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AIR

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Contents

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Abstract

Studies of the charter sector typically compare charters and traditional public schools at a point in time. These comparisons are potentially misleading because many charter-related reforms require time to generate results. We study quality dynamics among Texas charter schools from 2001-2011. School quality in the charter sector was initially highly variable and on average lower than traditional public schools. However, exits, improvement of existing charter schools, and expansion of higher-performing charter management organizations increased charter effectiveness relative to traditional public schools. We present evidence that reduced student mobility and an increased share of charters adhering to No Excuses- style curricula contribute to these improvements.

JEL Codes: H0, H75, I20, I21.

Introduction

The rapid expansion of the charter school sector in many states has proved controversial, in part because of mixed evidence on the role charters play in improving academic achievement. Some studies focusing on oversubscribed urban charter schools have found positive achievement impacts,[1] though these findings have yet to be generalized to other settings. In particular, studies focusing on all charter schools in a geographic area, not just those that are over-subscribed, have found much smaller or even negative impacts of charter schools on achievement.[2] These incongruous findings support the claims of both advocates and opponents of charter schools. Advocates point to the high quality of many oversubscribed schools as evidence that charters are living up to their promise. Opponents highlight the mediocre average outcomes and high variability in performance among the broader set of schools as evidence against further charter sector expansion or at times even the continuation of charter schools. Moreover, drawing appropriate implications for policy from existing evidence is hampered by the cross-sectional nature of the analyses. Deeper understanding of this market-oriented reform requires examination of the longer-term dynamics of the charter sector.

Although little comprehensive research exists on the evolution of charter school quality, two studies provide evidence consistent with effective market forces pushing schools to improve. First, Hanushek et al. (2007) show that higher school value-added increases the probability of student reenrollment in charter schools, suggesting that households respond to quality. Second, CREDO (2013)

[1]Abdulkadiroğlu et al. (2011), Angrist et al. (2012), and Angrist, Pathak, and Walters (2013) report results for charter schools in and around Boston, and Dobbie and Fryer (2011) and Hoxby, Murarka, and Kang (2009) report results for New York City.

[2] See, for example, evidence from statewide studies in Bifulco and Ladd (2006), Sass (2006), Booker et al. (2007), and Hanushek et al. (2007). See also the multiple state comparisons in CREDO (2009, (2013).

finds that average charter school effectiveness has improved relative to traditional public schools in a number of states and highlights the closure of poorly performing charter schools.

This paper capitalizes on detailed longitudinal data for students and schools to contribute new evidence to this debate. It has two principal aims. First, the paper describes how the distribution of charter school quality in Texas, one of the largest charter school states, has evolved between 2001 and 2011. Second, it investigates the extent to which more fundamental factors –student mobility, student selection into and out of charters, and the share of schools that adhere to a "No Excuses" philosophy – contribute to the observed changes in school quality.

The descriptive analysis provides strong evidence that charter school quality has improved over time in Texas. Specifically, we find that mean charter school mathematics value-added improved relative to traditional public schools by approximately 0.12 of a standard deviation, and similar improvements were seen throughout the distribution. Improvement in mean charter school reading value-added was about 0.09 of a standard deviation; however, for reading this improvement was concentrated at the lower end of the charter school quality distribution. Declines in the variances of charter-school mathematics and reading value-added driven by dramatic reductions in the numbers of schools in the left tales of the respective distributions accompany improvements in the average performance of charter schools.

To understand better the source of these improvements, we first consider how the dynamics of school entry and exit affect the distribution of school quality. We find that the voluntary and involuntary closure of underperforming schools, the increase in the quality of new entrants, and the improvement of existing schools combine to increase the mean and to reduce the variance of charter school value-added relative to traditional public schools. First, similar to the findings in CREDO (2013), schools that close prior to 2011, either voluntarily or following state authorizer intervention, come

disproportionately from the lower end of the quality distribution. Second, charter schools that open after 2001 and are still operating in 2011 have an average value-added that far exceeds those that closed and roughly equals the average of charter schools open the entire period. Third, average value-added increases for charter schools that remain open throughout the decade. Although average charter and traditional public school value-added is quite similar in 2011, the changes over time suggest that market forces contribute to these dynamic improvements in the charter sector.

The analysis of school factors provides evidence that the increase in the share of charter schools adhering to a No Excuses philosophy and the decline in student mobility contribute to the improvement in the sector. Even though inclusion of the student mobility and selection variables reduces the magnitude of the estimated No Excuses effect, it remains highly significant in all specifications. Student mobility, largely unstudied in this context, appears to contribute substantially to the improvement of the sector. This finding highlights the importance of patience in understanding the effects of a large-scale reform that opens the education sector to many new entrants of variable quality and that precipitates extensive switching among schools. Finally, although selection into charter schools on the basis of prior achievement and behavior becomes on average more positive over time, there is little evidence that these have been an important component of the improvement in charter school value-added.

We begin with a brief overview of the charter school market in Texas, followed by a description of the Texas Schools Project microdata used in the study. Then we discuss the various approaches used to measure school quality and describe the relative improvement of the charter sector. The final two sections examine the contributions of specific factors to the observed improvements and discuss policy implications and directions for future study.

The Texas Charter School Program

Since enacting charter school legislation in 1995, the Texas charter sector has grown into one of the largest in the nation. It ranks second nationally in both the number of charters operating and the number of students served by charters in 2010-11.[3] We first discuss the enabling legislation and subsequent modifications and then describe the growth of the Texas charter sector.

Institutional Structure

The Texas Education Code establishes four types of charters: home-rule school district charters, independent school district charters, university/college campus or program charters, and open enrollment charters. Open-enrollment charters, which are the focus of this study, constitute the majority of charter schools and educate a substantial fraction of the students enrolled in the sector. Open-enrollment charters are awarded under the auspices of the Texas State Board of Education, which acts as the primary overseer for these schools. These schools are independent public educational entities, and the state designates a unique county-district identifier for schools operating under each open enrollment charter. District charters, by contrast, are established by and accountable to the school districts in which they reside. The small number of university charters makeup the remaining charters in the state and their establishment and operation is similar in character to open-enrollment charters. Thus, we make no distinction between these and open enrollment charters and include university charters in all of the estimates. No home-rule district charters have been established as of this writing.[4]

[3]U.S. Department of Education (2014), Table 216.90 [http://nces.ed.gov/programs/digest/d13/tables/dt13_216.90.asp, accessed June 30, 2014].

[4] Home rule charter districts offer the possibility of increased flexibility for the entire district, but they also have a number of procedural requirements including approval by local voters. The Dallas Independent School District had met the initial requirements and had a charter commission that was developing a charter for the voters, but the commission voted to stop the process in January 2015. See http://www.homerulecommission.com/ [accessed October 31, 2015].

The defining feature of open-enrollment charter schools is their receipt of public funding without many of the regulatory restrictions, chiefly in the realm of personnel, inherent in traditional public schools. Outside of the requirements imposed by No Child Left Behind legislation for teachers in core areas in any open-enrollment charter receiving federal funds, these charter schools have almost no restrictions on hiring and firing. They may hire teachers who currently lack certification or bring skills and experiences that may not be rewarded in conventional public schools. In addition, open-enrollment charters are able to set salary and benefit schedules freely. By contrast, district charters maintain the hiring and salary rules of their home districts. This distinction leads to some important differences in the characteristics of staff: open-enrollment charters tend to employ less experienced teachers who are less likely to have a post-graduate degree than teachers in traditional public schools. Open enrollment charters also pay, on average, lower salaries.

Although district charters offer a degree of parental choice, they involve significantly different incentives for the traditional schools – because total district enrollment and revenue is unaffected by movement to charters. Additionally, because they involve existing personnel, support structures, and general institutional framework, the dynamics of start-up are quite different from those for new open enrollment charters. In some cases, it becomes difficult to distinguish the characteristics of a district charter from those of other schools in the district, and a number of district charter schools have been stripped of their charter status. Therefore, we focus on open-enrollment charters, because they more closely approximate new entrants into a competitive market.

Despite differences in hiring and staffing, all charters in Texas are similar in their stated goals to implement new curricular and disciplinary practices that improve the educational outcomes of their students. The path to achieving these goals differs, however, as both the public mission statements and operational choices of charters vary widely across the sector. For example, many combine standard

skills enrichment with an emphasis on discipline; others center the curriculum on more specialized interests such as athletics, the sciences, or music and the arts.

Regardless of curriculum, all charters are subject to the same accountability and testing requirements as traditional public schools. Performance on these achievement measures is the quality dimension central to the enabling legislation and the heart of our evaluation of performance.

Institutionally, there is not a one-to-one match between each charter granted and a specific school (called a campus in Texas). A charter school management organization (CMO) can hold more than one charter, and each charter can include multiple campuses in the same manner that a traditional public school district can include multiple campuses. As a general rule, each charter applies to one geographic market, and a CMO entering multiple markets will have multiple charters.

Figure 1 illustrates the institutional structure of the Texas charter sector and the dimensions over which a CMO can expand operations using *America Can!*'s entry and growth through 2011 as an example. *America Can!,* a 501(c)(3) non-profit organization, successfully applied for a charter in Dallas and operated one of the first charter schools in Texas in 1997. This CMO subsequently expanded along two dimensions. First, it received an additional four open enrollment charters (covering Houston, San Antonio, Ft. Worth, and Austin) between 1999 and 2005 for a total of five charter districts; and second, it increased the number of campuses operated in three of these charter districts. This pattern highlights a key aspect of the regulatory structure of charter schools in Texas: The approval process of charter districts in good standing to expand the number of schools is far less involved than applying for a new charter, suggesting that the cost of procuring approval for an additional school is likely to be modest relative to other costs associated with adding a school.

From 1997 to 2000, there was no statutory limit on the number of open-enrollment charters granted to management organizations that committed to operate schools that served at least 75

percent “at-risk” students, although the number of unrestricted open-enrollment charters was limited to 100. Two changes were made in 2001. In response to reports of poor performance and mismanagement at some schools, the legislature relaxed the at-risk student composition constraint.[5] At the same time, a strict limit of 215 was imposed on the total number of charters awarded under the open-enrollment program. This limit implicitly advantages existing charter holders by restricting the entry of new charter holders in an environment that permits incumbent CMOs to expand by opening new campuses.

Open-Enrollment Charter School Growth

Figure 2 illustrates the growth of open enrollment charters between 1995 and 2011. Prior to 2001, entry of charter school operators and the establishment of new districts constituted the bulk of expansion in the charter sector, as both the number of charter holders and districts increased. After 2001, however, the numbers of charter holders and districts remained roughly stable (around 150 holders and 200 districts), while the number of schools roughly doubled.

