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Allison Gilmour, Colin Shanks, Marcus A. Winters

Boston University Wheelock College of Education & Human Development
Wheelock Educational Policy Center

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Allison Gilmour	Colin Shanks	Marcus A. Winters
Associate Professor	Ph.D. Candidate	Associate Professor
Temple University	Boston University	Boston University

Abstract

Differences in the characteristics of students attending charter and traditional public schools have led to the concern that charter schools are systematically failing to meet their legal and moral obligation to educate all students. We exploit a randomized component in school assignments in Newark, New Jersey to measure the causal effect of enrolling in a charter school on students' subsequent mobility and disability classifications. Enrolling in a charter school reduces the likelihood that a student changes schools within the next two years overall and for students in underrepresented groups. The charter-induced reduction in student mobility is largely but not entirely driven by the fact that charter school students are often attending a school they highly preferred at entry. Enrolling in a charter school increases the likelihood that a student is declassified out of special education, but does not impact the probability that a student receives a new disability classification.

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1 Introduction

Numerous anecdotes of charter schools inappropriately discouraging unwanted students from applying ("cream skimming") or encouraging struggling students to leave for a different school ("pushing out") have led to the concern that charter schools are systematically failing to meet their legal and moral obligation to educate all students. Perhaps most distressingly, though federal law prohibits them from excluding students who require specialized services, charter schools enroll smaller proportions of students with disabilities and English learners (Els) than traditional public schools (Estes, 2004; United States Government Accountability Office, 2012). Such enrollment gaps raise important questions about the impact that charter schools have on the equitable distribution of school quality, especially in light of evidence that students in urban areas benefit academically from attending a charter school (Abdulkadiroğlu and Sönmez, 2003; Hoxby and Murarka, 2009; Dobbie and Fryer Jr, 2015; Abdulkadiroğlu et al., 2011, 2016, 2017; Angrist et al., 2010, 2013, 2016; Winters, 2020; Setren, 2019).

We use a rich set of data from Newark, New Jersey to shed light on why charter schools enroll relatively few Hispanic students, students with disabilities, and Els compared to the city's traditional public schools. We begin with descriptive analyses revealing that, as a practical matter, each aspect of the student enrollment and classification process contributes to observed enrollment gaps. We then exploit a randomized component in assignments to charter schools that participated in Newark's universal enrollment system (from here, "participating charter school"), which includes about 70% of the city's charter schools enrolling about 85% of its charter school students, to measure the causal effect of enrolling in a participating charter school on students' subsequent mobility and receipt of special education services. Several of our results challenge common beliefs about the nature of charter school enrollments.

Reducing enrollment gaps through policy requires first determining which stages of the enrollment and classification process disproportionately impact the enrollment of particular student subgroups in charter schools (Winters, 2013, 2015). Using both administrative enrollment data and information about parental schooling preferences revealed by the city's

universal enrollment system, we show that members of each student subgroup we consider are less likely than other students to seek enrollment in a charter school, more likely than other students to exit a charter school, and more likely to be declassified out of special education in charter schools than are students in traditional public schools. Each of these differences tends to increase the magnitude of enrollment gaps.

However, the results from such descriptive analyses could be misleading about the role that charter schooling itself plays in producing enrollment gaps. In particular, it is essential to distinguish the extent to which the cross-sector differences in student subgroup mobility and likelihood of receiving specialized services are caused by attending a charter school or are artifacts of pre-existing differences between students who enroll in each sector. For example, in the case of student mobility it is possible that parents who are willing to move their child to a charter school could be more willing than average to move their child between schools generally.

We find that enrolling in a participating charter school reduces the likelihood of subsequent mobility for students overall as well as for students with disabilities and Els. We find no statistically significant effect from enrolling in a participating charter school on the mobility of Hispanic students. Further, the relationship between enrolling in a participating charter school and mobility does not differ by the student's test scores at entry. These results build upon prior studies that reported less intensive attrition from charter schools than from traditional public schools but did not distinguish the causal effect of charter school attendance from other unobserved factors (Dauter and Fuller, 2011; Zimmer and Guarino, 2013; Winters et al., 2017b; Spencer, 2017; Winters, 2013, 2015; Nichols-Barrer et al., 2016). Previous estimates that exploit exogenous variation to measure the causal effect of charter school enrollment on student mobility overall have been limited subanalyses (Angrist et al., 2013; Abdulkadiroğlu et al., 2011), and no prior work explores differential attrition by student subgroup.[1] Thus, our analysis represents the most direct test to date for the claim that

[1]In addition to only studying mobility as a secondary analysis, Angrist et al. (2013) only provides evidence from a single charter program in Lynn, Massachusetts. Abdulkadiroğlu et al. (2011) obtains data from several

charter schools systematically push out certain students.

We provide further unique insights on the mechanisms underlying the relationship between charter schooling and student mobility. Specifically, we show that the reduction in student attrition probability caused by enrolling in a participating charter school declines by more than half when the model controls for the student's preference rank for their assigned school in the universal enrollment process. This pattern of results suggests that enrolling in a participating charter school decreases student mobility largely because such students are often already attending a school they highly preferred.

Finally, we add new causal estimates to an emerging body of research measuring the effect of charter school enrollment on the probability that a student's disability classification status changes (Setren, 2019; Winters et al., 2017a). Consistent with Setren (2019)'s recent findings from Boston, our results from Newark indicate that enrolling in a participating charter school increases the likelihood that a student with a disability is declassified out of special education, but does not impact the probability that a student is newly placed into special education. This result suggests that charter schools have disproportionately fewer students classified as having a disability in part because of differences in how the sectors would identify the same student for special education services.

The remainder of the paper proceeds as follows. Section 2 describes the data sources and provides descriptive information. Section 3 describes the empirical methods, and Section 4 reports the results from the analyses. Finally, Section 5 provides a brief discussion of the paper's contribution and concludes.

2 Data

We rely on two sources of administrative data. We matched administrative records on enrollment, demographic, and classification information for the universe of charter and traditional

Boston charter schools, but does not have access to the sort of ranked student preferences over schools that we exploit in this paper.

public school students in Newark with information about parental preferences and schooling assignments under the city's universal enrollment system.[2]

Since the 2014-2015 school year, Newark Public Schools (NPS) has used a universal enrollment system (branded Newark Enrolls)[3] that applies a deferred acceptance algorithm similar to that of Abdulkadiroğlu and Sönmez (2003) in order to assign students to all traditional public and magnet schools as well as the majority of charter schools. Charter schools may choose not to participate in the enrollment process and instead operate their own admission lottery. During the study's time period, about 70% of charter schools participated, representing about 85% of charter school enrollment.[4] Each spring under Newark Enrolls, parents who want their child to change schools send to the central school district a rank-ordered list of up to eight traditional public or charter schools. For students who participated in the subsequent school assignment process, we observe their rank-ordered school placement preferences and eventual school assignment offers.

Table 1 reports some descriptive statistics for relevant samples.[5] Most students qualified for free or reduced-priced lunch and identified with a racial/ethnic minority subgroup. Parents most often submitted rank-ordered lists of school preferences for students enrolling in kindergarten or ninth grade, which are the most common school entry grades for both charter and traditional schools in Newark. The proportion of Hispanic and Black students who submit any school preference is similar to the percentages of students that make up Newark's full student population. But relative to the total student population, Black students account for a larger proportion of students who include a charter school as one of their preferences. As a group, students who participate in Newark Enrolls have below-average standardized math and English and Language Arts (ELA) scores compared to other NPS students.

[2]See the Appendix A for further details about the process and match rates.

[3]Early in its history, Newark Enrolls was branded as One Newark. Newark Enrolls replaced lotteries or other selection mechanisms previously used by participating charter schools.

[4]Appendix Table A1 classifies the participation status of each charter school.

[5]The sample is composed of all NPS students in 2013-2014 and 2014-2015, when the two iterations of Newark Enrolls that we use occurred.

[Table 1 about here.]

Figure 1 illustrates enrollment differences between charter and traditional public schools for notable subgroups by grade level. The enrollment gaps are found in the area between the respective dashed and solid lines. For each subgroup there is a difference in representation within the sectors, though the patterns across grades vary markedly.[6]

[Figure 1 about here.]

When evaluating differential student mobility across charter and traditional public schools, we examine several outcome variables for a student in each year. In each instance, the initial postassignment year is viewed as the treatment year. We focus on outcomes 2 years after the initial postassignment year. We separately evaluate three distinct types of mobility:

- **Intra-NPS Mobility**: A student attended an NPS traditional public school or charter school in the postassignment year and then attended a different NPS traditional public school or charter school in any subsequent year.
- **NPS District Exit**: A student attended an NPS traditional public school or charter school in the post-assignment year and then is missing from the NJDOE data in at least one subsequent year. This is taken to indicate that the student left Newark or moved to a private school.
- **Lottery Reentry**: A student attends an NPS traditional public school or charter school in the post-assignment year and then reenters the Newark Enrolls lottery in a subsequent year.

The first two outcomes represent observed student mobility, whereas the last outcome represents intended mobility. We examine each of these three outcomes individually, the

[6]NPS serves a community where over 90% of students identify with a racial or ethnic minority. Therefore, a higher proportion of Black students generally implies a lower proportion of Hispanic students and vice versa.

combination of intra-NPS mobility or NPS exit, and the combination of any of the three outcomes. In all cases, we control for whether the student was affected by any school closures and whether the student undergoes any structural mobility after initial post-assignment enrollment. (Mobility is deemed structural if the student has reached the terminal grade in his or her school.) We exclude any students who did not appear at any NPS school in the post-assignment year.

3 Empirical Methods

3.1 Describing Student Preference and Mobility

We begin by naively comparing the mean rates of each aspect of the enrollment process by student subgroup for the full sample of students enrolled in Newark charter and traditional public schools. We then estimate descriptive regression models in order to measure the relationship between student characteristics and aspects of the enrollment process conditional on other student characteristics. Using the full sample of students enrolled in a Newark charter or traditional public school, we estimate ordinary least squares (OLS) regressions taking the form:

$$y_{it} = \alpha + \gamma X_{iT} + \lambda C_{i,T-1} + Z_{i,T-1} + \phi(C_{i,T-1} \times Z_{iT}) + \epsilon_{it} \quad (1)$$

where y_{it} is the outcome of interest for student i in year t; X_{iT} is a vector of control variables for observed student characteristics; $C_{i,T}$ indicates if the student was enrolled in a charter school in the previous year; $Z_{i,T}$ is a vector of indicators for Hispanic, special education, or El-status that is then interacted with previous charter school enrollment; and ϵ_{it} is the error term. We separately estimate models that include or exclude from X_{iT} the student's math and ELA score in the prior year because we do not observe the student's prior test score in all grades; thus, including prior math score as a covariate reduces the sample. The use of the interactions in Equation 1 allows us to assess whether school preferences and mobility differ for current charter and traditional public school students in the subgroups of interest.

3.2 Estimating the Causal Effect of Charter School Attendance on Mobility and Disability Classification Status

Though policy relevant, the results from estimating Equation 1 cannot be interpreted as the causal effect of charter school enrollment because there likely remains unobserved confounding variables that are associated with both charter school enrollment and the respective outcomes. We might also be concerned that compliance with a student's initial Newark Enrolls school assignment could be correlated with unobserved student characteristics that may also affect y_{it}.

We take several steps to address these areas of potential bias. The first step is to instrument for charter school enrollment with initial-round charter school assignment under Newark Enrolls. The second step is to control for unobserved student type via the propensity score control method developed by Abdulkadiroğlu et al. (2017) and recently applied by Winters (2020) to measure the effect of enrolling in a Newark charter school on student test scores. This method allows us to parsimoniously control for each student's unobservable type as indicated by their submitted preferences while still recovering the full range of quasi-experimental variation in the data.

