Online Appendix

Can Successful Schools Replicate?
Scaling Up Boston's Charter School Sector

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1 Data Appendix

We use lottery records, student demographic and enrollment data, state standardized test scores, and school personnel files in this article. Lottery records collected from individual schools contain the list of applicants, offer status, and factors that affect an applicant's lottery odds, including sibling status, disqualifications, late applications, and applying from outside of Boston. The Student Information Management Systems (SIMS) dataset contains enrollment and demographic data for all public school students in Massachusetts. Student standardized test scores come from the state database for the Massachusetts Comprehensive Assessment System (MCAS). The Massachusetts Education Personnel Information Management Systems (EPIMS) database provides school staff information. Next we describe these datasets, the matching process, and sample construction.

1.1 Lottery records

Massachusetts legally requires charters to admit students via lottery when more students apply to a charter school than the number of available seats for a given grade. Our paper uses records from charter lotteries conducted between spring 2004 to spring 2013 for 14 charter schools accepting students in 5th or 6th grade. Each of the 14 schools contributes oversubscribed lottery data.[1] Schools vary in the grades they serve and in years of operation. Table A1 lists this information and the years each school contributes to the analysis. We exclude one school that did not provide lottery records (Smith Leadership Academy) and two schools that closed before the charter expansion (Uphams Corner Charter School in 2009 and Frederick Douglass Charter School in 2005). Lottery data typically includes applicants' names, dates of birth, and lottery and waitlist offer status. Offers to attend charter schools either occur on the day of the lottery (referred to as *immediate offer*) or after the day of the lottery when students receive offers from the randomly sequenced waitlist as seats become available. In three out of the 65 lotteries in the study, the schools gave all applicants offers or did not give waitlist offers to non-siblings. Four lotteries did not distinguish the timing of the offers so we code the immediate offer variable to equal zero for these cohorts.

The Uncommon Schools/Roxbury Preparatory charter network held a single lottery for its three campuses in the Spring 2012 and Spring 2013 lotteries. When the school called a student's lottery number, the student could pick from the campuses that still had open seats. Our lottery records show which campus they picked at the time of the lottery. We find the last lottery number for each campus and code all students with better lottery numbers as having offers from that campus.

Uncommon Schools offered seats from the waitlist as they became available for individual campuses. Parents chose to accept or decline waitlist offers for single schools. If they declined, they were taken off the waitlist and would not be considered for seats at the other campuses.

1.2 Enrollment and demographics

The SIMS data contains individual level data for students enrolled in public schools in Massachusetts from 2003-2004 through 2013-2014. The data contains snapshots from October and the end of the school year. Each student has only one observation in each time period, except when

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[1]We do not have Spring 2004 lottery records for Brooke Roslindale, Boston Prep, and Academy of the Pacific Rim or Spring 2005 records for Brooke Roslindale. Brooke Roslindale does not have lotteries in after charter expansion because their elementary school students filled the middle school seat. All other schools and years have oversubscribed lottery data.

students switch grades or schools within year. Fields include a unique student identifier, grade level, year, name, date of birth, gender, ethnicity, special education status, limited English proficiency status, free or reduced price lunch status, school attended, suspensions, attendance rates, and days truant.

We code students as charter attendees in a school year if they attended a charter at any point during a year. Students who attend more than one charter school in a year are assigned to the charter they attended the longest. Students who attend more than one traditional public school and no charter schools in a year are assigned to the school they attended the longest. We randomly choose between schools if students have attendance ties between the most attended schools.

1.3   Test scores

This paper uses individual student math and English Language Arts (ELA) Massachusetts Comprehensive Assessment System (MCAS) test scores from 2003-2004 through 2013-2014. Massachusetts public school students take the exam each year in grades grades 5 through 8. Data includes the unique student identifier. We standardize the raw scores to to have a mean of zero within subject-grade-year in Boston.

