

Online Appendix for
ACCOUNTABILITY AND FLEXIBILITY IN PUBLIC SCHOOLS:
EVIDENCE FROM BOSTON'S CHARTERS AND PILOTS

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I Data Appendix

Data Sources

The data for this study come from four sources: the BPS assignment system, lottery records from individual charter schools, and two state-wide datasets, the SIMS and MCAS files. The BPS assignment data are documented in Abdulkadiroğlu, Pathak, Roth and Sönmez (2006). Lottery coverage is documented below and in Table A1. Following the discussion of lottery data, we describe the state data sets and our matching process in detail.

Lottery Coverage

Charter School Lotteries

- Of the four charters that enroll elementary school students, three had no usable lottery data. One K-8 school contributes to the middle school sample but is not used in the elementary school analysis because it added elementary grades only in 2006.

- Of the 12 charters that enroll middle school students, five contribute to the lottery analysis: Academy of the Pacific Rim, Boston Collegiate, Boston Preparatory, Edward Brooke and Roxbury Preparatory. Two non-included schools closed before or while the study was under way. Lottery data from four schools were unavailable, either because they were not archived or lost. The final omitted school, MATCH Charter Public Middle School, did not enroll 6th grade students until 2008.
- Of the eight (non-alternative) charter schools that enroll high school students, three contribute to the lottery analysis: City on a Hill, Codman Academy, and MATCH. Two non-included schools closed before or while the study was under way. Two schools do not admit via lottery in grade nine but rather admit students in grade five; they contribute to the middle school analysis. One did not have adequate lottery records to be part of the sample.

Pilot School Lotteries

- Of the eight pilot schools that enroll elementary school students, five were over-subscribed in our sample window and contribute to the lottery study: Lyndon, Mason Elementary, Mission Hill, Orchard Gardens, and Young Achievers. Two other Pilot schools, Dennis Haley and Mary Lyon, were converted to pilot status in Fall 2008, which was too late to contribute to the study.
- Of eight pilot middle schools admitting 6th graders, six were over-subscribed and contribute to the lottery study: Harbor School, Josiah Quincy, Lilla G. Frederick, Lyndon, Mission Hill, Orchard Gardens. The Boston Teachers Union School opened too late to contribute to the study. We also have middle school scores from three K-8 pilot schools: Lyndon, Mission Hill, and Young Achievers. A fourth K-8 pilot began enrolling kindergartners too late to contribute middle school outcomes.
- Of the six (non-alternative) 9-12 pilot high schools, two use lotteries and contribute to the lottery study: Another Course to College, and TechBoston Academy. One 6-12 pilot was not over-subscribed. A single alternative high school that serves an older population was omitted

from the study.

The applicant cohorts contributed by each school are detailed in Appendix Table A1.

State Data

The first state dataset is the Massachusetts Students Information Management System (SIMS). This contains snapshots of all students in public school in Massachusetts in October and at the end of the school year. The SIMS file includes demographic information on students, their current school, residence, and days of attendance. We work with the SIMS files for the 2001-2002 through the 2008-2009 school years. Schools are classified as pilot schools, charter schools, public schools, exam schools, and alternative/special education schools using a grade-specific algorithm described below. The second state-wide dataset is the Massachusetts Comprehensive Assessment System (MCAS) database. The MCAS files have raw test scores for Math, English Language Arts (ELA), and Writing for grades 3-8 and grade 10 from spring 2002-2008. We standardized MCAS scores by subject, grade, and year to a combined BPS and Boston charter schools reference population. MCAS scores were merged to the SIMS file using unique student identifiers (the SASID). Students in the MCAS file but not in the SIMS file are excluded because they cannot be assigned to schools.

Cohorts and Test Years Analyzed

The cohorts and test years analyzed in this study are summarized in the table below. Baseline years are defined as the year a student attended 8th grade for the high school sample, the year a student attended 4th grade for the middle school sample, and the year a student attended kindergarten for the elementary school and K2-applicants-to-K-8-middle-school samples. There are no baseline test score for this last group of students, but we pulled demographics from the baseline years listed in the table.

| | Elementary school | Middle (non-K2 applicants) | Middle (K2 lottery applicants) | High school |
|------------------------------|----------------------|-------------------------------|-----------------------------------|----------------|
| Outcome years | 2006-2009 | 2003-2009 | 2004-2009 | 2005-2008 |
| Lottery application years | 2002-2004 | 2002-2007 | 1997-2001 | 2003-2006 |
| Baseline years | 2003-2005 | 2002-2006 | 1998-2002 | 2003-2006 |

Notes: Lottery application years refer to Fall; outcome and baseline years refer to Spring. Baseline grades are kindergarten for elementary school and K2 middle school applicants, 4th grade for all other middle school students and 8th grade for high school students. The 2003 middle school outcome year is used only for 2002 pilot middle school 6th grade applicants, as we use BPS demographics for these students from 2001 and we do not have state demographics for 2001.

Analysis Samples

Three matched files constitute the extracts used for statistical analysis. The first (the charter lottery extract) was constructed by linking charter applicants to SIMS and MCAS data; the second (the pilot lottery extract) was constructed by linking students with a first-choice pilot in the BPS assignment mechanism to SIMS and MCAS records; and the third and largest (the observational extract) uses the SIMS and MCAS matched file without regard to charter and pilot application. Table A2 provides more details on how these three extracts were constructed. In the charter lottery sample, since students may apply to more than one charter school, we transform applications into one observation per student per each year. If, for example, a student applies to a charter entry grade in 2002 and later in 2003, the student contributes two observations.

All three extracts are limited to students enrolled in BPS or a Boston charter school as of the relevant baseline date.

Classification of Schools

We define pilot schools as those listed on the pilot school network website at <http://www.ccebos.org/pilotschools/schools.html>. We define charter schools as those schools identified as such by the Massachusetts Department of Elementary and Second Education website (<http://www.profiles.doe.mass.edu>). As discussed in the text, Health Careers Academy is a Horace Mann charter high school. Boston Day and Evening Charter, also a Horace Mann charter, serves over-age students. This school, along with Greater Egleston Community High School, a pilot school that also serves older students, was designated as an alternative/special education school rather than a charter or pilot and therefore omitted from our lottery analysis.

Placing Students at Schools

In the Massachusetts State SIMS file, school designation is grade-specific. When a student repeats grades, we kept the first school in grade. Students attending multiple schools in a given school year were assigned as follows:

- A student was assigned to a Boston charter or pilot school if any record for the grade shows attendance at a Boston charter or pilot.
- If a student attends multiple Boston charters or pilots, or both a Boston charter and pilot, the student was assigned to school for which the attendance duration is longest. Ties are broken randomly.
- Students attending multiple traditional BPS schools were assigned to the school of the longest attendance duration. Ties were broken randomly.