Lastly, we introduce a novel control that allows us to more meaningfully interpret the effect of enrolling in a participating charter school on student mobility: the student's preference rank for their assigned school in the universal enrollment process. In our environment, charter schools are typically ranked higher than traditional public schools on applicants' preference orderings, which may indicate a higher idiosyncratic taste for these schools among those assigned to them. One might expect students with a higher expressed preference for their school to exhibit lower mobility in the future, even holding constant their experience at the schools. Controlling for this ranking allows us to distinguish two conceptually distinct effects of charter enrollment on mobility: the direct effect of the treatment of attending a participating charter school, and the indirect effect of attending a more highly preferred school regardless of charter status.

3.2.1 Deferred Acceptance in Newark Enrolls

Our estimation strategy takes advantage of information about student and parental preferences and student assignments under Newark Enrolls, which applies a version of the deferred acceptance algorithm for assigning students to schools first developed by Abdulkadiroğlu and Sönmez (2003). Each spring, parents who want to enroll their child in a new school submit to the centralized school district a rank-ordered list of school preferences for their child's enrollment the following year. Students are guaranteed admission to their current school if they fail to obtain seats at any of their ranked schools and it offers the necessary grade level. Schools submit their number of available seats in each grade. Schools also have ranked priorities for students based on a few factors.[7] Finally, students are provided with a randomly generated lottery number that is used to break ties for students whose characteristics give them equal priority status.

The deferred acceptance algorithm uses the parental preferences and student priority categories to assign students to schools. Each student is considered for their first preference school, and students are ranked according to their priority status and assigned random number. If the number of students listing a school as their preference is less than or equal to the number of seats available in a given grade, these students are provisionally assigned to that school. If the number of applicants exceeds the number of available seats, those students below the allocation cutoff are considered for their next most preferred school via the same process along with the students who were provisionally assigned in the first step. Thus, a student may "bump" another student who was provisionally assigned a seat if they have a higher school priority category, or the same priority category combined with a more preferred lottery number. This process is repeated until all students are either assigned to

[7] Siblings of students currently enrolled in a school are given first priority, followed by students who live in the neighborhood surrounding a school. Schools with below-average enrollments of students receiving special education services and students eligible for free or reduced-price lunch also prioritize admissions for these subgroups as necessary to bring their proportion within the school up to the citywide average. Magnet schools additionally provide a rank-ordered list of applicants based on interviews and other criteria.

a school or have exhausted their list of schools. If a student fails to obtain a seat at any of their listed schools and their current school offers their grade, they are reseated at their current school or a "guaranteed" school most often based on their residence.

Unfortunately, the district was unable to provide the specific algorithm used to assign students, and thus we were forced to recreate the assignment mechanism. Some data limitations prevent us from fully replicating the process. First, due to not knowing the number of available seats for each school-grade combination, we instead estimate this based on the number of seats assigned less those that appear to be assigned based on reseating for students who exhausted their preferred school list. Second, the district did not provide the rankings of students applying to magnet schools, where admissions decisions could depend on criteria such as auditions, attendance records, or grades. We instead infer which students are sufficiently highly ranked for magnet school admission based on actual student assignments to those schools. Third, we did not have access to the exact details of priority assignment for students receiving special education services or free lunch; no attempt to replicate it improved assignment accuracy, so this priority is omitted in our simulations. Lastly, for the spring 2015 lottery, we do not have the results of the initial round of the algorithm; we instead use the final results after the second round and any manual adjustments made by Newark Enrolls for students known to have applied in the initial round. Despite these limitations, we are able to replicate the true seating assignments for 85% of participating students.[8]

For analyses that measure the causal effect of enrolling in a participating charter school on student mobility and classification, the estimation sample includes students who participated in the initial assignment round of the 2014 or 2015 Newark Enrolls process for grades K-11 that are successfully matched to records in the NJDOE data in the preassignment and

[8]The results are not sensitive to changes in how student assignments are modeled. The preferred results reported in the paper use the version of the assignment algorithm for each cohort year that assigned the highest percentage of students to the school to which they were actually assigned when using the city's lottery numbers for student assignments.

postassignment years.[9] For analyses that include prior test scores as a control, we are limited to students who sought a seat in Grades 4-9 in the 2014 lottery and Grades 4-11 in the 2015 lottery, as only these students had prior test scores.[10]

3.2.2 Using Information from the Deferred Acceptance Algorithm to Estimate Causal Effect of Attending a Participating Charter School

Conditional on student preference and school priority categories, assignment to a participating school in Newark is determined by the distribution of each student's randomly generated lottery number. Student preferences and school priority categories are fixed and observed. We simulate student assignments 500 times, each using the student's stated preferences and characteristics but a new randomly generated assignment of lottery numbers. The proportion of simulations in which a student is assigned to a participating charter school represents that student's probability of charter school assignment, also known as the student's charter propensity. We then use this propensity score as a control variable in the regressions. In effect, the model compares students who did or did not enroll in a participating charter school while holding constant any differences in likelihood of enrollment stemming from their preferences and priority status at each participating charter school. Abdulkadiroğlu et al.

[9]We exclude prekindergarten applications for several reasons. First, prekindergarten enrollment is optional in Newark, and thus there may be severe selection effects. Second, relatively few charter schools offer prekindergarten enrollment. Third, NPS offers several schools that are exclusively prekindergarten establishments, which is qualitatively different from traditional public schools in other grades. Lastly, there is a substantial private prekindergarten segment in Newark that operates outside the Newark Enrolls framework. Newark Enrolls also included a second round for students who had not initially participated, were unmatched in the first round, or were unsatisfied with their initial assignment. As reentry into the second round is potentially endogenous, we only consider participants in the first round.

[10]Newark students were typically tested in Grades 3-9 prior to the 2014-2015 school year; thereafter, testing was expanded to include most students enrolled in Grades 9-11. In the 2014-2015 school year, New Jersey also transitioned its mathematics and ELA standardized testing from the New Jersey Assessment of Skills and Knowledge (NJASK) to exams provided by the Partnership for Assessment of Readiness for College and Careers (PARCC).

(2017) shows that by exploiting the random component in school assignments, controlling for the propensity score sufficiently accounts for unobserved student differences to allow for causal interpretation of effects.[11]

We estimate a two-stage least squares regression. The first stage uses observed student characteristics, the propensity score, and an indicator for whether the algorithm assigned the student a seat in a participating charter school to predict whether a student enrolls in a participating charter school. The second-stage model then uses the vector of baseline characteristics, the propensity score, and the first stage's prediction of charter school enrollment to explain the respective measure of mobility or classification status in a subsequent year. Formally:

$$C_{iT} = \alpha + \pi A_{iT} + \phi X_{iT} + \lambda p_{iT} + \mu_{iT} \tag{2}$$

$$y_{it} = \alpha + \beta \hat{C}_{iT} + \gamma X_{iT} + \delta p_{iT} + \epsilon_{it} \tag{3}$$

where C_{iT} indicates if student i enrolled in a participating charter school following the Newark Enrolls process during year T, A_{iT} indicates whether student i was assigned to a participating charter school in Newark Enrolls for year T, p_{iT} is the student's simulated propensity score for charter assignment, and the vector X_{iT} includes observed demographic characteristics at the time the student participated in the enrollment process. The exclusion restriction assumes that conditional on charter assignment propensity and the other covariates, assignment A_{iT} to a participating charter school is associated with enrolling in a participating charter school but has no other impact on student mobility outcomes.

[11]Notice that our identification strategy based on controlling for charter propensity within a deferred acceptance system differs substantially from more common propensity score strategies that match students in charter schools to demographically similar students in traditional public schools (for instance, CREDO (2015). Charter propensity in our case is the probability that a student will be assigned to a charter school given their and others' preferences and priority status and does not directly depend on a student's demographic characteristics or prior test scores.

The coefficient β from Equation 3 can be interpreted as the local average treatment effect on the respective outcome y_{it} of attending a participating charter school for applicants who enroll in a participating charter school following an offer through Newark Enrolls. This estimate treats as noncompliers students who decline an assignment to a participating charter school or who enroll in a participating charter school via a subsequent Newark Enrolls round or other avenues. The central assumption for interpreting β as the causal effect of attending a participating charter school is that the deferred acceptance mechanism assigns applicants with the same preferences and priorities for assignment to a school with equal probability.

When evaluating cross-sector differences in disability classification, y_{it} equals 1 if the student receives the respective services in year t and equals 0 otherwise.[12]

We also separately evaluate the effect of enrolling in a participating charter school on the probability that a student receives a new classification or the probability that a student is declassified by restricting the models to include within the sample only students who at time T did or did not have the classification.

When evaluating the potential for differential effects on student mobility of enrolling in a participating charter school by subgroup, y_{it} indicates one of several measures of student movement or preference to change schools described previously. We add to Equation 3 an interaction between the characteristic in year T and participating charter school enrollment following the Newark Enrolls process where Z_{iT} is a vector of indicators for Hispanic, special education, and El status.

[12]We do not report in the main text the results for analyses of the impact of participating charter enrollment on classification into or out of being an El because in practice the analyses are not very informative. First, we observe so few students entering participating charter schools with a current classification of being an El that our results for the effect of enrolling in a participating charter on the likelihood that the student is declassified are estimated too imprecisely to allow for meaningful interpretation. Second, it is difficult to apply the same charter propensity technique in this setting, because very few Els assigned to noncharters have nontrivial charter propensity. Incidents of students already enrolled in either sector who are newly classified as an English learner are so rare than the results from cross-sector differences are not policy relevant. We nonetheless report results from these models in Appendix D.

$$y_{it} = \alpha + \beta \hat{C}_{iT} + \gamma X_{iT} + \delta p_{iT} + \lambda Z_{iT} + \phi(\hat{C}_{iT} \times Z_{iT}) + \epsilon_{it} \quad (4)$$

As discussed in Abdulkadiroğlu et al. (2017), an advantage of using a centralized enrollment system is that it allows us to use identifying variation from a much broader set of charter schools than is often available when measuring the effect of attending a charter school in other localities. First, the estimated charter school impact is not limited to only students attending charter schools that are oversubscribed. All students with a probability of assignment to a participating charter school between 0 and 1 contribute to the identification of β. Second, the availability of a centralized data set removes the need to acquire historical lottery records from each charter school individually, which often leads to the exclusion of many charter schools in a locality. Notably, however, our estimates only apply to the charter schools that participate in the Newark Enrolls process. In order to compare attending a participating charter school to attending a traditional public school, which we argue is the most policy-relevant estimate, we include as a control variable an indicator for whether the student attended a nonparticipating charter school.

3.2.3 Covariate Balance

We test the plausibility that controlling for charter propensity adequately accounts for unobserved confounding variables by evaluating whether observable student demographic covariates are balanced between those offered and not offered a seat in a participating charter school when controlling for the propensity score.

The first two columns of Table 2 compare the unconditioned observed demographic characteristics of participants offered or not offered a seat in a participating charter school, and the third and fourth column report the result of the above-described regression without controlling for the propensity score. The two groups have similar gender and race/ethnicity characteristics, but there are statistically significant differences at baseline assignment in terms of the percentage of free or reduced-price lunch or El-status.

[Table 2 about here.]