Figure 3 shows the stock and flow of charters by type. It includes the number of charter districts by active status relative to the state limit as well as the number annual charter authorizations and discontinuations. The number of charters increased through 2001 partly due to the elimination of the separate “at-risk” charter category and the more than doubling of the cap on unrestricted open enrollment charters. The annual increase in the number of new charter districts, however, declined steadily between 1999 and 2002. Exit of charter school operators during the period spanning 2000 – 2011 contributed to these changes as some had their charters revoked and others voluntarily

[5] Even though the at-risk requirements were modified, the charter sector has continued to enroll an increasingly larger share of poverty students compared to the traditional public school sector.

surrendered them. Most of the increase in charter schools, however, can be attributed to expansion of campuses among existing charter districts.

The UTD Texas Schools Microdata Panel

The cornerstone of this research is the microdata constructed by the Texas Schools Project at the University of Texas at Dallas. These data include test scores, demographic characteristics, and information on school attendance and academic programs for a stacked panel of students and schools.[6] Our analysis focuses on over 400 separate charter school campuses and their enrollees for the period spanning 2001 to 2011. School information includes location, grade levels offered, enrollment, charter school type, state accountability rating, and information on all staff. Student information includes demographics, mathematics and reading test results, school attended, grade, and academic program. Students who switch schools, including between traditional public and charter schools, can be followed as long as they remain within the Texas public school system.[7]

Mathematics and reading assessments come from statewide criterion-referenced achievement tests administered during our period of study. From 1993-2003, the Texas Assessment of Academic Skills (TAAS) was administered each spring to students enrolled in grades three through eight. In 2003, Texas introduced the Texas Assessment of Knowledge and Skills (TAKS).[8] TAKS expanded the number of subjects for which students were required to demonstrate proficiency and elevated the difficulty of the tests. The tests are not vertically aligned. Thus, these tests cannot be used to measure absolute changes

[6]A more detailed description of the underlying database can be found in Kain (2001) and other publications on the website for the Texas Schools Project: http://www.utdallas.edu/research/tsp-erc/.
[7] Private schools enrollment in Texas remains relatively small at less than six percent in 2011 (U.S. Department of Education (2014)).Moreover, in 2010 only 23 percent of people born in Texas had migrated to another state, making it the state with the lowest out-migration rate in the nation(Hanushek, Ruhose, and Woessmann (2015)).
[8] The TAKS exam was recently repealed by the Texas legislature and schools will now transition to End of Course Exams.

over time in charter school quality; rather they provide information on performance relative to other students and schools in the same grade and year.

Because the test structure, number of questions, and average percent correct vary across time and grades, we standardize all test scores to have a mean of zero and a variance equal to one for each grade and year. To address potential concerns associated with imposing a new testing regime, we examine the sensitivity of the results to changes from TAAS to TAKS. We also standardize Spanish language tests separately to avoid potential bias that may arise from pooling.

Any school without students in the TAAS/TAKS data is excluded from the sample; therefore, our number of charters will differ from public records of the number of authorized charter schools.[9] Also omitted are those charter schools exclusively serving children with special needs, residents in treatment programs, or students with diagnosed behavioral problems.

For the subsequent analysis of charter sector improvement, we construct a unique database that incorporates the operational focus of each charter school. Specifically, on the basis of information gathered through interviews and records investigations, we classified each CMO on the basis of whether or not it adheres to a No Excuses philosophy as defined below in Section 6 and in Appendix B. We also use the components of the "No Excuses" taxonomy in separate analyses.

Measuring Charter School Quality

The primary concern in measuring charter school performance is that unobserved differences between charter school and traditional public school attendees contaminate comparisons of achievement in the two sectors. This is particularly salient in this analysis, as evidence below illustrates the increasingly positive selection of charter school entrants in terms of prior achievement. We begin

[9]Note, however, that students do not have to have to complete the tests to be included in the TAAS/TAKS file.

with a school-level value-added model (which becomes the base specification in our subsequent estimation). In the context of this model, we highlight potential problems introduced by purposeful sorting of students into schools. From that, we consider common alternative approaches to mitigate these problems in the estimation of charter school effects and how these interact with our focus on the estimation of changes over time in charter school effectiveness.

School Value-added Model

Equation (1) is a value-added model where achievement A for student i in grade g and school s is a function of prior achievement, prior behavior (D), contemporaneous student and family factors (X), a school fixed effect that measures school quality (δ_s), and a random error:

$$A_{is} = f(A_{i,t-1}) + 1[D_{i,t-1}] + X_{is}\beta + \delta_s + \epsilon_{is} \qquad (1)$$

Following the literature, we control for prior achievement with cubic functions in both mathematics and reading scores. We also include an indicator for receipt of a disciplinary infraction in the prior year. The vector X includes indicators for race, ethnicity, gender, and mobility. Note that we suppress grade fixed effects and the time subscript to simplify presentation.

School value-added estimates come from separate regressions for each year, and the grade fixed effect is a year-by-grade error component intended to capture grade-specific changes over time in the test instrument and state-level policy changes. Within this framework, we estimate the full distribution of school quality across both traditional and charter schools. Further, and key to this study, we trace the evolution of quality across time and then consider how market dynamics enter.

The validity of the school fixed effects as measures of quality depends upon the assumption that the prior test scores, disciplinary infraction measures, mobility controls, and other included variables account for confounding factors related to school quality. While a vigorous debate continues about the

estimation and use of teacher value-added measures, much less attention has gone into such estimation at the school level. Two concerns have dominated the discussion of teacher value-added but are much less important here. First, researchers continue to debate the extent to which systematic student sorting, both within and between schools, contaminates estimates of teacher value-added. Rothstein (2010) provides evidence of bias introduced by endogenous sorting into classrooms, but Chetty, Friedman, and Rockoff (2014a) find that including one-year lagged achievement along with common demographic characteristics effectively eliminates bias.[10] Our focus on average school quality rather than the effectiveness of individual teachers, however, reduces the relevance of issues related to classroom placement.[11] Second, concerns about the variance of estimation error and the instability of teacher effects, particularly in proposed uses for personnel decisions, have been extensively discussed. These problems are, however, largely related to small samples for individual classroom teachers (McCaffrey et al., 2009) and are much less important at the school level.

Nevertheless, the possibility that these included variables fail to account fully for sorting among schools is still present. Research on charter schools has adopted a variety of approaches to account for unobserved heterogeneity, and the merits of each have now been examined extensively. We focus primarily on school value-added measures within the context of alternative approaches.

In terms of internal validity, admissions lotteries constitute the gold standard, as they effectively randomize assignment to charters and in the absence of nonrandom attrition produce consistent estimates of charter school effects. However, only oversubscribed schools conduct admissions lotteries, and an analysis of sector dynamics must cover all charter schools. Lottery studies are still relevant to the

[10]In unpublished papers, Rothstein (2014) asserts that bias in estimation remains, while in response Chetty, Friedman, and Rockoff (2014b) reject his test.

[11] It may be that classroom placement of students is productive, i.e., average student gains are higher in schools where student groupings and matches with teachers are optimal. For our analysis this is simply reflected in the overall school value-added, and we make no attempt to disentangle such sources of any differences in school value-added.

extent that they provide evidence on the performance of other estimation methods. Although comparisons between lottery and observational estimates of charter school quality employing value-added approaches do not exist for Texas, Abdulkadiroğlu et al. (2011), Dobbie and Fryer (2013), and Deming (2014) present evidence that lottery approaches and alternative observational identification strategies generate broadly similar estimates in their work on Massachusetts, New York, and North Carolina, respectively.

Matching of charter school students with observationally equivalent students in the traditional public schools from which new charter entrants originate has been used in used in several recent studies; e.g., see CREDO (2013) and Angrist, Pathak, and Walters (2013) along with studies investigating the correspondence of lottery and observational estimates. Although these matching approaches do not address selection on unobservables, they do account for systematic differences in observed characteristics and the composition of traditional public schools previously attended by charter school students.[12] In an evaluation of alternative approaches, Fortson et al. (2012) find that such matching methods produce estimates that are not significantly different from lottery-based estimates over the same sample of schools; estimates produced by regression adjustments without matching of students tend to be fairly close in magnitude though statistically different.

Importantly, while prior discussions have emphasized the degree to which the estimator accounts for unobserved heterogeneity, consideration of the statistical methods also conflates issues related to the comparison group for charter schools. This complicates the interpretation of any

[12] Student fixed effects provides another alternative approach to the identification of charter and traditional public school quality, as each student acts as his or her own control; see Bifulco and Ladd (2006), Sass (2006), Booker et al. (2007), and Hanushek et al. (2007). However, in models with student fixed effect only students who attended schools in both sectors contribute to identification. Estimates based only on switchers may be particularly prone to biases introduced by time-varying student shocks. Moreover, in their study of variation in teacher value-added estimates, Guarino, Reckase, and Wooldridge (2015) find that the types of shocks typically considered problematic in this context appear to introduce less bias into value-added estimates produced by the lagged-achievement model than those produced by other models, including those with student fixed effects.

differences among lottery-based, matching, and simple regression-adjusted value-added models. The general value-added estimator weights each traditional public school on the basis of enrollment, while the matching models weight on the basis of the distribution of traditional public schools previously attended by charter school students and the lottery-based estimators weight on the basis of the distribution of traditional public schools attended by lottery losers. The traditional public school comparison groups for the matching and the lottery-based estimates invariably reflect a geographic distribution similar to that of the charter schools, while the comparison group for the regression model generally reflects the statewide distribution of traditional public school students. This difference may contribute to the finding in Fortson (2012) of a greater similarity between lottery-based and matching estimators.

In our context of dynamic market adjustments with a rapidly growing charter sector, matching model estimates of changes over time in the charter-traditional public school quality differential will reflect any changes over time in the quality of the traditional public schools that students leave to enroll in charters schools.[13] Consider both the response to a change in the quality of a charter school and the expansion of the charter sector. If a charter school improves it is likely to appeal to students from higher-quality traditional public schools. In addition, because a CMO is likely to consider traditional public school quality and the local demand for charter schools in the determination of where to open a school, a decline in the quality of traditional public schools may elevate the probability that a charter school opens in a local community. Each of these processes may lead estimates of changes in charter school quality based on matching methods to diverge from those produced by a statewide comparison,

[13] Changes over time in the composition of schools that hold lotteries also changes the control group of traditional public schools.

because changes in the pattern of transitions to a charter school would have a negligible effect on traditional public school enrollment shares.[14]

Relatedly, any competitive effects of charter schools on the quality of instruction in the traditional sector are likely to be strongest in schools most directly affected by charter school competition. Therefore, matching models might also be more prone to general equilibrium effects that dampen estimates of charter sector improvement. In a preliminary analysis not reported, we found a strong positive relationship between charter school quality and the quality of the origin schools in the traditional sector after controlling for school fixed effects. While this association does not provide causal evidence of a competitive effect, it is consistent with the possibility that such competitive effects may be present.

All in all, the matching and lottery estimates differ from the statewide value-added models in the construction of the traditional public school comparison group and likely also in the sensitivity to the influences of unobserved heterogeneity and traditional public school responsiveness to competition from the charter sector. Consequently, we provide two sets of estimates to illuminate the sensitivity of the findings to the empirical specification. The baseline results use estimates of school quality produced by regression-adjusted value-added models, referred to as statewide comparisons. The second set of results use estimates of school quality produced by matching models similar in spirit to the approach proposed in Angrist, Pathak, and Walters (2013).