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Table A.1: Charter and Pilot School Study Participation

| | Years in Lottery Study (1) | Years with initial offer data (2) | Grade Coverage (3) | Year Opened or Converted (4) | Notes (5) |
|--|-------------------------------------|--|--------------------------|---------------------------------------|---|
| <i>I. Elementary School (3rd and 4th grades)</i> | | | | | |
| Charter Schools | | | | | |
| Boston Renaissance Charter Public School | x | x | K-6 | 1995 | School lottery data are unavailable for elementary school. |
| Conservatory Lab Charter School | x | x | PK-5 | 1999 | School lottery data are unavailable for elementary school. |
| Edward Brooke Charter School | x | x | K-8 | 2002 | Became K-8 in 2006, so test scores are not used in elementary analyses. |
| Neighborhood House Charter School | x | x | K-8 | 1995 | School lottery data are unavailable for elementary school. |
| Pilot Schools | | | | | |
| Boston Teachers Union School | x | x | PK-2, 6 | 2009 | New school in 2009. Does not contribute to observational or lottery analysis. |
| Gardner Elementary School | x | x | K-5 | 2007 | All applicants in 2002-2004 are accepted. Converted from regular public school. |
| Haley Elementary School | x | x | PK-5 | 2008 | Converted from regular public school. |
| Lee Academy | x | x | K-5 | 2004 | New school in 2004, all applicants in 2004 are accepted. |
| Lyndon K-8 School | 2002-2004 | x | K-8 | 1995 | |
| Mary Lyon School | x | x | K-9 | 2008 | Converted from regular public school |
| Mason Elementary School | 2003-2004 | x | PK-5 | 2003 | All applicants in 2002 are accepted. Converted from regular public school. |
| Mission Hill School | 2002-2004 | x | K-8 | 1997 | |
| Orchard Gardens K-8 School | 2003-2004 | x | K-8 | 2003 | No Kindergarten class in 2002 (new school). |
| Young Achievers K-8 School | 2002-2004 | x | K-8 | 1995 | |

Notes: Schools may not participate in the lottery study (those marked with x in column (1)) if they are undersubscribed, only have seats for students with guaranteed admissions, did not keep sufficient records, or if they do not have an entry lottery at the school level start grade as indicated in the notes. Some schools are excluded because they opened too late to be relevant for the study. Fredrick Douglass Charter School and Roxbury Charter High Public School were closed by the State Board of Education in the 2004-2005 school year. A school that spans K-8 is listed as both elementary and middle. These schools are part of the elementary pilot school lottery study, and also for the middle school pilot school lottery student with entry at K and 6.

Table A.1: Charter and Pilot School Study Participation (cont.)

| | Years in Lottery Study (1) | Years with initial offer data (2) | Grade Coverage (3) | Year Opened or Converted (4) | Notes (5) |
|---|----------------------------|-----------------------------------|--------------------|------------------------------|--|
| <i>II. Middle School (6th, 7th, and 8th grades)</i> | | | | | |
| Charter Schools | | | | | |
| Academy of the Pacific Rim Charter Public School | 2005-2007 | 2005-2007 | 5-12 | 1997 | Insufficient lottery records from 2002-2004. Entry grade was 6th until 2007. |
| Boston Collegiate Charter School | 2002-2006 | 2002-2006 | 5-12 | 1998 | |
| Boston Preparatory Charter Public School | 2005-2007 | 2005-2007 | 6-10 | 2004 | All applicants in 2004 accepted. Initial offer only 2005 (all applicants eventually accepted). |
| Boston Renaissance Charter Public School | x | x | K-6 | 1995 | School lottery data are unavailable. |
| Edward Brooke Charter School | 2006 | 2006 | K-8 | 2002 | Entry grade was 5th until 2006 when school become K-8. Initial offer data only for 2006 (all applicants eventually accepted) |
| Excel Academy Charter School | x | x | 5-8 | 2003 | Insufficient admissions lottery records. |
| Frederick Douglass Charter School | x | x | 5-12 | 2000 | Closed. |
| MATCH Charter Public Middle School | x | x | 6-7 | 2008 | New school. |
| Neighborhood House Charter School | x | x | K-8 | 1995 | School lottery data are unavailable for elementary school. |
| Roxbury Preparatory Charter School | 2003-2007 | 2006-2007 | 6-8 | 1999 | Ever offer only 2003-2005. |
| Smith Leadership Academy Charter Public School | x | x | 6-8 | 2003 | Insufficient admissions lottery records. |
| Uphams Corner Charter School | x | x | 5-8 | 2002 | Insufficient admissions lottery records. Closed. |
| Pilot Schools - 6th Grade Applicants | | | | | |
| Boston Teachers Union School | x | x | PK-2, 6 | 2009 | New school in 2009. Does not contribute to observational or lottery analysis. |
| Harbor School | 2002, 2006-2007 | x | 6-8 | 1997 | All applicants in 2003-2005 are accepted. |
| Josiah Quincy Upper School | 2004-2007 | x | 6-12 | 1999 | No Grade 6 class in 2002 and 2003 (new school). |
| Lilla G. Frederick Pilot Middle School | 2004-2007 | x | 6-8 | 2003 | No Grade 6 class in 2002 and all Grade 6 applicants in 2003 are accepted. |
| Lyndon K-8 School | 2004-2007 | x | K-8 | 1995 | All Grade 6 applicants in 2002 and 2003 guaranteed admission. |
| Mission Hill School | 2002-2003, 2007 | x | K-8 | 1997 | All Grade 6 applicants in 2004-2006 guaranteed admission. |
| Orchard Gardens K-8 School | 2003-2007 | x | K-8 | 2003 | No Grade 6 class in 2002 (new school). |
| Young Achievers K-8 School | x | x | K-8 | 1995 | All Grade 6 applicants in 2002-2007 guaranteed admission. |
| Pilot Schools - K2 applicants | | | | | |
| Lyndon K-8 School | 1997-1998, 2000-2001 | x | K-8 | 1995 | All K2 applicants in 1999 were admitted. |
| Mary Lyon School | x | x | K-9 | 2008 | Converted from regular public school. |
| Mission Hill School | 1998-2001 | x | K-8 | 1997 | |
| Orchard Gardens K-8 School | x | x | K-8 | 2003 | |
| Young Achievers K-8 School | 1999-2001 | x | K-8 | 1995 | Error in records 1998, all K2 applicants in 1997 guaranteed admission. |

Notes: Schools may not participate in the lottery study (those marked with x in column (1)) if they are undersubscribed, only have seats for students with guaranteed admissions, did not keep sufficient records, or if they do not have an entry lottery at the school level start grade as indicated in the notes. Some schools are excluded because they opened too late to be relevant for the study. Fredrick Douglass Charter School and Roxbury Charter High Public School were closed by the State Board of Education in the 2004-2005 school year. A school that spans K-8 is listed as both elementary and middle. These schools are part of the elementary pilot school lottery study, and also for the middle school pilot school lottery student with entry at K and 6.

