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# Choice and Change: The Implications of Charter School Expansion for School and Neighborhood Diversity in NYC

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In this paper we estimate the effect of charter schools on the diversity of nearby traditional public schools (TPSs) and neighborhoods in New York City. We employ a difference-in-differences approach that exploits the differences in the expansion of the charter sector between grades in the same school. This approach allows us to isolate the effect of charter schools from other neighborhood demographic changes. Our results show small positive effects of charter school expansion on TPS diversity as measured by the entropy score. This change is explained by small increases in the number of White students attending nearby TPSs and larger reductions in the number of Black and Hispanic students in these schools. We also find descriptive evidence that while both neighborhoods and TPSs are slightly more diverse following charter school expansion, schools are changing faster than their surrounding neighborhoods.

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# Choice and Change: The Implications of Charter School Expansion for School and Neighborhood Diversity in NYC

**Abstract**

In this paper we estimate the effect of charter schools on the diversity of nearby traditional public schools (TPSs) and neighborhoods in New York City. We employ a difference-in-differences approach that exploits the differences in the expansion of the charter sector between grades in the same school. This approach allows us to isolate the effect of charter schools from other neighborhood demographic changes. Our results show small positive effects of charter school expansion on TPS diversity as measured by the entropy score. This change is explained by small increases in the number of White students attending nearby TPSs and larger reductions in the number of Black and Hispanic students in these schools. We also find descriptive evidence that while both neighborhoods and TPSs are slightly more diverse following charter school expansion, schools are changing faster than their surrounding neighborhoods.

Keywords: charter schools; neighborhoods; diversity; integration

## Introduction

One well-known feature of the United States' education system is a heavy reliance on attendance zones to determine children's school assignments. Attendance zones often reinforce patterns of residential and school segregation as families factor demographics or perceived school quality into their residential location decisions. Such segregation may be undesirable given the benefits associated with integrated neighborhoods and schools, including higher academic performance and attainment, better health, and higher income (Johnson, 2011; Juvonen et al., 2018). Policies that decouple home and school, such as school choice, therefore have strong intuitive appeal as they may provide broader access to high quality schools and increase neighborhood integration. This may be particularly true in cities, where density and public transportation facilitate children traveling to school outside of their neighborhoods. Yet neighborhood integration may come at the cost of school integration, if, as prior work shows,

students opting out of their zoned schools attend more segregated schools (Frankenberg et al., 2017; Renzulli & Evans, 2005; Wilson & Bridge, 2019). As school choice continues to expand, it is important to understand the possible consequences of increased choice for *both* residential and school diversity. Yet, most of the existing research examines these issues in isolation (Bifulco et al., 2009; Candipan & Brazil, 2020; Clotfelter et al., 2013; Marcotte & Dalane, 2019), and studies that explore both (Bischoff & Tach, 2020; Candipan, 2019; Coughlan, 2018) rarely provide causal estimates or do not examine changes beyond 2010 (Rich et al., 2021).

In this paper, we address this gap by examining how the expansion of a specific type of school choice—charter schools—over almost two decades shaped neighborhood and school diversity in an urban context. We focus our analysis on charter schools because they represent one of the fastest growing forms of school choice in U.S. cities (Candipan and Brazil 2020; Denice et al., 2021). Further, unlike many other forms of school choice, charter schools are not permitted to directly screen students and are free of charge. Thus, charter schools potentially cater to a wider pool of applicants than other choice options. We focus on an urban environment because it is easier for students to access charter schools in cities, both because it is more likely that students will live close to a charter school and because it is easier for students to attend charter schools located far from home using public transportation. Thus, the effects of charter schools on neighborhood and traditional public school (TPS) diversity are probably largest in urban environments. We study New York City (NYC) due to its historically high levels of residential and school segregation and rapidly expanding charter sector. Recent work has highlighted the importance of studying specific locations, as the effects of charter school expansion are likely context specific (Denice et al., 2021), and no prior work specifically explores the effects of charter schools on both school and neighborhoods demographics in NYC.

Disentangling the effects of charter schools on TPSs and neighborhood characteristics is difficult because of other confounding processes that could explain both charter school openings and demographic changes in neighborhoods and schools (Burdick-Will et al., 2013; Candipan, 2020; Davis & Oakley, 2013). To overcome this challenge, we use a difference-in-differences design, exploiting the phase-in of charter schools over time and the relative size of the charter sector in each TPS-grade. This allows us to compare the composition of TPS-grades experiencing changes in charter school exposure to the composition of TPS-grades *within the same school* experiencing no changes in charter school exposure. Student demographics in grades that do not experience changes in charter school exposure serve as a good counterfactual. They should not be directly affected by charter expansion but should reflect other demographic changes occurring in schools and neighborhoods unrelated to charter growth.

To examine the relationship between school and neighborhood segregation, we use a similar empirical approach but construct an outcome that captures the difference between the racial composition of TPSs and that of the *school-age* population residing in the neighborhood where the school is located, which allows us to explore the extent to which school and neighborhood demographic changes mirror one another. Our study contributes to the existing literature by obtaining credibly causal estimates of the effects of charter schools on the racial composition of nearby TPSs and their neighborhoods and provides evidence of the broader implications of school choice policies in a large, racially diverse urban setting.

## Section 2. Charters and Sorting

### How might charter schools affect sorting across schools?

In a system where all students attend their zoned school, school composition directly reflects neighborhood sorting. This sorting involves decisions across several dimensions,

including neighborhood characteristics (i.e physical location and demographics), level of local public services (i.e school quality), and housing consumption (i.e unit size and/or quality). Such sorting was first proposed by Tiebout (1956), who suggested that households choose their desired level of public services, such as school quality, by "voting with their feet," the end result of which is homogeneous neighborhoods containing households with a shared set of preferences about education and other public goods. Indeed, a substantial literature supports this theory, documenting higher income households sort into neighborhoods with higher quality schools (Bayer et al., 2007), and that the racial composition of schools may drive residential choice among White parents (Billingham & Hunt, 2016; Lankford & Wyckoff, 2006). This suggests that the link between neighborhood and schools is an important driver of both racial and socioeconomic segregation in schools.

In a school system with choice, such as charter schools, school composition will reflect both neighborhood sorting and more direct preferences about schools. If, for example, students of color are disproportionately drawn to charter schools, TPSs could become more attractive to White parents who may prefer schools with lower shares of Black and Hispanic students. This could increase segregation between schools.

Evidence examining student transfers *into* charters does indeed suggest that those moves tend to be to more segregated schools. Studies from both North Carolina and Arizona find that students transfer to charter schools that are more racially and ethnically segregated than the schools they previously attended (Bifulco & Ladd, 2007; Clotfelter et al., 2013; Garcia, 2008). Denice and colleagues (2021) find similar results in Kansas City, but with the caveat that segregative moves are concentrated among students transferring to newly opened charter schools, while White students who switch to a neighborhood school or pre-existing charter

school choose schools with *higher* shares of Black students than their prior school. While informative, these studies do not shed light on how segregation under choice compares to a counterfactual of no choice, i.e., where all students attend their zoned school.

Two studies (Bifulco et al., 2009; Saporito & Sohoni, 2006) address this issue by comparing the demographic composition of schools students attend with the counterfactual demographic composition of schools if all students attended their zoned school. Both studies find that schools are more segregated under actual enrollment patterns than they would be if all students attended their zoned school but are based on a cross-section and therefore unable to estimate changes in the racial composition of schools with the introduction – and expansion – of the charter sector. This is important not only for recovering causal estimates but also for understanding how policies governing charter school expansion might influence segregation.

Most similar to our study, Monarrez et al. (2022) exploit between-grade variation in school system charter school enrollment share to examine the effects of charter schools on TPS school segregation in a national sample. They find that charter schools increase the segregation of Black, Hispanic, and White students, but that there is substantial variation by state and level of geography, with larger segregative effects in cities and districts with high shares of Hispanic and Black students. This, in combination with Denice et al. (2021), highlights the importance of analyzing specific urban contexts to provide a more complete understanding of how charter schools affect TPS diversity. In other words, national analyses, while important to understand general trends, do not reflect the local policy context, and may hide substantial variation.

**How might charter schools affect residential sorting?**

By permitting children to enroll in a school outside of their attendance zone, charter schools weaken the link between neighborhood and school, allowing families to place more

weight on other dimensions of residential locations such as housing quality and other neighborhood amenities. For example, if families are able to access high quality charter schools outside of their immediate neighborhood, they may opt to purchase more and better quality housing in neighborhoods with lower quality zoned TPSs and lower house prices. Access to choice may also be viewed as an amenity that induces households to move closer to charter schools, which are often located in lower income neighborhoods. For some parents, the opening of a charter school may send a signal about improvements in neighborhood quality further contributing to changing demographics (Davis & Oakley, 2013). In turn, reduced demand for housing in neighborhoods with high quality TPSs may then free up the market in neighborhoods with historically tight and expensive housing markets to low-income and minority households. This may ultimately lead to lower levels of residential segregation.

Conversely, it is possible that charter schools are perceived as low quality, signs of poor neighborhood quality, or even disamenities, if parents believe that charter schools attract larger shares of low-income students and students of color to the neighborhood. Therefore, charter school expansion has the potential to increase residential segregation if White or high income households actively avoid living close to a charter school.

Finally, charter schools may have no impact on residential segregation if households' preferences regarding the racial and socio-economic characteristics of their neighbors outweighs preferences for school quality and composition. While there is some evidence that households sort both on racial characteristics of the neighborhood *and* quality of zoned schools (Bayer et al., 2007), the relative strength of preferences regarding neighborhood and school characteristics is largely unknown. However, qualitative evidence suggests that charter schools may have little impact on location decisions of low-income households, which may also limit effects on

residential segregation (Cuddy et al., 2020).

Structural general equilibrium models of the effects of choice on neighborhood segregation tend to support predictions that school choice will reduce neighborhood segregation (Nechyba, 2003). Consistent with these models, Brunner et al., (2012) find evidence that higher income households relocate to lower-quality districts with lower housing prices after the introduction of inter-district choice. These findings are promising in terms of choice reducing socioeconomic residential segregation but it is unclear whether we should expect similar effects on the racial/ethnic composition of neighborhoods. It is also unclear whether we would expect to observe similar patterns in response to the opening of charter schools, which tend to locate in areas with higher concentrations of low-income students and students of color (Gilblom & Sang, 2019; Saultz et al., 2015) and which tend to be perceived differently by parents than TPSs (Brown & Makris, 2018). Indeed, evidence on how charter expansion is related to neighborhood demographics is mixed and may be context specific. Quantitative studies find that, in some cities, charter schools attract White and non-poor residents to largely minority neighborhoods (Davis & Oakley, 2013; Pearman & Swain, 2017). Consistent with this, qualitative evidence suggests that charter schools may be used by White parents dissatisfied with their neighborhood TPS to attract other White middle-class families to the neighborhood (Hankins, 2007).

