ATU-- Professional Development Grant

Final Report

Prepared by

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grant received

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Purpose

This grant was used to fund travel to the SEA meetings so I could present research. The purpose of the research is to evaluate how charter schools influence the academic performance of students who attend them, and the school districts that students opt out of to attend the charter school.

Review

We are able to observe all public school students in MA in grades 6, 8 and 10 for the three student students cohorts completing 10 grade in 2005 - 2007. There was considerable expansion in charter schools in this time, so our paper measures the academic changes observable from the added choices in the education environment. This particular paper is different from previous charter school studies in that we compare the students' performance in the charter schools relative to the feeder schools that students opted out of in order to attend the charter school. I am not aware of any previous research using this methodology, although the state of Massachusetts has published summary statistics making comparisons of charters to their feeder schools. My co-author on this project is the former Education Commissioner of Massachusetts, so we have access to data that may not be available to all researchers.

Summary of Findings

We find that charter schools, like most public schools, show performance that varies considerably. When compared to the local feeder schools, we find preliminary evidence that charter schools located in urban areas of Massachusetts outperform consistently and the charter schools in rural areas of the state show little statistical difference from the public schools. Since the urban public schools are the ones that tend to perform poorly overall, urban charter schools may provide a value enhancing alternative for students.

I presented this research at the SEA meetings in Washington, DC in November, 2008. This particular session only had about 15 people present, but I was able to get some good feedback from participants and other research currently being conducted in the economics of education field.

Conclusion

Attending the conference and presenting the paper was a very valuable experience for me. In January, some researchers at Harvard released a paper that also evaluates the performance of schools in Boston[1] with findings similar to ours . At this point my co-author and I believe our best contribution lies in considering the urban/ non-urban distinction when looking at charter schools statewide. We plan to continue work on this paper during the spring semester and submit to a journal for publication this summer.

The preliminary paper presented at the conference is attached.

The trip cost a little less than estimated since the hotel conference discount was higher than I had anticipated and I was able to take the metro from the airport. I am not sure how it is normally handled when the trip is funded jointly by a grant and departmental funds, but you can contact Tracie White at twhite@atu.edu or 968-0233 regarding any financial adjustments that may need to be made.

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[1] Abdulkadiroglu, Atila, Josh Angrist, Sarah Cohodes, Susan Dynarski, Jon Fullerton, Thomas Kane, and Parag Pathak. 2009. *Informing the Debate: Comparing Boston's Charter, Pilot and Traditional Schools.* Boston, MA: The Boston Foundation.

Charter School Participant Effects in Massachusetts

Robert M. Costrell (University of Arkansas) and Julie R. Trivitt (Arkansas Tech University)

Introduction and Summary

Charter schools are an educational innovation dating to the 1990s that offer students a public school alternative to traditional district schools. The idea behind this innovation -- originally championed by President Clinton and a variety of reform-minded governors and state legislators -- is that a public chartering entity (such as a state board of education) would grant these schools a renewable charter, with exemption from various bureaucratic rigidities, and in return, the school would have to perform well in order for the charter to be renewed. States also typically place caps on the size of the charter sector, either at the state level or by locality, and these caps are often the flash point of contention between charter advocates and opponents. The debates over expanding or tightening these caps often feature studies purporting to show that charter schools raise or do not raise student performance.

Charter studies have not yet reached any general conclusions regarding the relative performance of charter and districts schools, and they face a few difficulties in doing so. The first difficulty is that charter programs vary considerably by state, in governance, mission, funding, size, and degree to which they fundamentally differ from traditional district schools in their operations. This makes it hard to generalize from even the best state studies. In addition, data limitations and methodological challenges have hampered research, although progress has been made in recent years in overcoming some of these difficulties. For example, earlier studies based on school-level data have been gradually superseded by student-level longitudinal studies as such data sources were developed for state and Federal accountability purposes. Methodological disputes typically focus on the problem of selection bias. There is debate over whether student fixed effects address the problem, or whether this introduces another bias by effectively restricting attention to students who switch between charter and district schools, while excluding the larger group of students who stay in one type of school or the other.[1]

This paper provides student-level longitudinal evidence on another state -- Massachusetts. Although we offer no methodological breakthroughs, we do pose the question somewhat differently from many studies, namely how performance in any given charter school compares with that of the sending district, as opposed to how the charter sector as a whole compares with the traditional sector as a whole. In this respect, we emulate a previous study of Massachusetts (discussed below). We find that the difference between student performance in charter and sending districts depends significantly on whether the district is a low-income urban district or some other type of district. This finding is certainly policy-relevant for Massachusetts, since the demand for more charters faces the state's cap in low-income urban districts, but not so much in other districts. Similar issues of charter location arise elsewhere, and other researchers might want to consider whether the results we find in Massachusetts generalize to other states.

[1] See, for example, Betts and Hill (2006) for a survey of methods and a recommended hierarchy of preferred methods. See also Ballou (xxxx) for the pros and cons of fixed effects.

Massachusetts Charter Schools

Massachusetts' charter schools were created as part of that state's Education Reform Act of 1993.[2] Massachusetts was the fourth state to create charter schools, so it is a program with a longer history than most, but it is also smaller than in some other states, due to a rigorous approval process and relatively tight enrollment caps that have prevented further growth in the urban areas where they are in most demand. The state's first charter schools opened in 1995, with fifteen schools enrolling 2,613 students. By 2004, there were 56 charter schools enrolling 20,259 students, but growth has since slowed, in large part due to the caps. As of 2008, 61 charter schools were operating, with 26,236 students (projected), comprising approximately 2.8% of total K-12 public enrollment. [3]

The composition of charter enrollment is 49 percent black and Hispanic, and 44 percent low income. By comparison, the state figures are 22 percent and 30 percent, respectively. The charters' higher rate of minority and low income enrollment reflects their popularity in urban districts. A major policy debate in Massachusetts in recent years has concerned the district enrollment caps (as opposed to the statewide cap), which threatens to prevent further growth in these districts. Consequently, it is of significant policy relevance to compare the performance of charter schools with the sending districts, and to distinguish between the high-demand urban districts and others in the state.

There has been one longitudinal study of Massachusetts charter schools based on individual student data, a study commissioned by the state's Department of Education (National Center for the Improvement of Educational Assessment, 2006), covering data from 2001-2005.[4] This study was based on hierarchical linear modeling (HLM) methodology. The general finding was that the average controlled gain score for students in charter schools exceeded those in the sending districts more often than not for math, but not for English. The present study differs in a number of respects, including modeling details and more years, but reaches findings that are consistent with the earlier study in the case of math (we do not have data on English). In addition, we find that the results are significantly more favorable for charter schools that draw from low-income urban districts than from suburban, rural, and other districts.

[2] This act also revamped the state's district funding system, introduced state standard-setting, and graduation exit exams. It was enacted at a time when the state's education system was found wanting by the state's business and political leaders, as well as by the state's highest court. These measures are widely credited with helping improve Massachusetts education, as indicated by its rise in NAEP rankings to the top of the nation, and also by the 2005 decision of the state's highest court to vacate its 1993 finding of constitutional failure to educate. (See Costrell (xxxx, xxxx), Reville (xxxx), Jacobs (xxxx))

[3] In addition, four charter schools were closed (or not renewed) by the state and four others closed on their own. The 61 charter schools include 54 "Commonwealth" charters, granted by the state board of education, and 7 "Horace Mann" charters, granted by the district, which are less independent in structure. This paper focuses on the Commonwealth charters.

[4] In addition to the longitudinal analysis, the study also included cross-sectional comparisons between the performance of the charter schools and that of the comparison sending districts (at the school level and subgroup).

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Data

The Massachusetts Comprehensive Assessment System (MCAS), the state's accountability exams, began in 1998, in math and English (ELA). Beginning in 2001, the 10th grade exams served as a graduation requirement (for the graduating class of 2003). From 2001 to 2005, math exams were administered in grades 4, 6, 8, and 10, with the full NCLB complement of grades 3-8 and 10 following in 2006. We obtained longitudinal data from the Massachusetts Department of Education[5] to track three cohorts culminating in 10th grade math. Since the department does not consider their pre-2001 longitudinal linking to be reliable, the earliest 10th grade cohort with three scores available was 2001-03-05, for grades 6, 8, and 10. We were able to add two more comparable cohorts for 2002-04-06, and 2003-05-07.[6]

MCAS scaled scores range from 200 to 280, with 2-point intervals. The scale is equated across time such that 220, 240, and 260 denote "basic," "proficient," and "advanced," and the scales in between these cut points are interpolated from raw scores. The scaling procedure does not ensure linearity between current and prior test scores (the key longitudinal relationship), but the empirical deviations from linearity seem to be minor.[7] However, since the lowest scaled score of 200 includes students with unexcused absences, the relationship is discontinuous at 200; there are very few such students, but our regression accommodates that discontinuity.

