in average composition and exposure, the broader patterns of segregation across schools remained unaffected.

Taken together, the event study results provide strong visual support for the parallel trends assumption. They also corroborate the main findings: across the 300 largest U.S. school districts, centralized-admission lotteries produced modest but detectable changes in school composition and

intergroup exposure, without affecting overall levels of school segregation within districts as measured by the dissimilarity index.

Discussion

In this study, we present the first nationwide analysis of the relationship between school racial and ethnic segregation and centralized-admission lotteries in the largest U.S. school districts. Over the past few decades, centralized-admission lotteries have multiplied as researchers and policymakers highlighted their potential to improve efficiency and equity by reducing admissions barriers and broadening access to information and desirable schools. Evidence here suggests the integrative effects of these systems are limited, at best. While centralized lotteries may modestly shift student composition, they do not appear to reduce district-wide patterns of segregation.

Empirical evidence from this study challenges the logic or theory of change concerning lotteries, whereby a fairer, more equitable enrollment system could contribute to desegregation. Centralized admission lotteries carry the potential to improve equitable access to schools and reduce segregation because they address administrative barriers, constrain forms of self selection, and democratize school admissions. By randomizing school assignment, certain forms of bias like cream skimming and the use of parental resources to find loopholes are minimized. Where families have a tendency to select schools with more students like themselves (Hailey, 2022), algorithmic assignment complicates this preference. Further, as centralized lotteries streamline information and application processes, they have the potential to make it easier for disadvantaged students to navigate school finding and selection. Much like the intent behind school choice programs, centralized admission lotteries can break the link between residential and school-based segregation by sorting students to schools beyond their neighborhood. Even though these systems undermine

mechanisms of exclusion and racial, ethnic, or socioeconomic separation associated with school choice, structural patterns of school segregation remain entrenched and largely uninterrupted.

One explanation for the increase in White student enrollment involves the role of gentrification and who participates in centralized lotteries. Research indicates that White and more-affluent families leverage school assignment systems to a disproportionate degree, using information and social and cultural capital to obtain access to high-status schools (Posey-Maddox et al., 2025; Sattin-Bajaj & Roda, 2020). In this way, wealthier families might relocate either into these districts or strategically within them, as centralized lotteries offer opportunities for placement in "desirable" schools. Presumably, these families would be transferring from private schools or strategically moving into or within the district. This interpretation would suggest why shares of White students rose and exposure shifted modestly while measures of evenness remained steady. Relatedly, the structure of many centralized admission lotteries could encourage this behavior, as these systems embed neighborhood, sibling, and other school-based preferences that fill open seats before main round lottery participants can contend for these spots (Saltmarsh & Lagos, 2024). Such priorities may be well intentioned – as ways to unify siblings or promote neighborhood cohesion – but they supersede randomization, invite a potential workaround for more mobile families, and diminish the number of open seats in high-status schools, thereby hindering the capacity for these systems to promote equitable opportunity or school integration. Other equity concerns stem from questions about the function of lottery algorithms. One study conducted in New Orleans shows that when Black and White families, who tend to request different sets of schools, list the very same high performing kindergarten programs on their application that White students are more likely to be offered admission (Valant & Walker, 2025).

Findings related to ongoing patterns of school segregation are consistent with a preliminary analysis (Monarrez, & Chien, 2021) and results from single-district and international studies that also used the dissimilarity index. Research conducted in New Olreans (Lincove & Valant, 2024), Washington, D.C. (Saltmarsh & Lagos, 2024), and Chile (Honey & Carrasco, 2023; Kutscher et al., 2023) has found that centralized lotteries have little to no effect on desegregation and may even contribute to stratification as White and more-privileged families contend for seats in top-performing public schools. These studies highlight the persistence of segregation despite administrative reforms, especially when these mechanisms are not optimized to advance diversity or integration. As most school segregation in the U.S. stems from neighborhood housing patterns (Monarrez, 2023; Reardon & Owens, 2014), more powerful or multidimensional reforms, involving changes in housing and transportation, will likely be needed to alleviate school segregation. As part of a package of policies, central office leaders should also consider expanding the number of seats in high performing schools and closing lower performing schools to reduce segregation by race and income (Glazerman & Dotter, 2017).