Table A.1: Charter and Pilot School Study Participation (cont.)

| | Years in Lottery Study (1) | Years with initial offer data (2) | Grade Coverage (3) | Year Opened or Converted (4) | Notes (5) |
|--|-------------------------------|--------------------------------------|-----------------------|---------------------------------|--|
| <i>III. High School (10th grade)</i> | | | | | |
| Charter Schools | | | | | |
| Academy of the Pacific Rim Charter Public School | x | x | 5-12 | 1997 | No admissions lottery for students in Grade 9. |
| Boston Collegiate Charter School | x | x | 5-12 | 1998 | No admissions lottery for students in Grade 9. |
| City On A Hill Charter Public School | 2004-2006 | 2004-2006 | 9-12 | 1995 | Initial offer data only for 2002 and 2004 (all applicants eventually accepted), records unclear in 2003. |
| Codman Academy Charter Public School | 2004 | 2004 | 9-12 | 2001 | Initial offer data only for 2004 (all applicants eventually accepted) |
| Frederick Douglass Charter School | x | x | 5-12 | 2000 | Closed. |
| MATCH Charter Public High School | 2003-2006 | 2003-2006 | 9-12 | 2000 | |
| Roxbury Charter High Public School | x | x | 9-12 | 2003 | Closed. |
| Horace Mann Charter Schools | | | | | |
| Boston Day and Evening Academy Charter School | x | | 9-12, Alt | 1998 | Included in observational study as alternative school. |
| Health Careers Academy Charter School | x | x | 9-12 | 1998 | Insufficient lottery records. |
| Pilot Schools | | | | | |
| Greater Egleston Community High | x | x | 9-12, Alt | 1996 | Included in observational study as alternative school. Converted from regular public school. |
| Another Course to College | 2003-2006 | x | 9-12 | 2003 | No Grade 9 class in 2002 (new school). Converted from regular public school. |
| Boston Arts Academy | x | x | 9-12 | 1998 | Selective admissions. |
| Boston Community Leadership Academy | x | x | 9-12 | 2002 | Selective admissions. Converted from regular public school. |
| Fenway High School | x | x | 9-12 | 1995 | Selective admissions. Converted from regular public school. |
| Josiah Quincy Upper School | x | x | 6-12 | 1999 | All students guaranteed admission. |
| New Mission High School | x | x | 9-12 | 1996 | Selective admissions. |
| TechBoston Academy | 2003-2006 | x | 9-12 | 2002 | No Grade 9 class in 2002 (new school). |

Notes: Schools may not participate in the lottery study (those marked with x in column (1)) if they are undersubscribed, only have seats for students with guaranteed admissions, did not keep sufficient records, or if they do not have an entry lottery at the school level start grade as indicated in the notes. Some schools are excluded because they opened too late to be relevant for the study. Fredrick Douglass Charter School and Roxbury Charter High Public School were closed by the State Board of Education in the 2004-2005 school year. A school that spans K-8 is listed as both elementary and middle. These schools are part of the elementary pilot school lottery study, and also for the middle school pilot school lottery student with entry at K and 6.

Table A.2: Sample Selection

| | Elementary (1) | Middle School (2) | High School (3) |
|--|-------------------|----------------------|--------------------|
| <i>A. Charter Lottery Sample</i> | | | |
| Application cohorts | - | 2002-2007 | 2003-2006 |
| Applications to charter in entry grades | - | 3,161 | 3,199 |
| Excluding applications not matched to state dataset | - | 3,078 | 3,066 |
| Excluding applications with sibling priority | - | 2,832 | 3,024 |
| Excluding late applicants | - | 2,831 | 3,024 |
| Transforming applications into one observation per student | - | 2,335 | 2,304 |
| Excluding students with no follow-up test score | - | 2,106 | 1,826 |
| Excluding students not in BPS or in a charter school in Boston at baseline (this also drops those without baseline demographics) | - | 1,386 | 1,484 |
| Excluding students with no baseline test scores | - | 1,363 | 1,474 |
| Number of follow-up ELA scores for students in BPS or a Boston charter at baseline | - | 3,157 | 1,473 |
| Number of follow-up Math scores for students in BPS or a Boston charter at baseline | - | 3,317 | 1,455 |

Table A.2: Sample Selection (cont.)

| | Elementary (1) | Middle School (2) | | High School (3) |
|--|-------------------|--|-----------------------------------|--------------------|
| <i>B. Pilot Lottery Sample</i> | | | | |
| Application cohorts | 2002-2004 | <i>6th grade applicants</i> 2002-2007 | <i>K2 applicants</i> 1997-2001 | 2003-2006 |
| Applied to pilot school as first choice | 1,259 | 4,865 | 1,273 | 1,422 |
| Excluding guarantees and students with sibling priority | 1,051 | 3,545 | 1,007 | 1,391 |
| Excluding students that applied to a pilot not subject to randomization | 934 | 1,722 | 752 | 1,391 |
| Excluding students with no follow-up test score | 730 | 1,605 | 482 | 1,095 |
| Excluding students not in BPS or in a charter school in Boston at baseline (this also drops those without baseline demographics) | 596 | 1,492 | 481 | 1,038 |
| Excluding students with no baseline test scores | - | 1,324 | - | 1,032 |
| Number of follow-up ELA scores for students in BPS or a Boston charter at baseline | 1,141 | 3,254 | 1,060 | 1,034 |
| Number of follow-up Math scores for students in BPS or a Boston charter at baseline | 1,139 | 3,684 | 1,093 | 1,022 |

Table A.2: Sample Selection (cont.)

| | Elementary (1) | Middle School (2) | High School (3) |
|---|-------------------|----------------------|--------------------|
| <i>C. Regression Sample</i> | | | |
| Baseline years | 2002-2005 | 2002-2007 | 2002-2007 |
| Students in BPS or in a charter school in Boston and demographics at baseline | 21,589 | 28,005 | 30,443 |
| Students in BPS or in a charter school in Boston and demographics at outcome | 15,952 | 23,482 | 22,231 |
| Excluding students with no follow-up test score | 15,465 | 22,657 | 20,236 |
| Excluding students with no baseline test scores | - | 22,115 | 19,675 |
| Number of follow-up ELA scores for students in BPS or a Boston charter at baseline and outcome | 26,383 | 44,077 | 20,110 |
| Number of follow-up Math scores for students in BPS or a Boston charter at baseline and outcome | 23,695 | 48,357 | 19,799 |