Raw Relationships

Figure 1 illustrates the raw relationship between students' 8th-grade scores and their own prior scores in 6th grade, for charter and district (i.e. non-charter) students. The size of the bubbles represents the share of students (in charter or district schools) at any given 6th-grade score. This relationship is of the type commonly examined in the literature, but it is potentially misleading, since the non-charter students are from all districts, rather than the districts that send students to the charter schools. With that caveat (revisited below), the data suggest that among students with 6th grade scores below about 240 ("proficient"), charter students do slightly better than district students in 8th grade, while the reverse is true for students who are already proficient in 6th grade.

Figure 2 provides a more direct comparison between charter students and students in the sending districts, for the case of Boston. There are six charter schools that draw exclusively from Boston, which had 8th grade scores in the period FY03-05 (accounting for about 20 percent of all such charter students). The results shown in Figure 2 are similar to those in the statewide comparison of Figure 1, again indicating higher 8th grade scores for Boston charter students than

[5] The department was recently renamed the Department of Elementary and Secondary Education.

[6] Fourth-grade scores would have been available for this last cohort, for 2001, but since such data would not have been reliable for earlier cohorts, they were not obtained for this one either. The last cohort was provided with greater restrictions on small cells than the first two cohorts, which does raise some comparability concerns.

[7] In addition to the linear relationships estimated below, we also considered spline functions, joined at the equated scale scores, but the results were not notably different.

district students, for the range of 6th grade scores up to about 240, followed by an inconsistent pattern at higher scores.[8]

The same kind of calculation can be done for each charter school, compared to its sending district, and the differences (i.e. distance between red and blue dots) can be aggregated to make broader comparisons. Figure 3 depicts the results, for all 28 charter schools with 8th grade scores (excluding 3 regional charter schools, for which no single sending district exceeded a small fraction of the charter's enrollment). Figure 3 differs conceptually from Figure 1, which did not directly compare charters and sending districts. However, the results are similar: there is a predominantly positive difference between charters and sending districts, except for the relatively few charter students who were high scoring to begin with.

It is also of interest to distinguish between charters in the low income urban districts, where the demand is greatest, and those in other districts. Of the 28 charter schools with 8th grade scores, 15 were low-income and from low-income urban sending districts and 13 were in a variety of suburban, rural, and other areas.[9] For each charter school, we calculated the average, over all 6th grade scores, of the difference between the charter and the primary sending district's 8th grade scores (i.e. the average of the vertical variable in diagrams such as Figure 3). These averages are depicted in Figure 4. Of the 15 urban-based charters, only 3 had a negative difference, compared to 6 out of 13 among the other charters.

The relationships between 10th grade and 8th grade scores in charter and district schools are depicted in corresponding diagrams, Figures 5-8. Figure 5 shows 10th grade scores in charters are generally higher than in district schools, for given 8th grade scores. Figure 6 shows the corresponding relationship between charters and district schools for Boston. Figure 7 shows the difference between 10th grade scores in charters and their sending districts, conditional on 8th grade scores, with strong positive difference for those with low 8th grade scores, and mixed results for those with high 8th grade scores. Figure 8 compares the charter-sending district difference for low-income urbans vs. other non-regional charters. Non-regional charters serving grade 10 are particularly concentrated in low-income urban districts, so there is a greater spread of results in those districts, compared to other districts. However, there is still evidence that on average the advantage for charters is greater in low-income urban districts. It is also interesting to note that of the three such charters that did not compare well with the sending district, two were later shut down.

Estimation

As previously discussed, comparing a charter school to the sending school is a more valid comparison than comparing charter schools to public schools overall. To better measure the effects of charter schools we estimate two econometric models and compare the rate at which

[8] The district students with high 6th grade scores are highly concentrated in Boston's three exam schools (Boston Latin, Boston Latin Academy, and O'Bryant School of Math and Science). If we exclude these schools, to focus the comparison on schools for which charter students are more commonly seeking an alternative, the picture is more favorable to charters.

[9] The criterion we use is that the minimum of the charter's and sending district's percent free-and-reduced lunch is 40 percent or more.

charter schools outperform their sending counterparts under the two models. The first model we refer to as the school effects model is effectively a cross-section estimation where we control for demographic and prior test scores using individual level data. The model we estimate is

$$M_{G8} = \varphi_0 + \varphi_1 M_{G6} + \boldsymbol{\varphi}\mathbf{Demogs}_{G8} + \beta\mathbf{School}_{G8} + u, \quad (1)$$

where M is the scaled score on the MCAS Math test in grade 8 or grade 6, **Demogs** is a vector of demographic control variables including race, gender, limited English proficiency, special education designation, and free or reduced price lunch as a proxy for household income. **School** is a vector of indicator variables for each public and charter school district in Massachusetts, and u is the usual normally distributed error term. The control variables also include an indicator variable for the cohort and scoring 200 on the 6th grade exam due to the possibility of being assigned a 200 for an unexcused absence. Once we estimate this model we are interested in testing whether $\beta_{charter} = \beta_{sending}$ for each combination of charter and sending school pairs, or equivalently, whether $\beta_{charter} - \beta_{sending} = 0$. We estimate the same equation using test score data from grade 10 as the dependent variable and test scores from grade 8 as a control variable. The model is estimated using OLS with the Boston school district as the excluded district indicator.

The second model we estimate, our fixed effects models, is

$$M_t = \alpha_i + \varphi_1 M_{it-1} + \boldsymbol{\varphi}\mathbf{Demogs}_{it} + \boldsymbol{\beta}\mathbf{School}_{it} + u_{it}. \quad (2)$$

The obvious difference from the previous model is that now the demographic control variables will only include items that can vary for some students over time. In our case that is special education classification, limited English proficiency, and free or reduced price lunch eligibility. This model also requires a student to be observed in all three grades to be included in the estimation, and for schools that include both 8th and 10th grades, the estimated coefficient is a function of both grades rather than each grade individually as in the school effects model. Once again, we are interested in testing $\beta_{charter} = \beta_{sending}$.

The estimated coefficients for the school effects and fixed effects models are shown in Tables 1 & 2. Table 1 shows the results for charter schools enrolling 8th graders and Table 2 shows the results for charter schools enrolling 10 grade students. The first column on the left shows the charter school/ sending school pair. The next column shows the difference in mean 8th grade test score conditional on 6th grade score. The next columns show the estimated coefficients from the school effects model for the charter school and sending school, respectively, followed by the difference in the coefficients and the p-value for testing the equality of the two coefficients. The last column has the same estimates for the fixed effects model. The schools above the break are the low-income urban school and below the break are all other schools.

Discussion

Several noteworthy results emerge from Tables 1A and 2A. In both models there are positive and negative differences for urban and non-urban schools. There some of differences are insignificant, but there are also many strongly statistically significant results. The difference between the coefficients can be thought of as the degree to which the charter school "outperforms" the sending school, or the value added to the students' test scores by attending the charter school. When negative, this indicates the charter school underperforms the sending school. The mean effect for urban and non-urban charters are shown at the bottom of the tables 1A and 2A. In each case the mean for urban charters is positive and higher than the mean for non-urban charters. This would indicate, on average, urban charter schools outperform the sending school, and do so to a larger degree than non-urban charters. Non-urban charter schools actually appear to underperform the sending school on average in every model but the school effects model using grade 10 data.

Tables 1B and 2B summarize the results and significance levels of the estimated differences. A Kolmogorov Smirnov test of equality of distributions was run on each set of results testing whether the differences between charter and sending coefficients among urban and non-urban appear to be drawn from the same population. The probability of the test is shown. For the school effects model we cannot reject the null hypothesis that the observed differences were drawn from the same population at the 5% level for either grade, although 8th grade is close at 5.9%. For the fixed effects model we can reject that the observed differences are random and conclude that charter schools in urban and non-urban areas have different effects relative to the sending schools.