[14]The findings in Gleason et al. (2010) illustrate the possibility that changes over time in the distribution of traditional public schools can alter estimates of charter school effects. First, the lottery-based method generates substantial heterogeneity in estimated charter school effects. Second, the estimated effect of charter school attendance is much higher for low-income students. This finding is consistent with the possibility that the gains from charter school attendance are likely higher in areas with lower-quality traditional public schools (assuming that school quality tends to be lower as poverty increases). Some of the observed variation almost certainly reflects heterogeneity in charter school effects, but the pattern is consistent with the existence of heterogeneity in traditional public school quality as well.

Specifically, Angrist, Pathak, and Walters (2013) construct estimates of charter school effectiveness by comparing the achievement of charter school enrollees with a control sample of traditional public school students that fall within the same baseline year- gender-race-school cell. This specification is estimated on observational data and controls for initial achievement and the number of years a student is enrolled in any charter school. They use this estimator to study overall effects of attending charter schools, on average, across a student's career. Because our goal is to estimate the evolution of charter quality over time, we modify their approach. Our year–over–year estimates instead compare the achievement of charter school enrollees to their public school counterparts that fall within the same race–gender-school cell controlling for a flexible function of past achievement scores and other observable characteristics. Hence, our matching estimates provide a more ``localized'' estimate of changes in school effectiveness

Evolution of the Charter School Quality Distribution

In this section, we describe changes over time in charter school mathematics and reading value-added between 2001 and 2011 relative to traditional public schools and subsequently examine the contributions of school improvement, school closures, and the entry of new schools to these changes. We adjust for differences in years of operation across school by regressing the school quality estimates on a set of indicators for the first, second, third, and fourth years of operation and then use the residuals as the measures of quality, though unadjusted estimates (not reported) reveal almost identical patterns. We provide parallel estimates for a statewide comparison group and for the more localized comparison group provided by the matching estimator.

Statewide Comparisons

We first describe changes over time in the distribution of charter school value-added in comparison to traditional public schools across the state. Then we consider the contributions of school improvements, closures and entry to these changes.

Performance trends over time

Figure 4 illustrates changes over time in the 25th, 50th, and 75th percentiles of charter school value-added in mathematics and reading relative to the corresponding percentiles of the traditional public school mathematics and reading distributions (The full distributions are shown in Appendix A). Relative improvements in charter school mathematics value-added (Panel A) occurred throughout the distribution and decade, though increases at the 25th percentile were roughly twice as large as those at the 50th and 75th percentiles.[15] In 2001, charter school mathematics value-added was roughly 0.3 standard deviations below traditional public school value-added at the 25th percentile, but by 2011 that gap fell to less than 0.1 standard deviations. By comparison, the difference at the median declined from slightly more than 0.1 standard deviations to roughly zero, and the difference at the 75th percentile changed from a charter school deficit of almost 0.1 standard deviations to a charter school advantage of roughly 0.05 standard deviations.

Panel B illustrates charter sector improvement in reading value-added. At the 25th percentile the gains are comparable to those for mathematics; the reading value-added differential went from a charter school deficit of almost 0.25 standard deviations to a slight charter school advantage by the end of the period. At the 50th and 75th percentiles charter schools start very close to traditional public schools, but they also show far smaller improvements.

[15]Note that the differential declines between 2001 and 2003, the period in which the state switched from the TAAS to the TAKS test, and between 2003 and 2011 when the TAKS was used throughout. This consistency indicates that the observed pattern is not just a testing phenomenon.

Overall, the average performance of charter schools relative to traditional public schools improved over this period by 0.12 standard deviations in mathematics and 0.09 standard deviations in reading. Kolmogorov – Smirnov tests for equality of the charter and TPS mathematics and reading distributions at the end of the observation period reject the equality of the distributions at the 1 percent level. These increases are similar in magnitude to typical estimates of a one standard deviation difference in teacher value-added or the benefits of a substantial reduction in class size. The smaller change for reading is consistent with the frequent finding that schools exert a greater effect on learning in mathematics than in reading.

In addition to the average improvement there is also a significant fall in the variance of charter school quality. While charter school quality is much more dispersed than TPS quality at the beginning of the period, the improvements – particularly at the bottom end – draw in the long left tail of the charter school quality distribution over time (see Appendix Figure A1). By the end of the period, the overall quality distributions, especially in reading, look very similar.

Any interpretation of these figures in terms of the absolute level of charter school quality depends in part upon quality changes in the traditional public school sector. If, for example, the quality of traditional public schools in Texas is falling over this period due to the expansion of the charter sector or other factors, the catch-up of charter schools may not indicate much if any quality improvement. Alternatively, if traditional public schools improve – either in response to competition from the charter sector or for other reasons – the observed increase in charter school quality would actually understate the improvement in charter school effectiveness. Imberman (2011) highlights the difficulty of identifying the causal effect of competition on traditional schools resulting from charter schools. Therefore, we simply describe changes over time in state average achievement to provide a context for the relative improvement of the charter sector.

During the sample period, the general increase in scores on the National Assessment of Educational Progress (NAEP) suggests a positive change over time in the quality of public education in Texas. The average NAEP score improved from 2000-2011 in fourth and eighth grade mathematics and from 1998-2011 in fourth grade reading (NCES 2015); the average NAEP score remained roughly constant in 8th grade reading during this period.[16] Given the increase over time in the minority enrollment share and the lower average scores of blacks and Hispanics than whites, the improvements in the overall average NAEP scores may well underestimate the gains in school quality. Looking at subgroups, whites, blacks, and Hispanics each improved over this period on all of the NAEP tests including eighth grade reading (NCES 2015).[17] Thus, the relative improvement of charter schools is not driven by a decline in the average quality of traditional public schools, rather our estimates may understate the gains in absolute performance.

Entry, Exit, and Improvement

Table 1 disaggregates these overall trends by providing a description of performance changes associated with entry, market (i.e., voluntary) closures, authorizer closures, and improvement.[18] The average increases of 0.12 and 0.09 standard deviations in mathematics and reading, respectively, are attributable to a combination of: (1) improvement in charter schools that persist throughout the period (Panel A); (2) the disproportionate closure of low value-added schools (Panels B and C); and (3) an average value-added of new schools that far exceeds that of the schools that closed (Panel D). Value-added increased by 0.10 standard deviations in math and 0.04 standard deviations in reading for schools

[16] NAEP is a national test, often called the "Nation's Report Card," given to representative samples of students in all states. It has reported state performance in math and reading at grades 4 and 8 every two to four years since 1992. Eighth grade reading tests were not available until1998.
[17] Note that schools across the country also tended to improve on these tests over the period, perhaps indicating the impact of federal accountability legislation (No Child Left Behind, or NCLB). Nonetheless, Texas students as a whole and across the racial/ethnic subgroups generally improved more than the national average over this period.
[18] As noted, the tests changed in 2003. Appendix A provides a similar description for just the 2004-2011 period when the TAKS test was used throughout. For this shorter period, the same patterns of charter school improvement hold, although the magnitudes of change are smaller.

that remained open throughout the entire period. The difference between the average value-added of all schools that closed during the period and those that entered equals 0.21 standard deviations in math and 0.24 standard deviations in reading, though schools forced to close by the authorizer actually had somewhat higher average value-added in mathematics than those that closed voluntarily. (The gap in reading was minimal). Notice that the contribution of entrants is amplified by the large number of entrants relative to the number of charter schools continuously open and relative to the number that closed between 2001 and 2011.

The much higher average value-added of entrants compared to exits suggests systematic differences between charter management organizations that expanded and those that contracted. To examine this relationship more closely, we construct a panel of the annual number of schools operated by each charter management organization each year. We estimate the relationship between CMO expansion and quality by regressing the change in the number of schools operated in year t on the average mathematics and reading value-added of the CMO operated schools in year t-1and year fixed effects. Columns 1 and 2 of Table 2 show a strong, positive relationship between the change in the number of schools and average mathematics and reading value-added of the schools operated in the previous year that is robust to the inclusion of CMO fixed effects. This pattern is consistent with the notion that quality affects demand for a CMO's schools and that CMOs respond in part by expansion or contraction of the number of schools in operation.

The remaining columns explore the possibility of asymmetry in CMO expansion and contraction. Columns 3 and 4 report linear probability models estimating the relationship between CMO average prior year value-added and the probability that the CMO increased the number of schools operated (Columns 3 and 4) and the probability that the CMO decreased the number of schools operated (Columns 5 and 6). Although positive, the coefficients on mathematics and reading value-added in

expansion (Columns 3 and 4) are small and insignificant. In contrast, the coefficients in Columns 5 and 6 reveal a larger and significant negative relationship between the prior average value-added and the probability that the number of schools operated by a CMO declined.

The overall pattern is consistent with higher-quality CMOs increasing their market share over time. Importantly, the estimates remain significant even for models that include CMO fixed effects, so they are not just reflecting significant behavioral differences among CMOs.

Matching Estimates

We now replicate the previous analysis using the estimates of school value-added generated by the matching models based on Angrist, Pathak, and Walters (2013). Because the pattern of estimates is quite similar we focus on the few salient differences.

Performance trends over time

The top pane of Figure 5 shows the changes over time at the 25th, 50th, and 75th percentiles of the charter school mathematics value-added distributions, and similar to the statewide analysis the figure reveals improvements across the distribution. Unlike the statewide comparisons with gains concentrated in the lower portion of the distribution and spread throughout the period, however, gains in the matching model are quite similar at the 25th, 50th, and 75th percentiles and concentrated in the first half of the decade. This is consistent with the possibility that charter schools began drawing students from more effective public schools over time, in part because charter schools that closed had drawn students from less-effective public schools. Such improvement in the traditional public school comparison group would produce the observed pattern.

By comparison, the patterns for reading are much more similar across the two models, with improvement concentrated at the 25th percentile of the distribution regardless of the comparison group. Nonetheless, the divergence in timing remains in that the matching model estimates show much smaller

charter school gains post-2006, particularly at the 25th percentile. Again, such a pattern is consistent with improvement in the traditional public school comparison group.

Entry, Exit, and Improvement

Table 3 disaggregates the contributions of school entry, closures and improvement to the changes over time in the matching method value-added estimates. The patterns in the table are qualitatively and quantitatively similar to those for the statewide comparison for both mathematics and reading. Specifically, schools in operation in both 2001 and 2011 improve somewhat more in mathematics than reading, schools that close voluntarily are drawn from the lower portion of the distribution and much less effective than those that open, and schools closed by the state authorizer are not as ineffective as those that close voluntarily in terms of mathematics value-added. One difference is the very low average reading value-added of schools closed by the authorizer in Table 3; the corresponding value using the state comparison group is much more similar to the average for schools that closed voluntarily. Note that there are six fewer schools in Table 3 due to the absence of matches with non-missing data.

