

Do Small Schools Improve Performance in Large, Urban Districts? Causal Evidence from New York City

**Amy Ellen Schwartz, Leanna Stiefel,
Matthew Wiswall**

NYU

April 2011



Why Study Small Schools?

- Adopted by major cities including NYC, Chicago, LA, San Diego, Phil. and Boston.
- Strong support from funders: Gates, Carnegie, OSI & USDOE.
- The “logic” of small school reform has broad appeal.
 - More personalized, more supportive environment
 - Smaller cohort raises participation in sports, leadership, etc.
 - More schools means more choice and competition
- But large comprehensive schools offer flexibility and diversity.
- What works? An empirical question.
- We examine the effectiveness of the small high schools reform in the country’s largest school district.²

Two Key Challenges in Estimating Impact

1. What's the Counterfactual?

- Small high schools reform did not occur in isolation.
 - Existing (old) small high schools
 - Closing of poorly performing (large) schools
 - Portfolio strategy with school choice
 - Opening of new “medium sized” high schools
 - Other reforms

2. Selection of students into schools

- We use proximity to small schools as an IV.

The Changing Context Matters

- Previous literature compares student performance in small and large high schools, in a single school year.
 - Implicitly ignores other changes in district schools
 - Incomplete comparison in changing school districts
- We evaluate the effectiveness of four generations of small schools in a dynamic district (NYC) and compare:
 - Small vs. Large
 - New vs. Old
- Our methodology illustrates a rigorous, causal approach to evaluating real district behavior and reforms implemented on a large scale.



Small Schools in the Literature: Early Studies

- Lee, V.E. and Smith, J.B. (1997), “High School Size: Which works best and for whom?”
 - Sample: Three panels of NELS:88 includes those with data at the three waves who stay in the same high school until graduation: 9,812 students in 789 public, Catholic, and elite private high schools.
 - Key Findings: Schools in the range of 600-900 are most effective for minority students and enrollment size has stronger effect on learning in schools with lower-SES students and also in schools with higher concentrations of minority students.
- Stiefel et al. (2000), “High School Size: Effects on Budgets and Performance in New York City”
 - Sample: 121 high schools, enrolling 85% of the 288,379 high schools students in 1995-96.
 - Key Findings: Small academic high schools have budgets per graduate similar to those of large schools, and overall, results indicate that small schools are cost-effective (as well as large high schools).



Small Schools in the Literature: Recent Studies

- Bloom et al. (2010), “Transforming the High School Experience”
 - Sample: 105 “small schools of choice” over years 2005-2008
 - Key Findings: For cohort 2005, students were 6.8% more likely to graduate if they enroll in SSCs than if they do not
 - Limitation: Restricted to students participating in the HSAPS lottery
- Barrow et al. (2010), “The Impact of Small Schools in Chicago: Assessing the Effectiveness of Chicago’s Small High School Initiative”
 - Sample: 22 small high schools in Chicago from 2002-2008
 - Key Findings: Using quasi-experimental variation in the distance between students’ homes to high school as an IV, they found a positive effect of small school attendance on continuation through high school and graduation
 - Limitation: Only 11 treatment schools are observed for a full five years after the start of 9th grade

Preview of Results

- Attendance in a small school is associated with higher student performance compared to large schools.
- Instrumenting for small school attendance using proximity of student residence to small schools suggests no statistically significant effects.
- Importantly, IV results hide important heterogeneity in school effects – between schools of different vintage.
- In fact, *newly* established schools have strong positive effects on student performance whereas older small schools do not.
- We explore how differences between these schools are related to effectiveness and whether they can or will be sustained.
- Our results suggest that observed improvements in high school outcomes may well be a product of an overall strategy in which new small school creation was only one part.