1.4   Staff records

The Education Personnel Information Management Systems (EPIMS) contains yearly staff level data for all employees in Massachusetts public schools. We use data collected in October of the 2007-08 through the 2013-14 school years. Data includes job position, school, full time equivalency, date of birth, date of hire for first public school job in Massachusetts, license status, and highly qualified status. We use the full time equivalency of all staff and teachers. If one school has two half time teachers, they are counted as one full time equivalent teacher. A teacher who teaches at multiple schools counts towards the staff statistics at each school.

1.5   Matching data

We use applicants' names, date of birth, grade, and year to match their lottery records to the state enrollment data. The applicants who uniquely and exactly match the grade, year, name, and date of birth (if available) in the state records are assigned to the matched unique student id. After this initial match, we strip names in the lottery and enrollment data of spaces, surnames, hyphens, and apostrophes. Unique matches after this cleaning are assigned to the matched unique student id. Then, we use reclink, a fuzzy matching STATA program, to suggest potential matches for the remaining students. This matches students with slight spelling differences and those who appear in one grade older or younger than the charter application grade. We hand check these suggested matches for accuracy. We search for the remaining unmatched students by hand in the data. Typically this last group contains name truncations, name misspellings, or first and last names in the wrong field.

The matching process assigns 95 percent of applicants to the state administrative records (see Table A3). Students who do not match either enroll in private, parochial, or out-of-state schools, have names and birthdates too common to match, or have spelling errors too extreme to match with confidence. Receiving a charter offer makes students 3.8 more likely to match to the data,

as shown in Table A3. As a result, our findings show causal estimates for the set of students who enroll in Massachusetts Public Schools.

We match the enrollment and demographic data to the student test scores using the unique student identifier. Students who attend out of state, private, or parochial schools do not have test score outcomes for their years outside of Massachusetts public schools.

1.6   Sample restrictions

We exclude applicants who receive higher or lower preference in the lottery. Late applicants, those who apply to the wrong grade, out-of-area applicants, and siblings fall into these categories and typically have no variation in offer status. When students have duplicate applications within an individual school's lottery, we keep only one application. If students apply to charter schools in different years, we use only the first application year. We restrict the sample to students with baseline demographics data, excluding students applying from outside of Massachusetts public schools. With these restrictions imposed, the original raw sample of applications narrows from 20,981 to 8,473.

References

Massachusetts Department of Elementary and Secondary Education. 2011-2014. Educator Personnel Information Management System (EPIMS). Commonwealth of Massachusetts. Multiple electronic files.

Massachusetts Department of Elementary and Secondary Education. 2001-2014. Massachusetts Comprehensive Assessment System (MCAS). Commonwealth of Massachusetts. Multiple electronic files.

Massachusetts Department of Elementary and Secondary Education. 2011-2014. Student Course System (SCS). Commonwealth of Massachusetts. Multiple electronic files.

Massachusetts Department of Elementary and Secondary Education. 2001-2014. Student Information Management System (SIMS). Commonwealth of Massachusetts. Multiple electronic files.

2 Additional Tables

Table A1: Charter Middle Schools in Boston

	Year Opened (1)	Grades (2)	Outcome Years In Analysis (3)
Proven Providers			
Roxbury Preparatory: Mission Hill Campus	1999 - 2000	5 - 8 (12)	2004-05 - 2013-14
Brooke Roslindale	2002 - 03	5 - 8	2006-07 - 2009-10
Excel East Boston	2003 - 04	5 - 9 (12)	2008-09 - 2013-14
MATCH Middle School	2008 - 09	6 - 8	2008-09 - 2013-14
Expansion Charters			
Roxbury Preparatory: Lucy Stone Campus	2011 - 12	5 - 8	2011-12 - 2013-14
Roxbury Preparatory: Dorchester Campus	2012 - 13	5 - 7 (8)	2012-13 - 2013-14
Brooke Mattapan	2011 - 12	5 - 8	2011-12 - 2013-14
Brooke East Boston	2012 - 13	5 - 7 (8)	2012-13 - 2013-14
Excel Orient Heights	2012 - 13	5 - 7 (8)	2012-13 - 2013-14
KIPP	2012 - 13	5 - 7 (8)	2012-13 - 2013-14
UP Academy Boston	2011 - 12	6 - 8	2011-12 - 2013-14
Other Charters			
Academy of the Pacific Rim	1997 - 98	5 - 12	2005-06 - 2013-14
Boston Collegiate	1998 - 99	5 - 12	2004-05 - 2013-14
Boston Prep	2004 - 05	6 - 12	2005-06 - 2013-14
Not Included in Study			
Helen Davis Leadership Academy	2003 - 04	6 - 8	declined to participate
Frederick Douglas Charter	2000 - 01	6 - 10	closed in 2004-05
Uphams Corner Charter	2002 - 03	5 - 8	closed in 2008-09