The final two columns of the table report the coefficient and p-value from regressions comparing students offered or not offered a seat in a participating charter school conditional on charter propensity. Conditioning on charter propensity greatly mitigates the unconditioned differences in the demographic profiles of the two groups. A joint F-test finds no statistically significant difference between the groups taking into account all of the pre-treatment characteristics when conditioning on charter propensity, indicating that doing so removes the observed differences between those offered or not offered a seat in a participating charter school.[13]

4 Results

4.1 Unconditional Differences in Entry, Exit, and Classification

Table 3 reports the mean value for each aspect of the enrollment process by subgroup. The top panel reports results using data for all NPS students. Though informative, the full-sample results are somewhat difficult to interpret as measures of preference and mobility because they mix students who are making a structural move with students who are stating a preference for a new school even though they can continue within their current school. Thus, we focus our attention on the results reported in the bottom panel, which includes only students who are making a structural move and are thus forced to change schools.

[Table 3 about here.]

Students with disabilities, Els, and Hispanic students are all more likely to submit a list of schools to Newark Enrolls, but Els and Hispanic students are less likely to include at least one participating charter school on their list than their counterparts. Conditional on

[13]Though the samples are not identical, Winters (2020) followed the same process to calculate charter propensity in Grades 4-10 within Newark during this time period and found that controlling for the propensity score created balance between the groups according to baseline test scores in math and ELA. Such a comparison is not possible in this case, however, because the sample includes students in grades that are not tested.

being offered a seat at a participating charter school, there are no statistically significant differences in take-up rate between Els or Hispanic students and their peers, while students with disabilities are less likely to accept a seat.

Among those who entered a charter school following a structural move, Hispanic and non-Hispanic students are similarly likely to leave the school within the next 2 years, while Els are less likely to do so than non-Els and students with disabilities are more likely to leave than students without disabilities. This pattern of results would tend to reduce the percentage of students within the charter sector who have a disability, and is at least consistent with the theory that charter schools disproportionately push out such students. However, students in each subgroup are less likely to exit their school within the next 2 years if they are attending a charter than if they are attending a traditional public school.

Students with disabilities who enter a charter school are more than twice as likely to be declassified out of special education within the next 2 years than are those who enter a traditional public school, while the likelihood that a student without a disability classification receives one within the next 2 years is similar across the two sectors. The differences for Els are more modest; students who enroll in charter schools are slightly less likely to be declassified or to receive a new El classification.

4.2 Descriptive Regressions

Figure 2 reports the relationship between student characteristics and the probability of a given outcome associated with student mobility that results from estimating Equation 1. We report the results visually to simplify the comparisons from the model that includes several interaction terms.[14] Coefficients should be interpreted as relative to a non-Hispanic student without El or special education classification who enrolls in a traditional public school.

The northwest panel, labeled as subfigure (a), illustrates the conditional relationship between student characteristics and the probability that a student leaves their school within the next 2 years. The northeast panel, labeled as subfigure (b), shows the relationship

[14]See Appendix B tables with relevant coefficients, standard errors, and number of observations.

between student characteristics and submitting any list of school preferences to Newark Enrolls for the following year's school assignment. The last two panels, labeled as (c) and (d), report the relationship between student characteristics and submitting a preference list that includes a participating charter school unconditional and conditional on having submitted any list, respectively.[15]

[Figure 2 about here.]

Looking at participation in Newark Enrolls, we make two observations. First, Hispanic, El, and special education students are less likely to participate in the process than non-Hispanic, non-El, and non-special education students regardless of which type of school the students are currently attending. Second, both overall and within each subgroup we consider, students in charter schools are less likely to participate in Newark Enrolls in pursuit of a different school than are comparable students in traditional public schools.

Turning to panel (c), we can see the same facts hold true with respect to the likelihood that students submit a list of school preferences that includes one or more participating charter schools, with the exception of Hispanic students in charter schools, who are similarly likely to submit a list that includes a participating charter school as Hispanic students in a traditional public school. However, a slightly different picture emerges in panel (d). Conditional on students having submitted a list to Newark Enrolls, charter students are more likely to include a participating charter school in their list. More interestingly, whether Hispanic, El, and special education students are more or less likely to list a charter school than non-Hispanic, non-El, and non-special education students appears to vary by the sector in which the student was enrolled during the prior year. Among traditional public school students, these groups are less likely than other students to include a participating charter school in their list. However, for current charter school students, these students are similarly or more likely to include a participating charter school than the comparison group. This

[15] All regressions include controls for students' gender, free or reduced lunch status, date of birth, race, grade, Newark Enrolls cohort, and terminal grade status.

would seem to suggest that even when charter school students want to leave their school, they are not dissuaded from the charter school sector entirely.

4.3 Causal Effect of Charter School Enrollment on Mobility

[Table 4 about here.]

Table 4 reports the results from estimating Equations 2 and 3 to measure the causal effect of enrolling in a participating charter school on student mobility. Here we report estimates where the dependent variable is whether the student made an intra-NPS move, left the NPS school district, or reentered the Newark Enrolls lottery within the following 2 years.[16] The coefficient on *Participating Charter School* represents the estimated effect of enrolling in a participating charter school, conditional on student characteristics and the charter propensity measure described in Section 3.2.2.

We report the results from models that either include or exclude controls for the student's rank-order preference for the school in which they enrolled in the year following participation in Newark Enrolls, because comparing results from these models reveals an important aspect of student mobility within a choice environment. Both analyses find that enrolling in a participating charter school reduces the probability that a student will leave their school within the next 2 years. However, controlling for the rank-order preference that the student gave at the time of applying to the school in which she ultimately enrolled reduces the coefficient estimate by more than half. Relative to students who enrolled in their most preferred school (the omitted comparison group), those who enrolled in their second preferred school are about 0.069 percentage points more likely to change schools in a subsequent year, and those who enrolled in a school they preferred third or lower are even more likely to change schools. The key insight to be gained by this pattern of results is that attending a participating charter school reduces student mobility in large part, though not

[16]For results after 1 year for both cohorts or after 3 years for the 2014 cohort, see the Appendix. We also include results for intra-NPS moves, NPS district exit, and Newark Enrolls reentry as separate outcomes.

exclusively, because students attending a participating charter school tend to be enrolled in a school that they highly desired at the time of application.

We now turn to the interacted model from Equation 4 that evaluates the effect of enrolling in a participating charter school on mobility for students within particular subgroups. For Els, the interaction terms are statistically significant in most models, indicating that the effect of enrolling in a participating charter school on mobility for such students is greater than the effect for other students. These students have an even lower probability of mobility when enrolled in a participating charter school compared to non-El students. Across both sectors, students with disabilities had a higher probability of mobility, with no evidence of a differential effect of disability status on mobility from attending a participating charter school.[17] Further, the sum of the coefficients for *Participating Charter School* and the interaction terms are negative and statistically significant, which indicates that enrolling in a participating charter school reduces the probability of changing schools for both Els and students with a disability.

That the coefficient on the interaction term for Hispanic students is statistically significant and positive indicates that enrolling in a participating charter school impacts the probability of attrition differently for Hispanic and Black students. However, the sum of the coefficient on the interaction term and the coefficient for *Participating Charter School* is negative but not statistically significant, indicating that the overall probability of student mobility for these students was lower than for Hispanic students in traditional public schools.[18] That is, enrolling in a participating charter school decreases the likelihood of

[17]In fact, given that the interaction coefficients are negative for these students, they have *lower* probability of subsequent mobility, if anything.

[18]In Appendix E, we investigate this further by adding an interaction for *Black x Participating Charter School*. This effectively changes the reference group in comparison to which these coefficients are defined from being all participating charter students (mostly Black students) to non-Black, non-Hispanic students. We find that in this model, both the interaction term for *Black x Participating Charter School* and *Hispanic Participating Charter School* are negative and statistically significant, indicating lower mobility for both groups relative to their non-Black, non-Hispanic peers. Thus, the positive coefficient in Table 5 for *Participating Charter School x Hispanic* can be explained by very low mobility for Black charter students,

changing schools for both Hispanic and Black students, but the effect is more pronounced for Black students.

[Table 5 about here.]

Some prior authors have focused on whether lower-performing students are differentially likely to exit charter schools conditional on other covariates (Zimmer and Guarino, 2013; Winters et al., 2017b). We build upon this prior work by presenting in Table 5 causal estimates that interact whether the student enrolled in a participating charter school with the student's test score at the time of participating in the enrollment system. We find that students who had lower test scores at entry were less likely to change schools in the next 2 years if they entered a participating charter school than they would have otherwise.[19]

The use of interactions make the relative attrition for students by subgroup and sector difficult to fully decipher from Table 5. Figure 3 clarifies the relationships by illustrating the probability of mobility within 2 years by school sector and classification status implied by the estimates that include rank controls. Each line reported in the figure illustrates the estimated effect and 95% confidence interval for a student in the respective group relative to traditional public school students in the omitted group who are enrolled in a traditional public school.

[Figure 3 about here.]

Though the differences are often statistically insignificant, within each characteristic comparison the estimate suggests that enrolling in a participating charter school reduces the likelihood that students in the more disadvantaged subgroup exit or attempt to exit their school relative to both more advantaged students enrolled in a traditional public school and

who form most of the comparison group within participating charter schools.

[19]Within this sample, the interaction term for *Hispanic* × *Participating Charter School* is negative, not statistically significant, and very small in magnitude, while the coefficient on *EL* × *Participating Charter School* becomes statistically significant but is negative in sign. This would indicate that these students have lower probability of mobility than Els in traditional public schools.

students with the same characteristic who are enrolled in a traditional public school. For example, the estimate for students with disabilities within participating charter schools is negative, suggesting that mobility is less likely for these students than for students without disabilities in traditional public schools. That the estimate for students with disabilities in participating charter schools is below the coefficient for students with disabilities in traditional public schools indicates that enrolling in a participating charter school reduces the probability that students with disabilities exit their schools relative to students with disabilities who remain in traditional public schools. The pattern of results is similar for Els, and is similar in direction but statistically insignificant for Hispanic students.

4.4 Causal Effect of Charter Enrollment on Special Education Classification

Table 6 reports the results from estimating Equations 2 and 3 to evaluate the effect of enrolling in a participating charter school on the probability of a student having an Individualized Education Program (IEP) 1, 2, or 3 years later. The top panel includes all students, and the outcome variable is an indicator for subsequent special education classification. The second panel reports results from estimating models that include students who were not enrolled in special education at the time they participated in the enrollment system, and thus addresses whether attending a participating charter school makes a student more or less likely to acquire a new special education classification. The bottom panel reports results from models restricted to include students who had a disability at the time of school assignment, and thus evaluates the extent to which enrolling in a charter school changes the probability that a student is declassified out of special education. Because rates of classification and declassification differ by grade level, we also include results where the sample is restricted to entrants in early elementary, late elementary, or secondary grades.

[Table 6 about here.]

Enrolling in a participating charter school has no statistically significant effect in either

direction on the probability that a student without disabilities at the time of entry is identified for special education services within the next 3 years. The coefficients are all near zero and estimated fairly precisely. The result does not depend on the grade level in which the student entered the participating charter school.

However, the results in the bottom panel show that enrolling in a participating charter school leads to a statistically significant decrease in the probability that a student who at entry was receiving special education services still had an IEP 2 or 3 years later. The magnitude of the effect in the model that includes all relevant students regardless of entry grade is similar to the naive difference in new classifications across sectors shown in Table 3. The effect is driven by students who entered the assignment system in elementary grades, and for these students the magnitude of the effect is notably large. Enrolling in a participating charter school decreases the probability that a student remains in special education 3 years later by about 20 percentage points for students who entered in Grade 4-6, and by about 31 percentage points for students who entered the participating charter school in Kindergarten through Grade 3.

5 Conclusion

We analyze parental schooling preferences, student mobility, and changes in student classifications in Newark, New Jersey to shed light on the factors that drive demographic differences between students attending participating charter schools and traditional public schools. We find that students who are Hispanic, have a disability, or are learning English are less likely to submit school preference listings that include a participating charter school, but that enrolling in a participating charter school decreases the probability of changing schools and decreases the likelihood of continuing to receive special education services.

