Preliminary draft. Not for citation. Comments welcome.

The Effect of Charter Competition on Traditional Public School Students in Texas

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April 2004

Abstract

Institutional reforms of the public school system which expand choice, such as vouchers, compete with within-institution reforms, such as reductions in class size, as policies to enhance performance. Choice reform is especially attractive because it has the possibility of increasing educational outcomes without increasing costs. Competition induced by school choice might lead traditional public schools to be more cost efficient while increasing student performance.

The emergence of charter schools provides an important opportunity to test the competition hypothesis. Charter schools operate as new public sector entrants and compete directly with traditional public schools for students. Although they retain the major defining characteristics of a public school, especially public funding, charters are freed from some regulations. The ability to differentiate their operations makes them potentially strong competitors for existing public schools in the market for seats. Texas has been an important player in the emergence of the charter school industry. We test for a competitive charter effect by looking for changes in student achievement in traditional public schools following charter market penetration. We use an eight-year panel of data on individual student test scores for public schools students in Texas in order to evaluate the achievement impact of charter schools. We control for student background in two ways. We estimate a campus fixed effects model which also controls for observed student and student family background characteristics. We also estimate a student fixed effects model, controlling directly for student and student family background characteristics. For both models we find a positive and significant effect of charter school penetration on traditional public school student outcomes.

I. Introduction

The debate over choice reform of U.S. elementary and secondary public schools continues to rage. Against a backdrop of measured and perceived declines in the quality of public school outputs, institutional reforms which expand choice, such as vouchers, compete with within-institution reforms, such as reductions in class size, as potential performance-enhancing policies. One claim which distinguishes choice reform from most within-institution reforms is the possibility of increasing educational outcomes for all students without increasing the allocation of resources to the educational sector. The theoretical argument for the existence of such student population welfare-improving choice policies is based upon potential inefficiency within the current public education market. In particular, existing public school suppliers may not be cost-efficient due to technical and/or allocative failures. Weak incentives could result in public schools operating above their relevant cost frontiers. A significant literature has developed which suggests that a lack of competition in the education market is an important root cause of this cost inefficiency. If choice reforms increase effective competition and all suppliers in the post-reform equilibrium move towards or onto their frontiers, then improvements of the Pareto-type are possible. Examples of papers which develop this theme include Hoxby (2000, 2003), Dee (1998), and Grosskopf et al (2004).

The emergence of charter schools as a type of institutional reform provides an important opportunity to test the competition hypothesis. Charter schools operate as new public sector entrants and compete directly with traditional public schools for students. Although they retain the major defining characteristics of a public school: public sector funding, non-selective admission, and public sector monitoring, charters are given degrees of freedom from some regulations[1]. The ability to differentiate their operations makes them potentially strong competitors for existing public schools in the market for students.

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[1] Charter schools in Texas are exempt from teacher certification and minimum salary requirements, and have greater freedom in devising their curriculum. They remain subject to many of the programmatic requirements that fall on all public schools, such as those regarding special education, bilingual education, and extracurricular activities.

Broad evidence as to the success of the charter sector is its rapid growth. During the 1994-95 school year there were roughly 100 charter schools enrolling 25,000 students in the United States; during the 2000-01 year there were over 2000 charter schools operating with an enrollment of over half a million students (RPP International, 2001). Over the same time period, the number of states which had passed charter legislation grew from 20 to 37 (plus the District of Columbia).

Texas has been an important player in the emergence of the charter school industry. The original charter legislation in Texas was passed in 1995. The first sixteen schools opened in the 1996-97 academic year with an enrollment of 2,412. By 2001-02, almost 47,000 students were enrolled across the 179 operating charter schools. These 47,000 students represent 1.1% of the total public school student enrollment in Texas.

Despite the rapid growth, the Texas charter sector is still in its infancy. It may be premature to make a definitive evaluation of the relative performance of charters. It is not too early, however, to look for a response from traditional public schools to the entry of charters.

We test for a competitive charter effect by looking for changes in student achievement outcomes in traditional public schools following charter market penetration. We utilize an eight-year panel of data on individual test scores for public schools students in Texas to evaluate the achievement impact of charter schools. We control for student background in two ways. One model we estimate has campus fixed effects and includes student characteristics as explanatory variables, to control for observed student and student family background characteristics as well as for overall campus characteristics. A second model has student fixed effects, controlling directly for student and student family background characteristics. For both campus fixed-effect and student fixed-effect models, we find a positive and significant effect of charter school penetration on traditional public school student outcomes. These findings are supportive of the potential for systemic welfare-improving reallocations from competition-enhancing school reform policies.

II. Charter Schools in Texas

Since the passage of the original charter school legislation in 1995, charter schools in Texas have been expanding rapidly in the number of charter school districts, charter school campuses, and students. The expansion is at least partly attributable to the supportive charter law environment. The charter law structure in Texas is ranked as the seventh most charter-friendly in the United States by the Center for Education Reform (1997). An idiosyncracy of the Texas charter legislation is that, beginning with the 1998-99 school year, some charters were granted on the condition that they serve primarily (at least 75%) academically "at-risk" students. The number of charters issued to this type of school was not capped as it was for open enrollment charters. This charter law incentive structure had an effect, as well over half of the new charter schools which opened in academic years 1998-99 and 1999-00 were of the at-risk type. This distinction between charter types and chartering rules was eliminated prior to the 2000-01 academic year.[2]

As one might expect when a new group of competitors enters an industry, most of the growth in students enrolled in charters is driven by the entrance of new firms, as opposed to the expansion of existing firms. As shown in Table 1, there were 16 charter schools in academic year 1996-97, the first year of charter operation. This grew to 61 charters in 1998-99, 142 in 1999-00, and 179 in 2001-02. Enrollment in charters also grew rapidly, from 2,412 in 1996-97 to 12,226 in 1998-99, 25,687 in 1999-00, and 46,939 in 2001-02. To put this in perspective, by AY 2001-02 charter schools were enrolling over 1% of the total public school student body in Texas.