Notes: This table lists Boston middle school charter schools by school type, opening year, grade levels, and outcome years included in the analysis. Grade levels shown in parentheses indicate planned enrollment grades which were not present at the time of analysis.

Table A2: Lottery Records

Year of application	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	All
Total number of records	341	739	913	1143	1422	1595	1467	4283	4312	4766	20981
Excluding disqualifed applications	341	738	911	1135	1404	1594	1444	4273	4305	4760	20905
Excluding late applications	340	738	909	1135	1363	1566	1397	4163	4196	4583	20390
Excluding out of area applications	340	733	900	1123	1353	1548	1379	4094	4071	4513	20054
Excluding siblings	300	677	836	1021	1223	1408	1249	3758	3760	4320	18552
Excluding records not matched to SIMS	266	634	801	1000	1181	1378	1179	3627	3573	4016	17655
Keep only first year of charter application	266	617	770	962	1093	1282	1038	3308	2962	3469	15767
Excluding repeat applications	266	617	770	962	1093	1282	1038	3308	2962	3458	15756
Reshaping to one record per student	265	523	586	760	868	963	812	2055	1715	1900	10447
Has baseline demographics and in Boston at baseline	176	382	437	571	679	722	623	1790	1499	1594	8473

Notes: This table summarizes the sample restrictions imposed for the lottery analysis. Disqualified applications are duplicate records and applications to the wrong grade.

Table A3: Match from Lottery Data to Administrative Data

| | | | Regression of Match on Offer | |
| | Number of Applications | Proportion Matched | Immediate Offer | Any Offer |
Lottery Year	(1)	(2)	(3)	(4)
2004	268	0.989	-0.006	-0.007
			(0.026)	(0.013)
2005	616	0.987	-	0.002
			-	(0.013)
2006	742	0.991	-	0.004
			-	(0.016)
2007	924	0.984	0.019**	0.034***
			(0.008)	(0.013)
2008	1018	0.957	0.042***	0.061***
			(0.013)	(0.019)
2009	1106	0.977	0.004	0.011
			(0.011)	(0.010)
2010	1041	0.924	0.065***	0.071***
			(0.016)	(0.017)
2011	2614	0.954	0.018***	0.025***
			(0.007)	(0.007)
2012	2503	0.939	0.001	0.033***
			(0.011)	(0.011)
2013	2712	0.902	0.045***	0.078***
			(0.012)	(0.015)
All Cohorts	15482	0.949	0.023***	0.038***
			(0.003)	(0.004)

Notes: This table summarizes the match from the lottery records to administrative student data. The sample excludes late applicants, siblings, disqualified applicants, duplicate names, and out-of-area applicants. Columns (3) and (4) report coefficients from regressions on a dummy for a successful match on immediate and any charter offer dummies. All regressions control for school-by-year dummies.
*significant at 10%; **significant at 5%; ***significant at 1%

Table A4: Alternative Definition of Proven Provider & Replicate

	Before Charter Expansion			After Charter Expansion			
		2SLS				2SLS	
	Non-Charter Mean	Proven Providers	Other Charters	Non-Charter Mean	Proven Providers	Expansion Charters	Other Charters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Math	0.117	0.337***	0.201***	-0.074	0.314***	0.218**	0.207***
		(0.043)	(0.025)		(0.087)	(0.092)	(0.044)
N				17395			
English	0.201	0.162***	0.091***	-0.032	0.155*	0.202**	0.105**
		(0.043)	(0.024)		(0.089)	(0.094)	(0.044)
N				17316			