Why parents of students with disabilities or Els are less likely to seek admission into a participating charter school deserves closer attention. One possibility is that charter schools actively dissuade students with particular characteristics from submitting an application

or enrolling in the school if they were allocated a seat. Most support for this concern is anecdotal. However, a recent study by Bergman and McFarlin Jr (2020) lends at least some support for this idea by finding evidence that indicating that a child has a disability, was Hispanic, or previously engaged in disruptive behavior within an enrollment inquiry from a parent reduced the probability that charter schools respond to the inquiry more than it reduced the probability that a traditional public school responds. [20] Though highly suggestive, it's notable that the authors do not observe the extent to which differences in school responses may impact parental decisions to ultimately apply to a charter school.

There are also less scandalous reasons that parents of children with particular characteristics might not pursue a seat in a charter school. For instance, charter schools often do not provide transportation and thus are more attractive to parents who live in the neighborhood, which might not reflect the same demographic characteristics of the larger district (Teske et al., 2007). Even without prompting from the school, parents of a child with a disability or who is not proficient in English may question whether charter schools have the resources to meet their child's needs (Lange and Lehr, 2000; Waitoller et al., 2017; Waitoller and Super, 2017). Indeed, the special education gap is smallest amongst students with disabilities that are associated with less significant needs, such as learning disabilities and speech/language impairments (Waitoller et al., 2017). Waitoller and Super (2017) found qualitative evidence that Black and Latinx parents of students with disabilities in Chicago considered closely the special education services that they believed would be available to their child. Additionally, parents who have newly immigrated or are otherwise not proficient in English might be more likely to enroll their children in traditional public schools associated with their area of residence due to a lack the informational resources necessary to equally participate in the school choice process.

We find that students with disabilities, Hispanic students, and Els are more likely to

[20]Bergman and McFarlin Jr (2020) found no difference between charter and traditional public schools in the failure to respond to either Hispanic students or students with behavioral problems; that is, both groups of schools were similarly less likely to respond to these emails.

leave charter schools than are their counterparts but are either as likely or less likely to leave their school if they enroll in a participating charter school than a traditional public school. We argue that our findings represent the most convincing evidence to date contrasting the common claim that charter schools systematically push out students in particular subgroups.

Our finding that enrolling in a highly preferred school explains a considerable portion of the difference in the probability that students leave charter schools is a unique and policy-relevant contribution. There are multiple potential explanations for this result. For instance, parents might be good at identifying the school that is the best fit for their child (Bruhn, 2020), in which case allowing them a choice could substantially reduce their need to identify an alternative in the future. Or, the fact that the act of the parent choosing a school might result in greater satisfaction in and commitment to the school from the choice alone could lead parents to keep their child in a highly preferred school once enrolled (Festinger, 1957; Patall et al., 2008).

Finally, we also add to recent studies evaluating the effect of enrolling in a charter school on the probability that a student receives special education services. Similar to recent results from Boston (Setren, 2019), we find that students with disabilities are far more likely to lose these designations when enrolled in a participating charter school than when enrolled in a traditional public school. Students in charter schools could lose their designation for two reasons. The first, less optimistic reason could be that charter schools declassify students so as not to be responsible for providing students with extra services or to be beholden to additional accountability policies. The second, more optimistic reason for higher rates of declassification in charter schools could be that charter schools better address the learning needs of students with disabilities. Consistent with that second interpretation, Winters (2020) similarly found positive effects of attending a charter school in Newark on the math and ELA outcomes of students with disabilities. Setren (2019)'s evaluation of Boston charter schools similarly found that enrolling in a charter school caused an increase in the test scores for both students with disabilities and English learners.

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Table (1) Newark Public Schools Students and Newark Enrolls Participants Characteristics

Variable	All Newark students	Newark Enrolls participants	Participants listing 1+ charter
Newark Enrolls participant	0.14	1.00	1.00
Listed charter in Newark Enrolls	0.09	0.63	1.00
Previous participating charter student	0.19	0.07	0.11
Previous nonparticipating charter student	0.04	0.03	0.04
2014 cohort	0.48	0.51	0.53
Female	0.49	0.50	0.51
Black	0.57	0.58	0.75
Hispanic	0.36	0.36	0.23
White	0.07	0.05	0.01
Free lunch	0.67	0.60	0.62
Reduced free lunch	0.06	0.04	0.04
Special education	0.12	0.10	0.09
English Language Learner	0.08	0.06	0.03
Math Score	0.00	-0.08	-0.14
Missing math score	0.08	0.07	0.06
English & language arts (ELA) score	0.00	-0.11	-0.12
Missing ELA score	0.08	0.07	0.06
Expected grade: K	0.07	0.23	0.21
Expected grade: 1	0.08	0.05	0.05
Expected grade: 2	0.08	0.05	0.05
Expected grade: 3	0.08	0.05	0.06
Expected grade: 4	0.07	0.04	0.05
Expected grade: 5	0.07	0.09	0.10
Expected grade: 6	0.07	0.04	0.05
Expected grade: 7	0.07	0.04	0.04
Expected grade: 8	0.07	0.04	0.04
Expected grade: 9	0.07	0.32	0.30
Expected grade: 10	0.06	0.02	0.02
Expected grade: 11	0.06	0.01	0.01
Expected grade: 12	0.11	0.00	0.00
Structural move grade	0.11	0.57	0.52
Attending participating charter	0.23	0.29	0.45
Attending nonparticipating charter	0.04	0.03	0.03
Not attending any NPS school	0.14	0.11	0.12
Attending first choice	0.06	0.42	0.37
Attending second choice	0.01	0.10	0.10
Attending third choice	0.01	0.05	0.06
Attending a listed choice	0.09	0.64	0.60

Note: The above table reports means for each characteristic. The sample is composed of all NPS students in the 2013-2014 and 2014-2015 school years, when the two iterations of Newark Enrolls that we use occurred. Students enrolled in both years appear twice. Math and ELA scores are standardized to have a mean value of 0 and standard deviation of 1 within each grade, subject, and year with the exception of Algebra I, Algebra II, and Geometry scores. In the case of these scores, they were standardized within subject and year but across all grades. Test scores were marked missing only if the student was in a grade that was typically tested. Expected grade is the grade in which a student would be expected to apply for a seat were they to participate in Newark Enrolls. For example, current third graders would be expected to apply for a fourth grade seat. Current 11th and 12th grade students were combined as "Expected grade: 12." A structural move grade is defined as the terminal grade for the student's current school.

Table (2) 2014-2015 Covariate Balance With and Without Charter Propensity Score

Variable	Nonoffer mean	Offer mean	No prop. coef.	No prop. p-val	Prop. coef.	Prop. p-val
Female	0.51	0.51	-0.00	0.97	-0.02	0.43
Black	0.76	0.78	0.02	0.18	-0.01	0.61
Hispanic	0.22	0.20	-0.02	0.13	0.01	0.58
Free lunch	0.68	0.53	-0.14	0.00	-0.02	0.40
Red. price lunch	0.05	0.03	-0.01	0.08	-0.01	0.18
Prev. spec. ed.	0.08	0.07	-0.01	0.53	0.02	0.04
English Language Learner	0.04	0.03	-0.02	0.01	-0.00	0.94
F-stat			13.12	0.00	1.44	0.18

Note: In each row, the second and third columns report the unconditional mean of an indicator variable for the student characteristic listed in the first column for students in the sample who were or were not offered a seat at a participating charter school via the first round of the 2014 or 2015 Newark Enrolls process. The fourth and fifth columns report the coefficient on charter assignment in a regression of charter assignment and a cohort indicator on the relevant demographic indicator, while the sixth and seventh columns report the same coefficient for a regression that includes the charter propensity score described in Section 4.2. The final row reports the result of an F-test for joint significance of all the variables listed in the first column.

Table (3) Summary Comparisons by Subgroup

	All grades									
	All students	SWD	SWoD		El	Non-El		Hispanic	Non-Hispanic	
Participation										
Submit preference	0.14	0.12	0.14	***	0.10	0.15	***	0.14	0.14	
Charter school preference	0.09	0.07	0.09	***	0.04	0.09	***	0.06	0.11	***
Enroll in charter, conditional on offer	0.89	0.81	0.89	***	0.85	0.89		0.88	0.89	
Exit school within 2 years										
Conditional on charter enrollment	0.37	0.42	0.36	***	0.42	0.37		0.44	0.36	***
Conditional on TPS enrollment	0.54	0.60	0.53	***	0.46	0.55	***	0.49	0.59	***
Change classification within 2 years										
Conditional on charter enrollment		0.23	0.07	***	0.71	0.00	***			
Conditional on TPS enrollment		0.11	0.09	***	0.68	0.02	***			
	Observed structural movers									
	All students	SWD	SWoD		El	Non-El		Hispanic	Non-Hispanic	
Participation										
Submit preference	0.71	0.82	0.70	***	0.79	0.71	***	0.76	0.67	***
Charter school preference	0.41	0.42	0.41		0.30	0.41	***	0.29	0.54	***
Enroll in charter, conditional on offer	0.89	0.83	0.90	**	0.96	0.89		0.88	0.90	
Exit school within 2 years										
Conditional on charter enrollment	0.28	0.38	0.28	**	0.12	0.29	**	0.30	0.28	
Conditional on TPS enrollment	0.38	0.41	0.37	**	0.32	0.38	***	0.32	0.46	***
Change classification within 2 years										
Conditional on charter enrollment		0.26	0.06	***	0.62	0.01	***			
Conditional on TPS enrollment		0.11	0.07	***	0.68	0.06	***			

* $p < 0.1$; ** $p < 0.05$; ***$p < 0.01$

Note: Each set of columns reports whether the proportions are significantly different by subgroup (e.g., students with disabilities vs. students without disabilities). Students are considered observed structural movers if they are in the terminal grade at their current school at the time of their participation in Newark Enrolls. School exit and classification changes are recorded as of the 2016-2017 and 2017-2018 school years for the 2014 and 2015 Newark Enrolls cohorts, respectively. Students are considered to have exited their current school if either they are enrolled in a different NPS school or have left the NPS school district.

Table (4) Effect of Enrolling in a Participating Charter School on Later Mobility

	Dependent variable	
	Any mobility or reentry	
	(1)	(2)
Participating charter school	-0.224^{***}	-0.082^{***}
	(0.026)	(0.026)
Charter propensity	0.160^{***}	0.034
	(0.023)	(0.023)
Nonparticipating charter school	0.015	0.037
	(0.029)	(0.029)
Rank 2 match		0.069^{***}
		(0.012)
Rank 3 match		0.158^{***}
		(0.016)
Rank 4 match		0.184^{***}
		(0.022)
Rank 5 match		0.158^{***}
		(0.030)
Rank 6 match		0.205^{***}
		(0.038)
Rank 7 match		0.143^{***}
		(0.047)
Rank 8 match		0.247^{***}
		(0.055)
No ranked match		0.168^{***}
		(0.014)
Matched backed		0.068^{***}
		(0.015)
Observations	13,868	13,868
Adjusted R^2	0.137	0.155

$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Note: All regressions include controls for students' gender, free or reduced lunch status, date of birth, special education status, El- status, race, ethnicity, neighborhood of residence, grade, Newark Enrolls cohort, previous charter attendance, school closures, and terminal grade status. The outcome variable is an cumulative indicator for whether the student made an intra-NPS move, exited the NPS school district, or reentered Newark Enrolls after the initial post assignment year. Charter propensity is calculated as described in Section 4.2.