**Evidence on choice, neighborhood, and school segregation**

There are three studies that explore the response of both neighborhood and school racial composition to school choice. These studies tend to find divergent demographic trends between neighborhoods and schools. Coughlan (2018) finds that between 1991 and 2005, the majority of cities experienced increasing neighborhood integration and school segregation, while Bischoff & Tach (2020) find that choice generates racial imbalance between neighborhoods and schools.

Rich et al. (2021) find that charter schools expansion from 2000 to 2010 increased White-Black school segregation with no effects on White-Hispanic school segregation and reductions in residential segregation. However, this study does not speak to changes that could have occurred in the last decade during a period of rapid charter school expansion. While important contributions to the literature, these studies tend to focus on pairwise measures of segregation, which may fail to capture the processes occurring in racially diverse cities, like NYC. Further, like Monarrez et al. (2022), the broad approach taken by these studies may miss important district-level policies and local processes related to both neighborhoods and schools that are relevant for shaping effects.

Our study adds to this literature by obtaining credibly causal estimates of the effects of charter schools on the racial composition of surrounding TPSs. It also provides descriptive evidence on the relationship between charter school expansion and the demographics of surrounding neighborhoods. By exploring these relationships in a specific urban context and comparing our results to previous studies, we are able to shed light on the broader implications of charter school policies in an urban setting.

**Section 3. NYC Context**

NYC schools and neighborhoods are among the most segregated in the country, with a substantial number of children attending schools composed almost entirely of students of their same race and ethnicity (Cohen, 2021). In 2017, White and Asian students were the minority of the public school population at approximately 16 percent each, while most students were either Black (26%) or Hispanic (41%). In 2000, about 13 percent of elementary schools were intensely segregated (over 90% of students of the same race) but this declined to 6 percent by 2017.[1]

[1] Author's calculations based on CCD and NYCDOE data.

Over the past two decades, NYC has experienced rapid demographic changes, including increases in its Hispanic and Asian populations, and rapid gentrification with White middle-class families moving into traditionally minority neighborhoods (Mordechay & Ayscue, 2021). This rapid pace of neighborhood change may have resulted in schools that are more segregated than their neighborhoods (Hemphill & Mader, 2016). Given its historically high levels of segregation, rapid demographic shifts, and dramatic expansion of the charter sector, as well as its unique charter school context described below, NYC is a key context for studying the effects of charter school expansion on school and neighborhood diversity.

***Charter Schools in NYC***

The first charter school opened in NYC in academic year (AY) 1999-00 and the number grew rapidly to 214 in AY 2016-17, when this study ends. While the number of charter schools was initially capped at 100 statewide, this cap was raised to 200 in 2007, with up to 50 of the additional charters reserved for NYC. The cap was raised again in 2010 to 460 (NYSED, 2022). Charters in NYC have a variety of educational missions and goals, including diverse-by-design charter schools with a focus on diversity across a number of dimensions, including race and socioeconomic status, although the number of these schools was limited during our study period.

While charter schools operate throughout NYC, their location is hardly random. Most charter schools are located in either Manhattan (primarily in Harlem) the Bronx, or Brooklyn, with fewer schools in Queens and Staten Island, and the majority are in or near high poverty census tracts (Cordes, 2018). As shown in Figure 1, Community School Districts (CSDs) that experienced the most charter growth from 2000 to 2017 also tend to have a higher non-White elementary school aged population.[2] Specifically, those CSDs with the highest charter shares in

[2] CSDs are a set of 32 sub-city administrative school districts.

2017 are comprised entirely of school zones where 80-100 percent of children ages 5-9 are non-White. Conversely, CSDs containing school zones with relatively low percentages of non-White children (0-20 percent), tend to have small charter school shares. For example, school zones in CSD 31 (Staten Island), where only 1.2 percent of K-5 students are enrolled in charter schools, tend to have much smaller percentages of non-White children compared to other school zones.

Charter schools are prohibited from screening students, but starting in 2008, all NYC charter schools were required to give admission preferences to students residing in the same CSD as the charter school. While admission preferences were not required prior to 2008, many charter schools chose to exercise them. In oversubscribed charter schools, these preferences dictate that students living within a charter school's CSD be given a priority in the admissions process. In popular charter schools, this may mean that all students offered admission reside in the charter school's CSD. Thus, one of the only ways that a family can directly increase the chance of being admitted to a particular charter school is to live in the CSD where that school is located. We exploit this feature of NYC charter school admissions in our identification strategy.

***Other choice***

There are several elementary school choice options in addition to charter schools – recent estimates find that 40 percent of entering kindergartners in 2016-17 enrolled in some form of choice (Mader et al., 2018). Some of these other choice options, such as gifted and talented programs are limited in number and, importantly, have admissions criteria that are unlikely to influence residential sorting. Students can also exercise choice through participation in bilingual programs. However, these are also limited. For example, only about half of the 508 bilingual

programs operating in 2018 are were for elementary school only.[3]

Magnet schools are also open to all students, regardless of residential location. In 2008, there were 8 magnet schools serving all elementary school grades (Schwartz et al. 2014). This number grew to 26 by 2021, though not all of these may have been in operation during our sample period. The city also operates a small number of unzoned elementary schools that, while not assigned to a neighborhood, may limit admission to students in particular CSDs. Although there are selective schools at both the middle and high school level, no selective schools exist at the elementary level, which is the focus of this paper.

At broader levels, NYC also has open enrollment CSDs. Schools in these CSDs do not have specific attendance zones and can be attended any child residing within that CSD. District 1 in the Lower East Side of Manhattan was the only CSD with such policies during our entire study period, while CSDs 7 and 23 in the Bronx converted to choice districts beginning in 2014. Finally, students are eligible for school transfers under certain conditions such as concerns with academic progress, safety, travel hardship, or having a sibling at a different school.[4]

Thus, while there are many forms of elementary-level school choice in addition to charter schools, many of these are limited to specific populations of students, screen applicants, and/or do not have strict geographic requirements. In contrast, charter schools, are technically open to all students but offer some geographic admission preferences.

## Section 4. Methods

### *Data and sample*

[3] Author's calculations using the 2018-2018 Anticipated Bilingual Education Programs List available on the NYC Open Data Portal: https://data.cityofnewyork.us/Education/2017-2018-Anticipated-Bilingual-Education-Programs/ydbx-4ufw

[4] More information on transfers: https://www.schools.nyc.gov/docs/default-source/default-document-library/a101-admissions-readmissions-transfers-english

Our data come from three sources: the Common Core of Data (CCD), the U.S. Census, and school-zone shapefiles. The CCD annual contain enrollment by grade and race/ethnicity for both TPSs and charter schools as well as information on school location. We use these data to construct TPS-grade level measures of racial composition. We use the 2000 and 2010 Census and the 2014-2017 American Community Survey (ACS) five-year estimates to construct racial composition measures at the school-zone level.

Our sample consists of all NYC elementary schools from AY 2000 to 2017. Since there are numerous grade configurations in NYC, we define elementary schools as any school that contains a fourth grade, which encompasses several grade spans such as K-4, K-5, and K-8 and aligns with definitions used in other studies (Candipan & Brazil, 2020; Cordes, 2018). We focus on elementary schools because charter penetration was (and still is) highest in the elementary grades and because middle and high school students have more school choice options. We further limit our sample to schools that are located in one of the 29 CSDs that ever has a charter elementary school during our sample period.[5] We do so for two reasons. First, our empirical strategy relies on within-CSD admission preferences and changes in charter school shares over time and schools in CSDs without charter schools, which experience no change in charter shares, will not contribute to our estimates. Second, schools located in CSDs that never have a charter school are likely different than schools in CSDs that ever have a charter school and may therefore serve as a poor comparison. For example, as shown in Table 1, school-grades in CSDs that never have a charter school have significantly lower percentages of Black and Hispanic students and lower percentages of students eligible for free or reduced price lunch (46.49 versus 71.74 percent). They also tend to be more diverse (entropy 0.77 versus 0.54) and no school-

[5] No charter elementary schools opened in CSDs 20 (Brooklyn), 25 (Queens) or 26 (Queens) from 2000-2017.

grades are intensely segregated using a 90% threshold. With our restrictions, the final analytic sample includes 742 unique schools and 67,478 school-year-grade observations.

***Measures***

We measure demographic composition of TPSs in multiple ways. First, we capture racial diversity using the entropy score for each school-grade following other studies on the topic (Coughlan, 2018). The entropy score is computed as: $E = \sum_{r=1}^{r}(p_{rg})ln\left[\frac{1}{p_{rg}}\right]$ where racial and ethnic groups are indexed by r, and the proportion of each group in a grade is measured by $p_{rg}$.[6] We focus on four racial and ethnic groups: White, Black, Hispanic, and Asian or other race and ethnicity.[7] Higher values of the entropy score indicate more racial diversity. At the extremes, a value of 0 indicates no diversity (all students in a school-grade are the same race) and a value of 1 indicates that all four racial and ethnic groups are equally represented (i.e., 25 percent each).[8]

While the entropy score can be used to understand how evenly racial/ethnic groups are distributed within a school, it does not shed light on the actual distribution of groups. Further, it is possible for two school-grades to have the same entropy score, but different racial compositions. For example, our sample contains two different school-grades with an entropy score of 0.80. School-grade A is 54.3% Black, 28.1% Hispanic, 7.0% White, and 10.5% Asian, while school-grade B is 7.0% Black, 10.5% Hispanic, 54.3% White, and 28.1% Asian. Therefore, we also explore other measures of demographic composition. We examine the share and number of students in a grade by race and ethnicity to explore the specific changes in racial and ethnic composition that may be driving changes in diversity. Following Cohen (2021) and

[6] We use log base 4 to estimate the entropy score because it forces the score to range from 0 to 1.

[7] Students identified as another race/ethnicity are a very small share of students and are coded with Asian students.

[8] Models estimated using measure of diversity based on the Herfindahl index produce similar results and are available upon request. This measure is similar to the one in Denice et al. (2021).

Mader et al. (2018), we also create an indicator for intense segregation, which takes a value of 1 if a school-grade is 90 percent or more of the same race. This allows us to explore whether or not charter schools increase TPS diversity on a margin that reduces intense segregation.