Data and Sample

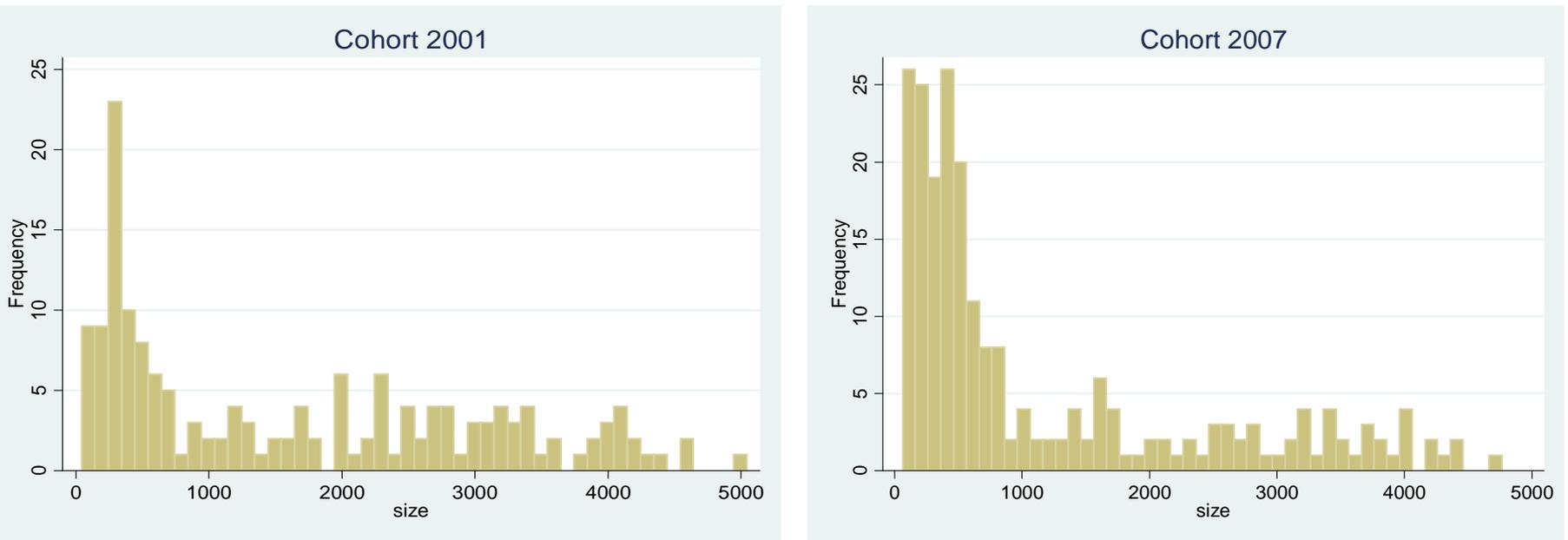
- Student- and school-level data from the New York City Department of Education (NYCDOE) administrative datasets.
- Student-level data are drawn from a census of New York City public high school students expected to graduate between 2001 and 2008.
- We include high schools attended by these students, excluding a small group of specialized program schools (e.g. “last chance” schools or schools for pregnant mothers) or special education schools.
- We exclude students that live in and attend high school in Staten Island because of the absence of small high schools there in this period.

Table 1: Number of High Schools and Enrollment In Cohort, by Size, Year (Cohort) and New

Cohort	2001	2002	2007	2008
Small				
% enrolled	8.81	8.45	18.58	22.01
# of schools	60	58	115	156
Non-Small				
% enrolled	91.19	91.55	81.42	77.99
# of schools	104	109	109	116
Cum. New-Small				
% enrolled	0	0	11.41	16.33
# of schools	0	0	67	113
Cum New-Non-Small				
% enrolled	0	0	1.49	3.41
# of schools	0	0	7	15
Total Closed by F' 08				8

A Significant Change in the Distribution of Students Across Schools of Different Sizes

Figure 1: Distribution of New York City High Schools by Enrollment for Cohorts 2001 and 2007





Also Changes in Proximity to Small Schools

Table 2: Descriptive Statistics of New York City High School Students by Cohort and School Size

	Cohort 2001			Cohort 2008		
	all	small	non-small	all	small	non-small
% enrolled small schools	8.81	100	-	22.01	100	-
# of schools	164	60	104	272	156	116
min dist to nearest small HS	1.38	0.95	1.43	1.21	0.66	1.37
min dist to nearest non-small HS	0.63	0.62	0.63	0.64	0.56	0.67
Observations	31204	2749	28455	37455	8243	29212

New Small Schools Created Differently

- Application process and regulatory environment changed after 2002 (Cahill and Hughes, 2010; Bloom et al., 2010).
 - A competitive application process to evaluate plans for academically rigorous curricula and partnerships with CBOs. (Some proposals were rejected.)
 - New schools usually supported by foundation funded non-profit organizations (e.g., New Visions)
 - Granted some exemptions in first years from serving Special Ed and LEP students and some union rules on hiring teachers (some exemptions slated to sunset.)
 - New principals from The NYC Leadership Academy -- Corcoran Schwartz and Weinstein (2010).
- Other macro changes – i.e., large growth in school spending.