Notes: This table reports the main 2SLS results from Table 6, but using alternative charter school type categorizations. In this robustness check, MATCH Middle School, UP Academy Boston, and KIPP Boston are considered other charters.
*significant at 10%; **significant at 5%; ***significant at 1%

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Table A5: Covariate Balance

	Before Charter Expansion		After Charter Expansion		
	Proven Providers	Other Charters	Proven Providers	Expansion Schools	Other Charters
	(1)	(2)	(3)	(4)	(5)
Female	0.000	-0.004	-0.005	0.011	0.020
	(0.034)	(0.028)	(0.027)	(0.027)	(0.028)
Black	-0.026	0.007	-0.027	-0.025	-0.015
	(0.032)	(0.027)	(0.027)	(0.026)	(0.028)
Latino/a	0.027	0.000	-0.001	0.005	-0.010
	(0.031)	(0.022)	(0.027)	(0.026)	(0.027)
Asian	-0.014	0.007	0.008	0.010	0.000
	(0.009)	(0.008)	(0.010)	(0.011)	(0.009)
White	0.016	-0.003	0.007	0.001	0.018
	(0.011)	(0.024)	(0.010)	(0.012)	(0.017)
Subsidized Lunch	0.015	0.010	-0.011	-0.016	-0.016
	(0.029)	(0.027)	(0.020)	(0.019)	(0.023)
English Language Learners	-0.005	-0.001	-0.004	-0.039	-0.027
	(0.023)	(0.014)	(0.027)	(0.026)	(0.025)
Special Education	-0.005	0.005	0.002	0.013	0.018
	(0.027)	(0.022)	(0.021)	(0.022)	(0.022)
Attended charter before applying	0.010	-0.008	-0.015	-0.015*	-0.003
	(0.019)	(0.020)	(0.010)	(0.008)	(0.014)
Baseline math score	-0.024	-0.022	0.058	-0.033	-0.004
	(0.071)	(0.053)	(0.050)	(0.051)	(0.055)
Baseline English score	-0.036	0.000	0.048	0.037	0.011
	(0.071)	(0.052)	(0.053)	(0.051)	(0.055)
N (offered)	1009	1309	1466	1825	1142
P-value	0.594	0.891	0.526	0.136	0.979

Notes: This table reports coefficients from regressions of baseline characteristics on charter offers, controlling for lottery risk set indicators. P-values are from tests of the hypothesis that all coefficients are zero.
*significant at 10%; **significant at 5%; ***significant at 1%

Table A6: Attrition

	Before Charter Expansion			After Charter Expansion			
		Offer Differential			Offer Differential		
	Non-offered Followup Rate	Proven Providers	Other Charters	Non-offered Followup Rate	Proven Providers	Expansion Charters	Other Charters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Math	0.834	0.018	0.032**	0.869	0.000	0.013	-0.023
		(0.018)	(0.015)		(0.015)	(0.016)	(0.018)
N				20102			
English	0.825	0.018	0.034**	0.869	0.001	0.011	-0.025
		(0.017)	(0.015)		(0.015)	(0.016)	(0.018)
N				20102			

Notes: This table investigates attrition for randomized charter school lottery applicants. Columns (1) and (4) report fractions of follow-up test scores in grades five through eight that are observed for students not offered seats. Columns (2)-(3) and (5)-(7) report coefficients from regressions of a follow-up indicator on a lottery offer indicator (immediate or waitlist) and students not offered seats. Regressions control for lottery risk sets, as well as gender, ethnicity, a female-minority interaction, special education, English language learner, subsidized lunch status, and grade and year indicators. Standard errors are clustered by student.