To explore neighborhood diversity, we construct entropy scores using the racial composition of elementary school-age children (ages 5-9) at the school zone level, focusing on the same four racial and ethnic groups. To do so, we spatially match census tracts to NYC school zones as defined in 2000. For census tracts linked to more than one school zone, we apportion population based on the share of the census tract located in each school zone. For example, if 60 percent of the census tract's area is contained in school zone A and 40 percent in school zone B, we assign 60 percent of the population to zone A and 40 percent to zone B. We use census tracts rather than block groups because block group level race-by-age data are not available in the 2014-2017 ACS and we predict that charter school expansion will have larger effects on the composition of school-age children than the population writ large.[9] We use school zones as our measure of neighborhood because these are the most relevant measures of neighborhood for determining public school characteristics and are likely the geography most salient to parents when making residential location decisions. We use AY 2000, rather than contemporaneous school zones because we do not want to conflate changes in neighborhood population due to changes in school zone boundaries with changes due to charter schools.

To examine how TPS composition is changing *relative* to neighborhood composition, we construct a measure of the difference in entropy between TPS students in grades K-4

[9] While our approach will introduce error into our neighborhood demographic measures, we have no reason to believe that this error is correlated with charter school share. As such, while this additional error will reduce the precision of our estimates it will not bias coefficients. We also compared the distribution of entropy measures using block-group level data and those using census tract data for 2000 and 2010 and found significant overlap (Appendix Figures A1 and A2).

(corresponding to ages 5-9) and the school age neighborhood population. A positive value of this measure indicates that a TPS is *more* diverse than the surrounding neighborhood and a negative value indicates that the TPS is *less* diverse than the surrounding neighborhood.

The key measure of charter exposure is *SHARECHARTER*, which is calculated by dividing the number of students in a grade enrolled in charter schools in the CSD by the total number of public school students enrolled in that grade (charter plus TPS) in the CSD. This is meant to capture the relative size of the charter school sector. We also construct a second measure of charter exposure, *CHARTER*, which takes a value of 1 in the first year that a charter school opens in a CSD and all years after. We include this in our regressions to account for possible non-random timing of first charter school entry into a CSD.

### *Empirical Strategy*

#### *Changes in School Demographics*

The primary challenge to identifying the effects of charter schools on TPS composition is the non-random location of charter schools. In NYC charter schools tend to locate in areas of the city where TPSs have higher shares of Black, Hispanic, and poor students, and are generally less diverse (Table 1 and Figure 1). Therefore, a simple cross-sectional comparison of exposed and unexposed schools would yield biased estimates of the impacts of charters on TPS diversity.

To address this issue, we limit our analysis to CSDs with at least one charter elementary school in the period from 2000 to 2017 and use a difference-in-differences strategy that exploits the within-CSD charter school admission preference and two key sources of variation: the phase-in of charter schools, as most begin by offering kindergarten in the first year of operation and then expand by an additional grade each year, and the expansion in the relative size of the charter sector as more charter schools open within the CSD. Our models compare changes in the

demographic composition of grades experiencing changes in the charter share (first difference) with changes in the demographic composition of grades *in the same school* experiencing no changes in the charter share but that should otherwise experience other confounding factors such as changes in school-level resources, neighborhood demographics, etc. (second difference).

Specifically, we estimate the following:

$$Y_{gsdt} = \alpha + \beta_1 ShareCharter_{gdt} + \beta_2 Charter_{dt} + \theta_s + \gamma_g + \delta_t + \varepsilon_{gsdt} \quad (1)$$

Where Y is a measure of the demographic composition in grade g, in school s, in CSD d at time t, *ShareCharter* is equal to share of public school seats in grade g in CSD d at time t that are made up of charter school seats, and *Charter* is an indicator equal to 1 in the first year a charter school opens in the CSD and all subsequent years. Standard errors are clustered at the CSD-year level because this is the level of treatment. The model also includes school ($\theta$), grade ($\gamma$), and year fixed effects ($\delta$). The coefficient of interest is $\beta_1$, which captures the effect of increased charter enrollment share on the demographic composition of TPS-grades. A similar strategy is used by Monarrez et al. (2022) to examine the effects of charter school expansion on segregation nationally. This estimate can be interpreted as causal if, conditional on year effects and timing of initial charter school entry to the CSD, variation in charter share *within the same school* is random. We believe this is a credible assumption because the relative size of the charter share between two grades in the same school captures both the differential growth in the number of charter seats across grades as well as random fluctuations in enrollment between grades in the same school. However, we also perform a series of robustness checks to test the validity of this assumption, including an analysis for pre-trends in TPS characteristics.

*Changes Neighborhood Demographics*

To explore how charter school expansion is related to neighborhood diversity, we

estimate the following:

$$Y_{ndt} = \alpha + \beta_1 ShareCharterK4_{dt-1} + \beta_2 CharterK4_{dt-1} + \varphi_n + \delta_t + \varepsilon_{ndt} \quad (2)$$

Where Y is a measure of the demographic composition of neighborhood in CSD d at time t, *ShareCharterK4* is equal to charter enrollment share in grades K-4 in CSD d in year t-1, *Charter* is an indicator equal to 1 if a charter school first opened in in CSD d in year t-1 and all subsequent years, φ are neighborhood effects, δ are year effects, and $\varepsilon$ is the error term. In this model, the primary coefficient of interest is $\beta_1$, which indicates how charter share in the prior year is related to current neighborhood demographics and is identified from changes in elementary school charter share within neighborhoods over time. In this model, we use the previous year's value for charter share to allow for a lag between changes in charter school exposure and families' location decisions, which may take longer to respond than school enrollment decisions. Standard errors are clustered at the school-zone level. While neighborhood fixed effects account for all time-invariant characteristics of neighborhoods that may be related to charter share, models do not account for any endogeneity due to time-varying neighborhood characteristics. Including controls for characteristics such as neighborhood income or education would potentially control for outcomes that influenced by charter school expansion. These estimates should be interpreted as descriptive, but still provide important insight into the changing neighborhood demographics that accompany increased charter school exposure and the link between neighborhoods and schools.

## Section 5. Results

### *School Diversity*

Our results (Table 2) show a small, statistically significant positive effect of the share of charter seats on TPS diversity. Specifically, column 1 shows a 10 percentage point increase in

the share of charter seats in a grade results in a 2.9 percentage point increase in the entropy score (a 5.4 percent increase relative to baseline entropy). This is driven by an increase in the share of White and Hispanic students and decrease in the share of Black students enrolled in TPS-grades following charter expansion (columns 1-4). Further, this increase in diversity appears to occur on a margin that also affects intense segregation, as a 10 percentage point increase in charter seats lowers the probability of intense segregation by 3.06 percentage points (Table 2, Panel B, column 1). This aggregate effect largely reflects reductions in the probability that a TPS-grade is over 90 percent Black and is consistent with our findings that the share of charter seats decreases the share of Black students in a TPS-grade. We also find a small increase in the probability that a TPS-grade is over 90 percent White, about one-fifth the size of the effect on intense Black segregation. Overall, this suggests that charter school expansion may slightly increase diversity and reduce segregation in TPSs.

It is possible that changes in racial/ethnic shares are explained by the exit of one particular racial/ethnic group from TPSs with no meaningful enrollment changes among other groups. For example, it could be that results shown in in Panels A and B are due to differential exit from TPSs by Black students, while enrollments of other groups remain unchanged. When we explore how increasing charter share affects total TPS-grade enrollment, we find this may be the case (Table 2, Panel C). Charter schools have small negative effects on overall enrollment, with a 10 percentage point increase in charter seats leading to a reduction in TPS-grade enrollment of approximately 9 students. This change is mostly driven by the exit of Black and Hispanic students (6.1 and 2.5 fewer students for each 10 percentage point increase in charter share, respectively). This is slightly offset by small increases in the number of White students.

The primary concern with these estimates is that charter schools may open near in CSDs

where neighborhoods and schools are already undergoing demographic shifts, in which case the results may reflect these pre-existing trends rather than any causal effect of charter school expansion. To more formally test whether pre-existing trends explain our results, we restricted our data to the year in which a charter school first opened in a given grade in the CSD and all years prior and regress school-grade entropy and racial composition on a set of dummy variables indicating the number of years before a charter school first opened in the CSD, with the year of entry serving as the reference (Table 3). These regressions also include school, year, and grade fixed effects. Because charter schools opened at different times during the study period, we centered these indicators around 0 as the year of charter school opening. We find no evidence that TPS diversity was changing prior to charter school openings within a CSD (Column 1). While we do find small changes in the share of White and Black students prior to charter school entry (i.e., White shares are decreasing and Black shares are increasing), these are in the opposite direction of the effects we observe after charter entry, suggesting our results are not picking up a pre-existing trend (columns 2 and 3). We also re-estimate these models focusing on charter entry into grades K and 1 where we might be more concerned about picking up the effects of parents with small children moving into the neighborhood. We find similar results (Appendix Tables A1 and A2). Taken together, these analyses support the causal interpretation of our estimates.

Given the variation in the demographic composition of CSDs, we also explore whether results vary based on whether the CSD was more than 90 percent non-White at baseline (year 2000). We find that although charter expansion increases diversity in all CSDs, the effect is much larger in CSDs that were over 90 percent non-White (Table 4). A 10 percentage point increase in the share of charter seats in a grade results in a 3.3 percentage point increase in diversity in CSDs that are over 90 percent non-White, while the same change in charter share

increases diversity by only 0.97 percentage points in CSDs that are less than 90 percent non-White. The patterns explaining these changes in diversity also differ. Increased diversity in CSDs that are over 90 percent non-White appears to be driven primarily by the exit of Black and Asian/Other race students, with small increases in enrollment among White students. In CSDs that are below 90 percent non-White at baseline, increased diversity is driven by substantial increases in White enrollment, coupled with enrollment declines among all other groups.

Results by borough are largely consistent with our main findings but shed additional light onto geographic heterogeneity. While charter school expansion increases diversity across all boroughs, the patterns explaining this increased diversity differ. For example, while increased TPS diversity in Manhattan is explained by reductions in the share of White and Black students and increases in the share of Hispanic students, increased TPS diversity in Queens is driven entirely by increases in the share of White students. These analyses also confirm that charter school expansion decreased TPS enrollment across all boroughs (Appendix Tables A3 and A4)).