Small Schools Differ from Others in Observables

- Disproportionately black, Hispanic, and poor.
- Substantially lower average test scores in middle school.

	Cohort 2001			Cohort 2008		
	all	small	non-small	all	small	non-small
Demographic Characteristics						
% Female	52.93	59.00	52.34	53.25	57.25	52.12
% Black	41.62	43.98	41.39	36.31	42.93	34.44
% Hispanic	34.24	45.00	33.20	37.44	43.96	35.61
% Asian	10.56	3.86	11.20	14.74	7.02	16.91
% White	13.58	7.17	14.20	11.46	5.99	13.00
% English is home language	60.36	61.26	60.28	52.14	59.30	50.12
% Overage	18.92	18.33	18.97	16.73	18.00	16.37
% Free Lunch	73.64	77.92	73.23	77.48	80.41	76.65
% Limited English Proficiency	2.16	3.24	2.06	2.09	2.27	2.04
8th grade Math z-score	0.00	-0.19	0.02	0.00	-0.15	0.04
8th grade Read z-score	0.00	-0.15	0.01	0.00	-0.13	0.04
Observations	31204	2749	28455	37455	8243	29212

NYC Schools large and small have More Graduates and Fewer Dropouts

	Cohort 2001			Cohort 2008		
	all	small	non-small	all	small	Large
Outcomes						
% Graduated	51	53	51	68	74	66
% Continued Enrollment	28	29	28	20	17	21
% Dropout	17	14	17	9.4	7.0	10
% GED	4.4	3.0	4.5	2.7	2.0	2.8
% Took Regents Math	75	66.5	76	86	90	85
% Score >55 on Regents Math	82	77	83	96	96	97
% Score >65 on Regents Math	65	58	66	84	81	85
% Took Regents English	74	76	74	85.	89	84.5
% Score >55 on Regents English	95	91	95	96	95	96
% Score >65 on Regents English	68	58	69	87	84	88
Observations	31204	2749	28455	37455	8243	29212

Model

Our basic model expresses student performance as follows:

$$(1) Perf_{ijt} = \alpha_0 + \alpha_1 Small_{ijt} + ST_{it}' \alpha_2 + Test8_{it}' \alpha_3 + Borough_{it}' \alpha_4 + \varepsilon_{ijt}$$

Where

$Perf_{ijt}$ = a student outcome (such as earning a diploma within four years or taking a Regents' examination) for student i in school j in year t .

$Small_{ijt}$ takes a value of 1 if, in year t , student i attended a school j that is small (that is, enrolls 550 or fewer students)

ST_{it} is a vector of student characteristics, including gender, race/ethnicity, free lunch status, English language proficiency, and overage for grade. $Test8_{it}$ is a vector of eighth grade reading and mathematics exam scores (each score, each score squared, and interacted), and

$Borough_{it}$ is a set of borough fixed effects



Table 3: OLS Regression Results, Diploma Model

	(1)	(2) Extended Covariates
Small_2001	0.063*** (0.016)	0.077*** (0.015)
Small_2002	0.041** (0.020)	0.053*** (0.020)
Small_2007	0.092*** (0.012)	0.081*** (0.012)
Small_2008	0.124*** (0.011)	0.112*** (0.011)
Year 2002	-0.007 (0.005)	-0.008 (0.005)
Year 2007	0.094*** (0.010)	0.198*** (0.017)
Year 2008	0.124*** (0.010)	0.230*** (0.018)
Observations	138215	138215
R-squared	0.264	0.268