Centralized-admission lotteries have helped rationalize enrollment in the context of a changing landscape. Across the U.S., a rapid expansion of quasi-markets composed of charter, voucher, and open enrollment school options has upended traditional school attendance (Harris, 2024; Irwin et al., 2021; Monarrez et al., 2022). By design, lottery systems have streamlined school placement, making it more accessible and transparent (Glazerman & Dotter, 2017), but to the extent that these standardized systems make school choice enrollment fairer, they may not necessarily make it more equitable in terms of student placements or substantive outcomes. If centralized lotteries do not automatically align with equity goals, districts can modify algorithm design or add weights for underrepresented students to build in these priorities, as Washington,

D.C. officials have done with the expansion of an "at risk preference" (Coffin, 2024). At the same time, in pursuing integration, officials should account for political and practical risks that undermine this goal, such as "tipping points" (Greaves, 2024, p. 7) where efforts to promote diversity unintentionally trigger the outmigration of White and wealthier families.

In addition to the critical importance of lottery design, these results have further implications concerning transportation, school information, and participation. In light of residential segregation and the irregular location of schools across districts, districts need to make safe and viable transportation options available if families are going to take full advantage of open enrollment options (Valant & Lincove, 2023). Without transportation supports, marginalized families will be more likely to narrow their search with distance as a constraint. Additionally, participation in these systems is predicated on awareness of school choice opportunities, especially as the majority of districts with lotteries make participation optional. That is, families can bypass the lottery to have students attend their neighborhood school. Forms of differentiated engagement involving information and application support, carried out by community organizations and district personnel and targeting low-income families, may broaden participation (Fleming et al., 2015) and increase selection of higher-performing schools (Cohodes, et al., 2025).

By focusing on racial and ethnic segregation in the 300 largest districts, the results of this study may not be generalizable to smaller or rural districts. The lottery systems we study also vary across contexts, and local factors – like gentrification and housing policy – may also shape enrollment patterns in ways that are not consistent with the largest districts. Moreover, despite our best effort in finding accurate information and working with district leaders to find lottery year-of-implementation, some misunderstanding may have occurred in this process and can cause measurement error in our data. Still, this study advances our understanding about a policy

mechanism that affects large portions of U.S. student enrollment and is becoming increasingly salient across districts.

Future research might build on these findings to investigate other forms of segregation and meaningful heterogeneity among districts with centralized admission lotteries. For instance, researchers could utilize our novel dataset to measure patterns of segregation related to socioeconomic status, first language, and disability status. Especially as the scope of lottery participation varies across these large districts, future studies might also categorize and assess differences among these mechanisms, comparing impact, algorithm type, priority specifications and other dimensions of design. Highlighting conditions that help mitigate the segregative effects of school choice policies will be of particular interest to policy makers.

Even with null effects on school segregation, centralized-admission lotteries serve various functions that advance public and private goods. Compared to school-by-school enrollment, these systems enhance the transparency of school decisions, despite concerns about an opaque underlying mechanism (Akchurin & Chouhy, 2024). By reconciling families' lists of school preferences and offering placements almost instantaneously, they boost efficiency. If we interpret fairness as offering equal chances for students to attend the same school or as mitigating unjust practices like cream skimming, these systems are fairer than decentralized approaches. However, if desegregation is a policy objective, complementary reforms that promote diversity or structural shifts to a controlled choice model will likely be required.

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Tables and Figures

Table 1. Sample Descriptives at Baseline

Variable	Lotteries == 1	Lotteries == 0	Difference	*p value*
Schools, Enrollment and Population				
Enrollment	88941.97	42843.88	46098.10	0.00
Schools in District	128.70	57.17	71.54	0.00
Proportion Charter Schools	0.03	0.01	0.02	0.00
Proportion Magnet Schools	0.04	0.04	0.00	0.96
Total population	621460.28	265316.50	356143.78	0.00
School-Age Population	107776.99	49498.46	58278.52	0.00
School-Age Poverty	21590.70	7210.41	14380.30	0.00
Enrollment by region				
Central West	91652.67	35553.74	56098.93	0.07
Northeast	201058.30	50387.65	150670.60	0.09
Southeast	72560.86	41627.54	30933.32	0.00
West	67760.86	44563.78	23197.08	0.23
Political Leaning (2000-2020)				
Leaning Democrat	0.68	0.54		
Leaning Republican	0.32	0.46		
Number of districts	*71*	*225*		

Note: The table reports differences in mean covariates between districts with and without lotteries. The number of districts is 296 instead of 300 because four districts were created after 2000.