These results suggest that charter schools increase diversity in TPSs primarily by reducing the share/number of Black students and increasing the share/number of White students enrolled in these schools. One explanation for this finding is that Black students may be differentially more likely to exit TPSs to attend charter schools (Bifulco & Ladd, 2007; Bischoff & Tach, 2020; Frankenberg et al., 2017), and White students are more likely to enroll in TPSs with fewer minority students (Burdick-Will et al., 2013; Mordechay & Ayscue, 2021; Renzulli & Evans, 2005). In this case, we would expect little to no change in surrounding neighborhood demographics. A second potential explanation is that charter schools lead to changes in the racial/ethnic composition of nearby neighborhoods from which TPSs draw their students. For example, that charter schools attract White gentrifying parents who enroll their children in TPS

(Mordechay & Ayscue, 2021). We explore this possibility next.

***Neighborhood diversity***

Changes in neighborhood diversity largely mirror observed changes in school-diversity (Table 5, Panel A). Increasing the share of charter seats by 10 percentage points is associated with an increase in neighborhood diversity of school-age children of 2.4 percentage points. This change is explained by an increase in the share of White children (2.1 percentage points for a 10 percentage point increase in charter share) and a decrease in the share of Black (1.2 percentage points) and Asian/Other children (0.6 percentage points), a pattern largely consistent with our school-grade level analyses. This suggests that at least part of the change in TPS demographics may reflect changes in the surrounding neighborhoods.

When we explore *differences* between school and neighborhood composition, we find that while charter school expansion leads to increases in both school and neighborhood diversity, school diversity increases slightly faster. This is driven by an increase in the share of Hispanic students enrolled in TPSs relative to the surrounding neighborhood. The relative shares of White, Black, or Asian/other children in TPSs mirror changes in the neighborhood. Coupled with our findings that charter school expansion leads to declines in enrollment of Hispanic students in TPSs, this may suggest that Hispanic students are opting to attend charter schools at lower rates than other racial/ethnic groups from the same neighborhood.

To explore this possibility, we examine enrollment in charter schools and TPSs by race from 2003-2007. We find that the number of Black students in charter schools has consistently increased, while it has declined in TPSs. We find similar trends for Hispanic students, though their exit from TPSs is less pronounced, their numbers consistently increase in charter schools (Figure 2). This provides descriptive evidence that the effects of charter schools on TPS diversity

may be driven by increases in the number of Black and Hispanic students attending charter schools and a slight increase in White and Asian and other race students attending TPSs. This is also consistent with other studies that show enrollment trends by race (Mader et al., 2018).

***Robustness tests***

We conducted a series of additional analyses to examine whether our results are sensitive to our sample or model and to rule out alternative explanations for our findings. First, we re-estimated all models removing open enrollment CSDs 1, 7 and 23 from our sample and results remain unchanged. Because CSDs 7 and 23 only became open enrollment in 2014, we also re-estimated our regressions only removing these two districts starting in 2014. Our results are also not sensitive to this choice. Second, we re-estimated models controlling for distance to the nearest charter schools and results remain unchanged (Appendix Table A5). Third, we re-estimated all models replacing the *charter* indicator with a linear control for the number of years since charter opening. Our results are also not sensitive to this change (Appendix Table A6). Finally, we re-estimated our models including controls for school-level proficiency rates, percent of students receiving free or reduced price lunch, and teacher-pupil ratios and find the same results (Appendix Table A7).

Next, to examine whether our neighborhood analyses might be capturing other neighborhood changes independent of charter school expansion, we re-estimated our models with entropy and racial/ethnic composition of 18-19 year olds and 55-64 year olds as our outcomes. These groups are unlikely to make residential location decisions in response to the share of charter school seats because they are not enrolled in school themselves and are likely either too young (18-19) or too old (55 to 64) to make residential location decisions based on school-aged children of their own. We find an increase in the share of charter seats is associated with increased neighborhood diversity among these other age groups, but the change is about

half as large as we observe among elementary school age children (Appendix Table A8). Thus, while our neighborhood estimates may be picking up more general demographic changes occurring in neighborhoods where charters expand, these changes alone are likely not enough to explain the size of the changes we see among elementary school-aged children. However, we also explore whether our results are sensitive to controlling for neighborhood unemployment rate and percent of adults over 25 years of age with a bachelor's degree and our results are again unchanged (Appendix Table A9).

**Section 6. Conclusion**

Despite concerns that charter schools lead to more segregated schools and the promise of these schools for increasing neighborhood diversity, we find that at least in NYC, charter schools have little effect on either outcome. Charter school expansion has a small positive effect on school diversity and neighborhoods also become slightly more diverse following increases in charter school enrollment, but these effects are small and may not reflect economically meaningful or perceptible changes in the diversity of a given TPS-grade or school zone. The small increases in diversity we observe are likely explained by the movement of Black and Hispanic students to charters from highly segregated TPSs. Importantly, when we examine trends in entropy across the district, we see little evidence that the district as a whole is becoming more segregated. These results speak to key debates in the literature: the role of choice in school segregation and the potential for choice to break the link between neighborhood and school.

Our results are in contrast to some other existing evidence that charter schools lead to more segregated schools. This may be due to a number of factors including differences in the empirical approach and charter school context in other locations. Specifically, some prior studies rely on comparisons between the composition of schools students would have attended based on

their attendance zone and the composition of schools they actually attend. This approach may not provide a strong counterfactual, as it neglects the possibility that charter schools may induce families to move neighborhoods, or that charter school entry may be linked to other neighborhood changes. The empirical strategy we use in this paper provides a stronger counterfactual of what demographic changes might occur in the absence of charter school expansion, accounting for other neighborhood shifts by comparing demographic composition of different grades in the same school. Furthermore, the charter sector in NYC is relatively small, so results might differ from those in other urban districts with a larger number of charter schools. The use of geographic enrollment preferences in NYC may also explain differences in our findings, as prior work shows that charter schools appear to have larger effects on segregation *between* districts (Monarrez et al., 2022).

That said, our results align with recent trends in NYC regarding small declines in intensely segregated schools and increases in diversity in some CSDs (Cohen 2021), and support findings that suggest White middle-class families in gentrifying areas become more engaged with their local public schools (Freidus, 2019).

Compared to descriptive studies that find neighborhoods change more rapidly than their schools (Hemphill & Mader, 2016; Mordechay & Ayscue, 2021), our analyses suggest the opposite, with schools changing more rapidly than neighborhoods. We find that charter expansion may lead to resorting of students across TPS and charter schools, but more moderate changes in neighborhoods. Specifically, charter school expansion is related to higher shares of White children in a neighborhood, but does not seem related to lower shares of other racial or ethnic groups. This is not to say that our results imply that choice fails to break the neighborhood-school link, but rather changes in neighborhood composition may be slower to

occur than changes in school composition. Indeed, whether these trends persist in the long-term or whether increasing shares of White residents will ultimately lead to declines in Black, Hispanic, and Asian residents in a neighborhood is a task for future research.

Our results have several important policy implications. First, the evidence presented here in conjunction with prior evidence regarding the spillover effects of charter schools in NYC (Cordes, 2018) suggests that at the margin in this context, charter school expansion does not negatively impact performance or contribute to school segregation. In addition, it does not appear that charter school siting has negative consequences for racial sorting in the surrounding neighborhoods, particularly in a context that manages charter school growth, like NYC. Finally, given that our findings are in contrast to some other existing evidence that charter schools lead to increased school segregation, this suggests that certain features of the NYC charter school context including geographic preferences and growth caps may be important tools for limiting potential negative consequences of charter school expansion. That said, future research should explore whether there are similar findings in other large cities with comparable policies and the long run impacts of these demographic changes for schools and neighborhoods.

There are some limitations of this study worth mentioning. First, our results may mask heterogeneity by school and neighborhood. The effect of charter schools on TPS diversity may depend on TPS characteristics such as school quality, size, and grade-spans for example. Effects may also depend on the characteristics of the neighborhoods in which TPSs are located, such as the school-age population, density, education levels, etc. Second, while we can explore general enrollment trends between TPSs and charters over this period, we are unable to directly identify the extent to which individual students are transferring between sectors. This is an important area for future research. Third, while we find little effect of charter schools on neighborhood

composition, it may take more time for neighborhood composition to change in response to charter schools. Finally, as noted previously, due to data constraints with the 2014-17 ACS, we construct our neighborhood demographic measures using census tract level data. Since it is unlikely that families are distributed evenly across tracts by race, this introduces error into our neighborhood entropy and demographic measures. Although this does not bias our estimates, it does introduce additional unexplained error into our model, which reduces their precision.

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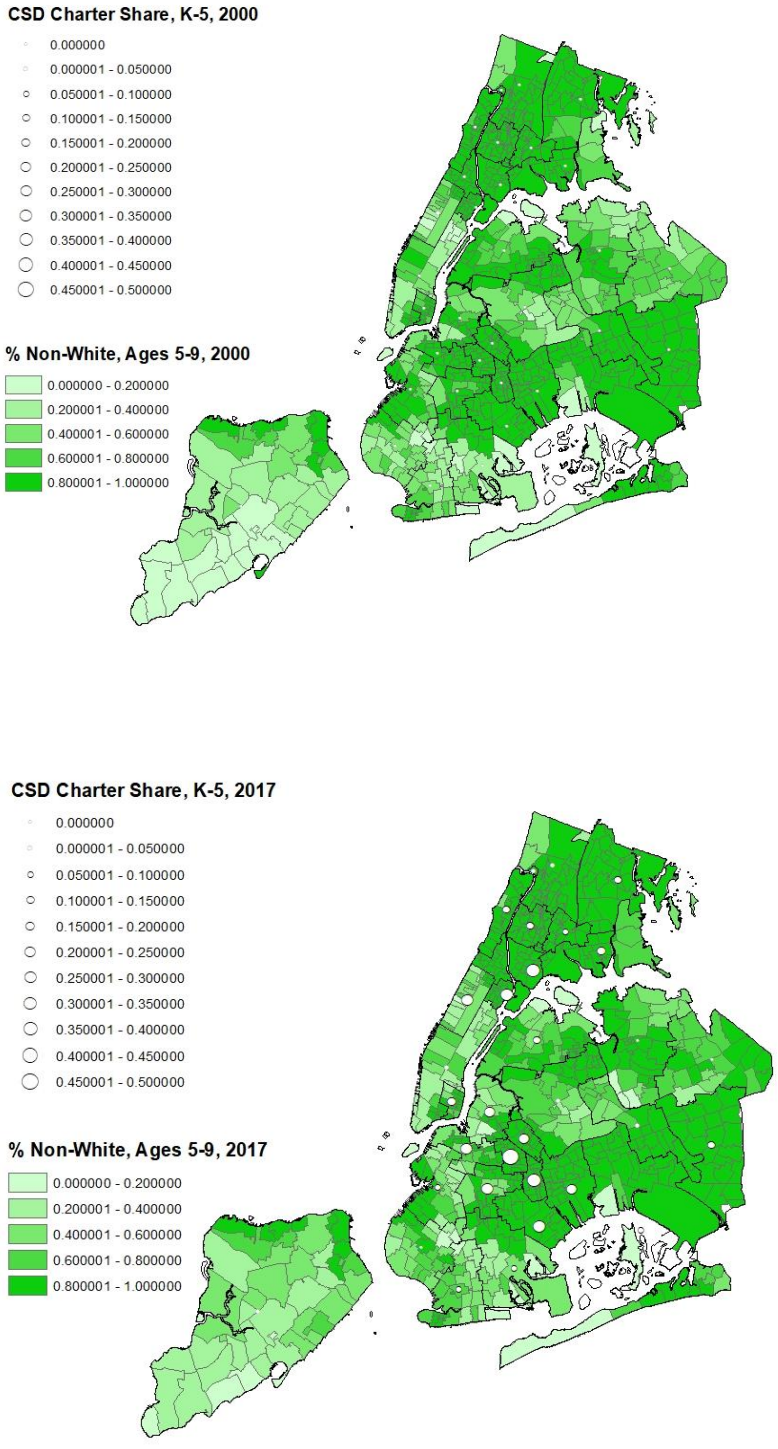
## Figures