Finally, a comparison of the estimated relationship between the changes in number of schools operated and CMO quality reveals a quite similar pattern across the two methods (Table 4). The net change in the number of schools operated is positively related to CMO average VA with a somewhat stronger relationship in reading than in mathematics. A small difference does emerge in the effects on expansion relative to contraction: in comparison to the statewide comparison estimates reported in Table 2, the coefficients in Table 4 reveal less asymmetry.

Exploratory Analysis of the Sources of Improvement

Recent evidence on the determinants of charter school quality reported in Furgeson et al. (2012), Angrist, Pathak, and Walters (2013), and Dobbie and Fryer (2013) highlights the particularly

strong performance of charter schools that set high expectations, require uniforms, or more broadly adopt a No Excuses philosophy. In this section we investigate the relationship between estimates of school quality and some of these same factors in an exploratory analysis of the factors that underlie the dynamic changes we observe. This work builds on the prior analyses by considering a much broader set of schools and highlighting the sensitivity of the estimates to the inclusion of information on student selection and mobility.

Considerable debate surrounds whether selection into and out of charter schools contributes to their performance, and prior evidence on Texas reveals that mobility adversely affects all students, movers and non-movers alike.[19] It is possible, of course, that increasingly positive selection among successive cohorts may affect achievement directly or indirectly through the creation of a more positive classroom environment for all students. However, existing empirical evidence is controversial on the importance and magnitudes of such effects. We control directly for prior achievement and behavior of all students including new entrants. The average prior performance of new entrants relative to their traditional public school classmates conditional on these controls provides some information on peer composition. Nonetheless, the absence of a compelling source of exogenous variation precludes the identification of causal effects of such policies or peer composition, leading us to focus on the descriptive question of the extent to which these student variables can account for the higher performance of schools adhering to a No Excuses philosophy.

The belief that students are inputs into education production in addition to being consumers of its output guides the model of schooling demand in the seminal work by Epple and Romano (1998). It has been reinforced by extensive work on peer effects in schools.[20] Informal conversations with CMO

[19]Nichols-Barrer et al. (2014) consider the conjecture that student attrition from KIPP schools might explain their success but reject it.
[20] See the review in Sacerdote (2011).

executives indicate that many share this belief. These executives, however, tend to emphasize behavior rather than achievement. The No Excuses philosophy encapsulates this theory, often featuring a number of rules or policies including strict discipline, contracts that require parental commitment, and uniforms aimed at creating a positive environment for learning (See Thernstrom and Thernstrom (2003), Mathews (2009)). These rules may contribute to a positive environment both through their direct effects on behavior and through their influence on enrollment and re-enrollment decisions.

We begin by describing trends in the share of schools that adhere to a NO Excuses philosophy to uncover whether the change is consistent with the expansion of the No Excuses model contributing to the improvement in charter sector quality; trends over time in mobility and selection are also presented. Next we report estimates of the relationship between charter school mathematics and reading value-added and adherence to a No Excuses philosophy for a series of specifications that progressively add controls for mobility and selection. Finally, we substitute indicators for the individual components used to classify schools as No Excuses in order to learn more about the underlying sources of any association with value-added. Importantly, the designation of a CMO as adhering to a No Excuses philosophy is not straightforward, as many that appear to operate with rules and practices that correspond to the No Excuses philosophy do not designate themselves in this way. Appendix B describes the extensive information and decision-rules that we use to determine whether a CMO should be classified as following a No Excuses philosophy.

Trends over time

Figure 6 shows that, by our measures, the share of students attending charter schools classified as adhering to a No Excuses philosophy increases from roughly 18 to 38 percent between 2001 and 2011. This substantial increase corresponds with the improvement of the charter sector.

The next two figures reveal trends over time that are also consistent with selection and mobility accounting for a portion of the observed improvement in the charter sector, and potentially, the observed association between value-added and a No Excuses philosophy. Figure 7 traces the proportion of charter and traditional public school students that are new to their school. (For this, we restrict the sample to students attending a grade in schools where the prior grade was offered; i.e., the sample excludes students in brand new schools or the first grade offered in a school). Remarkably, the annual share of new students exceeded, on average, 50 percent in charter schools until 2006, reflecting both the enrollment increases experienced by many schools in their early years of operation and frequent movement in and out of charter schools. The percentage of new students, however, declined by almost thirty percentage points between 2001 and 2011; even so, the level remained twice that of the traditional public schools.

To see the changes in composition of the students in charter schools, Figure 8 plots the mean differences in math and reading achievement and the probability of committing a disciplinary infraction between traditional public school students who transition to a charter school in the subsequent year and their schoolmates who remain in the traditional sector.[21] The high rate of charter school mobility shown previously, however, also means that the characteristics of new entrants may not accurately capture the overall degree of selection relevant for on-going school operations. Therefore, while the top panel compares all charter school entrants to schoolmates who remain in the traditional public sector, the bottom panel compares only charter entrants who remain in the charter school into the second year with the same set of schoolmates.

[21]Importantly, all comparisons of achievement and behavior apply to those during the year prior to charter school entry and thus rule out any influences of the charter school. Moreover, disciplinary infraction comparisons within a traditional public school at a point in time hold constant infraction policies and procedures and isolate differences in behavior. For these measures, we first compute the differences between each charter school entrant and her schoolmates who remain in the traditional public sector and then average over the sample of entrants.

Between 2001 and 2004, the entering achievement and behavior characteristics of charter-school students largely did not improve relative to schoolmates who remained in the traditional public sector, but this picture changed markedly in more recent years for both all entrants and those who remained into their second year at the charter. The average difference in mathematics achievement between students who entered a charter school and schoolmates who remained in the traditional sector was -0.23 standard deviations in 2001, fell to -0.30 in 2004, and then rose to -0.05 in 2011; the corresponding differences for reading were -0.20 standard deviations, -0.21, and 0.03, and the corresponding differences in the probability of a disciplinary infraction were 0.06, 0.16, and 0.05. In sum, student selection into charter schools based on achievement moved from being negative in 2001 to roughly neutral in 2011, while selection changed little in terms of behavior.

Entrants who remained in their charter schools into the second year following the transition were less negatively selected in 2001 and generally more positively selected in 2011 than new entrants as a whole, indicating adverse selection out of charters. By comparison, the traditional public school students who remained in their school into the second year were quite similar to those who remained in the traditional sector but switched schools prior to the second year.

Value-added, No Excuses, and Selection

For policy, a pressing question is the extent to which this student selection accounts for the higher performance of charter schools that adhere to a No Excuses philosophy or other operational characteristics associated with superior outcomes. In order to understand better the interrelationships among mobility, selection, and adherence to a No Excuses philosophy, we estimate a series of models that regress mathematics or reading value-added on various combinations of these variables.[22] Once

[22]For this analysis, the selection at the time of entry and reenrollment variables are computed as follows: first, each charter school entrant is assigned the difference between their prior achievement (or receipt of a disciplinary infraction) and the average among their traditional public school peers that remain in the traditional public sector. Next, these differences are averaged over all students that enter each school. The reenrollment selection variables are

again we begin with specifications that use the statewide estimates of value-added and then turn to those that based on local market matching models.

The No Excuses coefficients in both reading and mathematics are sensitive to the inclusion of the student composition variables, though they remain highly significant in all specifications (Table 5). In the mathematics models, the coefficient declines from 0.164 to 0.097 following the inclusion of the student mobility variable and to 0.092 in the specification that also adds the selection on achievement variables. By contrast, including the disciplinary infractions variables does not alter the No Excuses advantage, suggesting that selection on this dimension of student composition does not drive the changing performance of charter schools.

Estimates for reading follow a very similar pattern, declining from 0.091 to 0.028 following the inclusion of the mobility and selection variables. In this case the No Excuses coefficient is smaller and more sensitive to the additional inclusion of the selection on achievement variables.

A comparison between Tables 5 and 6 also reveals a very similar pattern of No Excuses coefficients across the two alternative methods for the estimation of value-added. In the case of mathematics, the No Excuses coefficient from regressions that use the value-added estimates produced by the matching method declines from 0.185 for a specification that does not control for mobility or selection to 0.129 following the inclusion of those controls, while in corresponding specifications for reading the No Excuses coefficient falls from 0.113 to 0.066.

computed similarly with the exception that the differences are averaged over only those students who remain in the same charter into their second year. For students who enter a charter school in year t, the degree of selection upon entry is related to value-added in year t, while the degree of selection at the time of reenrollment for the second year is related to value-added in year t+1. Standard errors are clustered at the school level; clustering at the CMO level has little effect on the standard errors.

Given the absence of a compelling source of exogenous variation and possibility that these variables capture unobserved student and school differences, the coefficients for the selection and mobility variables do not warrant a causal interpretation. Nonetheless, the insensitivity of the No Excuses coefficient to the inclusion of any of the selection variables in the mathematics specifications suggests that selection accounts for little of the No Excuses effect; more positive selection may contribute to charter school improvement in terms of mathematics value-added, but it does not appear to account for the higher performance of No Excuses schools. In reading the findings are more consistent with selection accounting for some of the association between school quality and adherence to a No Excuses philosophy. Again this is consistent with the notion that schools play a more important role in mathematics achievement than reading achievement.

The large and significant mobility estimates and the sensitivity of the No Excuses coefficients to the inclusion of mobility in combination with the dramatic decline in the average share of students who are new to the school suggest an important role for mobility in the improvement of the charter sector. One approach to quantifying that contribution is to use the causal estimate of mobility externalities from Hanushek, Kain, and Rivkin (2004), also based on Texas data, to estimate the contribution of mobility to the increase in charter school mathematics value-added.[23] That estimate suggests that the approximately 20 percentage point decline in the charter-traditional public school differential in the share of students that are new to the schools contributes roughly 0.04 standard deviations to the improvement of charter school math performance between 2001 and 2011.[24] Thus the greater sector stability *per se* accounts for over one-third of the decrease in the average mathematics value-added gap

[23]Note that estimates of the impact of mobility externalities are not available for reading

[24]Hanushek, Kain, and Rivkin (2004) find that the added disruption of high mobility creates an externality. That analysis is based on value-added models of achievement in Texas that include student, school-by-year, and school-by-grade fixed effects to account for confounding factors including perceived school quality and neighborhood shocks. A ten percentage point higher level of mobility reduces mathematics achievement by approximately 0.2 standard deviations in Texas public schools (independent of any impact on the individuals who move).

between charter and traditional public schools. Note, this is an estimate of the externality of high student mobility as the value-added regressions account for the direct effects of moving on individual movers.

The final component of this analysis examines the relationship between value-added and the underlying components of the No Excuses classification using the value-added estimates from the state comparisons (Table 7) and from the matching models (Table 8). A comparison of the two tables reveals many similarities but also some differences. In terms of similarities, the inclusion of the selection and mobility variables reduces the coefficients on the No Excuses components virtually across the board, though the magnitude of the reduction tends to be larger for mathematics and much larger for the state comparison method. Consequently, both the uniform and dress code indicators remain significant for reading using matching but not state comparisons; the uniform indicator does remain significant regardless of method for the mathematics specifications.