*significant at 10%; **significant at 5%; ***significant at 1%

Table A7: Overall Charter Effects

		First Stage	Reduced Form	2SLS
		(1)	(2)	(3)
Math		0.978***	0.218***	0.223***
		(0.025)	(0.023)	(0.023)
	N		17395	
English		0.977***	0.120***	0.123***
		(0.025)	(0.022)	(0.022)
	N		17316	

Notes: This table reports first stage, reduced form, and 2SLS estimates for the full sample of lotteried charter middle schools across all years and schools. The endogenous variable is years in any charter school and the instrument is any charter offer. The sample stacks post-lottery test scores in grades five through eight. Models control for baseline covariates and lottery risk sets. Standard errors are clustered by student.

 *significant at 10%; **significant at 5%; ***significant at 1%

Table A8: Reduced Form Charter Effects on Test Scores

| | Before Charter Expansion | | After Charter Expansion | | |
	Proven Providers (1)	Other Charters (2)	Proven Providers (3)	Expansion Charters (4)	Other Charters (5)
Math	0.386***	0.146***	0.157***	0.119**	0.102**
	(0.047)	(0.039)	(0.046)	(0.046)	(0.051)
English	0.157***	0.095***	0.069	0.093**	0.056
	(0.044)	(0.036)	(0.043)	(0.045)	(0.048)

Notes: This table shows reduced form estimates of the effects of charter offers on math and English scores. Charter offer equals one if the student receives an immediate or a waitlist offer. See Table 5 for detailed regression specification notes.

*significant at 10%; **significant at 5%; ***significant at 1%

Table A9: Ordinary Least Squares Estimates of Charter Effects

	Before Charter Expansion			After Charter Expansion			
		OLS				OLS	
	Non-Charter Mean	Proven Providers	Other Charters	Non-Charter Mean	Proven Providers	Expansion Charters	Other Charters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Math	0.004	0.355***	0.228***	-0.059	0.299***	0.322***	0.212***
		(0.010)	(0.010)		(0.011)	(0.014)	(0.010)
N (students)				31218			
N (scores)				84246			
English	0.009	0.268***	0.088***	-0.032	0.185***	0.161***	0.181***
		(0.010)	(0.011)		(0.012)	(0.013)	(0.010)
N (students)				31242			
N (scores)				84290			

Notes: This table reports ordinary least squares (OLS) estimates of the effects of time spent in charter schools on math and English scores for students who attend a school in Boston in the fourth grade. The sample stacks scores in grades five through eight for all Boston students. All regressions control for fourth grade math and English scores, as well as gender, ethnicity, a female-minority interaction, special education, English language learner, subsidized lunch status and grade and year indicators.

*significant at 10%; **significant at 5%; ***significant at 1%

Table A10: Charter Effects on Test Scores One Year After the Lottery

	Before Charter Expansion			After Charter Expansion			
		Estimates				Estimates	
	Non-Charter Mean	Proven Providers	Other Charters	Non-Charter Mean	Proven Providers	Expansion Charters	Other Charters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Panel A: First Stage Estimates					
Immediate Offer		0.748***	0.768***		0.572***	0.431***	0.620***
		(0.031)	(0.021)		(0.031)	(0.028)	(0.031)
Waitlist Offer		0.585***	0.471***		0.274***	0.258***	0.491***
		(0.025)	(0.029)		(0.026)	(0.026)	(0.039)
		Panel B: 2SLS Estimates					
Math	0.112	0.482***	0.201***	-0.054	0.521***	0.305**	0.076
		(0.075)	(0.063)		(0.106)	(0.121)	(0.086)
P-value: Equals proven provider			0.001			0.081	0.000
P-value: Equals other charters						0.058	
N (Applicants)	1172	1245	1769	2694	2281	2387	2375
N (Total scores)				7087			
English	0.221	0.095	-0.045	-0.051	0.231**	0.284**	0.034
		(0.078)	(0.061)		(0.112)	(0.129)	(0.089)
P-value: Equals proven provider			0.112			0.698	0.121
P-value: Equals other charters						0.045	
N (Applicants)	1138	1159	1762	2697	2286	2395	2382
N (Total scores)				7006			