Table (5) Effect of Enrolling in a Participating Charter School on Later Mobility: By Subgroup

	Dependent variable		
	Any mobility or reentry		
	(1)	(2)	(3)
Participating charter school	−0.096***	−0.043	−0.041
	(0.028)	(0.038)	(0.038)
Spec. ed.	0.056***	0.038**	0.044**
	(0.014)	(0.018)	(0.019)
Spec. ed. x participating charter school	−0.012	−0.005	−0.028
	(0.034)	(0.045)	(0.046)
El	0.001	−0.019	−0.012
	(0.018)	(0.023)	(0.026)
El x participating charter school	−0.067	−0.154**	−0.165**
	(0.070)	(0.067)	(0.068)
Hispanic	−0.049	−0.048	−0.055
	(0.091)	(0.099)	(0.099)
Hispanic x participating charter school	0.076***	−0.004	−0.006
	(0.027)	(0.038)	(0.037)
Math		−0.039***	
		(0.007)	
Math x participating charter school		0.023	
		(0.017)	
ELA			−0.023***
			(0.008)
ELA x participating charter school			−0.009
			(0.018)
Observations	13,868	7,390	7,286
Adjusted R^2	0.156	0.192	0.187

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: All regressions include controls for students' gender, free or reduced lunch status, date of birth, special education status, El-status, race, ethnicity, neighborhood of residence, grade, Newark Enrolls cohort, rank ordering of assigned school, match-back under Newark Enrolls, previous charter attendance, school closures, and terminal grade status. Math and ELA scores are standardized to have a mean value of 0 and standard deviation of 1 within each grade, subject, and year with the exception of Algebra I, Algebra II, and Geometry scores. In the case of these scores, they were standardized within subject and year but across all grades. The outcome variable is a cumulative indicator for whether the student made an intra-NPS move, exited the NPS school district, or reentered Newark Enrolls after the initial post-assignment year. Charter propensity is calculated as described in Section 4.2.

Table (6) Effect of Enrolling in a Participating Charter School on Subsequent Special Education Status

	Dependent variable			
	Special education classification			
	(1) All grades	(2) K-3	(3) 4-6	(4) 7-12
Students without disabilities				
Year 1	0.003	0.008	0.004	−0.006
	(0.004)	(0.006)	(0.009)	(0.006)
Year 2	0.002	−0.006	0.034*	−0.017
	(0.011)	(0.017)	(0.021)	(0.021)
Year 3	−0.008	−0.007	0.023	−0.048**
	(0.014)	(0.022)	(0.025)	(0.024)
Observations (by year)	11,934	5,156	2,200	4,578
	10,859	4,743	2,034	4,082
	10,047	4,410	1,909	3,728
Students with disabilities				
Year 1	−0.004	−0.078	−0.039	0.095
	(0.063)	(0.119)	(0.091)	(0.121)
Year 2	−0.125*	−0.311***	−0.164	0.027
	(0.071)	(0.117)	(0.124)	(0.124)
Year 3	−0.093	−0.314***	−0.197**	0.131
	(0.062)	(0.114)	(0.095)	(0.125)
Observations (by year)	1,943	397	449	1,097
	1,744	359	404	981
	1,622	337	384	901

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: All regressions include controls for students' gender, free or reduced lunch status, date of birth, special education status, LEP status, race, ethnicity, neighborhood of residence, grade, Newark Enrolls cohort, rank ordering of assigned school, match-back under Newark Enrolls, previous charter attendance, school closures, and terminal grade status. Classification changes are recorded as of the 2016-2017 and 2017-2018 school years for the 2014 and 2015 Newark Enrolls cohorts, respectively.

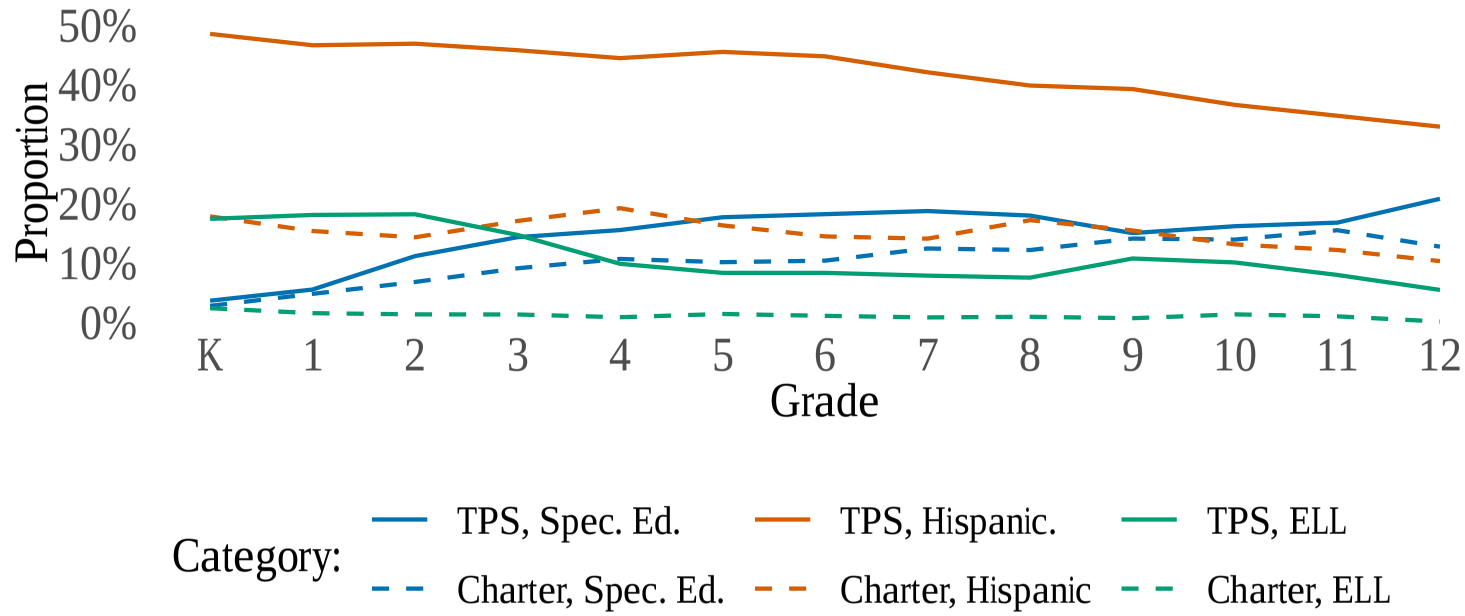
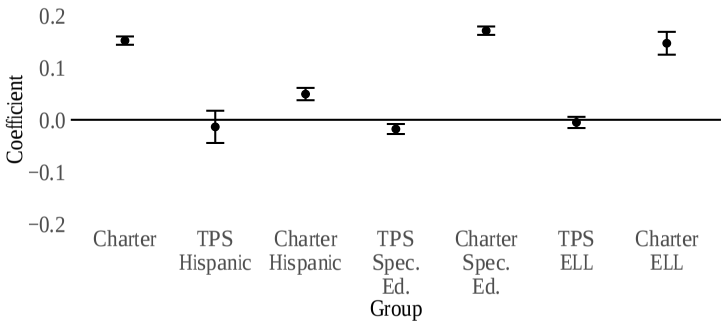
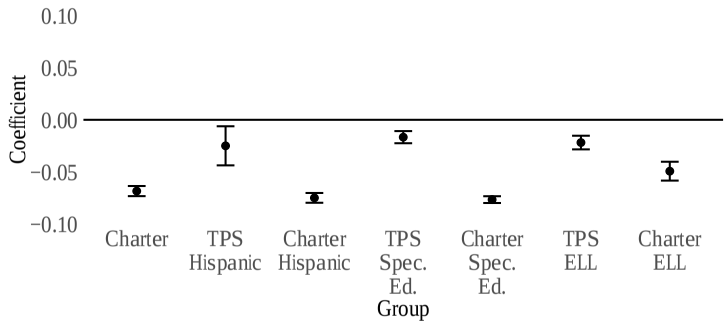


Figure (1) Enrollment Gaps by Grade

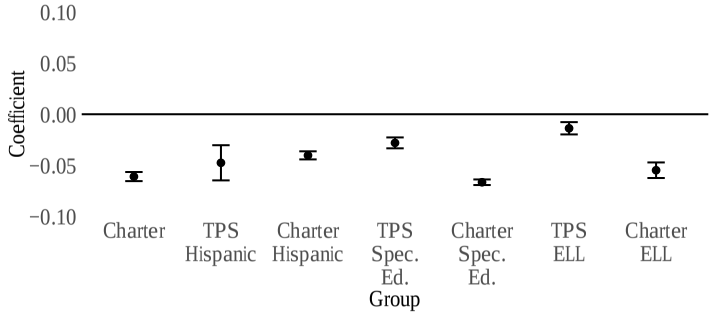
The figure displays the proportion of all NPS students in each category by sector and grade in the 2013-2014 and 2014-2015 school years.



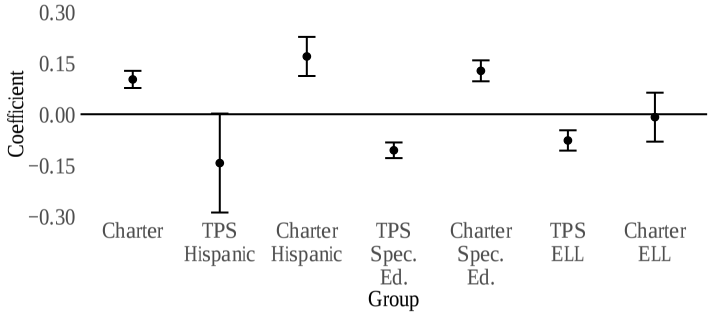
(a) Leaving Initial School



(b) Newark Enrolls Participation



(c) Charter School Listing



(d) Charter School Listing, Conditional on Participation

Figure (2) Descriptive Regressions for Student Mobility and Newark Enrolls Participation

All figures give the coefficient for each subgroup relative to non-Hispanic traditional public school (TPS) students without special education or LEP classifications. For charter school students in each subcategory, each figure displays the sum of the coefficients for charter school enrollment, the relevant subcategory, and an interaction of those two variables. Figure (a) displays coefficients from a regression where the outcome variable is changing schools between the first potential postassignment year and 3 years later (i.e., 2014-2015 and 2016-2017 for potential 2014 Newark Enrolls entrants, and 2015-2016 and 2017-2018 for potential 2015 Newark Enrolls entrants). Figure (b) displays the coefficients from a regression where the outcome is submitting a school preference listing to Newark Enrolls, and Figure (c) corresponds to submitting a school preference listing that includes at least one charter school. Figure (d) displays the coefficients for submitting a listing that includes at least one charter school, conditional on having submitted a school preference listing. In addition to the displayed categories, all regressions also include controls for students' gender, free or reduced lunch status, date of birth, race, neighborhood of residence, grade, Newark Enrolls cohort, and terminal grade status.