Distance matters

Table 4: First Stage, Likelihood of Attending a Small School

Minimum distance to nearest small HS	-0.090*** (0.002)
Minimum distance to nearest small HS - squared	0.011*** (0.000)
Minimum distance to nearest non-small HS	0.002 (0.007)
Minimum distance to nearest non-small HS - squared	0.004 (0.004)
Observations	138215
F- First Stage Excluded (4, 138191)	500.20
F-Total Regression (23, 138191)	424.35
R-squared	0.017



Table 5: IV Regression Results, Diploma Model

	(1)	(2)	(3)	(4)	(5)
	2001	2002	2007	2008	Pooled*
Small School	-0.469** (0.190)	-0.307* (0.160)	-0.049 (0.063)	-0.035 (0.075)	
Small_2001					-0.471*** (0.180)
Small_2002					-0.361** (0.163)
Small_2007					-0.104 (0.069)
Small_2008					0.011 (0.056)
Observations	31204	30798	38758	37455	138215
R-squared	0.193	0.218	0.236	0.214	0.226



Distinguishing between “New” and “Small” Matters

	(1)	(2)
	OLS	IV
Small_2007	0.059*** (0.016)	-0.556*** (0.174)
Small_2008	0.086*** (0.016)	-0.498*** (0.169)
New_2007	0.138*** (0.044)	-0.084 (0.208)
New_2008	0.110*** (0.030)	0.143 (0.109)
New Small 2007	-0.096** (0.048)	0.735** (0.338)
New Small 2008	-0.068** (0.034)	0.462** (0.216)
R-squared	0.241	0.144

Other Educational Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Graduated	Took	Took	English	English	Math	Math
	In 4 Yrs	English	Math	>55	>65	>55	>65
Small_2007	-0.534*** (0.182)	-0.314** (0.129)	-0.248* (0.130)	-0.172*** (0.060)	-0.510*** (0.159)	-0.110** (0.046)	-0.558*** (0.160)
Small_2008	-0.487*** (0.176)	-0.226* (0.129)	-0.219 (0.143)	-0.166*** (0.056)	-0.428*** (0.136)	-0.097* (0.050)	-0.338** (0.141)
New_2007	-0.064 (0.217)	0.015 (0.165)	0.057 (0.176)	-0.093 (0.070)	-0.129 (0.177)	-0.044 (0.055)	-0.162 (0.169)
New_2008	0.152 (0.118)	-0.006 (0.080)	-0.026 (0.090)	-0.021 (0.038)	-0.193* (0.103)	-0.021 (0.031)	-0.144 (0.089)
New Small 07	0.788** (0.358)	0.444* (0.255)	0.322 (0.269)	0.229** (0.115)	0.409 (0.281)	0.182* (0.094)	0.715** (0.285)
New Small 08	0.474** (0.230)	0.356** (0.179)	0.414** (0.198)	0.142** (0.070)	0.468*** (0.181)	0.079 (0.071)	0.374* (0.199)
R-squared	0.145	0.087	0.095	0.058	0.071	0.070	0.140



Student Composition is Different

	(1)	(2)	(3)	(4)	(5)
	% Black	% White	% Hispanic	% Asian	% Rec. Imm
Small_2007	0.135 (4.187)	-2.987 (2.377)	10.973*** (3.877)	-8.275*** (1.760)	-3.463*** (0.597)
Small_2008	4.118 (4.234)	-3.488 (2.359)	8.478** (4.020)	-9.236*** (1.739)	-3.813*** (0.632)
New_2007	-14.704 (11.357)	-5.192 (3.727)	30.470** (12.070)	-10.778*** (2.158)	-0.852 (1.220)
New_2008	-2.808 (7.631)	-2.269 (3.911)	13.062 (8.336)	-8.112*** (2.562)	-2.665*** (0.813)
New Small 2007	13.670 (12.123)	5.857 (4.495)	-34.206*** (12.756)	14.965*** (3.066)	2.428* (1.455)
New Small 2008	6.366 (8.637)	1.018 (4.467)	-16.964* (9.196)	9.742*** (2.945)	4.613*** (0.985)
R-squared	0.019	0.023	0.050	0.078	0.073
OSL model					



High Need Students Different – Resources, too.