Table A.3: Differential Attrition Omitting Unbalanced Cohorts

| Level | Subject | Charter Schools | | | Pilot Schools | | |
|-------------------|---------------------------------------|-----------------------------------|------------------|------------------------------------|-----------------------------------|------------------|------------------------------------|
| | | Prop of non-offered with MCAS (1) | Differential | | Prop of non-offered with MCAS (4) | Differential | |
| | | | Demographics (2) | Demographics + Baseline Scores (3) | | Demographics (5) | Demographics + Baseline Scores (6) |
| Elementary School | | | | | | | |
| | ELA | - | - | - | 0.853 | 0.036 (0.035) | - 1085 |
| | Math | - | - | - | 0.853 | 0.035 (0.035) | - 1085 |
| Middle School | | | | | | | |
| | ELA | 0.814 | 0.031 (0.021) | 0.027 (0.021) | 0.803 | 0.020 (0.021) | 0.003 (0.024) |
| | Math | 0.815 | 0.030 (0.021) | 0.029 (0.021) | 0.800 | 0.022 (0.021) | 0.007 (0.024) |
| High School | | | | | | | |
| | ELA | 0.785 | 0.001 (0.026) | -0.002 (0.026) | 0.756 | 0.020 (0.032) | 0.038 (0.032) |
| | Math | 0.778 | 0.000 (0.026) | -0.001 (0.026) | 0.752 | 0.013 (0.033) | 0.033 (0.032) |
| | Writing Topic and Writing Composition | 0.778 | 0.000 (0.026) | -0.001 (0.027) | 0.752 | 0.013 (0.033) | 0.032 (0.033) |

Notes: This table has the same notes as Table 5, and is based on a sample which excludes the following cohorts: Pilot 4th grade ELA and Math (2004 applicants), charter 7th grade ELA and Math (2004 6th grade applicants), and pilot 10th grade ELA, Math and Writing (2006 applicants).
 * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.4: Charter and Pilot Lottery Results Omitting Unbalanced Cohorts

| Level | Subject | Charter Schools | | | | | Pilot Schools | | | | |
|-------------------|---------------|-----------------|-----------------|----------|-------------------------|---|----------------|-----------------|---------|-------------------------|---|
| | | Basic controls | | | 2SLS w/ demographics | 2SLS w/ demographics and baseline scores | Basic controls | | | 2SLS w/ demographics | 2SLS w/ demographics and baseline scores |
| | | First Stage | Reduced Form | 2SLS | | | First Stage | Reduced Form | 2SLS | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | | |
| Elementary School | ELA | - | - | - | - | | 2.945*** | 0.209** | 0.071** | 0.062** | - |
| | | | | | | | (0.189) | (0.084) | (0.028) | (0.026) | |
| | | | | | | | | 1141 | 1141 | 1141 | |
| | Math | - | - | - | - | | 2.950*** | 0.110 | 0.037 | 0.033 | - |
| | | | | | | | (0.190) | (0.085) | (0.029) | (0.028) | |
| | | | | | | | | 1139 | 1139 | 1139 | |
| Middle School | ELA | 0.988*** | 0.258*** | 0.261*** | 0.212*** | 0.204*** | 1.526*** | 0.022 | 0.014 | 0.010 | -0.041 |
| | | (0.101) | (0.068) | (0.070) | (0.058) | (0.048) | (0.172) | (0.065) | (0.042) | (0.040) | (0.103) |
| | | | 3082 | | 3082 | 3027 | | 4314 | | 4314 | 3024 |
| | Math | 0.956*** | 0.391*** | 0.409*** | | | 1.450*** | -0.065 | -0.045 | -0.041 | -0.223** |
| | | (0.096) | (0.065) | (0.068) | 0.372*** | 0.351*** | (0.167) | (0.064) | (0.044) | (0.041) | (0.090) |
| | | | 3243 | | (0.060) | (0.049) | | 4777 | | 4777 | 3348 |
| | | | | | 3243 | 3185 | | | | | |
| High School | ELA | 0.550*** | 0.089 | 0.162 | 0.178* | 0.265*** | 0.603*** | 0.013 | 0.021 | -0.002 | -0.085 |
| | | (0.154) | (0.072) | (0.110) | (0.098) | (0.076) | (0.101) | (0.060) | (0.098) | (0.100) | (0.084) |
| | | | 1473 | | 1473 | 1401 | | 688 | | 688 | 648 |
| | Math | 0.543*** | 0.190** | 0.350*** | 0.368*** | 0.364*** | 0.599*** | -0.083 | -0.138 | -0.195 | -0.116 |
| | | (0.152) | (0.084) | (0.118) | (0.114) | (0.085) | (0.102) | (0.082) | (0.135) | (0.139) | (0.097) |
| | | | 1455 | | 1455 | 1432 | | 684 | | 684 | 672 |
| | Writing Topic | 0.551*** | 0.167* | 0.303** | 0.319*** | 0.349*** | 0.594*** | 0.090 | 0.151 | 0.136 | 0.144 |
| | | (0.155) | (0.089) | (0.128) | (0.120) | (0.120) | (0.102) | (0.071) | (0.116) | (0.124) | (0.121) |
| | | | 1461 | | 1461 | 1386 | | 679 | | 679 | 637 |
| | Writing | 0.551*** | 0.106 | 0.192 | 0.214* | 0.212** | 0.594*** | 0.087 | 0.147 | 0.130 | 0.132 |
| | Composition | (0.155) | (0.075) | (0.116) | (0.115) | (0.104) | (0.102) | (0.077) | (0.125) | (0.136) | (0.121) |
| | | | 1461 | | 1461 | 1386 | | 679 | | 679 | 637 |

Notes: This table has the same notes as Table 4A, and is based on a sample which excludes the following cohorts: Pilot 4th grade ELA and Math (2004 applicants), charter 7th grade ELA and Math (2004 6th grade applicants), and pilot 10th grade ELA, Math and Writing (2006 applicants).