Figures 9 and 10 show the difference in the estimated coefficients for urban and non-urban charter schools for 8th grade and 10 grade students, respectively. These are slightly different from the results in Tables 1 & 2 since it is relative to a weighted average of all sending schools rather than the coefficient of the primary sending school. In figure 9 there are clearly more non-urban charter schools that appear to underperform the sending school. The predominant observation from figure 10 is that 4 of the 13 urban charters outperform their sending school by a magnitude well beyond what any non-urban charters achieve.

Conclusions

Our preliminary analysis provides some evidence that urban charter schools outperform their sending school, which we believe to be the correct comparison to make in evaluating charter school performance. Clearly, more in-depth analysis and sensitivity analysis needs to be done before any broad conclusions can be reached. Due to tight enrollment caps on charter schools in Massachusetts, and the requirement that oversubscribed schools use a random lottery to assign openings, it is possible that in the future data will be able to evaluate this as a randomly assigned, controlled experiment.

Figure 1: 8th Grade vs. 6th Grade Scores, Charter and District Students, FY03-FY05

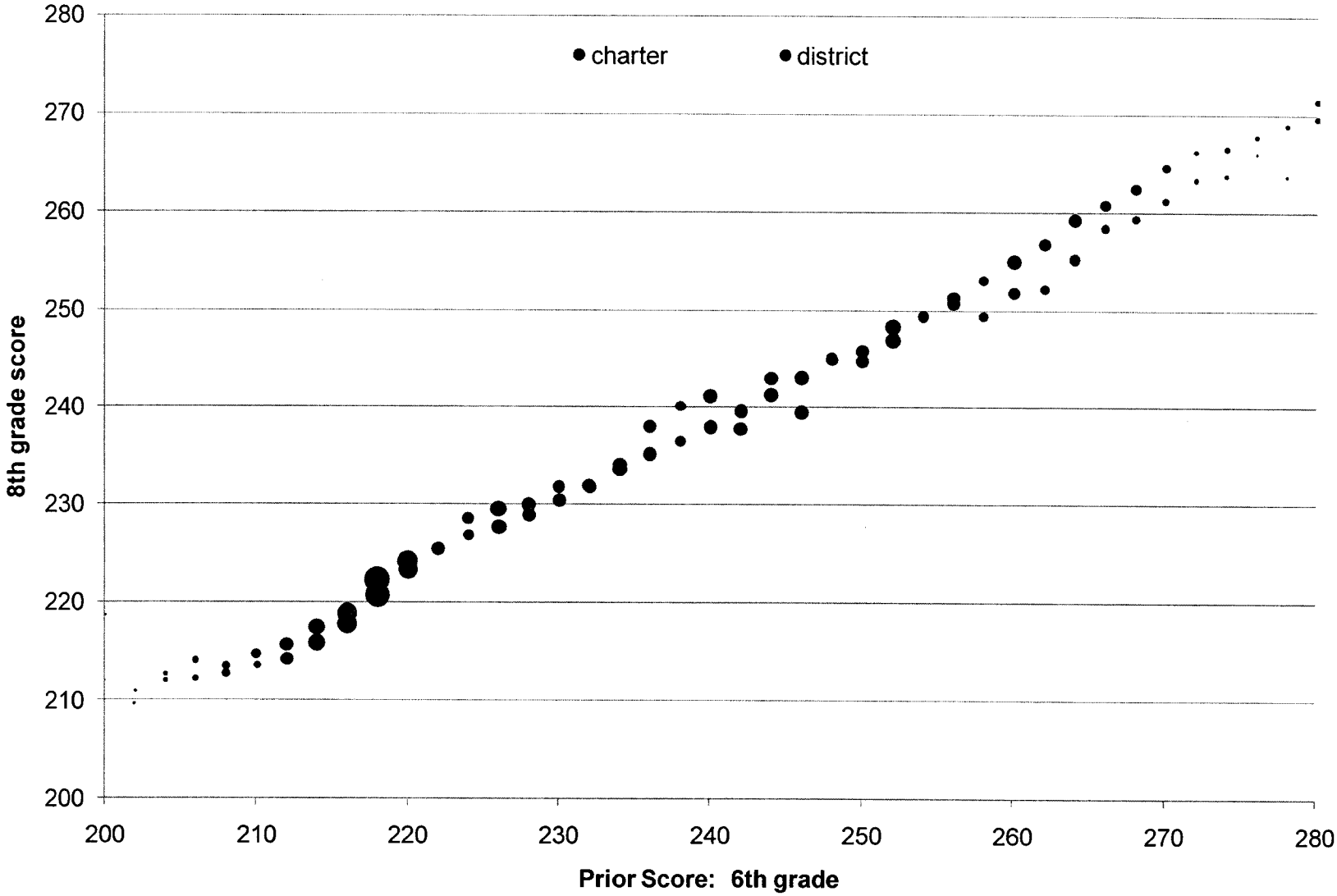


Figure 2: 8th Grade vs. 6th Grade Scores, Boston Charter and District Students, FY03-05