	(6)	(7)	(8)	(9)	(10)
	% Special Education	% Limited English	% Poor	Direct Services	Pupil : Teacher
Small_2007	4.486*** (1.055)	-3.803*** (1.068)	1.956 (4.603)	1,000.033* (532.861)	-2.436*** (0.471)
Small_2008	1.903* (1.059)	-5.147*** (1.332)	-0.650 (4.385)	1,828.529*** (533.365)	-2.452*** (0.429)
New_2007	3.507** (1.628)	9.393* (5.096)	20.977*** (7.258)	662.474 (558.070)	-2.959*** (0.633)
New_2008	1.228 (1.286)	1.774 (3.898)	7.657 (5.833)	674.100 (477.093)	-2.312*** (0.484)
New Small 2007	-5.950*** (2.034)	-7.511 (5.245)	-20.910** (8.854)	-596.032 (720.822)	2.069*** (0.788)
New Small 2008	-3.094* (1.662)	0.045 (4.058)	-1.500 (7.334)	-1,383.478* (786.347)	1.866*** (0.625)
R-squared	0.108	0.069	0.019	0.042	0.254

OSL model



Teacher Differences Significant

Panel C	(11) Percent Teaching Experience <=3 years	(12) Percent Teachers Masters+	(13) Percent Teacher Turnover	(14) Leadership Academy Principal
Small_2007	7.782*** (1.752)	-15.706*** (1.916)	2.570 (1.863)	0.120* (0.066)
Small_2008	7.248*** (1.662)	-14.284*** (2.086)	4.080* (2.084)	0.153** (0.070)
New_2007	9.321** (4.533)	-12.851*** (3.932)	6.894* (3.690)	-0.088*** (0.028)
New_2008	11.514*** (2.272)	-12.439*** (3.072)	2.739 (2.215)	0.054 (0.093)
New Small 2007	-0.535 (4.996)	8.628* (4.406)	-7.154* (4.194)	-0.016 (0.076)
New Small 2008	-2.612 (3.040)	6.129* (3.660)	-2.385 (3.005)	-0.163 (0.117)
Year 2008	-1.069 (1.293)	-0.079 (1.860)	2.059 (1.660)	-0.009 (0.039)
R-squared	0.289	0.364	0.045	0.025

OSL model



Small Schools Reform: Gender Differences

	(1)	(2)
	Male	Female
Small_2007	-0.526** (0.205)	-0.578*** (0.177)
Small_2008	-0.398* (0.227)	-0.548*** (0.177)
New_2007	-0.095 (0.206)	-0.062 (0.254)
New_2008	0.089 (0.120)	0.191 (0.140)
New Small 2007	0.718* (0.373)	0.726* (0.372)
New Small 2008	0.413 (0.303)	0.455* (0.242)
Year 2008	0.020* (0.011)	0.017 (0.012)
R-squared	0.175	0.102

IV model

Concluding Thoughts

- Context matters – careful consideration of the appropriate counterfactual is warranted.
- Selection matters.
- Size may matter – but our results indicate that size alone does not guarantee better outcomes. New small schools show positive results, while older small school show negative (or zero) results.
- What is the policy lesson? More work needs to be done to disentangle the key factors.
- Fiscal pressure make it particularly important to examine how important the extra supports, loosened rules, etc. have been.



Robustness Test: Small Defined as 650 or Fewer

- Change in cutoff indicates that for “new” small schools, a cutoff of less than 650 is important.

	(1)
Small_2007	-0.420*** (0.140)
Small_2008	-0.281** (0.128)
New_2007	-0.237 (0.359)
New_2008	0.176 (0.199)
New Small 2007	0.789 (0.483)
New Small 2008	0.236 (0.288)
Year 2008	0.013 (0.010)
R-squared	0.172