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

Table A.5.A: Ever Offer Covariate Balance with Followup

| | Charter Schools | | | | | Pilot Schools | | | |
|---|-------------------|--------------------------------|--------------------|--------------------------------|---------------------|---------------------|--------------------------------|-------------------|--------------------------------|
| | Middle School | | High School | | Elementary School | Middle School | | High School | |
| | All Lotteries | Lotteries with Baseline Scores | All Lotteries | Lotteries with Baseline Scores | All Lotteries | All Lotteries | Lotteries with Baseline Scores | All Lotteries | Lotteries with Baseline Scores |
| | (1) | (2) | (3) | (4) | (5) | (7) | (8) | (9) | (10) |
| Hispanic | -0.003 (0.026) | -0.008 (0.026) | -0.056* (0.029) | -0.054* (0.029) | -0.026 (0.041) | -0.025 (0.028) | -0.041 (0.039) | 0.009 (0.031) | -0.005 (0.032) |
| Black | -0.024 (0.032) | -0.021 (0.032) | 0.064** (0.032) | 0.061* (0.033) | 0.009 (0.045) | -0.001 (0.030) | 0.011 (0.041) | -0.013 (0.034) | 0.004 (0.035) |
| White | 0.021 (0.025) | 0.023 (0.025) | -0.010 (0.016) | -0.009 (0.017) | 0.030 (0.038) | 0.033 (0.022) | 0.032 (0.023) | -0.008 (0.019) | -0.002 (0.020) |
| Asian | 0.005 (0.009) | 0.005 (0.009) | 0.000 (0.013) | -0.002 (0.013) | -0.034* (0.019) | 0.000 (0.016) | -0.001 (0.021) | 0.012 (0.017) | 0.002 (0.017) |
| Female | 0.035 (0.033) | 0.035 (0.034) | -0.022 (0.034) | -0.031 (0.035) | 0.010 (0.052) | 0.000 (0.034) | -0.001 (0.044) | 0.002 (0.034) | -0.018 (0.036) |
| Free or Reduced Price Lunch | -0.007 (0.031) | -0.010 (0.031) | 0.027 (0.029) | 0.022 (0.030) | -0.100** (0.045) | -0.007 (0.026) | -0.024 (0.031) | 0.041 (0.029) | 0.042 (0.029) |
| Special Education | -0.018 (0.027) | -0.020 (0.027) | -0.007 (0.025) | -0.005 (0.026) | -0.038 (0.027) | 0.005 (0.023) | 0.017 (0.036) | -0.031 (0.024) | -0.027 (0.026) |
| Limited English Proficiency | 0.013 (0.016) | 0.014 (0.016) | 0.007 (0.011) | 0.009 (0.011) | -0.022 (0.026) | -0.035** (0.017) | -0.054** (0.027) | 0.009 (0.015) | 0.001 (0.012) |
| Baseline ELA Test Score | - | 0.038 (0.065) | - | -0.073 (0.055) | - | - | - | - | 0.064 (0.058) |
| Baseline Math Test Score | - | 0.083 (0.063) | - | -0.022 (0.060) | - | - | - | - | -0.035 (0.062) |
| Baseline Writing Composition Test Score | - | - | - | 0.010 (0.057) | - | - | - | - | 0.050 (0.061) |
| Baseline Writing Topic Test Score | - | - | - | -0.069 (0.058) | - | - | - | - | 0.007 (0.059) |
| p-value, from F-test | 0.903 | 0.834 | 0.549 | 0.510 | 0.073* | 0.489 | 0.559 | 0.848 | 0.823 |
| N | 1386 | 1356 | 1484 | 1390 | 596 | 1973 | 1302 | 1038 | 966 |

Notes: This table has the same notes as Table 3. The sample is restricted to students that have at least one followup test score.

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

Table A.5.B: Initial Offer Covariate Balance

| | All charter applicants | | | | Charter applicants with followup scores | | | |
|--|-------------------------|--|-------------------------|--|---|--|-------------------------|--|
| | Middle School | | High School | | Middle School | | High School | |
| | All Lotteries (1) | Lotteries with Baseline Scores (2) | All Lotteries (3) | Lotteries with Baseline Scores (4) | All Lotteries (5) | Lotteries with Baseline Scores (6) | All Lotteries (7) | Lotteries with Baseline Scores (8) |
| Hispanic | 0.009 (0.025) | 0.005 (0.025) | -0.036 (0.023) | -0.037 (0.024) | 0.011 (0.026) | 0.008 (0.026) | -0.053** (0.025) | -0.048* (0.026) |
| Black | -0.006 (0.031) | -0.012 (0.031) | 0.054** (0.026) | 0.056** (0.026) | -0.013 (0.032) | -0.018 (0.033) | 0.059** (0.029) | 0.057* (0.029) |
| White | 0.001 (0.024) | 0.010 (0.024) | -0.021* (0.012) | -0.022* (0.012) | 0.008 (0.025) | 0.016 (0.025) | -0.007 (0.014) | -0.008 (0.014) |
| Asian | -0.002 (0.009) | -0.001 (0.009) | -0.006 (0.009) | -0.008 (0.009) | -0.003 (0.009) | -0.003 (0.010) | -0.006 (0.010) | -0.009 (0.010) |
| Female | 0.020 (0.033) | 0.017 (0.033) | -0.017 (0.028) | -0.021 (0.029) | 0.017 (0.034) | 0.013 (0.034) | -0.008 (0.032) | -0.010 (0.033) |
| Free or Reduced Price Lunch | 0.041 (0.030) | 0.033 (0.030) | 0.001 (0.025) | -0.006 (0.025) | 0.043 (0.031) | 0.037 (0.031) | 0.014 (0.028) | 0.011 (0.028) |
| Special Education | -0.038 (0.025) | -0.034 (0.026) | 0.015 (0.021) | 0.010 (0.021) | -0.039 (0.026) | -0.037 (0.027) | 0.005 (0.023) | -0.003 (0.023) |
| Limited English Proficiency | -0.025* (0.014) | -0.026* (0.014) | 0.007 (0.010) | 0.006 (0.009) | -0.039*** (0.015) | -0.040*** (0.015) | 0.008 (0.010) | 0.010 (0.010) |
| Baseline ELA Test Score | - | -0.016 (0.069) | - | -0.050 (0.048) | - | -0.003 (0.071) | - | -0.076 (0.052) |
| Baseline Math Test Score | - | 0.090 (0.066) | - | -0.053 (0.050) | - | 0.130* (0.068) | - | -0.058 (0.055) |
| Baseline Writing Composition Test Score | - | - | - | 0.020 (0.050) | - | - | - | 0.026 (0.056) |
| Baseline Writing Topic Test Score | - | - | - | -0.062 (0.050) | - | - | - | -0.057 (0.053) |
| p-value, from F-test | 0.382 | 0.162 | 0.240 | 0.218 | 0.084* | 0.008*** | 0.446 | 0.354 |
| N | 1277 | 1248 | 1849 | 1723 | 1156 | 1133 | 1484 | 1390 |

Notes: This table reports results from regressions like those in Table 3, except initial offer is used rather than ever offer. Columns (1)-(4) use all lottery participants. Columns (5)-(8) restrict the sample to students with at least one followup test score.