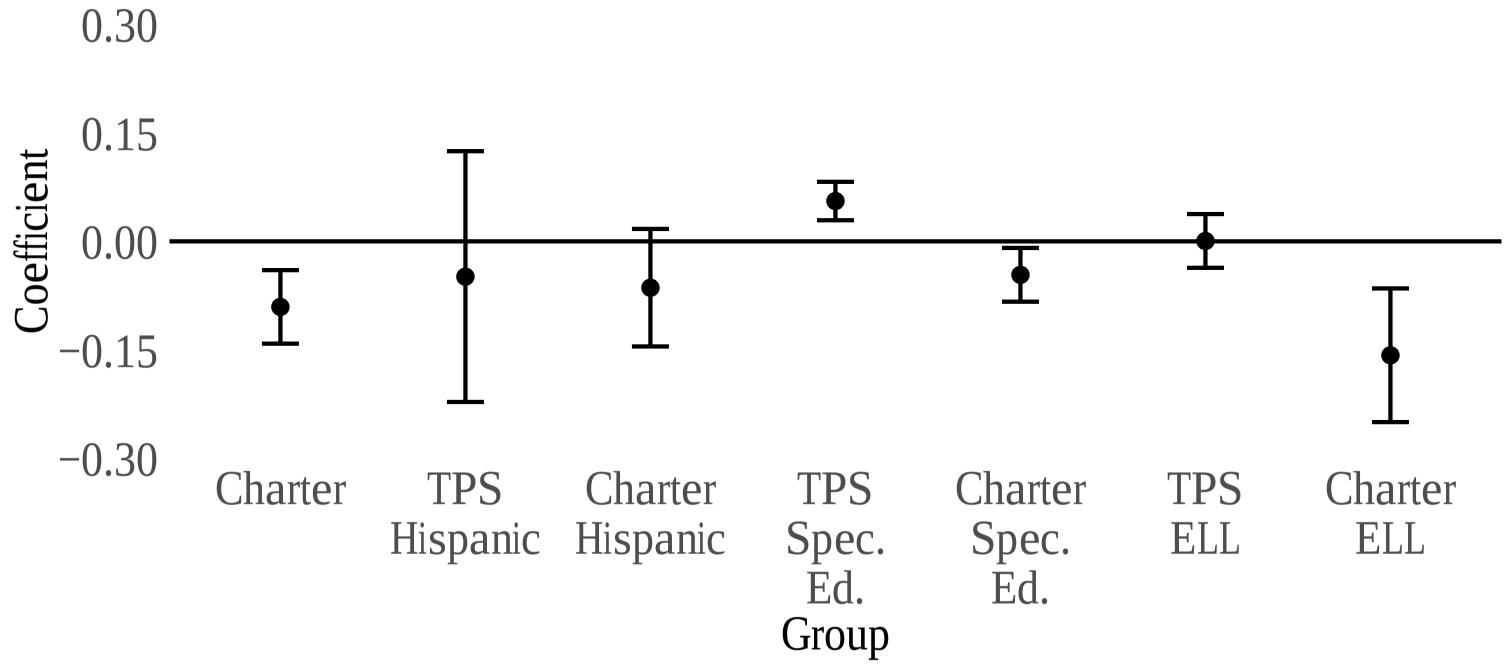


Figure (3) Causal Regression for Student Mobility

Coefficients for each subgroup are relative to non-Hispanic TPS students without special education or LEP classifications. For charter school students in each subcategory, the figure displays the sum of coefficients for charter school enrollment, the relevant subcategory, and an interaction of those two variables. In addition to the displayed categories, the regression include controls for students' gender, free or reduced lunch status, date of birth, race, neighborhood of residence, grade, Newark Enrolls cohort, charter propensity, previous charter attendance, school closures, and terminal grade status. The outcome variable is a cumulative indicator for whether the student made an intra-NPS move, exited the NPS school district, or reentered Newark Enrolls after the initial postassignment year.

Appendices

A Further Details on Data and Empirical Methods

In this appendix, we detail the data and specifications discussed in Sections 2 and 3.

A.1 NJDOE and NPS Student Information

We acquired administrative data for students attending traditional public and charter schools in Newark from 2011-2012 through 2017-2018 that contained the following information:

- Test scores
- School attended
- Date of birth
- Gender
- Race and ethnicity[1].
- Limited English program start and completion dates.
- Special education status[2]
- Free and reduced lunch status

These files sometimes contain multiple records per student; this could happen if the student changed schools. We filtered the data to a single record per student per year, under the assumption that the most accurate record for any student was the school with the most recent school entry date.

We supplemented these controls with the following information from the Newark Enrolls data files:

- Grade to which the student applied

[1]Students are marked as American Indian, Asian, Black, Hispanic, Pacific Islander, or White. These categories are not strictly mutually exclusive.

[2]Students with a code of X, 00, or 99 were assumed to be nonspecial education students. All other codes were assumed to indicate that a student had special education status.

- IEP status at time of Newark Enrolls participation
- Free lunch status at time of Newark Enrolls participation
- Geographic neighborhood at time of Newark Enrolls participation

A.2 Student Test Scores

In columns 3 and 4 of Table 5, we used test scores in math and English language arts (ELA)[3], sometimes referred to as Language Arts Literacy or LAL in NJDOE or NPS documents, in the year of Newark Enrolls participation as a baseline control. In 2013-2014, the relevant test scores were students' New Jersey ASK Mathematics Scaled Scores and New Jersey ASK LAL Scaled Scores, and typically tested grades were expanded from Grades 3-8 to Grades 3-11. In later years, New Jersey began using PARCC exams. For these years, we used the New Jersey PARCC Mathematics, Algebra I, Algebra II, Geometry, and LAL Scaled Scores.

Test scores were standardized to have a mean value of 0 and standard deviation of 1 within each grade, subject, and year, with the exception of Algebra I, Algebra II, and Geometry scores. In the case of these scores, they were standardized within subject and year but across all grades.

A.3 Charter Schools and Magnet High Schools

For each student in each year, we obtained the school most recently entered according to the NJDOE data. This was used to mark charter school attendance status in the year following Newark Enrolls participation. For analyses 2 or 3 years following Newark Enrolls participation, the relevant treatment variable was still assumed to be attendance in the year following participation.

Appendix Table A1 includes all Newark charter schools and their participation status in Newark Enrolls in 2014 and 2015.

[Table 7 about here.]

[3]In NJDOE or NPS data and documents, this is typically referred to as Language Arts Literacy (LAL).

NPS operates six magnet high schools that all use the Newark Enrolls system. None of the six are charter schools. These schools are permitted to use additional criteria to rank students in the Newark Enrolls process, including standardized test scores, attendance records, course grades, interviews, writing samples, and auditions. They are listed in Appendix Table A2.

[Table 8 about here.]

A.4 Newark Enrolls School Assignments, Lottery Simulation, and Propensity Scores

The following procedure was applied for 2014 and 2015 Newark Enrolls participants:

Student School Assignments: For both cohorts, we only consider students who participated in the initial round of Newark Enrolls for the reasons detailed in Section 3. For students in the 2014 cohort, we directly observe their first round assignment. For students in the 2015 cohort, we only have their final assignment after all rounds. Thus, this 2015 variable is noisy, and may not accurately represent the first-round assignment if the student chooses to reenter in the second round and receives a different assignment.

Student School Preferences and Guaranteed Schools: Students' choices were rearranged to remove any blank spots in their ordering between their first and last choice. This could occur if a student's submission included a school for which that student was not eligible. For example, if a first grade applicant submitted a listing of Park Elementary School, Malcolm X. Shabazz High School, and Hawkins Street Elementary School, they would be treated as if Hawkins Street Elementary School was their second choice school. Students could list up to eight schools, but were not required to list multiple schools.

If applicable, students were assigned a guaranteed school. Should a student receive a seat at none of the schools on their list, their current school was assumed to be guaranteed

unless they were marked as being in a transition grade for their school (i.e., a sixth grade applicant currently attending a school offering Grades K-5) or their school was closing.

Seat Allocations: The number of seats available for each grade-school combination was not available. We estimated this for every grade-school combination for which we observed an assigned student. For a given grade-school combination, the number of seats available was assumed to be the greater of students assigned to that school in the first round or after both rounds, less any seats that appeared to have been allocated as a result of being a student's guaranteed school. Assignments were assumed to be the result of guaranteed school status when students were matched back to their current school. Students from the geographic neighborhood of each school were assumed to have priority for 75% of available seats as described below, with the exception of students applying to high schools, multi-campus charters, or Philip's Academy Charter School.[4]

Propensity Score Calculation: Newark Enrolls assigns students to schools based on students' preferred list of schools, the number of seats available, a priority system, and a randomly generated lottery number. To generate the likelihood that a particular student would be assigned to a charter school holding constant all students' preferences, we simulated this process 500 times with new randomly generated lottery numbers.

For each simulated round of this process, the following algorithm was completed after generating new lottery numbers distributed uniformly between 0 and 1, with lower numbers granting higher probability of admission:

1. Assign all students to a school. For the first iteration, use the first choice school for all students. For all later iterations, use the same school as the previous iteration if they were temporarily assigned admission; otherwise use the next school on the student's list.

[4]Based on discussions with NPS employees familiar with the process, Philip's Academy Charter School was unable to apply geographic preferences due to rules regarding funding received from the federal government.

2. Assign all students two priority numbers.
    (a) Students' nongeographic priority number is their lottery number plus 0 if their current school is closing, 1 if they have a sibling at their applied school, and 2 otherwise.
    (b) Students' geographic priority number is their lottery number plus 0 if their current school is closing, 1 if they have a sibling at their applied school, 2 if they reside in the same neighborhood as their applied school, and 3 otherwise.
3. For magnet schools, assign temporary admission if they were eventually assigned to their applied school and 0 otherwise.
4. For nonmagnet schools, rank all students by geographic priority number at each grade-school combination, with the lowest number assigned a rank of 1. Assign temporary admission if their numerical rank is less than 75% of available seats for that grade-school combination.
5. For students applying to nonmagnet schools and not assigned admission in the previous step, rerank them within each grade-school combination by nongeographic priority number, and assign temporary admission if their numerical rank is less than 25% of available seats for that grade-school combination.
6. Repeat this process until all students have been assigned to a school or have exhausted all schools on their list without being assigned a seat.
7. For students still unassigned at the end of this process, assign them to their guaranteed school if applicable. Otherwise, classify them as unassigned.

At the end of this process, there are three possible outcomes for each student: they are assigned to a school on their list, they are assigned to their guaranteed school, or they are unassigned.

For each student, their charter school propensity score was calculated as the proportion of instances where their assigned school was one of the participating charter schools in Appendix Table A1. For example, if a student was assigned to a charter school in 200 of the

500 simulations, their charter propensity score would be 0.4.

A.5 Data Merge

All students who participated in the first round of Newark Enrolls received a charter school propensity score. These scores (and control variables found in the Newark Enrolls data) were merged to NJDOE administrative records for the year of and the year following assignment using students' Statewide Student Identifier (SID) numbers. In the 2014 and 2015 Newark Enrolls data, 21.65% and 18.28% of students are missing an SID code, respectively. In these same data sets, 14.3% and 16.9% of students have an SID code, but cannot be matched to records in one or both NJDOE files.

A.6 Regression Samples

To be included in our regression sample for n years after assignment, a student must have participated in that year's Newark Enrolls first round assignments and successfully merged to NJDOE records by SID number in the preassignment year and the first postassignment year (the "treatment" year).

All regressions, unless noted otherwise, contain the following control variables:

- Charter school propensity score
- An indicator for whether they were previously attending a participating charter school
- An indicator for whether they were previously attending a nonparticipating charter school
- Grade for which the student applied
- An indicator for having been in a transition grade at the time of Newark Enrolls
- An indicator for having been enrolled at the time of Newark Enrolls in in a school scheduled to close
- A set of indicators for student race and ethnicity
- Gender

- Date of birth
- Neighborhood at the time of Newark Enrolls assignment
- IEP status as recorded by Newark Enrolls
- Special education status as recorded by NJDOE at the time of assignment
- Free lunch status as recorded by Newark Enrolls
- Free and reduced lunch status as recorded by NJDOE at the time of assignment
- El status as recorded by NJDOE at the time of assignment
- Newark Enrolls cohort indicator

Additionally, they include indicators for whether the student had been subject to a structural move in each postassignment year, where a structural move is one caused by reaching the final grade in a school or school closure.

For the regressions controlling for student preferences, we include a categorical variable for the rank of the student's assigned school, and separate flags for students who did not obtain a match at a ranked school and for students matched back to their prior school.