The finding that value-added has the strongest relationship with the uniform requirement is consistent with the prior research, as is the positive relationship between value-added and high expectations. Note, however, that the high expectations coefficient is significant at only the 10 percent level in some specifications and not even at that level in others. Because a uniform requirement is straightforward to measure in comparison to classifications that require more discretion, the absence of measurement error may elevate the magnitude and significance of the uniform coefficient in comparison to others. While meriting additional investigation, the consistent pattern across cities and strength of the relationship after accounting for mobility and selection suggests that enforcement of a uniform requirement is associated with higher school value-added.

Other Contributing Factors

Classification as a No Excuses school is, of course, not the sole important dimension of school operations, and there are certainly others, most notably the quality of leadership and instruction, that vary among schools regardless of their philosophy. In fact, informal conversations with several executives employed by some of the largest CMOs operating in Texas, including several from No Excuses CMOs, reveal a strong emphasis on the hiring and development of effective school leaders. Some CMOs devote substantial resources to the identification and training of school leaders including year-long apprenticeships. These preparation programs differ considerably from the traditional public school job ladder of teacher to assistant principal to principal combined with some formal education in leadership. Other CMOs bemoaned the inability to afford such programs. Importantly, this commitment to leadership did not seem to depend on the degree of authority granted over personnel or programmatic decisions. Impediments to the measurement of leadership performance complicate the identification of its contribution to charter school quality and improvement, and this is a prime area for further investigation.[25]

Conclusions

This paper uses administrative microdata on schools and students to trace the evolution of charter school quality in Texas between 2001 and 2011 as measured by value-added to mathematics and reading. The results based on quality measures generated by a flexible value-added specification that controls for prior achievement and discipline and those generated by a matching procedure based

[25] See Branch, Hanushek, and Rivkin (2012)and Laing et al (2015) on both the potential importance of principals and the difficulty of measuring differences among principals. Bloom et al. (2014) also point to the importance of management in schools, relying on surveys of specific management practices. England has introduced Academy Schools which call for conversion of traditional public schools into institutions very similar to charter schools, and this has led to positive but heterogeneous impacts on student performance. When surveyed, a majority of the Academy Schools indicated that change in leadership was the most important element of their conversion; see Eyles and Machin (2014).

on the specification used in Angrist, Pathak, and Walters (2013) lead to the same finding: charter-school mathematics and reading value-added increased substantially relative to those for traditional public schools. This improvement is notable because there is evidence that traditional public schools were also improving on average over this time period.

The main results support the hypothesis that market forces are generating dynamic improvements in the charter sector. First, consistent with existing evidence, closing schools are drawn disproportionately from the bottom tail of the charter school distribution. Second, schools that open far outperform those that CMOs decide to close, with average value-added for new charters roughly equal to the average for existing charters. Finally, average value-added increases for charter schools that remain open throughout the period. Together these changes raise the mean and reduce the variance of school value-added relative to traditional public schools.

Examining the potential sources of these improvements, we find evidence that an increasing share of schools that adhere to a No Excuses philosophy and a reduction in student mobility as the sector matures contribute to the charter sector's improvement, though substantial portions of the improvement remains unexplained by these factors. Looking more closely at the first, the pattern of estimates suggests that student selection and mobility account for a portion of the No Excuses premium. Nevertheless, the No Excuses coefficient remains highly significant in all specifications, and additional controls for selection on behavior have little or no effect on the magnitude of the estimates. As a whole the findings are consistent with the belief that the schools adhering to a No Excuses philosophy are more effective on average, though the precise mechanisms are not identified. Additional investigation finds that a uniform requirement has the strongest relationship with value-added among the limited number of variables used to determine No Excuses status, but this may be driven in part by the precision with which this factor is measured.

The substantial decline in student mobility and the increasingly positive selection of new entrants to the charter sector provide valuable information on sector dynamics and the importance of patience in an evaluation of a large-scale educational reform, particularly one that relies on parental choices and market forces. The relaxation of constraints on school management induced many with little prior experience to enter into public education, and the large variation in school quality observed during the early years are consistent with growing pains associated with a new market. These factors likely contribute to the high student mobility and the unwillingness of many students making adequate progress in the traditional public schools to consider a switch to a charter

Over time, many low-performing schools closed and the average effectiveness of new market entrants and schools remaining open throughout the decade rose. As might be expected, students and families appear to respond favorably to these improvements. Over time selection into the charter sector became less negative, as the prior achievement of new entrants rose relative to their classmates who chose to remain in the traditional public school sector. Thus the families of higher-achieving students appear to have elevated their opinion of a charter schools as a viable alternative. Importantly, these responses amplified the improvements in the sector by raising the quality of the classroom environment.

The juxtaposition of these dynamic changes with cross-sectional comparisons of sector differences highlights the value of a focus on the trajectory of school quality as opposed to effectiveness at a point in time in the evaluation of a major educational reform. Much more can be learned about the behaviors of both families and education providers and the aspects of school operations that contributed to the improvement. Although the identification of the contributions of specific school factors including the quality of teachers, principals, and CMO executives may be difficult, this is a prime area for additional research.

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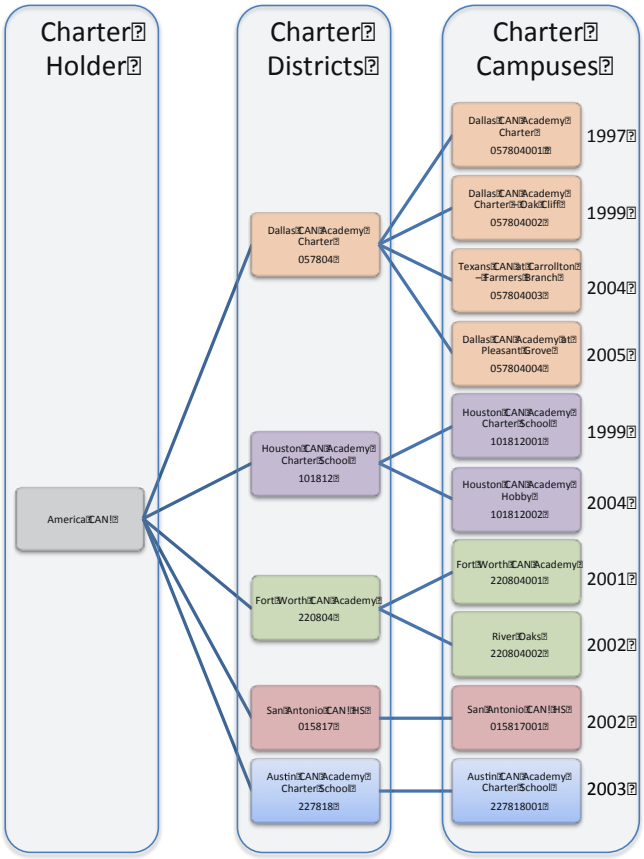
Figures

Figure 1: An example of the charter sector organizational structure: the expansion of the America Can! CMO from 1997-2011



Note: The number in each district and campus block refers to the relevant state ID code.