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

Table A.6: Graduation and Repetition for High School Students

| Outcome | Charter Schools | | Pilot Schools | |
|---|---------------------------|--|---------------------------|--|
| | Demographics (1) | Demographics and baseline scores (2) | Demographics (3) | Demographics and baseline scores (4) |
| Graduation (includes attriters) | -0.051 (0.089) 1130 | -0.052 (0.090) 1055 | -0.021 (0.056) 761 | -0.067 (0.058) 702 |
| Graduation (excludes attriters) | -0.016 (0.079) 990 | -0.026 (0.080) 926 | 0.010 (0.048) 655 | -0.017 (0.049) 607 |
| Ever repeat | 0.068 (0.045) 1561 | 0.064 (0.045) 1466 | -0.002 (0.035) 1119 | -0.001 (0.035) 1042 |
| Mean graduation rate in sample (including attriters) | 0.717 | 0.714 | 0.714 | 0.721 |

Notes: This table reports coefficients from 2SLS regressions using years in charter and pilot schools as the endogenous variable with the ever offer dummy as the instrument. The dependent variable in the first row is equal to one if a student graduated high school. The sample is restricted to students who should have graduated by Spring 2009. The sample in the next row excludes students who have not graduated and are not observed in Massachusetts public schools in the 2008-2009 school year. The "ever repeat" variable is one if a student ever repeats a grade. Robust standard errors are reported in parentheses.

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

Table WA: Charter School Lottery Audit

WA.1: Boston Preparatory Lottery Records

WA.1.A: Boston Preparatory Applicants

| | Lottery cohort | | | |
|---|----------------|-----------|-----------|---------------|
| | 2005-2006 | 2006-2007 | 2007-2008 | All lotteries |
| | (1) | (2) | (3) | (4) |
| Total number of entry grade records | 156 | 231 | 289 | 676 |
| Excluding duplicates within year | 156 | 229 | 288 | 673 |
| Excluding late applicants | 156 | 229 | 288 | 673 |
| Excluding applicants from outside of Boston | 156 | 229 | 288 | 673 |
| Excluding siblings | 154 | 223 | 271 | 648 |
| Excluding students not matched to the SIMS | 150 | 219 | 261 | 630 |
| Excluding repeat applicants | 145 | 207 | 245 | 597 |
| In Massachusetts public schools at baseline | 116 | 176 | 212 | 504 |
| In Boston public schools at baseline | 101 | 164 | 175 | 440 |
| Excluding students without a test score | 93 | 155 | 157 | 405 |

WA.1.B: Boston Preparatory Offer Information

| Lottery cohort | Calendar years observed | Grades observed | Number of applicants | Applicants in lottery sample | Percent offered | Percent offered initially | Percent attended |
|----------------|-------------------------|-----------------|----------------------|------------------------------|-----------------|---------------------------|------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2005-2006 | 2006-2008 | 6-8 | 156 | 93 | 1.000 | 0.699 | 0.441 |
| 2006-2007 | 2007-2009 | 6-7 | 231 | 155 | 0.929 | 0.310 | 0.439 |
| 2007-2008 | 2008-2009 | 6 | 289 | 157 | 0.777 | 0.306 | 0.350 |
| All cohorts | 2006-2008 | 6-8 | 676 | 405 | 0.886 | 0.398 | 0.405 |

Table WA: Charter School Lottery Audit (cont.)

WA.2: Academy of the Pacific Rim Lottery Records

WA.2.A: Academy of the Pacific Rim Applicants

| | Lottery cohort | | | |
|---|----------------|-----------|-----------|---------------|
| | 2005-2006 | 2006-2007 | 2007-2008 | All lotteries |
| | (1) | (2) | (3) | (4) |
| Total number of entry grade records | 169 | 189 | 214 | 572 |
| Excluding duplicates within year | 169 | 188 | 214 | 571 |
| Excluding late applicants | 169 | 188 | 214 | 571 |
| Excluding applicants from outside of Boston | 169 | 188 | 214 | 571 |
| Excluding siblings | 147 | 174 | 190 | 511 |
| Excluding students not matched to the SIMS | 145 | 170 | 186 | 501 |
| Excluding repeat applicants | 138 | 164 | 179 | 481 |
| In Massachusetts public schools at baseline | 112 | 127 | 159 | 398 |
| In Boston public schools at baseline | 105 | 118 | 149 | 372 |
| Excluding students without a test score | 95 | 109 | 130 | 334 |

WA.2.B: Academy of the Pacific Rim Offer Information

| Lottery cohort | Calendar years observed | Grades observed | Number of applicants | Applicants in lottery sample | Percent offered | Percent offered initially | Percent attended |
|----------------|-------------------------|-----------------|----------------------|------------------------------|-----------------|---------------------------|------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2005-2006 | 2006-2008 | 6-8 | 169 | 95 | 0.537 | 0.389 | 0.368 |
| 2006-2007 | 2007-2009 | 6-7 | 189 | 109 | 0.514 | 0.349 | 0.284 |
| 2007-2008 | 2008-2009 | 6 | 214 | 130 | 0.531 | 0.254 | 0.300 |
| All cohorts | 2006-2009 | 6-8 | 572 | 334 | 0.527 | 0.323 | 0.314 |

Table WA: Charter School Lottery Audit (cont.)

WA.3: Boston Collegiate Lottery Records

WA.3.A: Boston Collegiate Applicants

| | Lottery cohort | | | | | All lotteries |
|---|----------------|-----------|-----------|-----------|-----------|---------------|
| | 2002-2003 | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 | |
| | (1) | (2) | (3) | (4) | (5) | |
| Total number of entry grade records | 184 | 216 | 238 | 277 | 268 | 1183 |
| Excluding duplicates within year | 175 | 203 | 219 | 264 | 255 | 1116 |
| Excluding late applicants | 175 | 203 | 218 | 264 | 255 | 1115 |
| Excluding applicants from outside of Boston | 175 | 202 | 218 | 259 | 249 | 1103 |
| Excluding siblings | 162 | 184 | 189 | 240 | 226 | 1001 |
| Excluding students not matched to the SIMS | 136 | 143 | 155 | 197 | 194 | 825 |
| Excluding repeat applicants | 136 | 141 | 155 | 196 | 194 | 822 |
| In Massachusetts public schools at baseline | 89 | 92 | 101 | 137 | 145 | 564 |
| In Boston public schools at baseline | 79 | 82 | 88 | 124 | 125 | 498 |
| Excluding students without a test score | 71 | 72 | 80 | 112 | 108 | 443 |

WA.3.B: Boston Collegiate Offer Information

| Lottery cohort | Calendar years observed | Grades observed | Number of applicants | Applicants in lottery sample | Percent offered | Percent offered initially | Percent attended |
|----------------|-------------------------|-----------------|----------------------|------------------------------|-----------------|---------------------------|------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2002-2003 | 2004-2006 | 6-8 | 184 | 71 | 0.789 | 0.183 | 0.380 |
| 2003-2004 | 2005-2007 | 6-8 | 216 | 72 | 0.903 | 0.306 | 0.403 |
| 2004-2005 | 2006-2008 | 6-8 | 238 | 80 | 0.350 | 0.175 | 0.200 |
| 2005-2006 | 2007-2009 | 6-7 | 277 | 112 | 0.393 | 0.188 | 0.259 |
| 2006-2007 | 2008-2009 | 6 | 268 | 108 | 0.435 | 0.194 | 0.231 |
| All cohorts | 2004-2009 | 6-8 | 1183 | 443 | 0.542 | 0.205 | 0.284 |

Table WA: Charter School Lottery Audit (cont.)