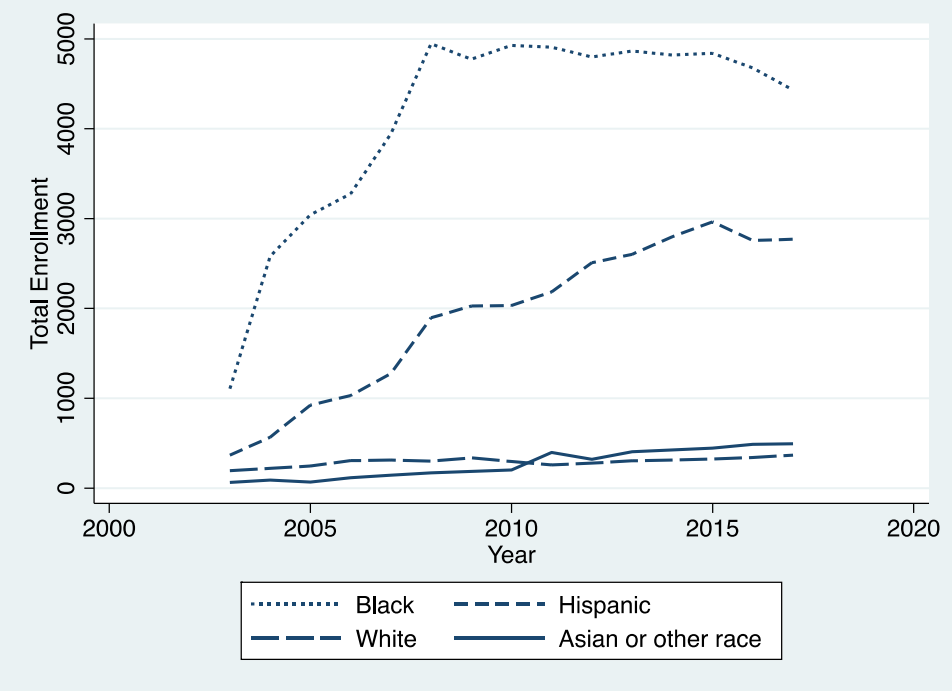
## Figure 1: Location and size of charter schools in NYC



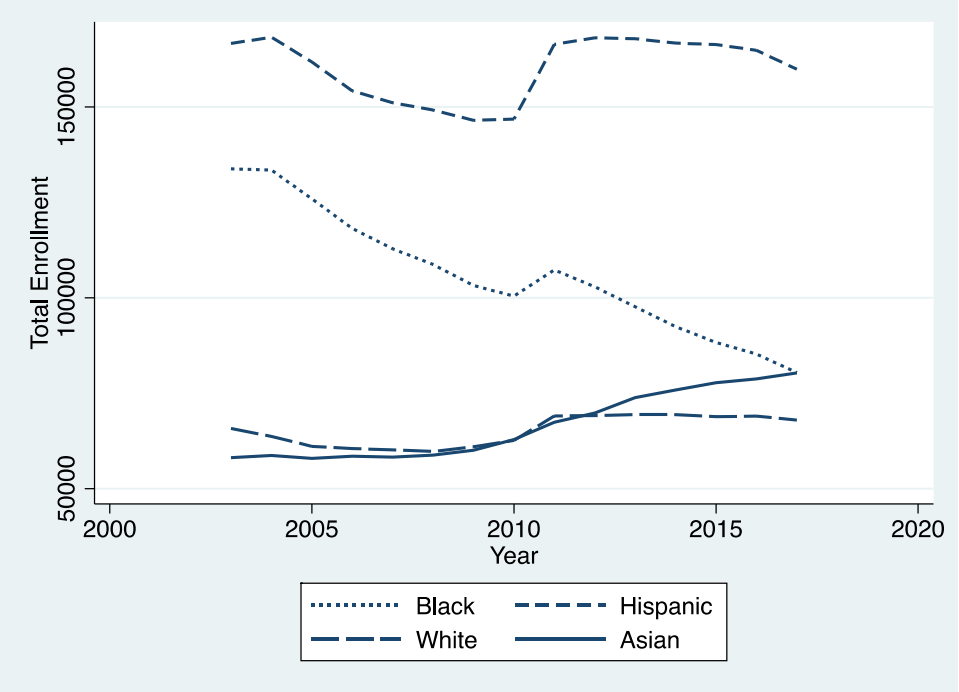

*Notes:* Author's calculations using data from the American Community Survey and the Common Core of Data.

**Figure 2: Changes in yearly enrollment by section and race/ethnicity**

*Panel A: Charter schools*




*Panel B: Traditional Public Schools*




*Notes*: Authors' calculations based on CCD. Figure begin in 2003 due to lack of reliable grade-level demographic data in charter schools prior to this year.

## Tables

**Table 1: Average characteristics school-grades and CSDs by charter school presence, baseline year**

| | Ever charter | | Never charter | |
|---|---|---|---|---|
| | Mean | s.d | Mean | s.d |
| *A. School-grades* | | | | |
| School enrollment | 839.47 | 334.55 | 759.94 | 316.10 |
| Grade enrollment | 121.67 | 58.08 | 109.18 | 51.04 |
| Share Black | 0.38 | 0.32 | 0.07 | 0.09 |
| Share Hispanic | 0.38 | 0.27 | 0.19 | 0.13 |
| Share White | 0.15 | 0.24 | 0.37 | 0.19 |
| Share Asian/Other race | 0.08 | 0.13 | 0.37 | 0.15 |
| Entropy score | 0.54 | 0.22 | 0.77 | 0.11 |
| Intense segregation | 0.15 | 0.35 | 0.00 | 0.00 |
| Free lunch (%) | 71.74 | 29.63 | 46.49 | 24.30 |
| Proficiency ELA | 29.09 | 18.48 | 55.21 | 17.12 |
| Proficiency Math | 45.18 | 22.94 | 74.20 | 14.20 |
| Observations | 3,476 | | 383 | |
| *B. CSDs* | | | | |
| Enrollment | 14,583.24 | 5,735.03 | 13,939.00 | 3,862.05 |
| Share Black | 0.40 | 0.27 | 0.06 | 0.03 |
| Share Hispanic | 0.40 | 0.24 | 0.20 | 0.08 |
| Share White | 0.11 | 0.15 | 0.34 | 0.08 |
| Share Asian/Other race | 0.08 | 0.09 | 0.39 | 0.08 |
| Entropy score | 0.65 | 0.22 | 0.87 | 0.03 |
| Intense segregation | 0.03 | 0.19 | 0.00 | 0.00 |
| Free lunch (%) | 73.62 | 14.09 | 45.73 | 22.96 |
| Proficiency ELA | 27.65 | 10.82 | 55.78 | 16.39 |
| Proficiency Math | 43.42 | 13.60 | 74.55 | 10.74 |
| Observations | 29 | | 3 | |

*Notes:* Panel A includes grades in K-5 in year 2000 (baseline year). Panel B includes CSD-level demographics also in the baseline year (2000). *Source:* Common Core of Data.

**Table 2: Regression results, charter schools and TPS school diversity and enrollment**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Entropy score | Share White | Share Black | Share Hispanic | Share Asian/Other |
| Panel A | | | | | |
| Share charter in grade | 0.292** | 0.088** | -0.142** | 0.075** | -0.021* |
| | (0.024) | (0.017) | (0.018) | (0.023) | (0.009) |
| Observations | 67,478 | 67,478 | 67,478 | 67,478 | 67,478 |
| R-squared | 0.848 | 0.956 | 0.963 | 0.945 | 0.928 |
| | Intense segregation | White | Black | Hispanic | Asian/Other |
| Panel B | | | | | |
| Share charter in grade | -0.306** | 0.067** | -0.348** | -0.021 | -0.005* |
| | (0.053) | (0.017) | (0.049) | (0.013) | (0.002) |
| Observations | 67,478 | 67,478 | 67,478 | 67,478 | 67,478 |
| R-squared | 0.590 | 0.347 | 0.594 | 0.708 | 0.674 |
| | Grade enrollment | White | Black | Hispanic | Asian/Other |
| Panel C | | | | | |
| Share charter in grade | -89.795** | 4.498+ | -60.942** | -24.833** | -8.518** |
| | -5.383 | (2.545) | (4.886) | (3.587) | (1.100) |
| Observations | 67,478 | 67,478 | 67,478 | 67,478 | 67,478 |
| R-squared | 0.842 | 0.921 | 0.891 | 0.901 | 0.933 |

Standard errors in parentheses (clustered by CSD-year)

** p<0.01, * p<0.05, + p<0.1

*Notes:* All models include school, grade, and year fixed effects. Sample restricted to K-5 grades in traditional public schools in community school districts that ever had a charter school. All models include a control that equals 1 in the year of charter school entry in the CSD and every year after to account for the non-random timing of charter entry. Share charter in grade is a continuous variable capturing the share of seats accounted for by charter schools in that grade and year. *Source:* Common Core of Data.