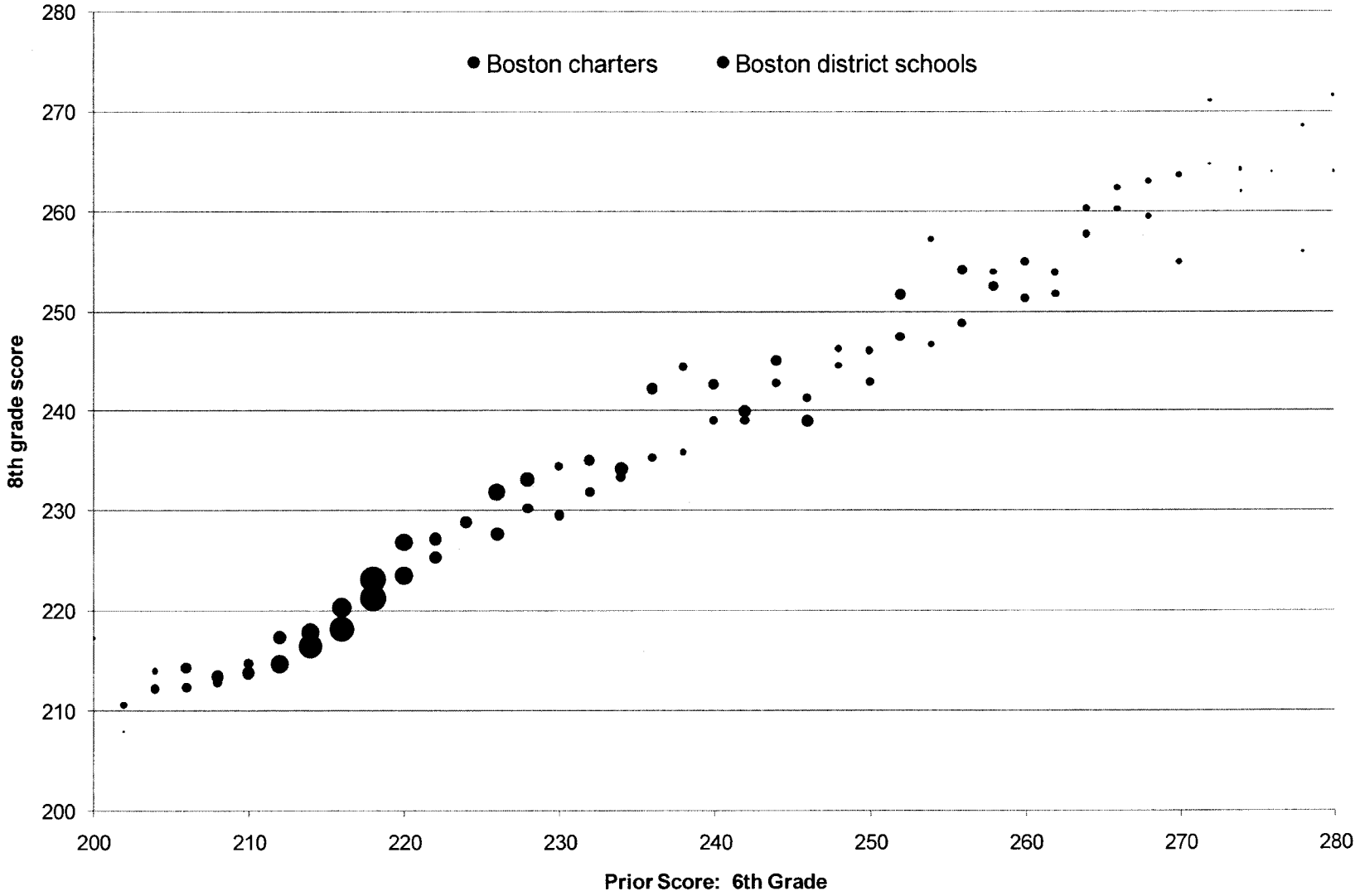
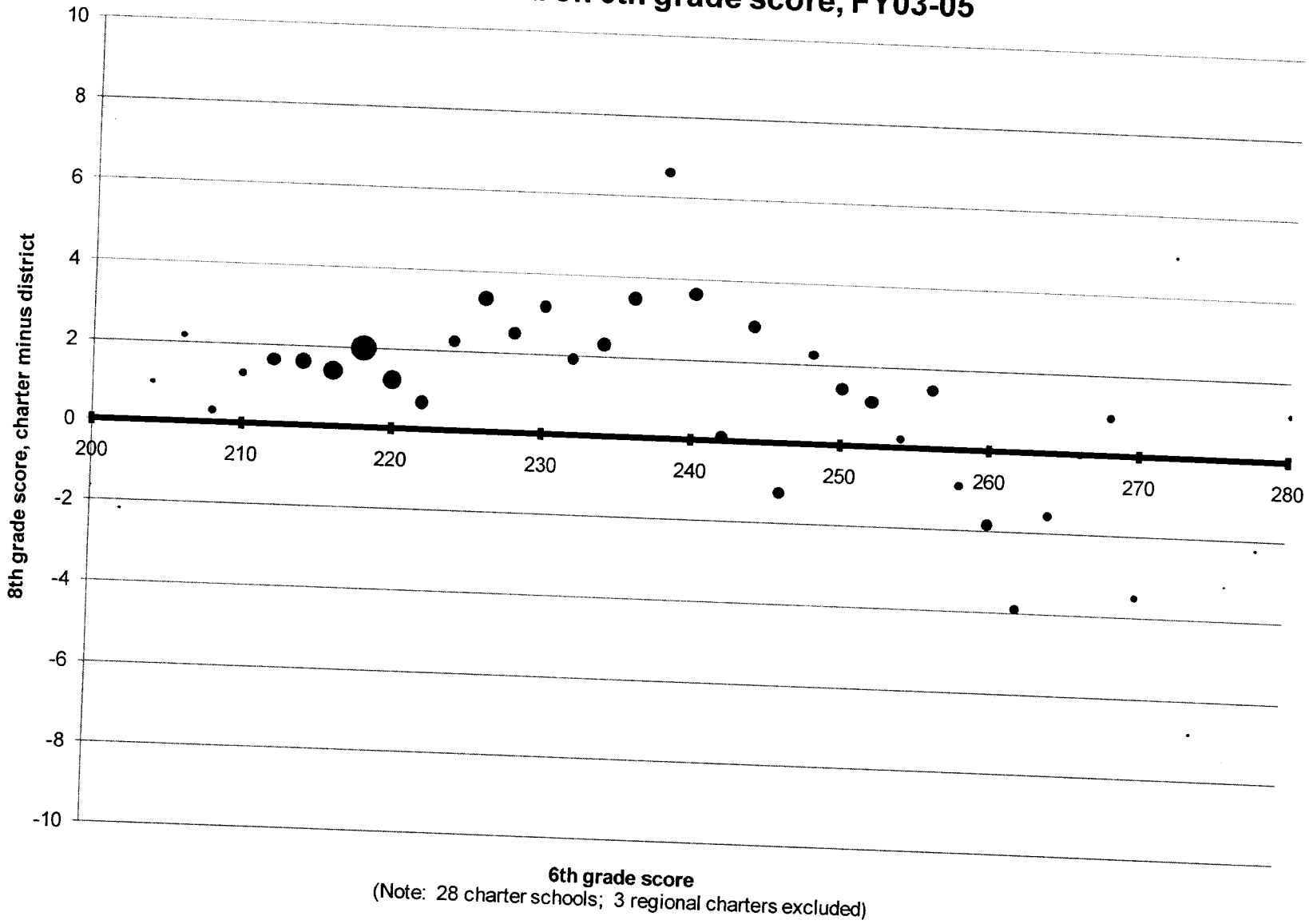


Figure 3: Charter vs. Sending District Scores, 8th grade, Conditional on 6th grade score, FY03-05



(Note: 28 charter schools; 3 regional charters excluded)

Figure 4: Charter vs. District, Low-Income Urban & Others. Average Difference, 8th grade, conditional on 6th, FY03-FY05

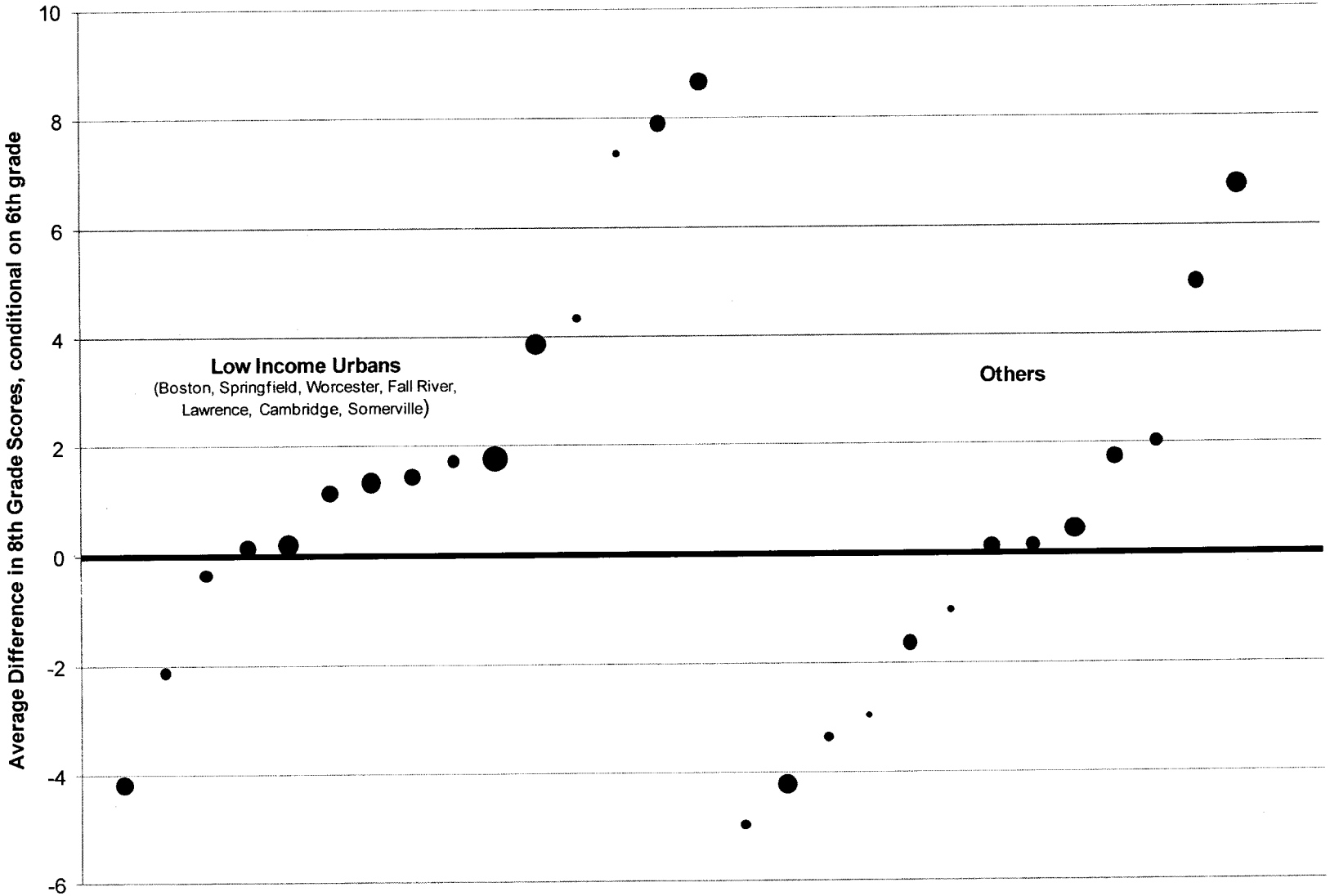


Figure 5: 10th Grade vs. 8th Grade Scores, Charter and District Students, FY05-FY07