IV model

Additional Slides

Table 3: OLS Regression Results, Diploma Models by Cohort

	(1)	(2)	(3)	(4)
	2001	2002	2007	2008
Small School	0.078*** (0.015)	0.052*** (0.020)	0.084*** (0.012)	0.108*** (0.011)
Female	0.100*** (0.006)	0.103*** (0.007)	0.058*** (0.006)	0.051*** (0.005)
Black	0.041*** (0.009)	0.045*** (0.010)	0.059*** (0.008)	0.049*** (0.008)
Asian	0.121*** (0.011)	0.122*** (0.011)	0.094*** (0.009)	0.065*** (0.009)
White	0.110*** (0.011)	0.083*** (0.014)	0.082*** (0.009)	0.066*** (0.010)
Overage	-0.104*** (0.007)	-0.127*** (0.008)	-0.113*** (0.006)	-0.125*** (0.007)
LEP	0.004 (0.020)	0.039* (0.024)	0.035** (0.015)	0.091*** (0.020)
Eng. Home Language	-0.048*** (0.007)	-0.068*** (0.008)	-0.044*** (0.007)	-0.046*** (0.007)
Poor	-0.003 (0.006)	-0.047*** (0.008)	-0.056*** (0.005)	-0.066*** (0.006)
Observations	31204	30798	38758	37455
R-squared	0.286	0.257	0.247	0.229

Appendix Table 1: Definition of Variables

Variable	Definition
<i>Distance Variables</i>	
min_dist_small_hs_res	The minimum distance between the nearest small high school address and student's residence zip code in 8 th grade
min_dist_nonsm_hs_res	The minimum distance between the nearest non-small high school address and student's residence zip code in 8 th grade
<i>Student Demographics</i>	
female	female=1, male=0
black	black=1, non-black=0
Asian	Asian=1, non-Asian=0
white	white=1, non-white=0
Hispanic	Hispanic=1, non-Hispanic=0
overage	Overage for student's expected graduation date
LEP	Limited English Proficiency status, based on 9 th grade year
English Spoken at Home	English is the home language, based on 9 th grade year
poor	Eligible for free lunch in 8 th grade
ELA	Standardized (z) 8 th grade English Language Arts test score
math	Standardized (z) 8 th grade math test score
Manhattan	9 th grade residence: Manhattan=1, other borough=0
Bronx	9 th grade residence: Bronx=1, other borough=0
Brooklyn	9 th grade residence: Brooklyn=1, other borough=0
Queens	9 th grade residence: Queens=1, other borough=0
late_variable name	The interaction of "late" (students expected to graduate in 2007 or 2008) and the variable

Appendix Table 1: Definition of Variables

<i>Student Outcomes</i>	
earned a diploma	Student earned a local, Regents, Regents Honors, or GED diploma
graduated in four years	Student earned a local, Regents, Regents Honors diploma within four years
continued enrollment	Student is still enrolled after four years of high school
dropout	Student dropped out of high school
GED	Student earned a GED
took Regents math	Student took the math sequential 1 Regents Exam
took Regents English	Student took the English Regents Exam
score >55 on Regents math	Student scored a 55 or greater on the math sequential 1 Regents Exam
score >65 on Regents math	Student scored a 65 or greater on the math sequential 1 Regents Exam
score >55 on Regents English	Student scored a 55 or greater on the English Regents Exam
score >65 on Regents English	Student scored a 65 or greater on the English Regents Exam
<i>Cohort ID</i>	
year 200X or cohort 200X	Student is expected to graduate high school in year (cohort) 200X and is in 8 th grade five years earlier

Appendix Table 1: Definition of Variables (continued)

<i>School Characteristics</i>	
small school	550 students or fewer enrolled, based on enrollment during the student's 9 th grade year
small_200X	Small school in student's 9 th grade year, for students expected to graduate in 200X
non-small	The school with greater than 550 students enrolled, based on enrollment during the student's 9 th grade year
new	School that did not have graduating classes before 2003
closed	Schools that served students in cohorts 2001, 2002, or 2007, but no longer had a graduating class by cohort 2008
pblack	Percent of black or African American students
pwhite	Percent of white students
phisp	Percent of Hispanic and Latino students
pasian	Percent Asian or Native Hawaiian/Other Pacific Islander students
pimmig	Percent of recent immigrant students (arrive < 3 years)
psped	Percent of students receiving special education services
plep	Percent of limited English proficient students
pfl	Percent of students eligible for free lunch
dir spend pp	Dollars spent on services provided directly to public school students and staff, and which take place primarily in the school building during the school day during the school year
pup_tch	Pupil to teacher ratio
per_fewer_3yrs_exp	Percent of teachers with fewer than three years of teaching experience
per_mas_plus	Percentage of teachers with Master's Degree plus 30 hours or doctorate
per_turn_all	Turnover rate of all teachers
Leadership Academy principal	A principal from Leadership Academy (LA) served in the school for at least one year between 2005 and 2008. Note that the first wave of LA principals was in 2005.