Table 2. Effects of Lottery Adoption on Segregation

	All		School choice	
	(1)	(2)	(3)	(4)
Panel A: Effects on Composition				
Proportion Asian Students	-0.007*	-0.007	-0.007	-0.007*
	-0.003	-0.004	-0.004	-0.003
Proportion Black Students	-0.013	-0.012	-0.01	-0.011
	-0.007	-0.007	-0.007	-0.007
Proportion Hispanic Students	0	-0.003	-0.003	0
	-0.005	-0.005	-0.005	-0.005
Proportion White Students	0.020*	0.020*	0.017*	0.017
	-0.009	-0.009	-0.009	-0.009
Proportion Students of Color	-0.020*	-0.020*	-0.017*	-0.017
	-0.009	-0.009	-0.009	-0.009
Panel B: Effects on Exposure				
Asian-White Exposure	0.026*	0.025*	0.022*	0.024
	-0.012	-0.011	-0.011	-0.012
White-Asian Exposure	-0.022***	-0.022***	-0.021**	-0.021**
	-0.006	-0.007	-0.007	-0.006
Black-White Exposure	0.013	0.016*	0.012	0.01
	-0.008	-0.008	-0.008	-0.007
White-Black Exposure	-0.018**	-0.020**	-0.017*	-0.016*
	-0.007	-0.007	-0.007	-0.006
Hispanic-White Exposure	0.002	0.005	0.002	-0.001
	-0.011	-0.01	-0.01	-0.011
White-Hispanic Exposure	-0.009	-0.013	-0.012	-0.009
	-0.007	-0.007	-0.007	-0.008
Student of Color-White Exposure	0.018*	0.018*	0.015	0.015
	-0.009	-0.008	-0.008	-0.008
White-Student of Color Exposure	-0.018*	-0.018*	-0.016*	-0.015*
	-0.008	-0.008	-0.008	-0.008
Panel C: Effects on Evenness				
Asian-White Dissimilarity	-0.008	-0.006	-0.003	-0.006
	-0.009	-0.008	-0.008	-0.009
Black-White Dissimilarity	0.002	0.002	0.003	0.003
	-0.006	-0.006	-0.006	-0.006
Hispanic-White Dissimilarity	0.004	0.004	0.007	0.006
	-0.006	-0.007	-0.007	-0.006
Student of Color-White Dissimilarity	0.002	0.002	0.004	0.003
	-0.006	-0.006	-0.006	-0.006
Covariates	*NO*	*YES*	*NO*	*YES*
Number of Districts	*290*	*286*	*251*	*247*

Note: The table reports two-way fixed effects estimates. Columns (1) and (3) present results without covariates. Columns (2) and (4) include control for covariates measured at baseline. Columns (1)–(2) use the full sample of schools districts, whereas Columns (3)–(4) restrict the sample to schools operating under school choice prior to the introduction of lotteries. All estimations exclude always treated districts. Columns (2) and (4) further exclude 4 districts with no measures at baseline.