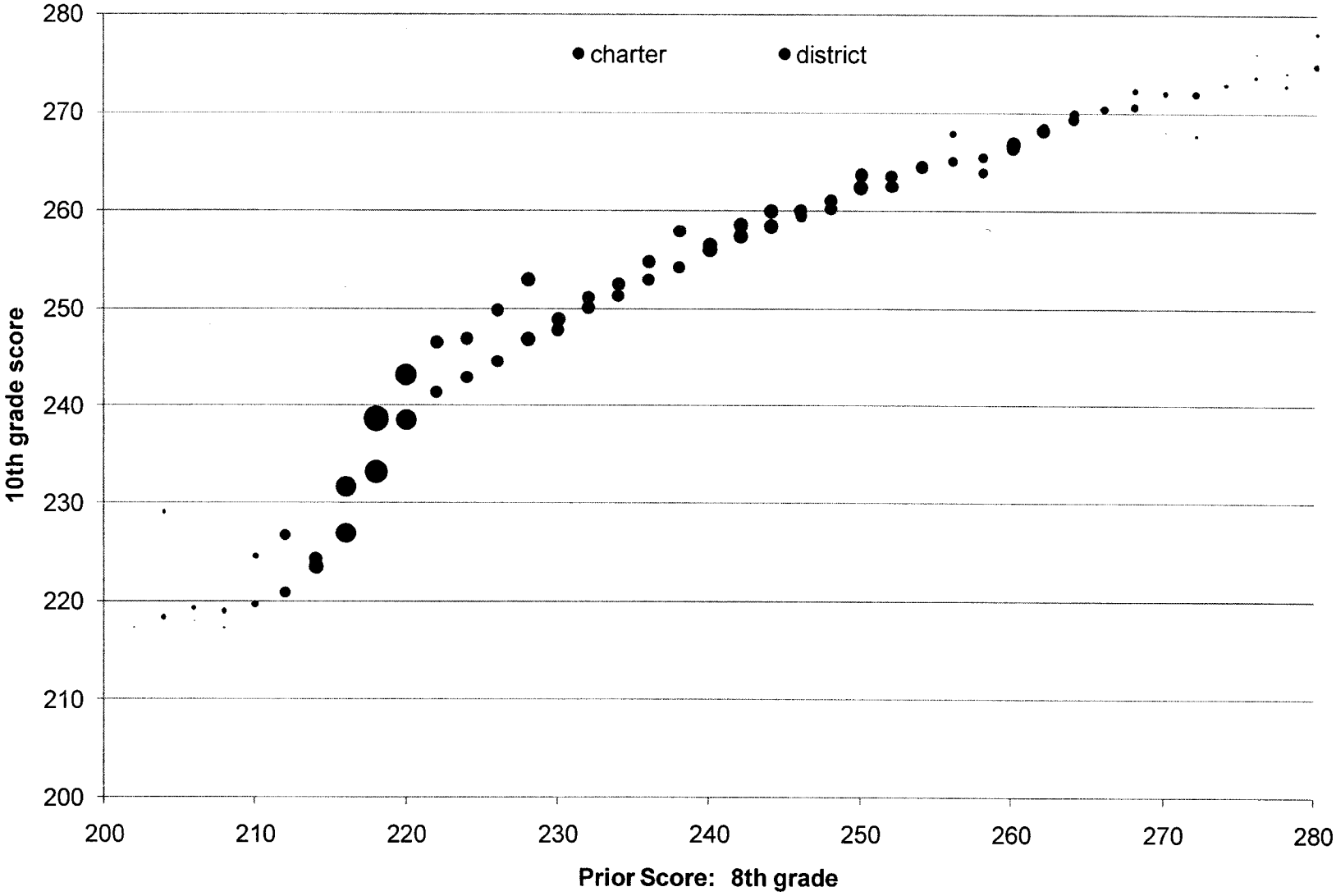


Figure 6: 10th Grade vs. 8th Grade Scores, Boston Charter and District Students, FY05-07