Figure 2: The Growth in Open-Enrollment Charter School, 1995-2011

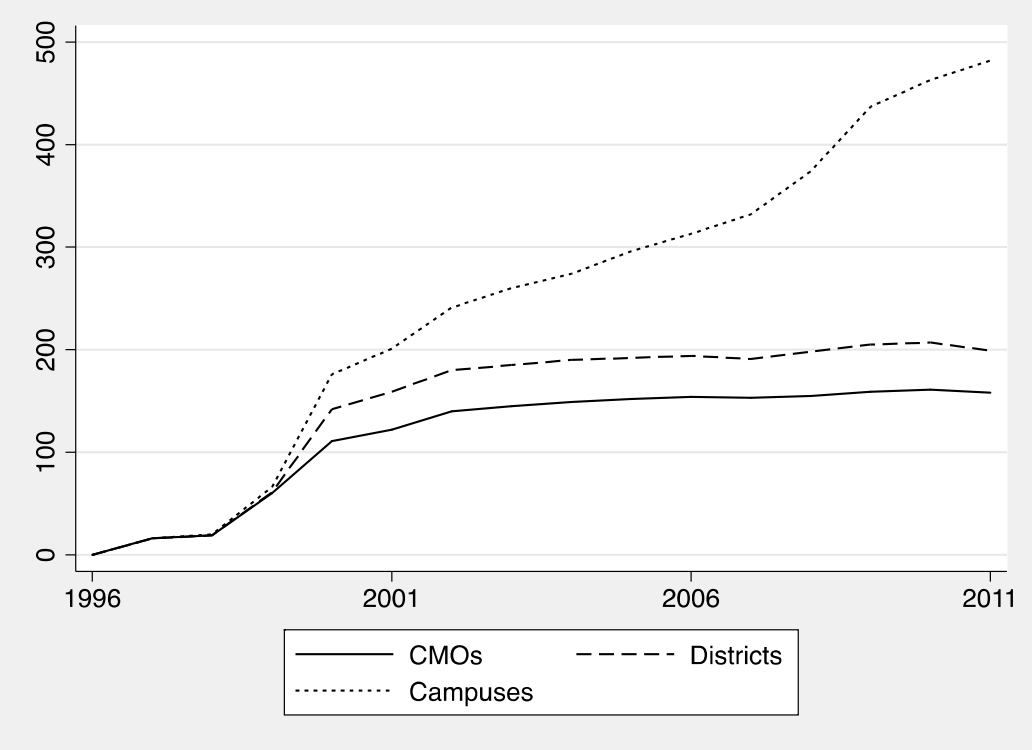


Figure 3. Stock and Flows of State Charters by Type, 1995-2011

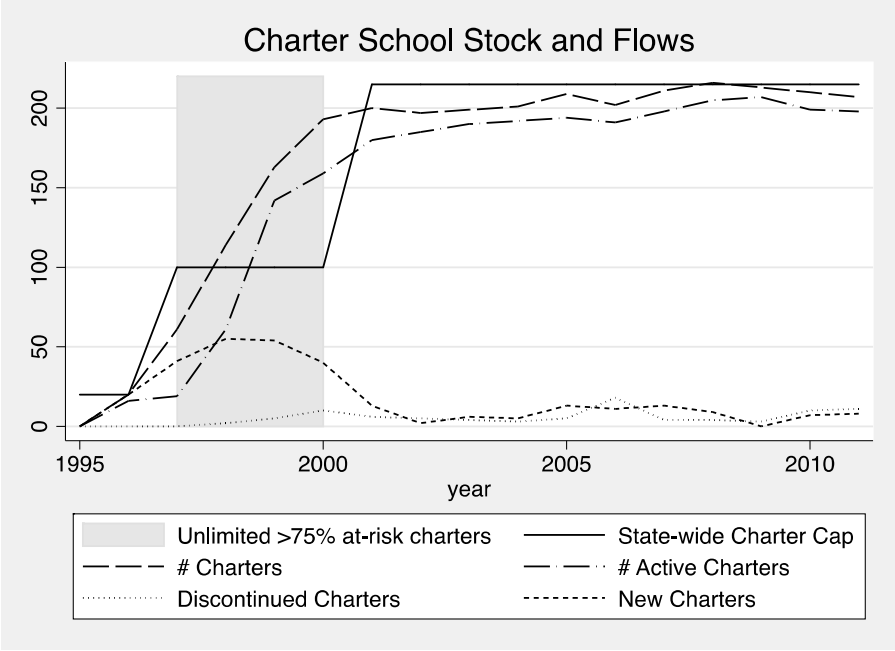
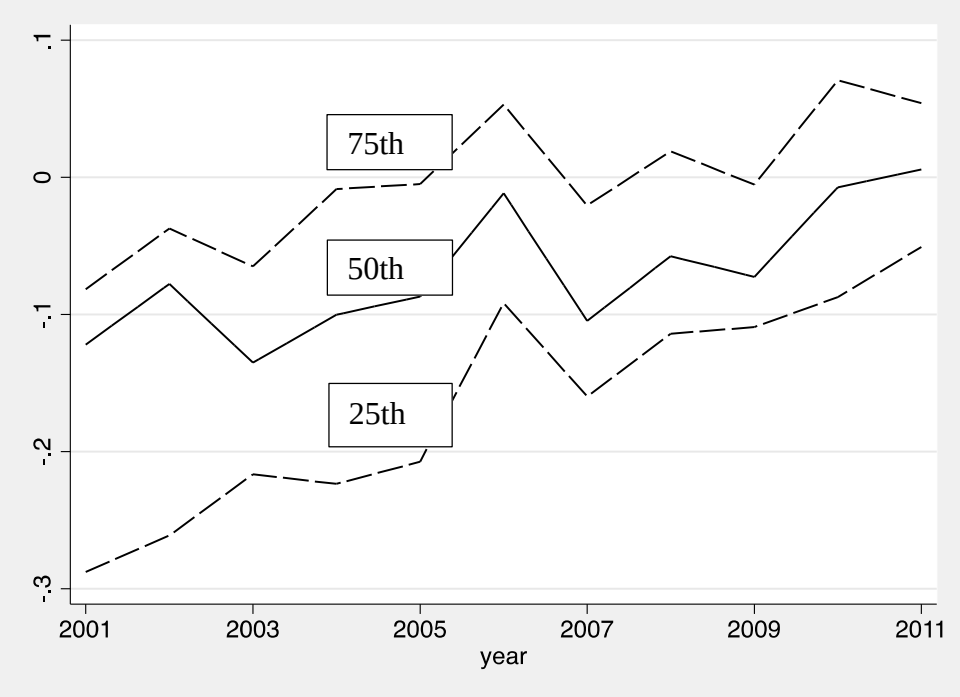
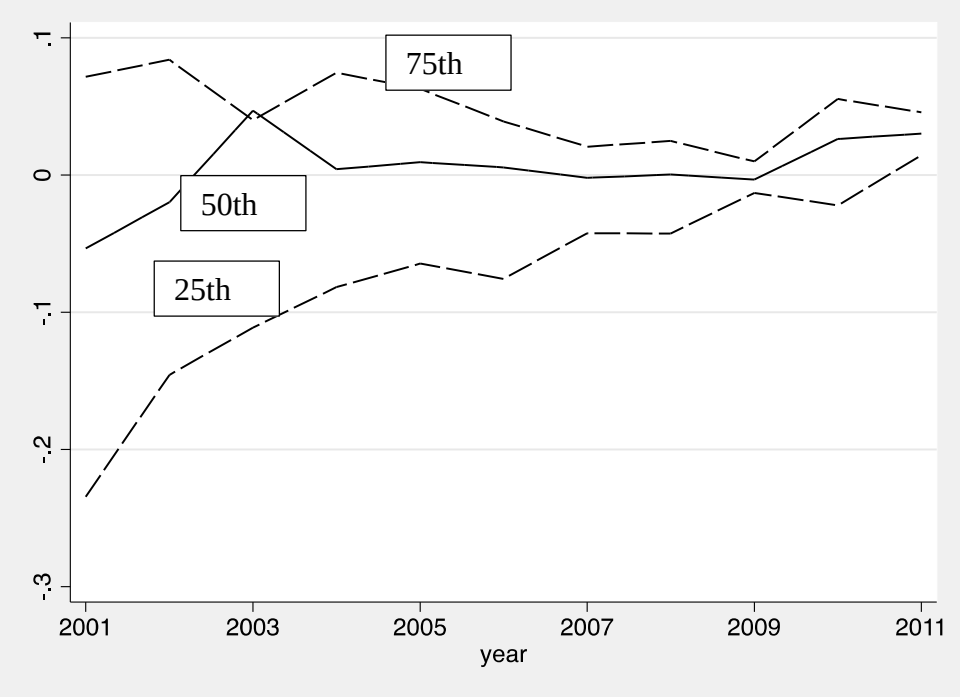


Figure 4: Charter School quality quartiles over time relative to TPS (Statewide Comparisons)

Panel A: Mathematics



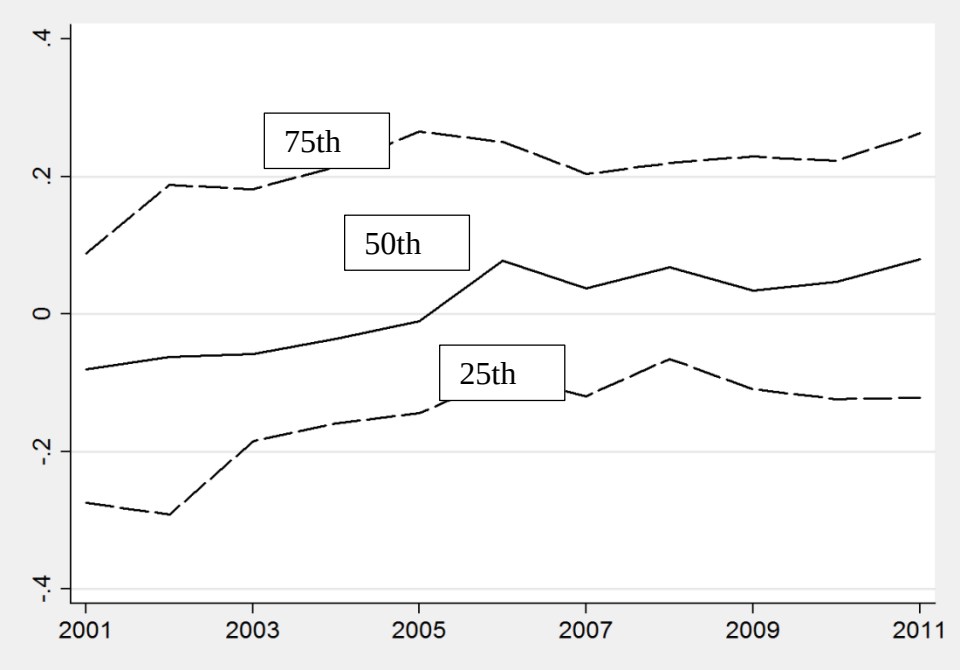
Panel B: Reading



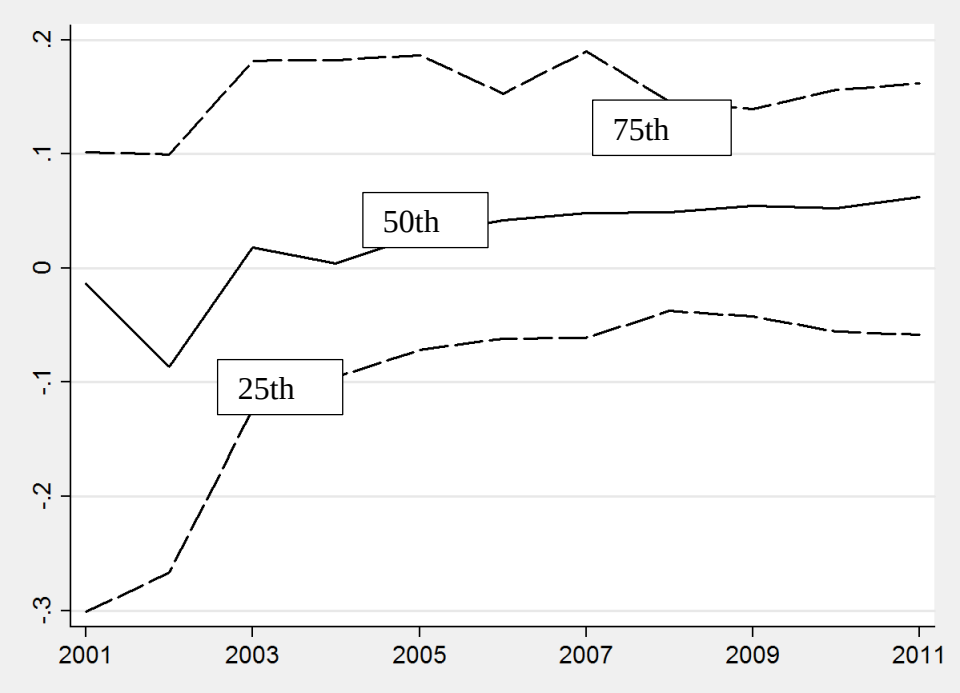
Note: Figures show the difference between the 25th, 50th, and 75th percentile of charter school quality distributions and the same percentile from the distributions of TPS quality based on statewide value-added models.

Figure 5. Charter School Quality Quartiles over time relative to TPS using Matching Procedure

Panel A. Mathematics

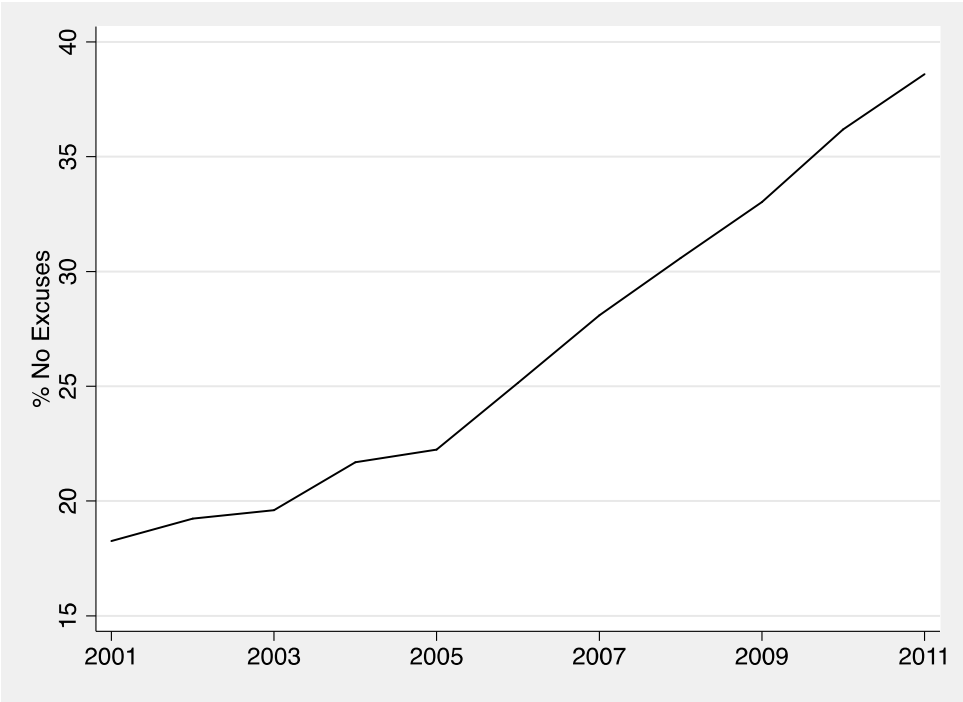


Panel A. Reading



Note: Figures show estimates at the 25th, 50th, and 75th percentile of the charter school quality distributions based on matching models.