**Table 3: Pre-trends by race and ethnicity, all grades**

| | Entropy score (1) | White (2) | Black (3) | Hispanic (4) | Asian/Other (5) |
|---|---|---|---|---|---|
| 12 or more years before | -0.002 | -0.002+ | 0.004** | -0.001 | -0.001 |
| | (0.002) | (0.001) | (0.001) | (0.002) | (0.001) |
| 11 years before | 0.004 | -0.006** | 0.005** | -0.000 | 0.002 |
| | (0.003) | (0.002) | (0.002) | (0.002) | (0.001) |
| 10 years before | 0.005 | -0.008** | 0.008** | -0.001 | 0.001 |
| | (0.004) | (0.003) | (0.002) | (0.003) | (0.002) |
| 9 years before | -0.001 | -0.009* | 0.009** | -0.001 | 0.000 |
| | (0.004) | (0.003) | (0.002) | (0.003) | (0.002) |
| 8 years before | 0.002 | -0.009* | 0.009** | -0.000 | -0.001 |
| | (0.005) | (0.004) | (0.003) | (0.004) | (0.002) |
| 7 years before | 0.001 | -0.011* | 0.011** | -0.002 | 0.001 |
| | (0.006) | (0.005) | (0.003) | (0.005) | (0.002) |
| 6 years before | 0.001 | -0.011+ | 0.012** | -0.003 | 0.002 |
| | (0.006) | (0.006) | (0.004) | (0.005) | (0.003) |
| 5 years before | 0.003 | -0.005 | 0.010* | -0.006 | 0.002 |
| | (0.007) | (0.006) | (0.004) | (0.006) | (0.003) |
| 4 years before | 0.000 | -0.001 | 0.011** | -0.010+ | -0.000 |
| | (0.008) | (0.007) | (0.004) | (0.006) | (0.003) |
| 3 years before | 0.004 | -0.001 | 0.014** | -0.009 | -0.004 |
| | (0.008) | (0.008) | (0.005) | (0.007) | (0.003) |
| 2 years before | -0.001 | 0.003 | 0.018** | -0.015+ | -0.006 |
| | (0.009) | (0.009) | (0.006) | (0.007) | (0.004) |
| 1 year before | -0.007 | 0.009 | 0.013* | -0.018** | -0.003 |
| | (0.008) | (0.008) | (0.006) | (0.007) | (0.003) |
| Observations | 29,858 | 29,858 | 29,858 | 29,858 | 29,858 |
| R-squared | 0.905 | 0.974 | 0.979 | 0.966 | 0.951 |

Standard errors in parentheses (clustered by school)
** p<0.01, * p<0.05, + p<0.1
*Notes:* Sample restricted to period before charter entry. Year of charter entry is omitted from the regression. All models include year and school fixed effects. *Source:* Common Core of Data.

**Table 4: Entropy results stratified by whether CSD is above 90% non-White at baseline**

| | (1) Entropy Score | (2) Share White | (3) Share Black | (4) Share Hispanic | (5) Share Asian/Other |
|---|---|---|---|---|---|
| *A. CSDs above 90% non-White at baseline* | | | | | |
| Share charter in grade | 0.334** | 0.044** | -0.170** | 0.103** | 0.023** |
| | (0.028) | (0.007) | (0.020) | (0.020) | (0.008) |
| Observations | 37,479 | 37,479 | 37,479 | 37,479 | 37,479 |
| R-squared | 0.813 | 0.872 | 0.959 | 0.956 | 0.873 |
| *B. CSD below 90% non-White at baseline* | | | | | |
| Share charter in grade | 0.097* | 0.374** | -0.098+ | -0.258** | -0.018 |
| | (0.042) | (0.049) | (0.050) | (0.048) | (0.026) |
| Observations | 29,999 | 29,999 | 29,999 | 29,999 | 29,999 |
| R-squared | 0.827 | 0.950 | 0.951 | 0.916 | 0.927 |
| | Total Enrollment | White | Black | Hispanic | Asian/Other |
| *C. CSDs above 90% non-White at baseline* | | | | | |
| Share charter in grade | -55.094** | 1.196+ | -52.623** | -1.589 | -2.078** |
| | (7.014) | (0.656) | (5.356) | (5.856) | (0.732) |
| Observations | 37,479 | 37,479 | 37,479 | 37,479 | 37,479 |
| R-squared | 0.828 | 0.846 | 0.873 | 0.888 | 0.914 |
| *D. CSDs below 90% non-White at baseline* | | | | | |
| Share charter in grade | -59.393** | 42.122** | -22.575** | -69.802** | -9.138** |
| | (9.414) | (7.746) | (5.616) | (8.017) | (3.168) |
| Observations | 29,999 | 29,999 | 29,999 | 29,999 | 29,999 |
| R-squared | 0.864 | 0.903 | 0.899 | 0.920 | 0.926 |

Standard errors in parentheses (clustered by CSD-year)

** p<0.01, * p<0.05, + p<0.1

*Notes:* All models include school, grade, and year fixed effects. Sample restricted to grades K-5 in traditional public schools in community school districts (CSD) that ever had a charter school. Share charter in grade is a continuous variable capturing share of seats accounted for by charter schools in that grade. Models stratified by whether the student population in the CSD above the citywide median non-White at baseline (year 2000). All models include a *charter* control that equals 1 in the year of charter entry in the CSD and every year after to account for the non-random timing of charter school entry.

*Source:* NYC Public School Administrative Data and Common Core of Data.

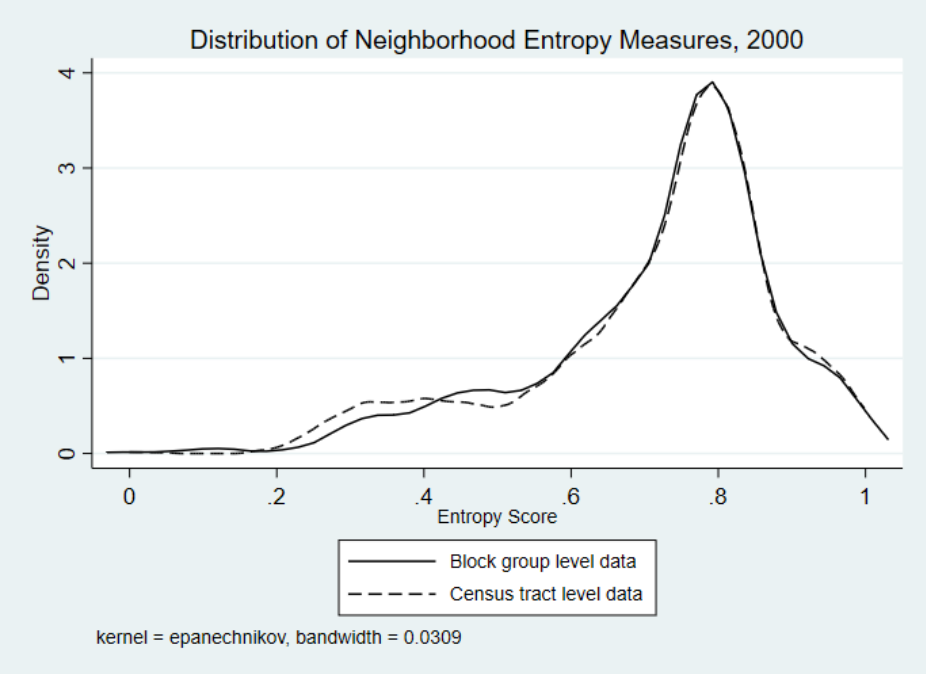
**Table 5: Regression results, effect of charter schools on neighborhood diversity**

| Panel A: | (1) Zone Entropy Score | (2) Share White | (3) Share Black | (4) Share Hispanic | (5) Share Asian/Other |
|---|---|---|---|---|---|
| Share charter in K-4 | 0.244** | 0.209** | -0.116* | -0.029 | -0.064* |
| | (0.052) | (0.034) | (0.047) | (0.032) | (0.033) |
| Observations | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 |
| R-squared | 0.868 | 0.968 | 0.969 | 0.943 | 0.917 |
| Panel B: | Entropy Score Difference | Share White difference | Share Black difference | Share Hispanic difference | Share Asian/Other difference |
| Share charter in K-4 | 0.150** | -0.048 | -0.045 | 0.085* | 0.009 |
| | (0.052) | (0.039) | (0.050) | (0.039) | (0.037) |
| Observations | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 |
| R-squared | 0.875 | 0.714 | 0.641 | 0.771 | 0.828 |

Standard errors in parentheses (clustered by school zone)
** p<0.01, * p<0.05, + p<0.1
*Notes:* All models include school zone and year fixed effects. Sample restricted to zones for traditional public schools in community school districts (CSD) that ever had a charter school. Charter equals 1 in the year of charter school entry in the CSD and every year after. Share charter in K-4 is a continuous variable capturing share of seats for students in grades K-4 accounted for by charter schools. Entropy score difference is equal to the entropy score for the TPs minus the entropy score for it's school zone. Share White, Black, Hispanic, and Asian/Other difference are constructed analogously. Models include a charter control that equals 1 in the year of charter entry and every year after to account for the non-random timing of charter school entry.
*Source:* Decennial Census, American Community Survey, and Common Core of Data.

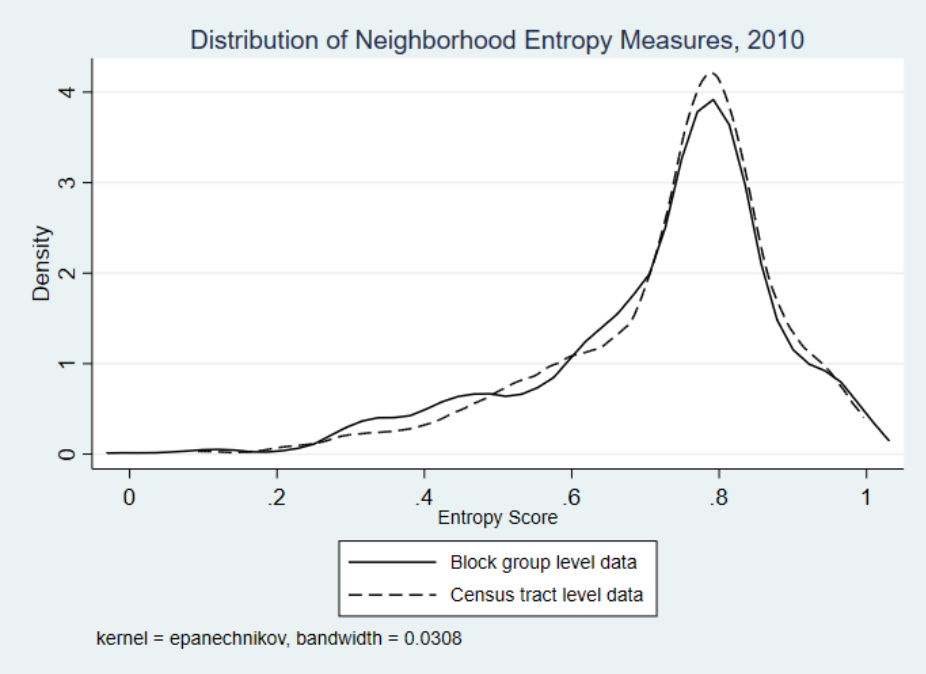
## Appendix

**Figure A1: Distribution of neighborhood census tract and block group entropy Measures, 2000**




*Source:* Decennial Census.