Figure 1. Lottery Adoption by Year

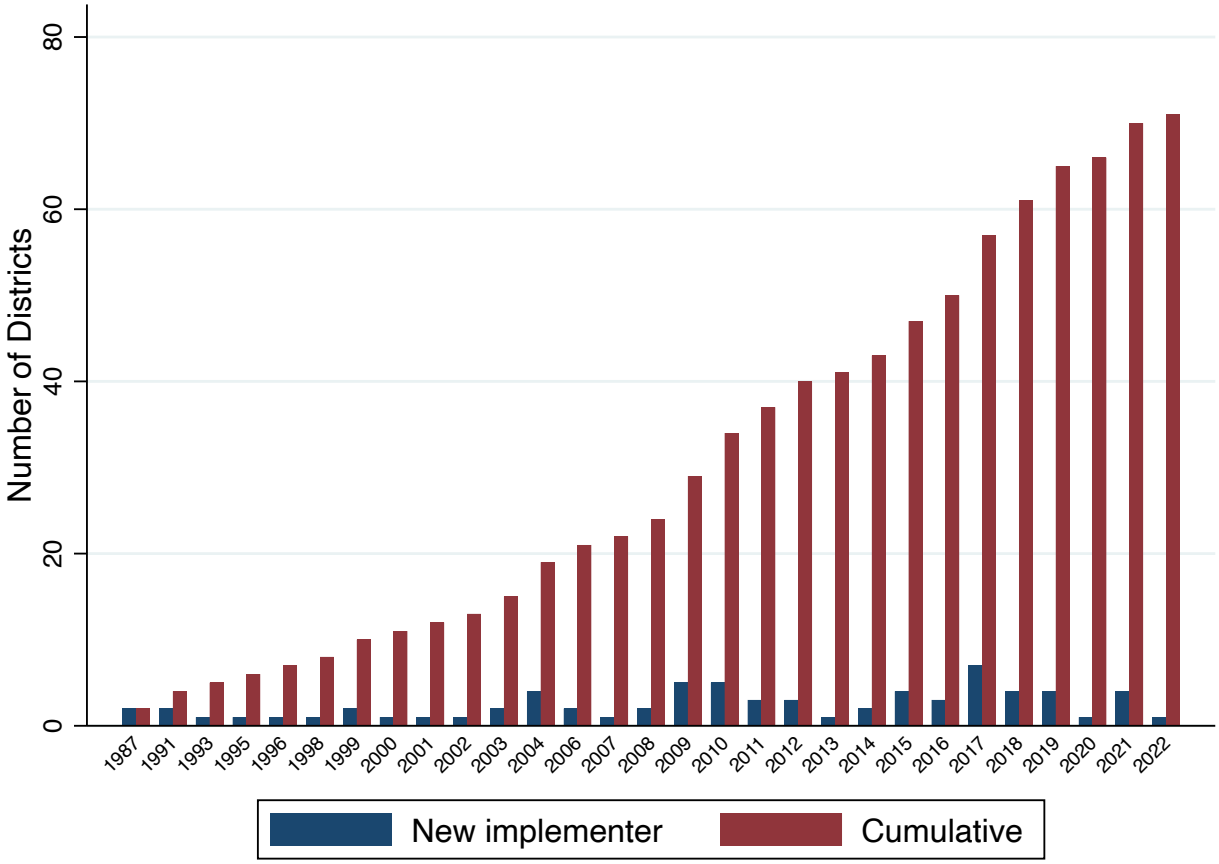

Figure 2. Effects on Composition