B Descriptive Mobility Regressions

As described in Section 3, we estimate Equation 1 to determine the descriptive relationship between student characteristics and a variety of outcomes associated with student mobility. The outcomes are indicators for whether a student:

- Leaves their school within 2 years
- Submits any list of school preferences to Newark Enrolls for the following year's school assignment
- Submits a list of school preferences to Newark Enrolls that includes one or more charter
- Submits a list of school preferences to Newark Enrolls that includes one or more charter, where the sample is restricted to students who submitted any list

The results are reported in Appendix Table A3. These results are reported graphically in Figure 2.

[Table 9 about here.]

C Results for Alternative Outcome Measures or Time Horizons

Appendix Table A4 presents our findings for each of the individual mobility categories separately. Column (1) matches Column (2) of Table 4.

We find that the lower subsequent mobility for students attending participating charter schools primarily operates through the channel of lower mobility within the NPS school district, rather than through exit from the district. Accordingly, we find that students attending participating charter schools are significantly less likely to reenter Newark Enrolls in subsequent years.

Appendix Table A5 presents our findings for 1, 2, and 3 years after Newark Enrolls participation. Due to the time range for our data, we are only able to observe outcomes 3

years later for the earlier of our two cohorts, the 2014 Newark Enrolls participants. Column (2) again replicates Column (2) of Table 4.

We find a negative effect on mobility in all three time horizons, although the magnitude is lower and the coefficient statistically insignificant for 3 years later.[5]

[Table 10 about here.]

[Table 11 about here.]

D El Classification Analysis

There are two primary issues in identifying clear, causal variation in El status changes in our settings. The first is related to data recording issues regarding the removal of El status, especially among those in charter schools. The second is a conceptual hurdle: Those El students assigned to charters and not assigned to charters differ substantially not just in demographics but also in their preference profiles, in a way that is difficult to convincingly control for with their charter propensity scores.

D.1 Data Recording Issues

In the annual data provided by NJDOE, we have access to two variables related to El status: El program start date and El program completion date. It is possible for a student to complete their El program but later be reclassified into El again; however, this is rare. Among Els in traditional public schools, these variables are recorded as expected. El students continuously enrolled in traditional public schools overwhelmingly retain their nonmissing El program start date across subsequent years' data, and typically acquire an El program completion date. However, the pattern for students who are enrolled in a charter school is less

[5]However, these coefficient values are not statistically significantly different from each other. We also find - but do not report here - that the mobility effect is significantly larger for the 2015 cohort than the 2014 cohort across all time horizons, which may explain why the coefficient of interest is smaller in magnitude when looking 3 years after participation.

consistent. It is not uncommon for these students to have missing El program start dates in later years, and they are less likely to ever acquire an El program completion date. Frequently they appear in later files as if they were non-El students. It appears that for charter school students who are declassified, many schools record this by simply not recording any date for either variable.

To alleviate this issue, we adopt the following procedure for determining students' year-by-year El classification:

1. El students are initially identified as those who have an El program start date in any year's file, with their status back-dated where relevant based on this date. They are classified as El students as long as they have an El program start date without a completion date.

2. Students' El status indicator is removed if they have an affirmative El program completion date for that year and all following years (unless they reenter the El program at a later date, in which case we consider them to have been El students continuously).

3. If there is a gap in their El status across years (i.e., the same El program start date is present without a completion date in 2014 and 2016, but missing in 2015), they are assumed to be El students in the intervening years.

4. If their El status disappears in a later year's file and does not reappear in a later year's file (e.g., they have an El program start date in 2014 but not in any subsequent years' files in which they appear), they are assumed to have been declassified.

D.2 El Classification Concerns and Results

Similar to (Setren, 2019) and our analysis of special education classification status, we look at whether attending a charter school has a causal effect on El declassification. It is worth noting that our analysis setting differs substantially from (Setren, 2019) in ways that make the expected result unclear. Her analysis looks at classification changes at the beginning

of the year – before the students have spent substantial time in their new schools. Thus, the tendency that she observes of charter schools to declassify students at higher rates almost certainly reflects institutional factors and practices rather than the effect of classroom practices and learning. We observe students' information at the end of each school year, so our findings include the effect of time spent in the classroom in the years following assignment under Newark Enrolls. While this certainly implies that we would observe higher absolute levels of declassification, it's unclear whether this would be expected to increase or decrease the gap in declassification practices between traditional public schools and charters. For example, if charters are more likely to declassify students on intake, our setting may allow traditional public schools sufficient time to "catch up" over the course of the subsequent years.

Our first hurdle in this analysis is that there are very few El students assigned to charters via Newark Enrolls in our data. Of the 635 El students in our sample with observable El status 2 years later, only 50 (8%) are assigned to a participating charter school, vs. 31% of non-El students in this sample. This is largely attributable to students' submitted preferences – only 199 out of these 635 El students (31%) included a charter school in their rankings, much lower than the 63% rate observed in the subsample of non-El students. Thus, we have a very small group of students to use to identify the causal effect in question. Nonetheless, we report our results for this subsample of El students in Appendix Table A6. The outcome variable is being classified as an El student 2 years later, so a positive coefficient indicates that students are more likely to retain classification, while a negative coefficient indicates that students are more likely to be declassified.

Prior to adding control variables, we do observe an initial negative effect on classification status similar to (Setren, 2019) – indicating that El charter students are more likely to be declassified than their traditional public school peers. However, our effects are much smaller than those found in Setren (2019) and too imprecisely measured to be statistically significant. Additionally, a different story emerges as we add additional controls. Within the sample of previously classified El students, those assigned to charter schools are much less likely to be

Hispanic (33% vs. 84%),[6] and more likely to qualify for free or reduced price lunch (90% vs. 71%) – both factors strongly predictive of declassification in our setting. Controlling for just these characteristics in Column (2) has the effect of changing the sign on the effect of charter school attendance, although it remains relatively small and imprecise.

The larger change comes when we additionally control for charter school propensity in the fashion of Abdulkadiroğlu et al. (2017) as discussed in Section 3. When doing this in Column (3), we see that the effect becomes very large and highly significant, indicating that charter attendance greatly decreases the likelihood of declassification. The coefficient on charter propensity score is very large and highly significant in the opposite direction. This finding is robust to the inclusion of additional controls in Column (4).

Interpreted at face value, this would suggest that the type of El students who seek out charter schools in the Newark Enrolls process are very likely to be declassified no matter what school they are assigned to, and that actually attending a charter school makes them less likely to be declassified. Thus, most of the reason that charter school students are declassified at higher rates can be attributed to the preexisting traits of these students.

However, we think these extremely large coefficient values should be interpreted with an abundance of caution due to sample limitations. In general, the goal of controlling for the students' charter propensity is to separate out the effect of attending a participating charter school from the effect of being the type of student who wishes to attend these schools (and may be systematically different regardless of sector assignment thereafter). For this method to be effective in causally separating these two factors, there must be substantial variation in this charter propensity variable across the sample, and in both the pools of students assigned to or not assigned to a charter school. While we observe this in our larger sample, it is not the case for the subsample of students with El designation: Almost all El students not assigned to a charter school have a charter propensity score of 0 (mean value of 0.03, with a mean value of 0.25 among the 10% of students with non-zero values), while charter

[6] Conversely, they are much more likely to be classified as Black. They are less likely to be classified as White.

propensity is much high for almost all El students (mean value of 0.76). This means that the identifying variation for charter propensity comes almost entirely from within the pool of students assigned to charter schools.[7]

This suggests that among students assigned to charter schools, the intensity of their relative preference for charter school attendance may be informative. However, it says relatively little about the cross-sector interpretation of this variable. As such, we believe that the coefficient values found via estimate Equations 2 and 3 in the subsample of El students are difficult to interpret, and strongly caution against taking the large coefficient values on participating charter school and charter propensity in Appendix Table A6 at face value.

Turning to non-El students in Appendix Table A7, we see similar dynamics in terms of the control variables: Hispanic students are more likely to be newly classified as El students while students qualifying for free or reduced price lunch as less likely to be newly classified as El students, and charter propensity is negatively associated with a new El classification. However, we see far less dramatic changes in the causal variable of interest for attendance at a participating charter school, and more modest (but statistically significant) coefficient values for this variable and charter propensity. This is likely because we have a much larger sample of non-El students and observe more cross-sector variation in the charter propensity variable for non-El students than we do in the El student subsample - the mean value of charter propensity among non-El students not assigned to a charter school is 0.09, and 0.4 among the approximately 22% of these students who have non-zero charter propensity. This likely contributes to our finding coefficient values that are more stable and plausible in magnitude for the non-El subsample.

[Table 12 about here.]

[Table 13 about here.]

[7] Analysis on only students with non-zero charter propensity is similar to Appendix Table A6 but is too imprecise for meaningful interpretation due to a sample size of only 112 students.

E Interaction of Race, Ethnicity, and Participating Charter Attendance

Table 5 reports a positive coefficient for *Hispanic x participating charter school*. While the sum of the coefficients for *participating charter school* and this interaction is insignificant and negative (indicating that Hispanic students who enroll in participating charter schools are similarly or less mobile than Hispanic students who enroll in traditional public schools), this interaction term would seem to indicate that these Hispanic students are more mobile than their non-Hispanic charter school peers. We investigate this by adding a further interaction term for *Black x participating charter school*. This changes the comparison group for the interaction term: While only including *Hispanic x participating charter school* effectively compares these students to all non-Hispanic charter school students, including both interaction terms changes the comparison group to non-Black, non-Hispanic students. This is a much smaller group - fewer than 1% of all students assigned to participating charter schools. Thus, this analysis should be considered exploratory.

Nonetheless, we present our findings in Appendix Table A8. We find that it presents a different story regarding Hispanic students at participating charter schools: they are much *less* mobile than non-Black, non-Hispanic students at these schools, but Black students at these schools are less mobile than both. Thus, whether Hispanic students at charter schools are more or less likely to leave depends on which within-school peers one compares them to.

[Table 14 about here.]

Table (A1) Newark Charter Schools

School	2014-2015 Newark Enrolls participant?	2014-2015 Newark Enrolls school code	NJDOE District & school code
Great Oaks Charter School[1]	Yes	711	6053-917
Lady Liberty Academy Charter School	Yes	713	7100-936
Marion P. Thomas Charter School	Yes	715	7210-940
Merit Prep Charter School[2]	Yes	716	6091-974
Newark Educators' Community Charter School	Yes	718	6029-911
Newark Legacy Charter School[1]	Yes	719	6037-922
Newark Prep Charter School[2]	Yes	720	6059-941
North Star Academy Charter School (Uncommon)	Yes	721	7320-960
People's Preparatory Charter School	Yes	722	6057-938
Philip's Academy Charter School	Yes	723	6094-968
Roseville Community Charter School	Yes	725	6058-939
TEAM Charter Schools (KIPP)	Yes	726	7325-965
The Paulo Freire Charter School[2]	Yes	728	6090-977
University Heights Charter School	Yes	729	8065-980
Vision Academy Charter School[3]	Yes	730	6038-923
Achieve Community Charter School[4]	No	N/A	6110-902
Discovery Charter School	No	N/A	6320-920
LEAD Charter School [4]	No	N/A	6109-953
Link Community Charter School	No	N/A	6099-986
Maria L. Varisco-Rogers Charter School	No	N/A	7735-975
M.E.T.S. Charter School[5]	No	N/A	6068-951
New Horizons Community Charter School[5]	No	N/A	7290-957
Robert Treat Academy Charter School	No	N/A	7730-970
The Gray Charter School	No	N/A	6665-930

[1] Great Oaks Charter School and Newark Legacy Charter School merged in 2016 and became known as Great Oaks Legacy Charter School, with Newark Enrolls school code 731.