WA.4: Roxbury Preparatory Lottery Records

WA.4.A: Roxbury Preparatory Applicants

| | Lottery cohort | | | | | All lotteries |
|---|----------------|-----------|-----------|-----------|-----------|---------------|
| | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | |
| | (1) | (2) | (3) | (5) | (6) | |
| Total number of entry grade records | 127 | 122 | 161 | 162 | 157 | 729 |
| Excluding duplicates within year | 127 | 122 | 149 | 162 | 157 | 717 |
| Excluding late applicants | 127 | 122 | 149 | 162 | 157 | 717 |
| Excluding applicants from outside of Boston | 127 | 122 | 149 | 162 | 157 | 717 |
| Excluding siblings | 118 | 111 | 137 | 150 | 144 | 660 |
| Excluding students not matched to the SIMS | 116 | 111 | 135 | 146 | 141 | 649 |
| Excluding repeat applicants | 115 | 110 | 132 | 134 | 130 | 621 |
| In Massachusetts public schools at baseline | 91 | 95 | 115 | 113 | 111 | 525 |
| In Boston public schools at baseline | 84 | 87 | 105 | 108 | 107 | 491 |
| Excluding students without a test score | 78 | 83 | 99 | 101 | 100 | 461 |

WA.4.B: Roxbury Preparatory Offer Information

| Lottery cohort | Calendar years observed | Grades observed | Number of applicants | Applicants in lottery sample | Percent offered | Percent offered initially | Percent attended |
|----------------|-------------------------|-----------------|----------------------|------------------------------|-----------------|---------------------------|------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2003-2004 | 2004-2006 | 6-8 | 127 | 78 | 0.718 | N/A | 0.513 |
| 2004-2005 | 2005-2007 | 6-8 | 122 | 83 | 0.590 | N/A | 0.590 |
| 2005-2006 | 2006-2008 | 6-8 | 161 | 99 | 0.515 | N/A | 0.505 |
| 2006-2007 | 2007-2009 | 6-7 | 162 | 101 | 0.693 | 0.495 | 0.436 |
| 2007-2008 | 2008-2009 | 6 | 157 | 100 | 0.750 | 0.670 | 0.500 |
| All cohorts | 2004-2009 | 6-8 | 729 | 461 | 0.653 | 0.582 | 0.505 |

Table WA: Charter School Lottery Audit (cont.)

WA.5: Edward Brooke Lottery Records

WA.5.A: Edward Brooke Applicants

| | Lottery cohort |
|---|----------------|
| | 2006-2007 |
| | (1) |
| Total number of entry grade records | 79 |
| Excluding duplicates within year | 79 |
| Excluding late applicants | 79 |
| Excluding applicants from outside of Boston | 76 |
| Excluding siblings | 66 |
| Excluding students not matched to the SIMS | 65 |
| Excluding repeat applicants | 65 |
| In Massachusetts public schools at baseline | 47 |
| In Boston public schools at baseline | 43 |
| Excluding students without a test score | 39 |

WA.5.B: Edward Brooke Offer Information

| Lottery cohort | Calendar years observed | Grades observed | Number of applicants | Applicants in lottery sample | Percent offered | Percent offered initially | Percent attended |
|----------------|-------------------------|-----------------|----------------------|------------------------------|-----------------|---------------------------|------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2006-2007 | 2008-2009 | 6 | 79 | 39 | 1.000 | 0.487 | 0.538 |

Table WA: Charter School Lottery Audit (cont.)

WA.6: City on a Hill Lottery Records

WA.6.A: City on a Hill Applicants

| | Lottery cohort | | | |
|---|----------------|-----------|-----------|---------------|
| | 2004-2005 | 2005-2006 | 2006-2007 | All lotteries |
| | (1) | (2) | (3) | (4) |
| Total number of entry grade records | 408 | 408 | 374 | 1190 |
| Excluding duplicates within year | 408 | 408 | 374 | 1190 |
| Excluding late applicants | 408 | 405 | 374 | 1187 |
| Excluding applicants from outside of Boston | 408 | 405 | 374 | 1187 |
| Excluding siblings | 392 | 393 | 374 | 1159 |
| Excluding students not matched to the SIMS | 372 | 369 | 366 | 1107 |
| Excluding repeat applicants | 370 | 365 | 364 | 1099 |
| In Massachusetts public schools at baseline | 340 | 324 | 318 | 982 |
| In Boston public schools at baseline | 332 | 307 | 301 | 940 |
| Excluding students without a test score | 277 | 246 | 245 | 768 |

WA.6.B: City on a Hill Offer Information

| Lottery cohort | Calendar years observed | Grades observed | Number of applicants | Applicants in lottery sample | Percent offered | Percent offered initially | Percent attended |
|----------------|-------------------------|-----------------|----------------------|------------------------------|-----------------|---------------------------|------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2004-2005 | 2006 | 10 | 408 | 277 | 1.000 | 0.123 | 0.191 |
| 2005-2006 | 2007 | 10 | 408 | 246 | 0.622 | 0.476 | 0.240 |
| 2006-2007 | 2008 | 10 | 374 | 245 | 0.849 | 0.616 | 0.318 |
| All cohorts | 2004, 2006-07 | 10 | 1190 | 768 | 0.831 | 0.393 | 0.247 |

Table WA: Charter School Lottery Audit (cont.)

WA.7: Codman Lottery Records

WA.7.A: Codman Applicants

| | Lottery cohort |
|---|----------------|
| | 2004-2005 |
| | (1) |
| Total number of entry grade records | 94 |
| Excluding duplicates within year | 94 |
| Excluding late applicants | 84 |
| Excluding applicants from outside of Boston | 84 |
| Excluding siblings | 84 |
| Excluding students not matched to the SIMS | 81 |
| Excluding repeat applicants | 81 |
| In Massachusetts public schools at baseline | 72 |
| In Boston public schools at baseline | 71 |
| Excluding students without a test score | 59 |

WA.7.B: Codman Offer Information

| Lottery cohort | Calendar | Grades | Number of | Applicants in | | | |
|----------------|----------|----------|------------|---------------|---------|-----------------|----------|
| | years | | | lottery | Percent | Percent offered | Percent |
| (1) | observed | observed | applicants | sample | offered | initially | attended |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2004-2005 | 2006 | 10 | 94 | 59 | 1.000 | 0.390 | 0.322 |

Table WA: Charter School Lottery Audit (cont.)