**Figure A2: Distribution of neighborhood census tract and block group entropy Measures, 2010**




*Source:* Decennial Census.

**Table A1: Pre-trends by race and ethnicity, Kindergarten**

| | White | Black | Hispanic | Asian/Other |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| 12 or more years before | 0.005 | 0.000 | -0.010+ | 0.004 |
| | (0.005) | (0.004) | (0.006) | (0.003) |
| 11 years before | 0.007 | -0.009 | -0.003 | 0.006 |
| | (0.008) | (0.006) | (0.009) | (0.005) |
| 10 years before | 0.004 | -0.005 | -0.012 | 0.013+ |
| | (0.013) | (0.008) | (0.013) | (0.007) |
| 9 years before | 0.009 | -0.011 | -0.020 | 0.022* |
| | (0.016) | (0.010) | (0.018) | (0.009) |
| 8 years before | 0.008 | -0.018 | -0.016 | 0.025* |
| | (0.021) | (0.012) | (0.021) | (0.011) |
| 7 years before | 0.016 | -0.016 | -0.032 | 0.033* |
| | (0.025) | (0.014) | (0.026) | (0.013) |
| 6 years before | 0.016 | -0.016 | -0.039 | 0.040** |
| | (0.029) | (0.016) | (0.030) | (0.015) |
| 5 years before | 0.023 | -0.024 | -0.047 | 0.048** |
| | (0.033) | (0.018) | (0.035) | (0.017) |
| 4 years before | 0.036 | -0.031 | -0.057 | 0.052** |
| | (0.037) | (0.021) | (0.038) | (0.019) |
| 3 years before | 0.039 | -0.026 | -0.064 | 0.051* |
| | (0.042) | (0.023) | (0.043) | (0.021) |
| 2 years before | 0.054 | -0.028 | -0.069 | 0.042+ |
| | (0.046) | (0.025) | (0.047) | (0.023) |
| 1 year before | 0.071 | -0.054 | -0.119* | 0.102** |
| | (0.055) | (0.033) | (0.060) | (0.031) |
| Observations | 4,538 | 4,538 | 4,538 | 4,538 |
| R-squared | 0.976 | 0.981 | 0.967 | 0.952 |

Standard errors in parentheses (clustered by school)

** p<0.01, * p<0.05, + p<0.1

*Notes:* Year of charter entry in grade is omitted. All models include year fixed effects. Column 1 also includes grade fixed effects.

**Table A2: Pre-trends by race and ethnicity, first grade**

| | White | Black | Hispanic | Asian/Other |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| 12 or more years before | -0.007 | -0.005 | 0.011* | 0.001 |
| | (0.005) | (0.004) | (0.005) | (0.003) |
| 11 years before | -0.013 | -0.004 | 0.009 | 0.008 |
| | (0.010) | (0.007) | (0.008) | (0.006) |
| 10 years before | -0.018 | -0.008 | 0.012 | 0.014 |
| | (0.015) | (0.011) | (0.012) | (0.009) |
| 9 years before | -0.023 | -0.015 | 0.022 | 0.016 |
| | (0.020) | (0.014) | (0.015) | (0.012) |
| 8 years before | -0.022 | -0.017 | 0.022 | 0.018 |
| | (0.025) | (0.017) | (0.018) | (0.015) |
| 7 years before | -0.031 | -0.022 | 0.027 | 0.025 |
| | (0.031) | (0.021) | (0.022) | (0.018) |
| 6 years before | -0.029 | -0.025 | 0.023 | 0.032 |
| | (0.036) | (0.024) | (0.026) | (0.021) |
| 5 years before | -0.029 | -0.027 | 0.025 | 0.031 |
| | (0.041) | (0.027) | (0.029) | (0.023) |
| 4 years before | -0.022 | -0.030 | 0.019 | 0.033 |
| | (0.046) | (0.031) | (0.033) | (0.026) |
| 3 years before | -0.022 | -0.030 | 0.029 | 0.023 |
| | (0.051) | (0.034) | (0.036) | (0.030) |
| 2 years before | -0.013 | -0.031 | -0.000 | 0.045 |
| | (0.056) | (0.038) | (0.041) | (0.033) |
| 1 year before | -0.036 | -0.060 | 0.041 | 0.054 |
| | (0.068) | (0.049) | (0.046) | (0.041) |
| Observations | 4,489 | 4,489 | 4,489 | 4,489 |
| R-squared | 0.978 | 0.984 | 0.973 | 0.955 |

Standard errors in parentheses (clustered by school)

** p<0.01, * p<0.05, + p<0.1

*Notes:* Year of charter entry in grade is omitted. All models include year fixed effects. Column 1 also includes grade fixed effects.

**Table A3: Effect of charter schools on TPS diversity, stratified by borough**

| | (1) Entropy score | (2) Share White | (3) Share Black | (4) Share Hispanic | (5) Share Asian/Other |
|---|---|---|---|---|---|
| *A. Manhattan* | | | | | |
| Share charter in grade | 0.310** | -0.061** | -0.258** | 0.337** | -0.017 |
| | (0.041) | (0.013) | (0.029) | (0.034) | (0.014) |
| Observations | 12,453 | 12,453 | 12,453 | 12,453 | 12,453 |
| R-squared | 0.856 | 0.943 | 0.920 | 0.942 | 0.946 |
| *B. the Bronx* | | | | | |
| Share charter in grade | 0.231** | 0.045** | 0.086** | -0.164** | 0.032** |
| | (0.036) | (0.010) | (0.021) | (0.016) | (0.011) |
| Observations | 15,039 | 15,039 | 15,039 | 15,039 | 15,039 |
| R-squared | 0.778 | 0.930 | 0.907 | 0.897 | 0.789 |
| *C. Brooklyn* | | | | | |
| Share charter in grade | 0.347** | -0.010 | -0.109** | 0.182** | -0.064** |
| | (0.029) | (0.035) | (0.020) | (0.044) | (0.018) |
| Observations | 21,801 | 21,801 | 21,801 | 21,801 | 21,801 |
| R-squared | 0.842 | 0.936 | 0.967 | 0.938 | 0.900 |
| *D. Queens* | | | | | |
| Share charter in grade | 0.022 | 0.257** | -0.112 | -0.136+ | -0.009 |
| | (0.166) | (0.081) | (0.111) | (0.074) | (0.090) |
| Observations | 13,624 | 13,624 | 13,624 | 13,624 | 13,624 |
| R-squared | 0.867 | 0.962 | 0.979 | 0.938 | 0.920 |
| *D. Staten Island* | | | | | |
| Share charter in grade | -0.095 | 0.564 | -0.481* | 0.727** | -0.810** |
| | (0.402) | (0.331) | (0.185) | (0.188) | (0.153) |
| Observations | 4,561 | 4,561 | 4,561 | 4,561 | 4,561 |
| R-squared | 0.875 | 0.965 | 0.933 | 0.903 | 0.805 |

Standard errors in parentheses (clustered by CSD-year)

** p<0.01, * p<0.05, + p<0.1

*Notes:* All models include year, grade, and school fixed effects. Omitted distance category: distance to nearest charter school more than 1.5 miles. All models include a *charter* control that equals 1 in the year of charter entry in the CSD and every year after to account for the non-random timing of charter school entry.

*Source:* NYC Public School Administrative Data and Common Core of Data.

**Table A4: Effect of charter schools on TPS enrollment, stratified by borough**

| | (1) Total Enrollment | (2) White | (3) Black | (4) Hispanic | (5) Asian/Other |
|---|---|---|---|---|---|
| *A. Manhattan* | | | | | |
| Share charter in grade | -65.812** | -11.830** | -51.960** | 2.441 | -4.463** |
| | (12.990) | (2.162) | (7.321) | (11.500) | (1.243) |
| Observations | 12,453 | 12,453 | 12,453 | 12,453 | 12,453 |
| R-squared | 0.757 | 0.921 | 0.798 | 0.855 | 0.953 |
| *B. the Bronx* | | | | | |
| Share charter in grade | -21.564** | 1.857 | 4.020 | -28.928** | 1.488 |
| | (4.837) | (1.233) | (3.985) | (3.694) | (1.290) |
| Observations | 15,039 | 15,039 | 15,039 | 15,039 | 15,039 |
| R-squared | 0.848 | 0.907 | 0.877 | 0.856 | 0.846 |
| *C. Brooklyn* | | | | | |
| Share charter in grade | -126.789** | -14.848** | -79.840** | -10.629* | -21.472** |
| | (10.622) | (5.051) | (6.392) | (4.659) | (3.114) |
| Observations | 21,801 | 21,801 | 21,801 | 21,801 | 21,801 |
| R-squared | 0.809 | 0.891 | 0.886 | 0.908 | 0.899 |
| *D. Queens* | | | | | |
| Share charter in grade | -206.614** | -8.613 | -87.572** | -75.348** | -35.081* |
| | (25.385) | (9.051) | (28.934) | (23.603) | (14.608) |
| Observations | 13,624 | 13,624 | 13,624 | 13,624 | 13,624 |
| R-squared | 0.877 | 0.917 | 0.905 | 0.927 | 0.928 |
| *D. Staten Island* | | | | | |
| Share charter in grade | -128.339 | 17.639 | -69.629** | 4.952 | -81.300** |
| | (120.033) | (68.987) | (11.549) | (54.373) | (12.233) |
| Observations | 4,561 | 4,561 | 4,561 | 4,561 | 4,561 |
| R-squared | 0.826 | 0.909 | 0.913 | 0.883 | 0.840 |

Standard errors in parentheses (clustered by CSD-year)

** p<0.01, * p<0.05, + p<0.1

*Notes:* All models include year, grade, and school fixed effects. Omitted distance category: distance to nearest charter school more than 1.5 miles. All models include a *charter* control that equals 1 in the year of charter entry in the CSD and every year after to account for the non-random timing of charter school entry.

*Source:* NYC Public School Administrative Data and Common Core of Data.