Figure 6: Trends over Time in the Share of Schools that Adhere to a No Excuses Philosophy



Note: No Excuses status is defined at the CMO level, and the percentage is expressed in terms of the number of students enrolled at a 'No Excuses' campus relative to all charter school students.

Figure 7: Proportion of Students that are New to the School in the Charter and Traditional Public School Sectors: 2001 to 2011

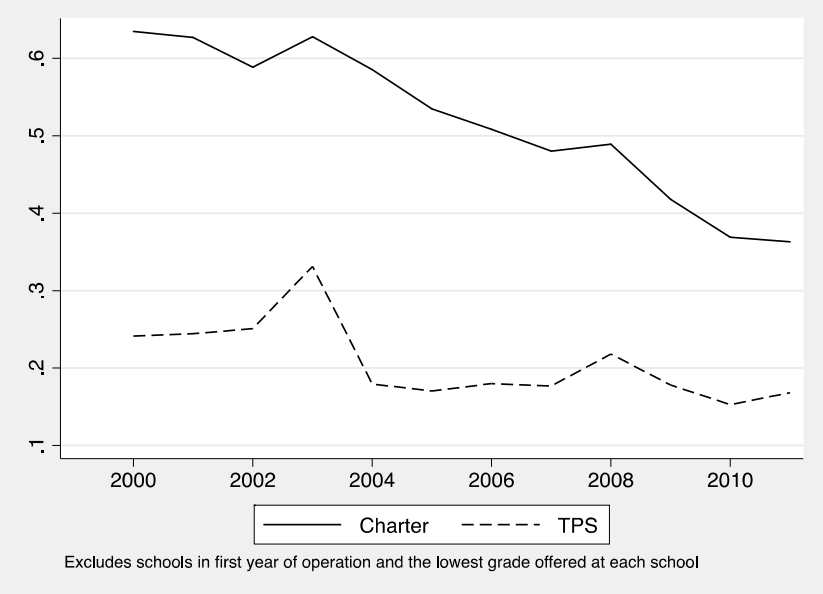
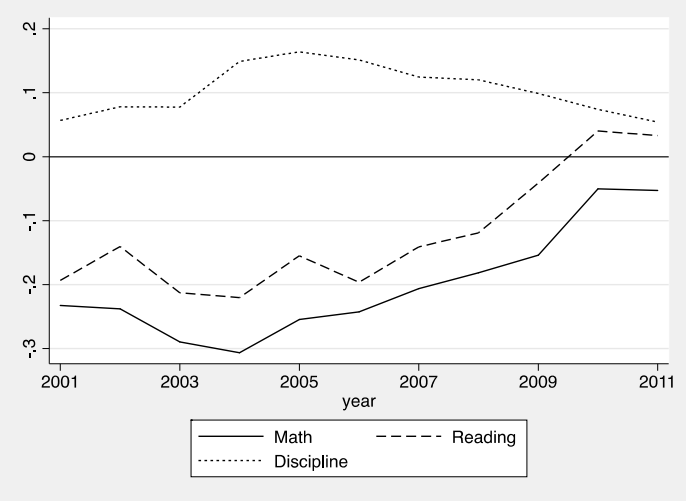
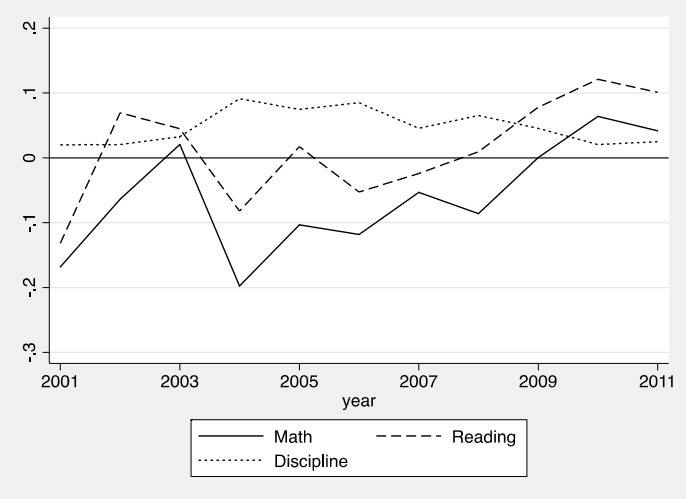


Figure 8: Trends Over Time in Selection into the Charter Sector by Prior Mathematics and Reading Achievement and the Probability of Receiving a Disciplinary Infraction: 2001-2011

Panel A: All Charter School Entrants



Panel B: Charter Entrants Who Remain into Their Second Year



Notes: These series compare students who transition to a charter school to their former schoolmates who remain at a traditional public school using information from the year prior to the transition. Math refers to average math achievement, reading refers to average reading achievement, and discipline refers to the probability of having committed any disciplinary infraction.

Tables

Table 1. Average Charter School Mathematics and Reading Value-added and Enrollment Shares for 2001 and 2011, by status of school operations (Statewide estimates)

	Mathematics		Reading	
	2001	2011	2001	2011
A. Schools in operation in 2001 and in 2011				
Average Value-added	-0.09	0.01	-0.03	-0.01
Share of Charter Enrollment	0.69	0.26	0.69	0.26
Number of Schools	96		96	
B. Market Closures				
Average Value-added	-0.25	.	-0.22	.
Share of Charter Enrollment	0.20	.	0.20	.
Number of Schools	45		45	
C. Authorizer Closures				
Average Value-added	-0.16	.	-0.23	.
Share of Charter Enrollment	0.11	.	0.11	.
Number of Schools	9		9	
D. Schools in operation in 2011 but not in 2001				
Average Value-added	.	-0.02	.	0.01
Share of Charter Enrollment	.	0.74	.	0.74
Number of Schools	320		319	

Notes: Average value-added for charter schools weighted by enrollment; traditional public school average value-added in each year deducted from the corresponding charter average. Empty cells in panels B, C and D correspond to years when these school categories are no longer in operation or have yet to begin operation. Estimates are constructed using statewide comparison group.

Table 2: Estimated Effects of Prior Year CMO Performance on the Number of Schools Operated (Statewide estimates)

	Net Change		Net Expansion		Net Contraction	
	(1)	(2)	(3)	(4)	(5)	(6)
CMO Average Math VA	0.168	0.150	0.047	0.038	-0.061	-0.057
	(0.068)	(0.074)	(0.026)	(0.028)	(0.018)	(0.020)
CMO Average Reading VA	0.229	0.203	0.036	0.021	-0.107	-0.092
	(0.084)	(0.090)	(0.032)	(0.033)	(0.022)	(0.023)
CMO FE	No	Yes	No	Yes	No	Yes
Mean	0.139		0.120		0.055	
N	1847		1847		1847	

Note: Data for regressions include all CMOs operating in each year. Each estimate comes from a separate regression. All regressions include year dummies. The dependent variable in columns (1) and (2) is the net change in the number of campuses in operation for a CMO, while in columns (3) - (6) the dependent variable is an indicator equal to one if the net change is positive (expansion) or negative (contraction). Estimates are constructed using statewide comparison group. Standard errors are clustered at the CMO level.

Table 3. Average Charter School Mathematics and Reading Value-added and Enrollment Shares for 2001 and 2011, by Status of School Operations (Matching estimates)

	Mathematics		Reading	
	2001	2011	2001	2011
A. Schools in operation in 2001 and in 2011				
Average Value-added	-0.01	0.05	-0.03	0.00
Share of Charter Enrollment	0.68	0.26	0.68	0.26
Number of Schools	92		92	
B. Market Closures				
Average Value-added	-0.17	.	-0.17	.
Share of Charter Enrollment	0.22	.	0.22	.
Number of Schools	44		44	
C. Authorizer Closures				
Average Value-added	-0.05	.	-0.34	.
Share of Charter Enrollment	0.10	.	0.10	.
Number of Schools	9		9	
D. Schools in operation in 2011 but not in 2001				
Average Value-added	.	0.09	.	0.07
Share of Charter Enrollment	.	0.74	.	0.74
Number of Schools	319		319	

Notes: Average value-added for charter schools is weighted by enrollment;. Empty cells in panels B, C and D correspond to years when these school categories are no longer in operation or have yet to begin operation. Estimates are constructed using matching model comparison group.

Table 4. Estimated Effects of Prior Year CMO Performance on the Number of Schools Operated (Matching estimates)

	Net Change		Net Expansion		Net Contraction	
	(1)	(2)	(3)	(4)	(5)	(6)
CMO Average Math VA	0.118	0.127	0.039	0.040	-0.029	-0.040
	(0.060)	(0.070)	(0.023)	(0.026)	(0.016)	(0.019)
CMO Average Reading VA	0.197	0.175	0.059	0.050	-0.061	-0.054
	(0.071)	(0.075)	(0.027)	(0.028)	(0.019)	(0.020)
CMO FE	No	Yes	No	Yes	No	Yes
Mean	0.139		0.120		0.055	
N	1847		1847		1847	

Note: Data for regressions include all CMOs operating in each year. Each estimate comes from a separate regression. All regressions include year dummies. The dependent variable in columns (1) and (2) is the net change in the number of campuses in operation for a CMO, while columns in (3) - (6) the dependent variable is an indicator equal to one if the net change is positive (expansion) or negative (contraction). Estimates are constructed using matching model comparison group. Standard errors are clustered at the CMO level.

Table 5. Estimated Effects of Program Characteristics and Student Selection on Charter School Value-added (Statewide estimates)

	Mathematics				Reading			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
No Excuses Indicator	0.164	0.097	0.092	0.092	0.091	0.038	0.027	0.028
	(0.023)	(0.020)	(0.021)	(0.021)	(0.016)	(0.014)	(0.014)	(0.014)
Proportion New		-0.373	-0.337	-0.359		-0.297	-0.227	-0.242
		(0.035)	(0.041)	(0.045)		(0.031)	(0.036)	(0.041)
Achievement Difference								
Entrants			0.025	0.034			0.063	0.068
			(0.020)	(0.021)			(0.019)	(0.021)
Persisters			0.008	0.012			0.014	0.014
			(0.014)	(0.015)			(0.012)	(0.012)
Infraction Rate Difference								
Entrants				0.073				0.059
				(0.047)				(0.048)
Persisters				-0.006				-0.024
				(0.035)				(0.035)
N	1409				1396			

Note: The estimates come from school-by-year-level regressions with estimated value-added produced by the statewide comparison model as the dependent variable. Regressions include demographic characteristics and year dummies. Standard errors are clustered at the campus level.