Appendix Table 2: Complete First Stage Results, Dependent Variable, Attends a Small High School

	(1)	(2)	(3)	(4)	(5)	(6)
	2001	2002	2007	2008	Pooled	Pooled*
min_dist_small_hs_res	-0.060*** (0.015)	-0.059*** (0.014)	-0.115*** (0.024)	-0.115*** (0.019)	-0.101*** (0.014)	-0.090*** (0.014)
min_sm_sq	0.006*** (0.002)	0.007*** (0.002)	0.014*** (0.004)	0.015*** (0.003)	0.012*** (0.002)	0.011*** (0.002)
min_dist_nonsm_hs_res	0.014 (0.039)	0.051 (0.034)	0.009 (0.055)	-0.051* (0.028)	0.011 (0.026)	0.002 (0.025)
min_nonsm_sq	0.002 (0.023)	-0.017 (0.020)	0.005 (0.037)	0.023 (0.015)	-0.001 (0.016)	0.004 (0.015)
Female	0.017** (0.007)	0.013* (0.007)	0.016* (0.010)	0.024** (0.011)	0.019*** (0.007)	0.015** (0.007)
Black	-0.014 (0.015)	-0.019 (0.017)	0.001 (0.020)	-0.005 (0.018)	-0.010 (0.013)	-0.018 (0.014)
Asian	-0.042*** (0.013)	-0.033** (0.013)	-0.020 (0.020)	-0.027 (0.020)	-0.032** (0.013)	-0.036*** (0.012)
White	-0.021 (0.017)	-0.030* (0.017)	-0.004 (0.024)	-0.037* (0.022)	-0.020 (0.015)	-0.020 (0.016)
Overage	-0.019*** (0.006)	-0.009 (0.006)	-0.013* (0.008)	-0.024*** (0.007)	-0.017*** (0.004)	-0.015*** (0.005)
LEP	0.030 (0.066)	0.007 (0.021)	-0.036** (0.016)	0.006 (0.022)	-0.013 (0.017)	0.019 (0.043)
Eng. Home Language	0.019** (0.009)	0.024*** (0.009)	0.018 (0.011)	0.046*** (0.010)	0.030*** (0.007)	0.021*** (0.008)
Poor	0.003 (0.004)	-0.002 (0.006)	-0.036*** (0.013)	-0.016 (0.011)	-0.016** (0.007)	0.000 (0.004)

Table continued on next slide

Appendix Table 2: Complete First Stage Results, Dependent Variable, Attends a Small High School (continued)

	(1)	(2)	(3)	(4)	(5)	(6)
	2001	2002	2007	2008	Pooled	Pooled*
ELA	-0.001 (0.004)	-0.000 (0.004)	0.006 (0.006)	0.007 (0.007)	0.002 (0.004)	-0.000 (0.003)
ELA Squared	-0.003** (0.001)	-0.000 (0.002)	0.001 (0.002)	-0.001 (0.002)	-0.000 (0.001)	-0.001 (0.001)
Math	-0.005 (0.005)	-0.017*** (0.004)	-0.005 (0.006)	-0.003 (0.007)	-0.007 (0.004)	-0.010** (0.004)
Math Squared	-0.002 (0.002)	-0.003* (0.002)	0.001 (0.002)	0.002 (0.002)	0.000 (0.001)	-0.002 (0.001)
ELA*Math	-0.004 (0.003)	-0.007** (0.003)	-0.014** (0.006)	-0.015*** (0.005)	-0.010*** (0.003)	-0.006** (0.002)
Manhattan	0.068 (0.054)	0.086 (0.053)	0.002 (0.075)	-0.044 (0.079)	0.017 (0.058)	0.067 (0.050)
Queens	-0.031 (0.039)	-0.007 (0.038)	-0.074 (0.073)	-0.208*** (0.072)	-0.083* (0.050)	-0.004 (0.037)
Brooklyn	-0.052 (0.036)	-0.031 (0.035)	-0.129* (0.068)	-0.205*** (0.071)	-0.111** (0.046)	-0.038 (0.034)
Year 2002					0.001 (0.008)	0.001 (0.008)
Year 2007					0.090*** (0.018)	0.201*** (0.050)
Year 2008					0.119*** (0.020)	0.230*** (0.051)
Observations	31204	30798	38758	37455	138215	138215
F- First Stage Excluded					654.22	500.20
F-Total Regression					670.73	424.35
R-squared	0.051	0.049	0.077	0.123	0.100	0.107