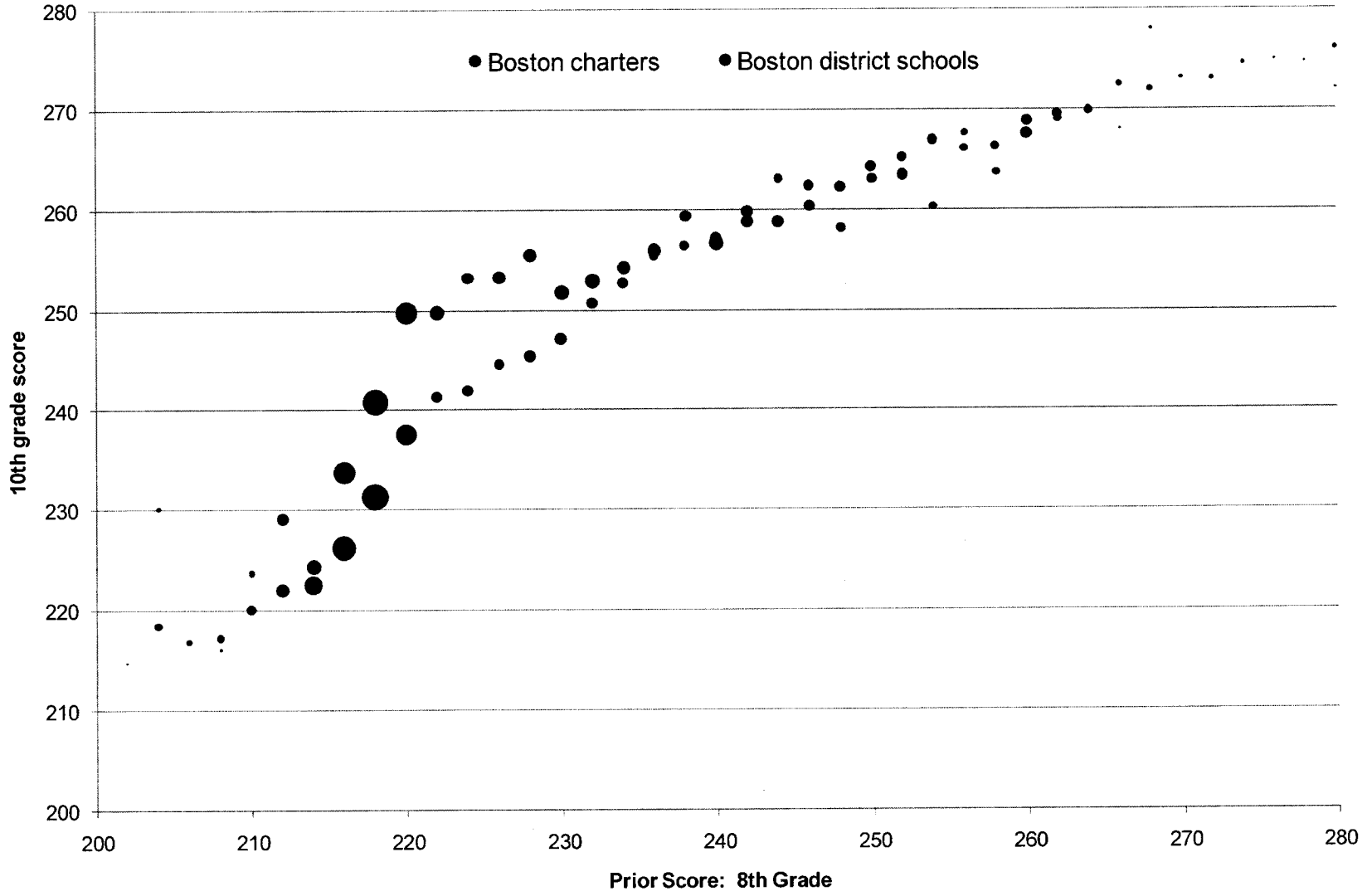
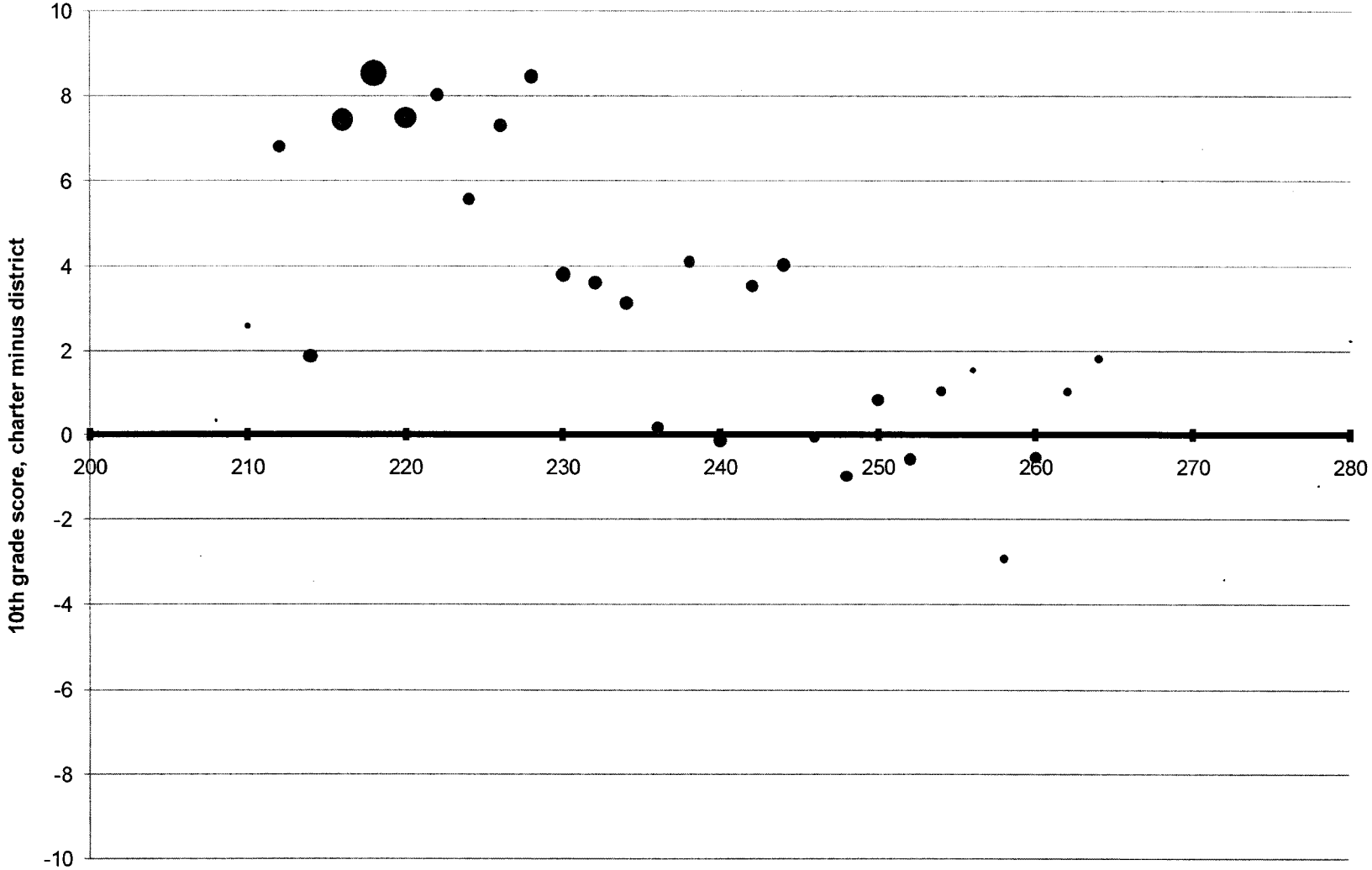


Figure 7: Charter vs. Sending District Scores, 10th grade, Conditional on 8th grade score, FY03-05



(Note: 17 charter schools; 5 regional charters excluded)

Figure 8: Charter vs. District, Low-Income Urban & Others. Average Difference, 10th grade, conditional on 8th, FY05-FY07

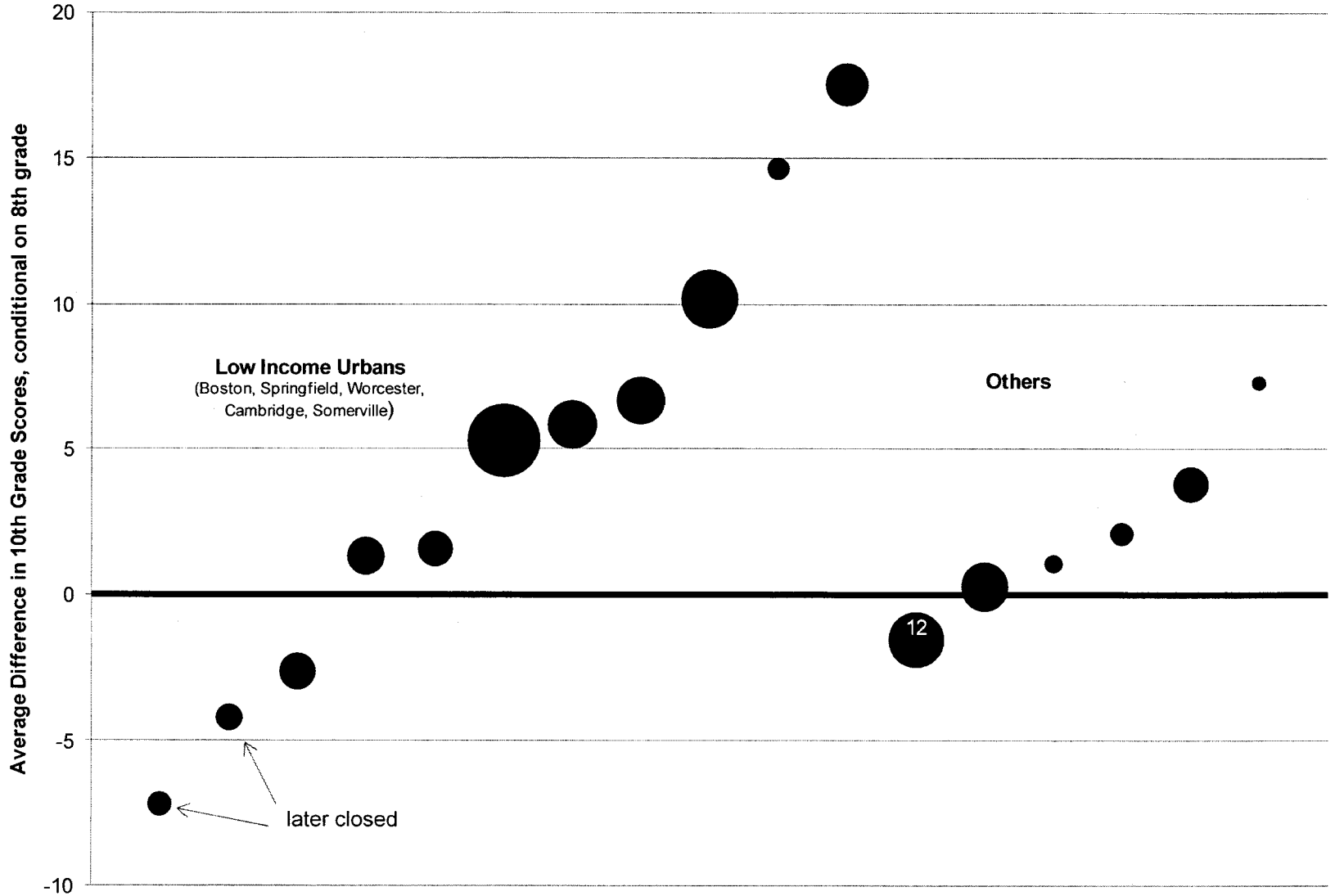


Figure 9: Charter vs. Weighted Average of Sending Districts, 8th grade
Difference in Regression Coefficients, conditional on 6th grade scores