Notes: Panel A reports the first stage effects of charter lottery offers on enrollment in a charter school in the first year after the lottery. Panel B displays the 2SLS estimates of the effects of charter school enrollment in the first year after the lottery on test scores. The endogenous variables are indicators of charter enrollment for the different charter types (pre-expansion proven providers, pre-expansion other charters, post-expansion proven providers, expansion schools, and post-expansion other charters). The instruments are immediate and waitlist lottery offer dummies for each school type. Immediate offer equals one for applicants offered seats on the day of the lottery. Waitlist offer equals one for applicants offered seats from the waitlist. Controls include lottery risk sets, as well as gender, race, ethnicity, a female-minority interaction, special education, English language learner, subsidized lunch status, and grade and year indicators.
*significant at 10%; **significant at 5%; ***significant at 1%

Table A11: Charter Effects on Test Scores with Immediate Offer Instruments Only

	Before Charter Expansion			After Charter Expansion			
		Estimates			Estimates		
	Non-Charter Mean	Proven Providers	Other Charters	Non-Charter Mean	Proven Providers	Expansion Charters	Other Charters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: First Stage Estimates						
Immediate Offer		0.855***	1.185***		0.710***	0.484***	0.854***
		(0.070)	(0.048)		(0.054)	(0.045)	(0.054)
	Panel B: 2SLS Estimates						
Math	0.117	0.294***	0.201***	-0.074	0.412***	0.408***	0.218***
		(0.061)	(0.031)		(0.082)	(0.085)	(0.068)
P-value: Equals proven provider			0.108			0.960	0.041
P-value: Equals other charters						0.036	
N (Applicants)	1093	1279	1909	2443	2303	2416	2405
N (Total scores)				17395			
English	0.201	0.165***	0.083***	-0.032	0.222**	0.267***	0.151**
		(0.061)	(0.030)		(0.090)	(0.086)	(0.067)
P-value: Equals proven provider			0.153			0.638	0.479
P-value: Equals other charters						0.197	
N (Applicants)	1087	1277	1911	2441	2307	2420	2412
N (Total scores)				17316			

Notes: Panel A reports the first stage effects of charter lottery offers on years of enrollment in charter schools. Panel B displays the 2SLS estimates of the effects of charter school attendance on test scores. The sample stacks post-lottery test scores in grades five through eight. The endogenous variables are counts of years spent in the different charter types (pre-expansion proven providers, pre-expansion other charters, post-expansion proven providers, expansion schools, and post-expansion other charters). The instruments are immediate offer dummies for each school type. Immediate offer equals one for applicants offered seats on the day of the lottery. Controls include lottery risk sets, as well as gender, race, ethnicity, a female-minority interaction, special education, English language learner, subsidized lunch status, and grade and year indicators. Standard errors are clustered by student.

*significant at 10%; **significant at 5%; ***significant at 1%

A12: Lottery Estimates of Effects on Peer Quality and School Switching

	Before Charter Expansion			After Charter Expansion			
	Non-Charter	2SLS		Non-Charter	2SLS		
	Mean	Proven Providers	Other Charters	Mean	Proven Providers	Expansion Charters	Other Charters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Peer Quality: Peer Baseline Sum of Math and English						
First Post-lotto Year	-0.979	0.234***	0.405***	-1.016	0.212***	0.174*	0.334***
		(0.059)	(0.042)		(0.070)	(0.090)	(0.059)
N (applicants)	1163	1102	1728	2803	2360	2474	2456
N (total)				7089			
Second Post-lotto Year	-0.824	0.168***	0.148***	-0.989	0.221***	0.102	0.197***
		(0.059)	(0.039)		(0.064)	(0.084)	(0.057)
N (applicants)	960	1050	1648	2295	2223	2327	2311
N (total)				6753			
Third Post-lotto Year	-0.699	0.078*	0.054*	-0.944	0.031	0.023	0.060
		(0.044)	(0.031)		(0.059)	(0.079)	(0.052)
N (applicants)	926	1043	1644	1486	1375	1560	1355
N (total)				5123			
	Panel B: School Switching After One Year						
Any Switch	0.499	-0.257***	-0.521***	0.500	-0.337***	-0.263***	-0.489***
		(0.047)	(0.043)		(0.077)	(0.096)	(0.072)
Switch Excluding Transition Grades	0.176	-0.064*	-0.140***	0.178	-0.057	-0.072	-0.088*
		(0.035)	(0.031)		(0.056)	(0.070)	(0.053)
Ever Attend Exam School	0.082	-0.053**	-0.033*	0.053	-0.021	-0.014	0.013
		(0.021)	(0.019)		(0.034)	(0.043)	(0.032)