**Table A5: Effect of charter schools on TPS diversity, controlling for distance to nearest charter school**

| Panel A | (1) Entropy score | (2) Share White | (3) Share Black | (4) Share Hispanic | (5) Share Asian/Other |
|---|---|---|---|---|---|
| Share charter in grade | 0.299** | 0.060** | -0.142** | 0.095** | -0.013 |
| | (0.025) | (0.017) | (0.020) | (0.024) | (0.009) |
| Distance to nearest charter | | | | | |
| Less than half a mile | 0.004 | 0.016** | -0.002 | -0.008* | -0.006** |
| | (0.004) | (0.003) | (0.003) | (0.003) | (0.002) |
| Half a mile to one miles | 0.003 | 0.015** | -0.005* | -0.006* | -0.003+ |
| | (0.004) | (0.003) | (0.002) | (0.003) | (0.002) |
| One to 1.5 miles | -0.001 | 0.004 | -0.003 | 0.004+ | -0.005** |
| | (0.004) | (0.003) | (0.002) | (0.002) | (0.002) |
| R-squared | 0.848 | 0.956 | 0.963 | 0.945 | 0.928 |
| Panel B | Intense Seg. | White | Black | Hispanic | Asian/Other |
| Share charter in grade | -0.321** | 0.049** | -0.336** | -0.031* | -0.004* |
| | (0.054) | (0.014) | (0.051) | (0.012) | (0.002) |
| Distance to nearest charter | | | | | |
| Less than half a mile | -0.007 | 0.010* | -0.022** | 0.005* | 0.000 |
| | (0.008) | (0.004) | (0.006) | (0.002) | (0.000) |
| Half a mile to one miles | -0.024** | 0.009* | -0.038** | 0.004 | 0.001 |
| | (0.009) | (0.004) | (0.007) | (0.003) | (0.001) |
| One to 1.5 miles | -0.010 | 0.009* | -0.023** | 0.003 | 0.002 |
| | (0.009) | (0.004) | (0.007) | (0.003) | (0.001) |
| R-squared | 0.590 | 0.348 | 0.595 | 0.708 | 0.674 |
| Panel C | Enrollment | White | Black | Hispanic | Asian/Other |
| Share charter in grade | -81.797** | 0.551 | -56.838** | -17.564** | -7.947** |
| | (5.904) | (2.587) | (5.030) | (3.451) | (1.157) |
| Distance to nearest charter | | | | | |
| Less than half a mile | -4.568** | 2.004** | -2.382** | -3.630** | -0.560+ |
| | (0.960) | (0.493) | (0.490) | (0.653) | (0.298) |
| Half a mile to one miles | -2.849** | 1.890** | -2.960** | -1.529** | -0.250 |
| | (0.954) | (0.486) | (0.466) | (0.585) | (0.348) |
| One to 1.5 miles | -1.287 | 0.306 | -2.284** | 0.737 | -0.047 |
| | (0.809) | (0.377) | (0.406) | (0.505) | (0.276) |
| R-squared | 0.842 | 0.922 | 0.891 | 0.902 | 0.933 |
| Observations | 67,478 | 67,478 | 67,478 | 67,478 | 67,478 |

Standard errors in parentheses (clustered by CSD-year), *** p<0.01, * p<0.05, + p<0.1

Notes: All models include year, grade, and school fixed effects. omitted distance category: more than 1.5 miles. All models include a charter control that equals 1 in the year of charter entry in the CSD and every year after to account for the non-random timing of charter school entry.

Source: NYC Public School Administrative Data and Common Core of Data.

**Table A6: Effect of charter schools on TPS diversity by race/ethnicity, controlling for number of years post charter entry**

| Panel A | (1) Entropy Score | (2) Share White | (3) Share Black | (4) Share Hispanic | (5) Share Asian/Other |
|---|---|---|---|---|---|
| Share charter in grade | 0.308** | 0.102** | -0.148** | 0.061* | -0.015 |
| | (0.024) | (0.018) | (0.018) | (0.024) | (0.009) |
| Years post charter | 0.000 | -0.002** | 0.001+ | 0.001* | -0.001** |
| | (0.001) | (0.001) | (0.000) | (0.001) | (0.000) |
| Observations | 67,478 | 67,478 | 67,478 | 67,478 | 67,478 |
| R-squared | 0.847 | 0.956 | 0.963 | 0.945 | 0.928 |
| Panel B | Intense Segregation | White | Black | Hispanic | Asian/Other |
| Share charter in grade | -0.315** | 0.070** | -0.354** | -0.024+ | -0.007** |
| | (0.051) | (0.018) | (0.047) | (0.012) | (0.002) |
| Years post charter | -0.003** | -0.001** | -0.002** | -0.001 | 0.000 |
| | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) |
| Observations | 67,478 | 67,478 | 67,478 | 67,478 | 67,478 |
| R-squared | 0.590 | 0.347 | 0.594 | 0.708 | 0.674 |

Standard errors in parentheses (clustered by CSD-year)
** p<0.01, * p<0.05, + p<0.1
*Notes:* All models include school, grade, and year fixed effects. Sample restricted to grades K-5 in traditional public schools in community school districts (CSD) that ever had a charter school. Charter equals 1 in the year of charter school entry in the CSD and every year after. Share charter in grade is a continuous variable capturing share of seats accounted for by charter schools in that grade.
*Source:* NYC Public School Administrative Data and Common Core of Data.

**Table A7: Effect of charter schools and TPS school diversity and enrollment, includes school-level controls**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Entropy score | Share White | Share Black | Share Hispanic | Share Asian/Other |
| Panel A | | | | | |
| Share charter in grade | 0.289** | 0.099** | -0.145** | 0.064** | -0.018* |
| | (0.024) | (0.014) | (0.018) | (0.021) | (0.008) |
| Observations | 66,344 | 66,344 | 66,344 | 66,344 | 66,344 |
| R-squared | 0.848 | 0.959 | 0.964 | 0.947 | 0.929 |
| | Intense segregation | White | Black | Hispanic | Asian/Other |
| Panel B | | | | | |
| Share charter in grade | -0.306** | 0.069** | -0.348** | -0.023+ | -0.004* |
| | (0.053) | (0.017) | (0.049) | (0.013) | (0.002) |
| Observations | 66,344 | 66,344 | 66,344 | 66,344 | 66,344 |
| R-squared | 0.590 | 0.350 | 0.594 | 0.707 | 0.681 |
| | Grade enrollment | White | Black | Hispanic | Asian/Other |
| Panel C | | | | | |
| Share charter in grade | -87.678** | 6.462** | -61.473** | -24.962** | -7.705** |
| | (5.339) | (2.214) | (4.926) | (3.566) | (1.012) |
| Observations | 66,344 | 66,344 | 66,344 | 66,344 | 66,344 |
| R-squared | 0.843 | 0.926 | 0.891 | 0.901 | 0.934 |

Standard errors in parentheses (clustered by CSD-year)

** p<0.01, * p<0.05, + p<0.1

*Notes:* All models include school, grade, and year fixed effects. Sample restricted to K-5 grades in traditional public schools in community school districts that ever had a charter school. All models include a control that equals 1 in the year of charter school entry in the CSD and every year after. Share charter in grade is a continuous variable capturing the share of seats accounted for by charter schools in that grade and year. All models include school controls: percent proficient in math, percent proficient in English Language Arts, percent receiving free or reduced price lunch, and teacher pupil ratio. All models include a *charter* control that equals 1 in the year of charter entry in the CSD and every year after to account for the non-random timing of charter school entry.

*Source:* NYC Public School Administrative Data and Common Core of Data.

**Table A8: Regression results, charter schools and neighborhood diversity, expanded ages**

| | (1) | (2) | (3) |
|---|---|---|---|
| | Entropy score ages 5-9 | Entropy score ages 18 to 19 | Entropy score ages 55 to 64 |
| Charter | -0.005 | 0.002 | -0.003 |
| | (0.007) | (0.009) | (0.006) |
| Share charter grades K-4 | 0.244** | 0.125* | 0.123** |
| | (0.052) | (0.057) | (0.047) |
| Observations | 1,825 | 1,825 | 1,825 |
| R-squared | 0.868 | 0.818 | 0.929 |

Standard errors in parentheses (clustered by school zone)
** p<0.01, * p<0.05, + p<0.1
*Notes:* All models include school zone and year fixed effects. Sample restricted to zones for traditional public schools in community school districts (CSD) that ever had a charter school. Charter equals 1 in the year of charter school entry in the CSD and every year after. Share charter in K-4 is a continuous variable capturing share of seats for students in grades K-4 accounted for by charter schools. Entropy score difference is equal to the entropy score for the TPs minus the entropy score for its school zone. Share White, Black, Hispanic, and Asian/Other difference are constructed analogously. Staten Island is not included because of insufficient variation over time.
*Source:* Decennial Census, American Community Survey, and Common Core of Data.

**Table A9: Effect of charter schools on neighborhood diversity, controlling for education and unemployment**

| Panel A: | (1) Zone Entropy Score | (2) Share White | (3) Share Black | (4) Share Hispanic | (5) Share Asian/Other |
|---|---|---|---|---|---|
| Share charter in K-4 | 0.229** | 0.116** | -0.096* | 0.016 | -0.036 |
| | (0.051) | (0.033) | (0.047) | (0.035) | (0.035) |
| Observations | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 |
| R-squared | 0.872 | 0.971 | 0.969 | 0.945 | 0.918 |
| Panel B: | Entropy Score Difference | Share White difference | Share Black difference | Share Hispanic difference | Share Asian/Other difference |
| Share charter in K-4 | 0.121* | 0.023 | -0.082 | 0.055 | 0.006 |
| | (0.057) | (0.038) | (0.050) | (0.039) | (0.039) |
| Observations | 1,825 | 1,825 | 1,825 | 1,825 | 1,825 |
| R-squared | 0.806 | 0.720 | 0.643 | 0.772 | 0.830 |

Standard errors in parentheses (clustered by school zone)
** p<0.01, * p<0.05, + p<0.1
*Notes:* All models include school zone and year fixed effects. Sample restricted to zones for traditional public schools in community school districts (CSD) that ever had a charter school. Charter equals 1 in the year of charter school entry in the CSD and every year after. Share charter in K-4 is a continuous variable capturing share of seats for students in grades K-4 accounted for by charter schools. Entropy score difference is equal to the entropy score for the TPs minus the entropy score for it's school zone. Share White, Black, Hispanic, and Asian/Other difference are constructed analogously. All models include a *charter* control that equals 1 in the year of charter entry in the CSD and every year after to account for the non-random timing of charter school entry.
*Source:* Decennial Census, American Community Survey, and Common Core of Data.