Appendix Table 3: Effect of Attending a Small School on Earning a Diploma, Covariates Interacted with Late Cohorts, Instrumental Variable Estimates

Small_2001	-0.471*** (0.180)
Small_2002	-0.361** (0.163)
Small_2007	-0.104 (0.069)
Small_2008	0.011 (0.056)
Year 2002	-0.021** (0.009)
Year 2007	0.196*** (0.031)
Year 2008	0.217*** (0.032)
Female	0.109*** (0.006)
Black	0.036*** (0.011)
Asian	0.102*** (0.012)
White	0.084*** (0.013)

Table continued on next slide

Appendix Table 3: Effect of Attending a Small School on Earning a Diploma, Covariates Interacted with Late Cohorts, Instrumental Variable Estimates (continued)

Overage	-0.123*** (0.006)
LEP	0.025 (0.033)
Eng. Home Language	-0.047*** (0.008)
Poor	-0.019*** (0.005)
ELA	0.103*** (0.003)
ELA Squared	-0.009*** (0.002)
Math	0.126*** (0.006)
Math Squared	0.007*** (0.003)
ELA*Math	-0.018*** (0.005)
Manhattan	0.046 (0.036)
Queens	0.023 (0.025)
Brooklyn	0.014 (0.024)

Table continued on next slide

Appendix Table 3: Effect of Attending a Small School on Earning a Diploma, Covariates Interacted with Late Cohorts, Instrumental Variable Estimates (continued)

late_female_hs	-0.052*** (0.007)
late_black	0.020* (0.011)
late_asian	-0.029** (0.012)
late_white	-0.018 (0.014)
late_ownership	0.002 (0.008)
late_ell_lep	0.023 (0.036)
late_english_hs	0.008 (0.009)
late_free_lunch_em	-0.045*** (0.007)
late_zread	-0.021*** (0.004)
late_zread2	0.004** (0.002)
late_zmath	-0.001 (0.004)
late_zmath2	-0.002 (0.002)
late_zreadmath	-0.022*** (0.006)
late_res_man	-0.062* (0.034)
late_res_queens	-0.050* (0.026)
late_res_brooklyn	-0.068*** (0.026)
Observations	138215
R-squared	0.226

The Number of Small Schools more than doubled between 2001 and 2008 with corresponding increases in the share of students attending

Table 1: Number of New York City High Schools and Enrollment In Cohort Sample, by Size and Year (Cohort)

Cohort	2001	2002	2007	2008
Small				
% enrolled	8.81	8.45	18.58	22.01
# of schools	60	58	115	156
Non-Small				
% enrolled	91.19	91.55	81.42	77.99
# of schools	104	109	109	116

Many New Small Schools Created 2001 -2008

Table 1: Number of New York City High Schools and Enrollment In Cohort Sample, by Size, Year (Cohort) and New

Cohort	2001	2002	2007	2008
Small				
% enrolled	8.81	8.45	18.58	22.01
# of schools	60	58	115	156
Non-Small				
% enrolled	91.19	91.55	81.42	77.99
# of schools	104	109	109	116
Cumulative New-Small				
% enrolled	0	0	11.41	16.33
# of schools	0	0	67	113
Cumulative New-Non-Small				
% enrolled	0	0	1.49	3.41
# of schools	0	0	7	15
Total Closed by Fall 08				8