Notes: This table displays 2SLS effects of charter enrollment in different types of charter schools on peer quality and switching schools on year after the lottery. Peer quality is defined as the average baseline test score math and English total for the other students in the student's school and grade. Students who do not appear in Massachusetts public schools in October following the charter application are not counted as school switchers. The switch excluding transitional grades equals one for students who switch schools in grades other than the exit grade of their first school. It does not equal one if the school closed the year the student switched. See Table 5 for detailed regression specification notes.

*significant at 10%; **significant at 5%; ***significant at 1%

Table A13: Charter School Effects for Subgroups

	Math scores					English scores				
	Before expansion		After expansion			Before expansion		After expansion		
	Proven Providers	Other Charters	Proven Providers	Expansion Charters	Other Charters	Proven Providers	Other Charters	Proven Providers	Expansion Charters	Other Charters
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
English Language Learner	0.288***	-0.194	0.505***	0.284*	0.329***	0.165	-0.254*	0.334***	0.220	0.233*
	(0.088)	(0.157)	(0.101)	(0.148)	(0.118)	(0.101)	(0.138)	(0.108)	(0.146)	(0.120)
N (scores)	468	455	1729	1804	1275	468	454	1733	1807	1279
Not English Language Learner	0.330***	0.192***	0.252***	0.334***	0.145**	0.127***	0.097***	0.090	0.242***	0.092
	(0.040)	(0.027)	(0.093)	(0.082)	(0.067)	(0.038)	(0.025)	(0.097)	(0.084)	(0.064)
N (scores)	3368	5640	2567	2955	3077	3286	5630	2565	2962	3084
Special Education	0.217**	0.156**	0.242	0.628***	0.180	0.039	0.119*	0.130	0.301	0.165
	(0.103)	(0.064)	(0.189)	(0.177)	(0.212)	(0.117)	(0.062)	(0.204)	(0.202)	(0.227)
N (scores)	693	1178	823	930	758	683	1171	818	936	763
Not Special Education	0.346***	0.184***	0.407***	0.270***	0.190***	0.158***	0.091***	0.232***	0.221***	0.109*
	(0.039)	(0.029)	(0.073)	(0.082)	(0.060)	(0.036)	(0.027)	(0.076)	(0.080)	(0.058)
	3143	4917	3473	3829	3594	3071	4913	3480	3833	3600
Below-mean baseline score	0.356***	0.239***	0.484***	0.481***	0.181**	0.148**	0.112**	0.324***	0.321***	0.165*
	(0.057)	(0.043)	(0.094)	(0.104)	(0.073)	(0.068)	(0.050)	(0.108)	(0.098)	(0.087)
N (scores)	1488	2072	2150	2265	1901	1320	1865	1964	2211	1727
Above-mean baseline score	0.343***	0.161***	0.207***	0.280***	0.240***	0.181***	0.080***	0.017	0.180**	0.132**
	(0.035)	(0.026)	(0.079)	(0.072)	(0.057)	(0.032)	(0.023)	(0.083)	(0.077)	(0.060)
N (scores)	2348	4023	2146	2494	2451	2434	4219	2334	2558	2636

Notes: This table reports 2SLS estimates of the effects of charter school attendance on test scores for subgroups of students. The sample stacks post-lottery test scores in grades five through eight. The endogenous variables are counts of years spent in the different charter types. The instruments are immediate and waitlist lottery offer dummies for each school type. Controls include lottery risk sets, as well as gender, ethnicity, a female-minority interaction, special education, English language learner, subsidized lunch status, and grade and year indicators.

*significant at 10%; **significant at 5%; ***significant at 1%