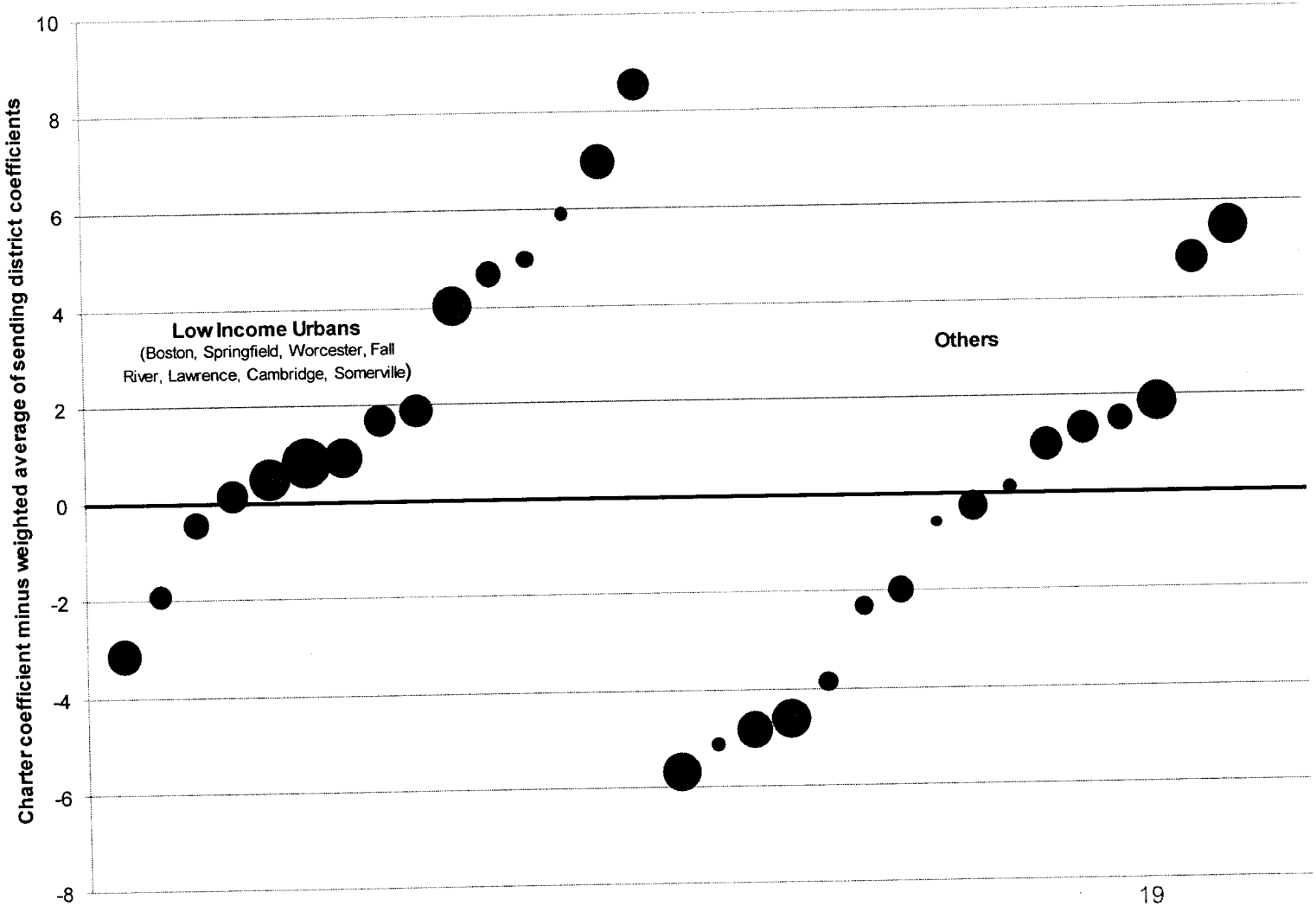


Fig 10: Charter vs Weighted Average of Sending Districts, 10th grade
Difference in Regression Coefficients, conditional on 8th grade scores