WA.8: MATCH Lottery Records

WA.8.A: MATCH Applicants

| | Lottery cohort | | | | |
|---|----------------|-----------|-----------|-----------|---------------|
| | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 | All lotteries |
| | (1) | (2) | (3) | (4) | (5) |
| Total number of entry grade records | 450 | 441 | 476 | 568 | 1935 |
| Excluding duplicates within year | 450 | 438 | 476 | 568 | 1932 |
| Excluding late applicants | 446 | 438 | 476 | 568 | 1928 |
| Excluding applicants from outside of Boston | 446 | 438 | 476 | 568 | 1928 |
| Excluding siblings | 437 | 429 | 472 | 568 | 1906 |
| Excluding students not matched to the SIMS | 419 | 404 | 444 | 555 | 1822 |
| Excluding repeat applicants | 419 | 402 | 442 | 548 | 1811 |
| In Massachusetts public schools at baseline | 332 | 341 | 382 | 482 | 1537 |
| In Boston public schools at baseline | 321 | 320 | 361 | 452 | 1454 |
| Excluding students without a test score | 257 | 266 | 284 | 363 | 1170 |

WA.8.B: MATCH Offer Information

| Lottery cohort | Calendar years observed | Grades observed | Number of applicants | Applicants in lottery sample | Percent offered | Percent | |
|----------------|-------------------------|-----------------|----------------------|------------------------------|-----------------|-------------------|------------------|
| | | | | | | offered initially | Percent attended |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 2003-2004 | 2005 | 10 | 450 | 257 | 0.202 | 0.148 | 0.121 |
| 2004-2005 | 2006 | 10 | 441 | 266 | 0.447 | 0.143 | 0.199 |
| 2005-2006 | 2007 | 10 | 476 | 284 | 0.546 | 0.123 | 0.130 |
| 2006-2007 | 2008 | 10 | 568 | 363 | 0.237 | 0.107 | 0.129 |
| All cohorts | 2004-2008 | 10 | 1935 | 1170 | 0.352 | 0.128 | 0.144 |

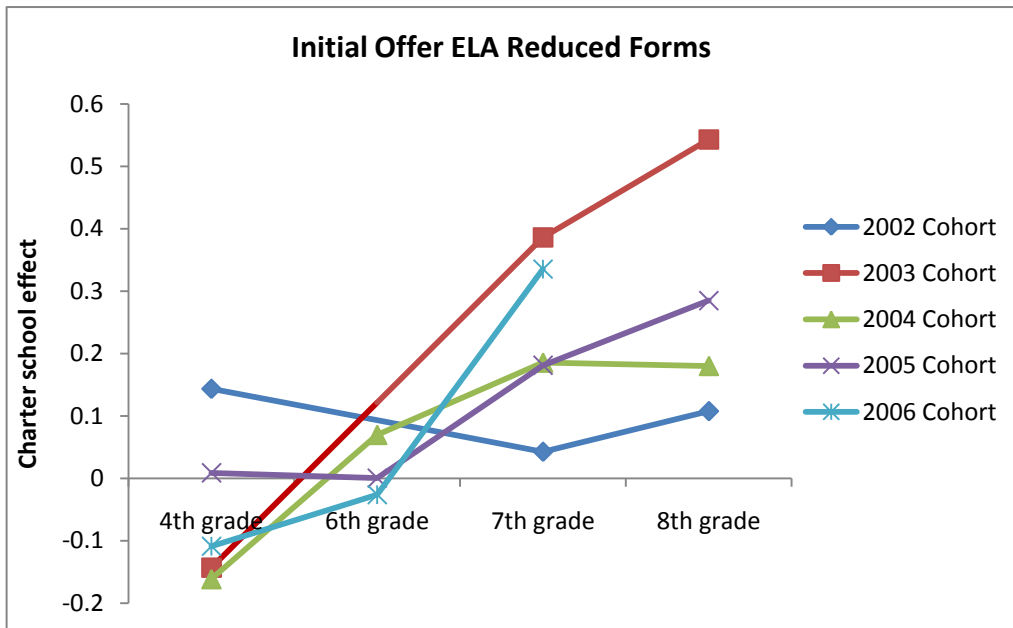
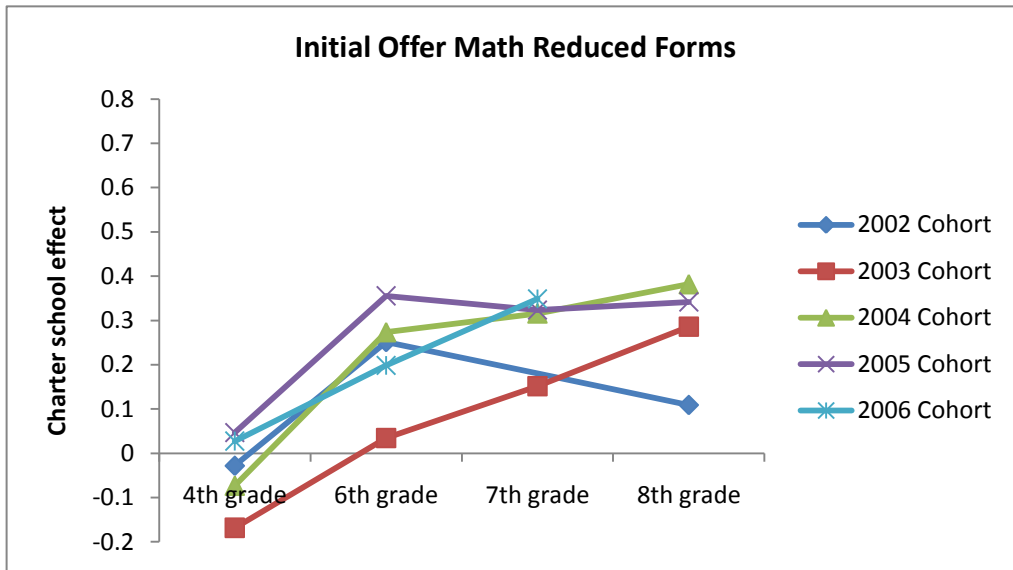


Figure A.1. Charter Initial Offer Reduced Forms

These figures plot reduced form initial offer math and ELA coefficients by grade and 4th grade cohort for charter applicants. All coefficients for a given plot come from a single regression that uses interactions of cohort, grade and the offer variable. Regressions include risk set and demographic controls. The points for 7th grade in the 2002 cohort are interpolated, as no 7th grade math test was given for this cohort.