Table 6. Estimated Effects of Program Characteristics and Student Selection on Charter School Value-added (Matching model estimates)

	Mathematics				Reading			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
No Excuses Indicator	0.185	0.128	0.127	0.129	0.113	0.067	0.061	0.066
	(0.030)	(0.029)	(0.030)	(0.030)	(0.022)	(0.023)	(0.023)	(0.022)
Proportion New		-0.317	-0.317	-0.360		-0.225	-0.194	-0.389
		(0.042)	(0.044)	(0.047)		(0.043)	(0.047)	(0.051)
Achievement Difference								
Entrants			-0.014	0.002			0.012	0.029
			(0.021)	(0.023)			(0.020)	(0.022)
Persisters			0.017	0.026			0.025	0.031
			(0.015)	(0.015)			(0.014)	(0.014)
Infraction Rate Difference								
Entrants				0.103				0.121
				(0.057)				(0.055)
Persisters				0.029				0.031
				(0.033)				(0.035)
N	1397				1385			

Note: The estimates come from school-by-year-level regressions with estimated value-added produced by the matching model as the dependent variable. Regressions include demographic characteristics and year dummies. Standard errors are clustered at the campus level.

Table 7. Estimated effects of Specific School Policies and Student Selection on Charter School Value-added (Statewide Estimates)

	Math		Reading	
	(1)	(2)	(3)	(4)
Uniforms	0.155	0.103	0.052	0.013
	(0.033)	(0.033)	(0.027)	(0.024)
Dress Code	0.046	0.034	0.010	0.007
	(0.031)	(0.029)	(0.026)	(0.023)
High Dosage Tutoring	-0.006	-0.015	-0.010	-0.024
	(0.032)	(0.031)	(0.021)	(0.022)
Parental Engagement	0.014	0.007	0.010	0.006
	(0.034)	(0.033)	(0.026)	(0.026)
High Expectations	0.050	0.033	0.034	0.020
	(0.027)	(0.026)	(0.020)	(0.019)
Days per year	0.005	0.006	-0.001	0.000
	(0.004)	(0.004)	(0.003)	(0.003)
Hours per year	-0.012	-0.027	0.008	-0.005
	(0.012)	(0.011)	(0.008)	(0.008)
Proportion New		-0.271		-0.194
		(0.046)		(0.041)
Achievement Difference				
Entrants		0.042		0.070
		(0.022)		(0.021)
Persisters		0.019		0.013
		(0.014)		(0.012)
Infraction Rate Difference				
Entrants		0.071		0.067
		(0.047)		(0.048)
Persisters		-0.019		-0.030
		(0.035)		(0.035)
N	1409	1409	1396	1396

Note: The estimates come from school-by-year-level regressions with estimated value-added produced by the statewide comparison model as the dependent variable. Regressions include demographic characteristics and year dummies. Standard errors are clustered at the campus level.

Table 8. Estimated effects of Specific School Policies and Student Selection on Charter School Value-added (Matching Model Estimates)

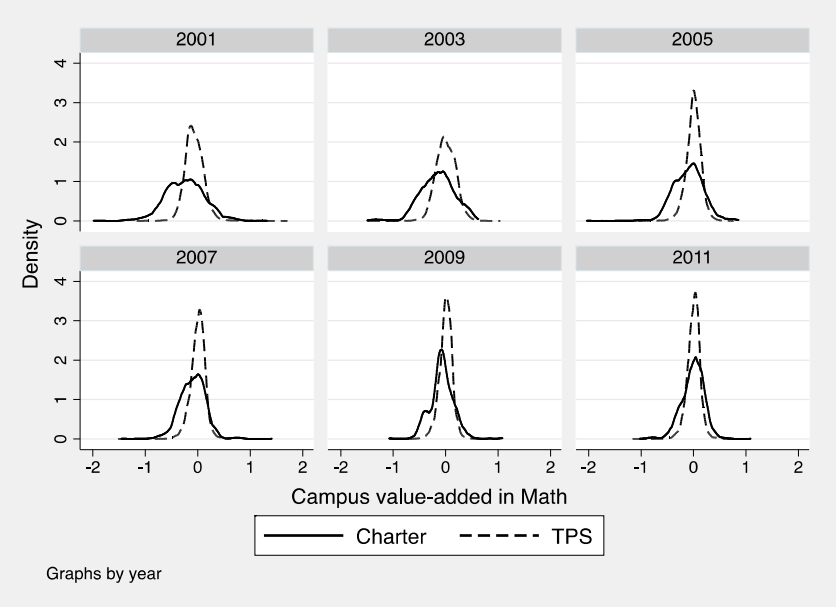
	Math		Reading	
	(1)	(2)	(3)	(4)
Uniforms	0.162	0.129	0.137	0.117
	(0.041)	(0.042)	(0.035)	(0.035)
Dress Code	0.063	0.054	0.081	0.077
	(0.037)	(0.036)	(0.031)	(0.030)
High Dosage Tutoring	-0.004	0.002	-0.001	0.000
	(0.047)	(0.045)	(0.034)	(0.032)
Parental Engagement	-0.026	-0.034	-0.023	-0.028
	(0.048)	(0.047)	(0.035)	(0.033)
High Expectations	0.062	0.053	0.045	0.042
	(0.033)	(0.032)	(0.027)	(0.026)
Days per year	0.002	0.002	0.000	0.000
	(0.005)	(0.005)	(0.003)	(0.003)
Hours per year	-0.011	-0.020	-0.013	-0.018
	(0.014)	(0.013)	(0.011)	(0.010)
Proportion New		-0.274		-0.167
		(0.055)		(0.048)
Achievement Difference				
Entrants		0.006		0.035
		(0.023)		(0.021)
Persisters		0.032		0.031
		(0.015)		(0.014)
Infraction Rate Difference				
Entrants		0.117		0.123
		(0.054)		(0.056)
Persisters		0.026		0.030
		(0.034)		(0.035)
N	1397	1397	1385	1385

Note: The estimates come from school-by-year-level regressions with estimated value-added produced by the matching model as the dependent variable. Regressions include demographic characteristics and year dummies. Standard errors are clustered at the campus level.

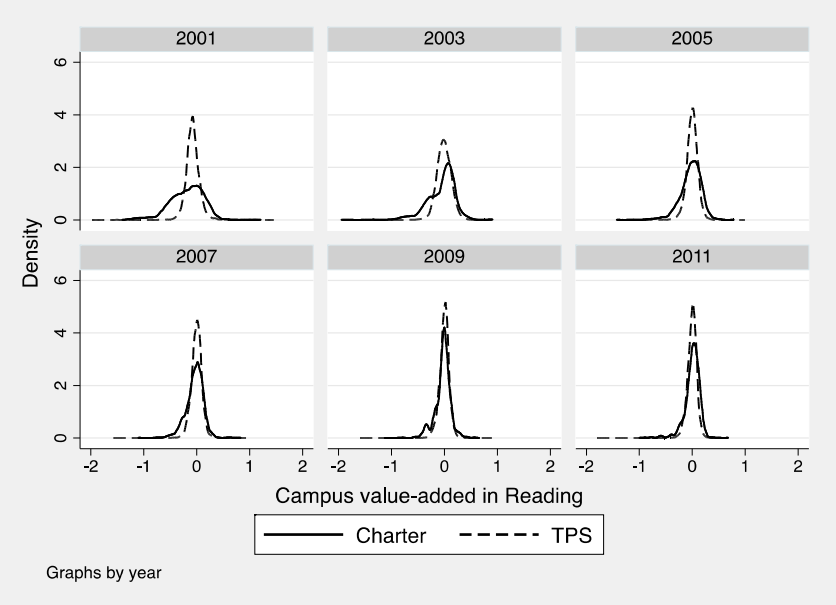
Appendix A

Figure A1. Distributions of School Quality by Year (Statewide estimates)

Panel A. Mathematics



Panel B. Reading



Notes: Distributions of residual quality after controlling for 1, 2, 3, 4, and 5+ years of operation. Kolmogorov – Smirnov tests performed for differences in distribution for each comparison year all yield p-values that indicate significant differences at the 1 percent level.

Appendix B: Classification of Schools as Adhering to the No Excuses Philosophy

We used a number of sources of information to determine whether a CMO adhered to the No Excuses philosophy. First, our research assistant called each school, described our project, and asked the representative if they could answer some questions about the school's approach to education. This often proved difficult, as many offered vague or curt responses. The research assistant then explored the website (if available), focusing on the mission or vision statements, superintendent's message, history, and other relevant information to gain a general feel for the school. Perhaps the most important source of information was the school handbook and code of conduct, and the research assistant carefully sifted through these documents. Finally, if none of these sources proved adequate, the research assistant searched for school reviews and articles that provided information on school policies and practices.

We focused on six areas to determine whether to classify a school as adhering to the No Excuses Philosophy. These areas are the following:

- **Discipline:** Most schools follow a progressive disciplinary system and provide clear expectations for behavior. Some schools, however, stand out as being particularly strict. We classify schools as strict in the discipline dimension if they use corporal punishment, impose strict zero tolerance policies for misbehavior, curfews, fine dining requirements (no talking or sharing), or sizable monetary fines for having cell phones or electronics, or undertake legal prosecution if a teacher is offended by students' language or other actions.

- **Expectations:** We use the following questions to determine whether a school sets very high expectations: Does the school hold all students to the same high expectations

regardless of extraneous circumstances or family background? Does the school follow state standards or hold their students to higher expectations (i.e. are students required to meet state required 90 percent compulsory attendance or do they require *all* students to maintain 95-100 percent attendance to stay enrolled?)? Does the school require that all students are accepted at a university? Are students expected to graduate from college?

- **Uniforms**: Does the school require students to wear uniforms? Adhere to a strict dress code? Are there serious consequences for failing to comply? Are students sent home? Fined? Given detention? How many infractions until there is a serious consequence?
- **Parental Involvement:** Are parents encouraged to actively participate in the school? Are parents required to sign a commitment form?
- **Incentives**: Does the school offer rewards to students who surpass expectations? Most schools recognize students through things such as honor roll, by allowing them to go on field trips, or by letting them have a free dress day. Some offer additional incentives such as monetary prizes or privileges for good grades, attendance, and have a strong belief in reinforcing good behavior.
- **Extra**: Is there an extended school day? Week? Year? Is Saturday school offered or required? Tutoring?

For some CMOs that were consistent across categories the classification decision was straightforward. For other CMOs the decision was more difficult, because they appeared to be strict in some dimensions but not others. In classifying these schools, we placed particular emphasis on the strictness of the disciplinary practices.