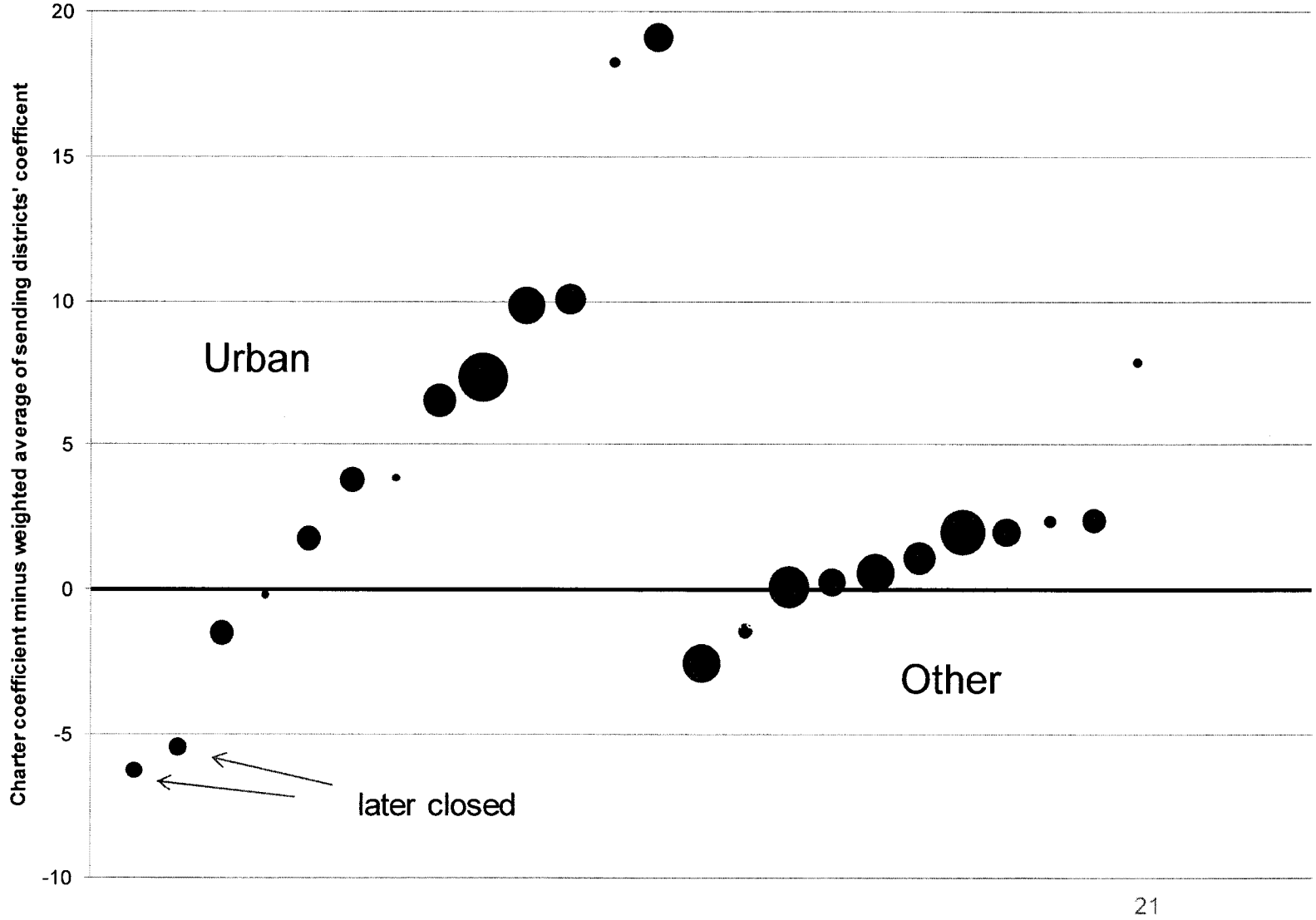


Table 1A **Grade 8 Estimated School Effects**

Charter		Sending		Diff	Estimated School Effects				Fixed Effects			
				non-reg	Charter	Sending	Diff	P-value	Charter	Sending	Diff	P-value
487	Somerville Charter	274	Somerville	-4.2	-2.1	2.4	-4.5	0.000	3.2	2.2	1.0	0.657
420	Benjamin Banneker	49	Cambridge	-2.1	-1.6	1.1	-2.7	0.002	-0.9	0.5	-1.4	0.506
449	South Boston Harbor	35	Boston	0.4	-0.5	0.0	-0.5	0.745	4.4	0.0	4.4	0.152
442	Frederick Douglass	35	Boston	0.5	0.1	0.0	0.1	0.867	0.4	0.0	0.4	0.784
481	Boston Renaissance	35	Boston	0.7	0.5	0.0	0.5	0.346	0.9	0.0	0.9	0.386
491	Atlantis	95	Fall River	1.3	-3.1	-4.3	1.2	0.060	3.2	0.6	2.6	0.030
454	Lawrence Family Development	149	Lawrence	1.5	0.8	-1.0	1.9	0.005	-1.7	1.0	-2.7	0.121
440	Community Day	149	Lawrence	1.7	3.7	-1.0	4.7	0.002	11.9	1.0	11.0	0.000
441	Sabis International	281	Springfield	1.8	-2.0	-2.8	0.8	0.166	4.8	-0.5	5.2	0.002
412	Academy Of the Pacific Rim	35	Boston	2.3	1.6	0.0	1.6	0.071	6.0	0.0	6.0	0.000
486	Seven Hills	348	Worcester	3.9	-1.1	-5.2	4.0	0.000	4.2	-0.1	4.2	0.000
444	Neighborhood House	35	Boston	4.7	4.8	0.0	4.8	0.006	1.6	0.0	1.6	0.349
451	Robert M. Hughes	281	Springfield	7.4	3.1	-2.8	5.9	0.006	8.1	-0.5	8.6	0.000
445	Abby Kelley Foster	348	Worcester	8.7	2.8	-5.2	7.9	0.000	0.3	-0.1	0.4	0.843
484	Roxbury Prep	35	Boston	9.1	8.5	0.0	8.5	0.000	6.8	0.0	6.8	0.000
418	Christa McAuliffe	100	Framingham	-4.9	-2.9	0.6	-3.5	0.048	-4.1	-0.3	-3.8	0.036
474	North Central Essential School	97	Fitchburg	-4.2	-5.5	-1.1	-4.4	0.000	-2.9	-0.1	-2.9	0.109
466	Martha's Vineyard	774	Upisland	-3.3	3.2	6.5	-3.3	0.064	-2.2	1.5	-3.8	0.131
450	Hilltown	210	Northampton	-2.9	-0.4	2.1	-2.5	0.384	-2.2	-2.3	0.0	0.988
447	Benjamin Franklin	101	Franklin	-1.6	1.3	2.2	-0.9	0.418	2.0	0.5	1.6	0.248
413	Four Rivers	114	Greenfield	-1.0	-1.6	-1.1	-0.5	0.844	5.9	3.2	2.7	0.281
435	Murdoch	56	Chelmsford	0.1	1.7	3.0	-1.3	0.229	-2.0	0.2	-2.3	0.094
488	South Shore	142	Hull	0.2	-4.7	-4.1	-0.6	0.596	-0.2	2.6	-2.8	0.159
432	Cape Cod	660	Nauset	0.5	3.0	2.5	0.5	0.596	0.0	3.9	-4.0	0.000
464	Marblehead	168	Marblehead	1.8	1.1	0.4	0.7	0.509	-4.3	-0.6	-3.7	0.001
482	River Valley	204	Newburyport	2.0	1.3	-1.2	2.5	0.059	-6.6	0.2	-6.9	0.000
483	Rising Tide	239	Plymouth	5.0	2.4	-2.6	5.0	0.000	-0.4	-0.1	-0.3	0.755
470	Mystic Valley	165	Malden	6.8	3.5	-2.6	6.1	0.000	-5.3	0.8	-6.1	0.000

mean	**urban**	**2.3**		**mean**	**urban**	**3.3**	
	non	**-0.2**			**non**	**-2.5**	

Table 2A

Grade 10 Estimated School Effects

Charter			Sending	Diff	Estimated School Effects				Fixed Effects			
				non-reg	Charter	Sending	Diff	p-value	Charter	Sending	Diff	p-value
412	Academy Of the Pacific Rim	35	Boston	6.7	10.1	0.0	10.1	0.000	6.0	0.0	6.0	0.088
422	Roxbury Charter	35	Boston	-7.1	-6.2	0.0	-6.2	0.000	-6.4	0.0	-6.4	0.000
437	City On A Hill	35	Boston	5.9	6.5	0.0	6.5	0.000	5.7	0.0	5.7	0.000
438	Codman Academy	35	Boston	-2.6	-1.5	0.0	-1.5	0.312	-0.1	0.0	-0.1	0.944
441	Sabis International Charter (District)	281	Springfield	5.3	2.3	-5.1	7.4	0.000	4.8	-0.5	5.2	0.002
442	Frederick Douglas	35	Boston	-4.2	-5.4	0.0	-5.4	0.004	0.4	0.0	0.4	0.784
445	Abby Kelley Foster	348	Worcester	1.6	-0.8	-2.8	2.0	0.112	0.3	-0.1	0.4	0.843
449	Boston Collegiate	35	Boston	1.3	3.8	0.0	3.8	0.000	4.4	0.0	4.4	0.152
458	Lowell Middlesex Academy	160	Lowell		1.7	-2.3	4.0	0.114	4.5	0.4	4.1	0.344
469	Media and Technology Charter (District)	35	Boston	17.5	19.1	0.0	19.1	0.000	21.9	0.0	21.9	0.000
487	Prospect Hill Academy Charter (District)	274	Somerville	10.2	9.1	-1.7	10.8	0.000	3.2	2.2	1.0	0.657
493	Phoenix Charter Academy (District)	163	Lynn		-1.8	-1.6	-0.2	0.966	0.0	-0.2	0.2	0.862
413	Four Rivers Charter	114	Greenfield	3.8	3.0	-1.2	4.2	0.013	5.9	3.2	2.7	0.036
414	Berkshire Arts and Technology	209	North Adams	2.1	-3.8	-4.1	0.3	0.874	-2.2	1.7	-3.9	0.281
466	Martha's Vineyard Charter (District)	700	Marthas Vineyard	1.1	2.0	-0.3	2.3	0.407	-2.2	2.8	-5.0	0.037
470	Mystic Valley Regional Charter (District)	165	Malden	0.3	1.4	0.6	0.8	0.359	-5.3	0.8	-6.1	0.000
474	North Central Charter Essential (District)	97	Fitchburg	-1.5	-3.1	-1.2	-1.9	0.060	-2.9	-0.1	-2.9	0.109
485	Salem Academy Charter (District)	258	Salem	7.3	6.4	-1.4	7.9	0.060	4.2	0.8	3.4	0.375
					Mean	Urban	4.2			Urban	3.6	
						Non	2.3			Non	-2.0	

Table 1B **Summary of Estimated Charter School Effects**
Grade 8

School Effects Model

	Underperforming				Overperforming		
	1%	5%	10%	same	10%	5%	1%
Urban	2	0	0	4	2	0	6
Non-Urban	1	1	1	7	1	0	3
Total	3	1	1	11	3	0	9

Kilmogorov Smirnov Test p-value = 0.059

Fixed Effects Model

	Underperforming				Overperforming		
	1%	5%	10%	same	10%	5%	1%
Urban	0	0	0	8	0	1	5
Non-Urban	4	1	1	7	0	0	1
Total	4	1	1	15	0	1	6

Kilmogorov Smirnov Test p-value = 0.000

Table 2B **Summary of Estimated Charter School Effects**
Grade 10

School Effects

	Underperforming				Overperforming		
	1%	5%	10%	same	10%	5%	1%
Urban	2	0	0	4	0	0	6
Non-Urban	0	0	1	3	1	1	0
Total	2	0	1	7	1	1	6

Kilmogorov Smirnov Test p-value = 0.760

Fixed Effects

	Underperforming				Overperforming		
	1%	5%	10%	same	10%	5%	1%
Urban	1	0	0	7	1	0	3
Non-Urban	1	1	0	3	0	1	0
Total	2	1	0	10	1	1	3

Kilmogorov Smirnov Test p-value = 0.000