[2] Merit Prep Charter School, Newark Prep Charter School, and the Paulo Freire Charter School were ordered to close in 2017 by NJDOE due to poor performance and did not participate in Newark Enrolls from 2017 onward.

[3] Vision Academy Charter was subsumed by Marion P. Thomas Charter School after the 2013-2014 school year and did not appear in later cohorts of Newark Enrolls.

[4] Achieve Community Charter School and LEAD Charter School opened in 2017. Achieve Community Charter School participated in the 2017 cohort of Newark Enrolls with the Newark Enrolls school code 732; LEAD charter school remains a nonparticipating charter school.

[5] M.E.T.S. Charter School and New Horizons Community Charter School became participating schools in the 2017 cohort of Newark Enrolls with the Newark Enrolls school codes of 733 and 717.

Table (A2) Newark Magnet High Schools

school	2014-2015 Newark Enrolls school code	NJDOE district & school code
American History High School	43	3570-087
Arts High School[1]	26	3570-010
Bard Early College High School	11	3570-304
University High School	24	3570-057
Science Park High School	25	3570-055
Technology High School	38	3570-056

[1] Arts High School includes several different programs. Prior to 2017, the Newark Enrolls data marks each of these separately (i.e., 26TR for students wishing to study in the trumpet program).

Table (A3) Descriptive Mobility Regressions

	Dependent variable			
	See Below			
	(1)	(2)	(3)	(4)
Previous charter student	0.152***	−0.068***	−0.061***	0.102***
	(0.004)	(0.002)	(0.002)	(0.010)
Hispanic	−0.014	−0.025***	−0.048***	−0.143**
	(0.016)	(0.007)	(0.006)	(0.064)
Previous charter student x Hispanic	−0.089***	0.018***	0.068***	0.211***
	(0.009)	(0.005)	(0.005)	(0.030)
Special education	−0.018***	−0.017***	−0.028***	−0.106***
	(0.005)	(0.003)	(0.002)	(0.013)
Previous charter student x special education	0.037***	0.008	0.022***	0.131***
	(0.012)	(0.006)	(0.005)	(0.030)
El	−0.005	−0.022***	−0.014***	−0.077***
	(0.005)	(0.003)	(0.002)	(0.016)
Previous charter student x El	−0.00005	0.041***	0.020	−0.034
	(0.026)	(0.015)	(0.013)	(0.094)
Dependent variable	Changes School	Any N.E. List Submission	1+ Charter on N.E. List Submission	1+ Charter, Conditional on N.E. List Submission
Observations	95,791	111,932	111,932	16,027
Adjusted R^2	0.276	0.369	0.200	0.252

Note: *p<0.1; **p<0.05; ***p<0.01

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: All regressions include controls for students' gender, free or reduced lunch status, date of birth, race, ethnicity, grade, and whether the students were required to move due to reaching a terminal grade. The outcome variable is noted at the bottom of each column.

Table (A4) Effect of Charter Attendance for 2014-2015 Lottery Cohorts

	Dependent variable					
	See Below					
	(1)	(2)	(3)	(4)	(5)	(6)
Participating charter school	−0.082***	−0.081***	−0.076***	−0.109***	0.005	−0.069***
	(0.026)	(0.026)	(0.027)	(0.023)	(0.019)	(0.022)
Charter propensity	0.034	0.036	0.031	0.034	0.026	0.034*
	(0.023)	(0.023)	(0.024)	(0.021)	(0.017)	(0.020)
Nonparticipating charter school	0.037	0.009	0.011	0.002	−0.003	0.047*
	(0.029)	(0.028)	(0.029)	(0.027)	(0.020)	(0.027)
Rank 2 match	0.069***	0.054***	0.059***	0.053***	0.005	0.077***
	(0.012)	(0.012)	(0.012)	(0.010)	(0.008)	(0.009)
Rank 3 match	0.158***	0.134***	0.134***	0.088***	0.031***	0.122***
	(0.016)	(0.016)	(0.016)	(0.014)	(0.012)	(0.013)
Rank 4 match	0.184***	0.150***	0.151***	0.070***	0.073***	0.120***
	(0.022)	(0.022)	(0.022)	(0.019)	(0.017)	(0.018)
Rank 5 match	0.158***	0.134***	0.136***	0.097***	0.046**	0.115***
	(0.030)	(0.030)	(0.030)	(0.026)	(0.022)	(0.024)
Rank 6 match	0.205***	0.178***	0.167***	0.128***	0.041	0.170***
	(0.038)	(0.038)	(0.039)	(0.035)	(0.028)	(0.033)
Rank 7 match	0.143***	0.146***	0.155***	0.037	0.076**	0.117***
	(0.047)	(0.046)	(0.047)	(0.039)	(0.037)	(0.037)
Rank 8 match	0.247***	0.209***	0.220***	0.164***	0.037	0.217***
	(0.055)	(0.057)	(0.059)	(0.057)	(0.043)	(0.057)
No ranked match	0.168***	0.135***	0.137***	0.098***	0.025**	0.144***
	(0.014)	(0.013)	(0.014)	(0.012)	(0.010)	(0.012)
Matched back	0.068***	0.060***	0.057***	0.050***	0.009	0.085***
	(0.015)	(0.015)	(0.015)	(0.013)	(0.011)	(0.013)
Dependent variable	Any Mobility or Reentry	Any Intra-NPS Move or Exit	Non-Structural Intra-NPS Move or Exit	Any Intra-NPS Move	Exited NPS District	Lottery Reentry
Observations	13,868	13,868	13,868	13,868	13,868	13,868
Adjusted R^2	0.155	0.159	0.061	0.169	0.024	0.269

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: All regressions include controls for students' gender, free or reduced lunch status, date of birth, special education status, El-status, race, ethnicity, neighborhood of resident, grade, Newark Enrolls cohort, and whether the students were previous charter attendees or were required to move due to school closures or reaching a terminal grade. The outcome variable is noted at the bottom of each column. Charter propensity is calculated as described in Section 4.2.

Table (A5) Effect of Charter Attendance for 2014-2015 Lottery Cohorts

	Dependent variable		
	Any mobility or reentry		
	1 yr	2 yr	3 yr
	(1)	(2)	(3)
Participating charter school	−0.064***	−0.082***	−0.042
	(0.025)	(0.026)	(0.034)
Charter propensity	0.019	0.034	0.002
	(0.022)	(0.023)	(0.030)
Nonparticipating charter school	0.040	0.037	0.036
	(0.027)	(0.029)	(0.042)
Rank 2 match	0.071***	0.069***	0.035**
	(0.011)	(0.012)	(0.017)
Rank 3 match	0.136***	0.158***	0.167***
	(0.016)	(0.016)	(0.022)
Rank 4 match	0.136***	0.184***	0.189***
	(0.021)	(0.022)	(0.028)
Rank 5 match	0.153***	0.158***	0.170***
	(0.029)	(0.030)	(0.037)
Rank 6 match	0.155***	0.205***	0.169***
	(0.037)	(0.038)	(0.044)
Rank 7 match	0.129***	0.143***	0.171***
	(0.043)	(0.047)	(0.055)
Rank 8 match	0.269***	0.247***	0.271***
	(0.058)	(0.055)	(0.056)
No ranked match	0.147***	0.168***	0.126***
	(0.013)	(0.014)	(0.017)
Matched back	0.065***	0.068***	0.078***
	(0.014)	(0.015)	(0.019)
Cohort	2014-2015	2014-2015	2014
Observations	13,868	13,868	7,097
Adjusted R^2	0.146	0.155	0.171

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: All regressions include controls for students' gender, free or reduced lunch status, date of birth, special education status, El-status, race, ethnicity, neighborhood of resident, grade, Newark Enrolls cohort, and whether the students were previous charter attendees or were required to move due to school closures or reaching a terminal grade. Charter propensity is calculated as described in Section 4.2.

Table (A6) El Classification Status - El Students Only

	Dependent variable			
	LEP status 2 years later (Mean value: 0.324)			
	(1)	(2)	(3)	(4)
Participating charter school	−0.055	0.054	0.432**	0.490**
	(0.075)	(0.075)	(0.195)	(0.201)
Charter propensity			−0.453**	−0.541***
			(0.185)	(0.192)
Nonparticipating charter school				0.204*
				(0.123)
Hispanic		0.228***	0.233***	0.172***
		(0.040)	(0.041)	(0.061)
Free lunch		−0.309***	−0.310***	−0.213***
		(0.042)	(0.042)	(0.050)
Reduced price lunch		−0.375***	−0.389***	−0.325***
		(0.092)	(0.094)	(0.106)
Observations	635	635	635	635
Adjusted R^2	0.0003	0.114	0.104	0.123
Additional controls?	No	No	No	Yes

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: The regressions in columns (1), (2), and (3) include only the listed variables, while the the regression reported in column (4) also includes controls for students' gender, date of birth, special education status, race, neighborhood of resident, grade, Newark Enrolls cohort, and whether the students were previous charter attendees or were required to move due to school closures or reaching a terminal grade. The outcome variable is noted at the bottom of each row. It also includes the ranked preference controls discussed in Section 4.3. Charter propensity is calculated as described in Section 4.2.

Table (A7) El Classification Status - Non-El Students Only

	Dependent variable			
	LEP status 2 years later			
	Mean value: 0.030			
	(1)	(2)	(3)	(4)
Participating charter school	−0.036***	−0.023***	−0.003	−0.019***
	(0.003)	(0.003)	(0.005)	(0.006)
Charter propensity			−0.021***	−0.028***
			(0.005)	(0.006)
Nonparticipating charter school				−0.041***
				(0.010)
Hispanic		0.065***	0.064***	0.027***
		(0.004)	(0.004)	(0.007)
Free lunch		−0.072***	−0.072***	−0.029***
		(0.004)	(0.004)	(0.003)
Reduced price lunch		−0.072***	−0.073***	−0.021***
		(0.004)	(0.004)	(0.003)
Observations	11,182	11,182	11,182	11,182
Adjusted R^2	0.007	0.084	0.085	0.129
Additional controls?	No	No	No	Yes

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: The regressions in columns (1), (2), and (3) include only the listed variables, while the the regression reported in column (4) also includes controls for students' gender, date of birth, special education status, race, neighborhood of resident, grade, Newark Enrolls cohort, and whether the students were previous charter attendees or were required to move due to school closures or reaching a terminal grade. The outcome variable is noted at the bottom of each row. It also includes the ranked preference controls discussed in Section 4.3. Charter propensity is calculated as described in Section 4.2.

Table (A8) Effect of Charter Attendance for 2014-2015 Lottery Cohorts By Grade

	Dependent variable	
	Any mobility or reentry	
	(1)	(2)
Participating charter school	−0.096***	0.138
	(0.028)	(0.084)
Black	0.029	0.165
	(0.090)	(0.101)
Hispanic	−0.049	0.082
	(0.091)	(0.101)
Black x participating charter school		−0.241***
		(0.082)
Hispanic x participating charter school	0.076***	−0.154*
	(0.027)	(0.084)
Observations	13,868	13,868
Adjusted R^2	0.156	0.157

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Note: All regressions include controls for students' gender, free or reduced lunch status, date of birth, special education status, El-status, race, ethnicity, neighborhood of residence, grade, Newark Enrolls cohort, rank ordering of assigned school, match-back under Newark Enrolls, previous charter attendance, school closures, and terminal grade status. The outcome variable is a cumulative indicator for whether the student made an intra-NPS move, exited the NPS school district, or reentered Newark Enrolls after the initial postassignment year. Charter propensity is calculated as described in Section 4.2.

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www.wheelockpolicycenter.org
wheelockpolicy@bu.edu

Boston University Wheelock College of Education & Human Development
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