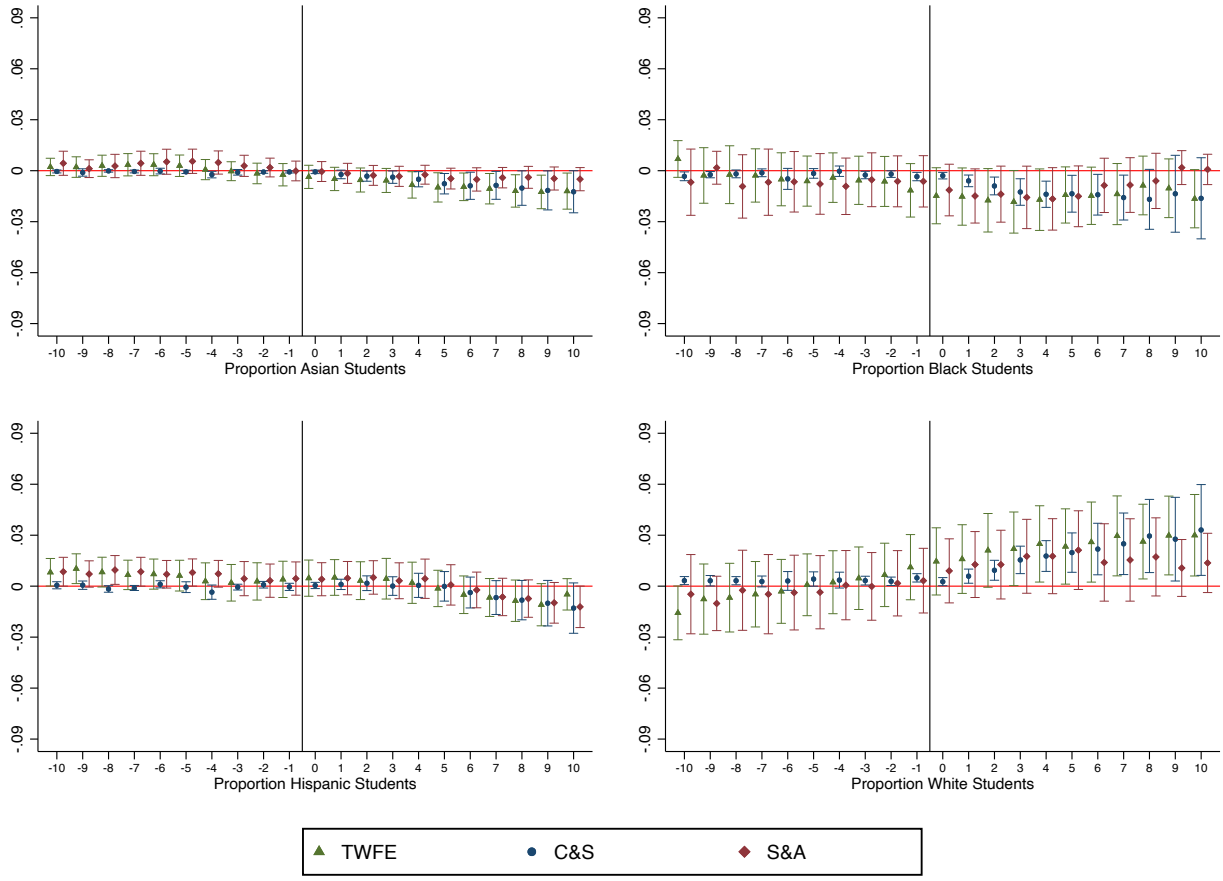

Figure 3. Effects on Exposure

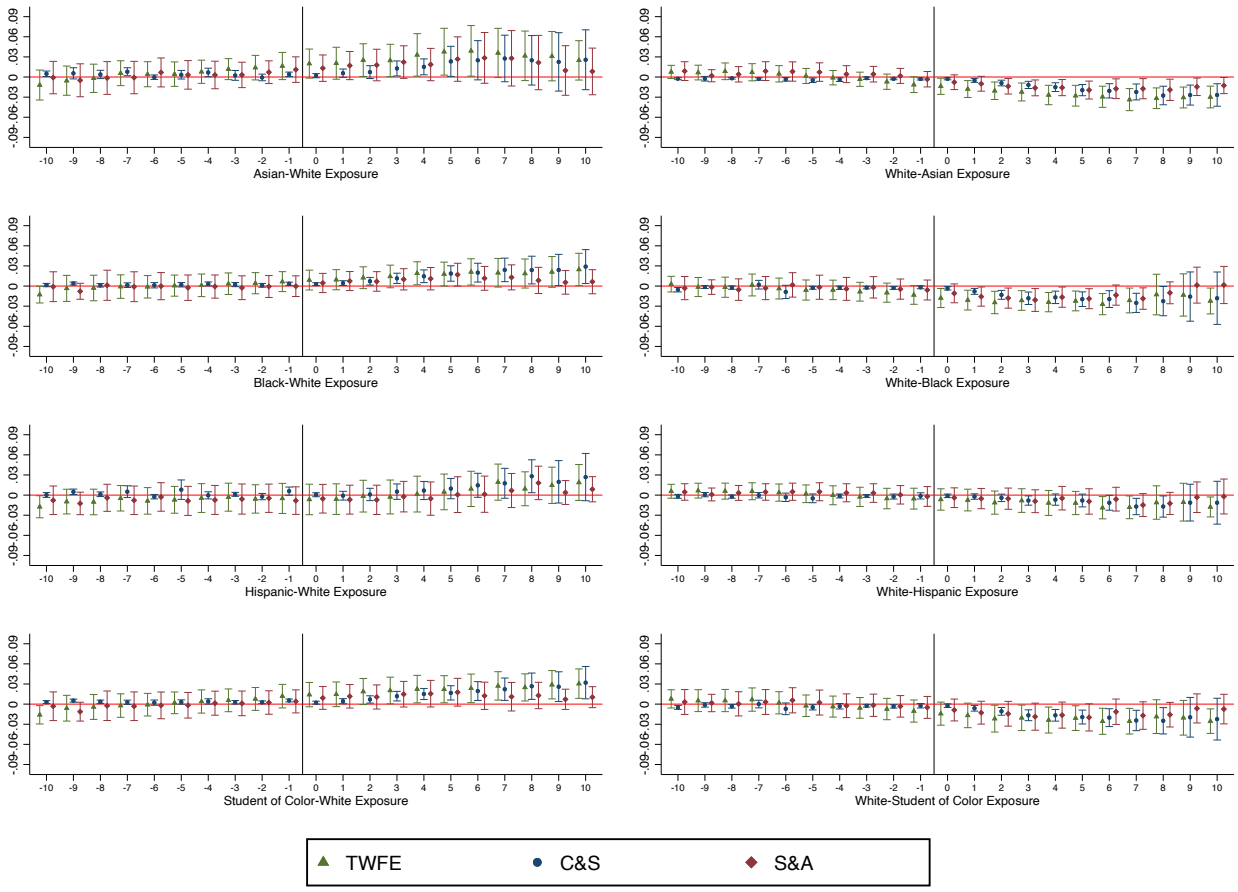

Figure 4. Effects on Dissimilarity