Charter schools in Texas are spatially concentrated. Although there are charter schools operating in 41 of the State's 254 counties, over 60% are located in counties within the four largest metropolitan areas: Houston, Dallas-Fort Worth, San Antonio, and Austin (see Table 2). These six counties (Bexar, Dallas, El Paso, Harris, Tarrant, and Travis) contain almost 48% of the population of Texas. At the same

[2]Open enrollment charters were initially capped at 60 for academic year 1998-99, then 120 for 1999-00. In 2001 the legislature eliminated the at-risk exemption and capped the number of charters at 215, while also allowing for unlimited charters sponsored by colleges or universities.

time, there are 35 additional counties in Texas containing 65 charters, and these counties account for 24% of the population of Texas. Finally, there are 213 counties in Texas without a single charter school.

The concentration of charters in metropolitan areas might be expected, as charters must draw students away from existing traditional public schools and may find it easier to attract a critical mass in areas of relatively high population density. This geographic concentration also suggests that the competitive effects of charters might be strongest, or at least most easily detected, in these six counties. On the other hand, school districts in major metropolitan areas may differ from school districts in other areas of the state in ways that lead to differential responses to charter school competition.

Table 3 provides information on the extent of charter school penetration of traditional public school districts. The table provides, for each relevant academic year, the number of traditional school districts containing at least one charter school, the enrollment of the districts containing at least one charter school, and the percentage of the overall public school enrollment that is in districts containing at least one charter school. The number of districts facing competition for students from at least one charter has increased from 5 in 1996-97 to 67 in 2001-02. While there are 1041 school districts in Texas so that 67 districts may seem like a small number, these 67 districts hold nearly 42% of the total public school enrollment in Texas.

When examining the effect of charter competition, one important issue is how to define the amount of charter competition that a traditional public school district or campus faces. We use two measures of charter competition. One, which we refer to as the district competition measure, is the percent of public school students in a district that attend a charter school, relative to total (traditional public plus charter) public school enrollment in a district. Our second measure, which we refer to as our campus competition measure, is constructed using the flow of students in and out of each campus. In each year the outflow of students to charters at a given campus is the number of students at that campus in the previous year that we observe moving to a charter school in the current year, divided by the total number of students at that campus in the previous year and that we can track to the current year. The inflow of students from charters to a given campus is the number of students at the campus in the current year that we observe in charter schools in the previous year, divided by the total number of students at the campus in the current year that we can track back to the previous year. The net flow of students to charters at the campus in that year is the out flow minus the in flow. The campus level charter competition measure is then the sum of this net flow in the current year and all previous years.

The district competition measure is the cleanest to construct, and has the relative advantage of focusing on the district, which presumably has a central decision maker allocating resources among campuses. The campus competition measure is more difficult to construct and seems more subject to measurement error, but has the relative advantage of providing a measure of charter competition as the campus level, an administrative level closer to the students we are observing. By using these two substantially different measures of charter competition we can see how robust our results are to how this important variable is constructed.

The State Board of Education is the principal chartering agency in Texas. This granting structure facilitates greater competition between charters and traditional local public schools than in many other states in which the local public school district is also the charter-granting agent. For charter schools in operation prior to the 2001-02 school year, the Texas school financing rules transfer one hundred percent of the maintenance and operation formula support, conditioned upon the enrollee's personal characteristics, from the child's home district to the charter school. The local district revenue implications of losing a student to a charter are thus larger in Texas than in either Michigan or Arizona, the two states which have been the focus of much of the charter school research to date. In both of those states, only the state portion of the pupil funding follows the student to the charter school.

In a recent paper on the competitive effect of school choice, Hoxby (2003) argues convincingly that a meaningful test of the school choice competition hypothesis requires a reform environment which meets six criteria. The criteria are of two types: (a) institutional – entry rules, funding rules and (b) data availability – pre- and post-reform. Hoxby demonstrates that Arizona and Michigan satisfy her criteria, and proceeds to analyze those two cases. As summarized in the paragraphs above, we would argue that Texas also satisfies the institutional requirements for a viable, competitive charter sector, and thus for a potential traditional public school competitive response. With respect to criterion (b), we have assembled a data set of individual student performance on the standardized reading and mathematics tests which have been administered to Texas public school students in grades 3 through 8 since 1994. This is detailed in our discussion of the data.

III. The Data

The data for this project were obtained from the Texas Education Agency and consist of district, campus and student level observations. The student level data consists of observations on all students in grades 3 through 8 (the grades in which the Texas Assessment of Academic Skills test, or TAAS test, is administered) from 1995 to 2002. Each student was given a unique identification number, which allows us to track each student as long as they remain in the public school system. The data contain student, family, and program characteristics including gender, ethnicity, eligibility for a free or reduced price lunch (used here to indicate economically disadvantaged status), limited English proficiency, and participation in special education.[3]

The TAAS test in math and reading is administered in the spring to all students in grades 3 through 8 and 10. Approximately 15% of students in the relevant grades do not take the test either because they are exempt or they are absent on testing days.[4] The TAAS math and reading tests each contain 40 questions. These are criterion reference tests, so each year the TEA transforms the raw scores into the Texas Learning Index or TLI, which allows comparisons across school years and grades, and

[3] Due to confidentiality concerns at TEA, the data on student characteristics such as ethnicity are masked if there are fewer than five students in a cell in a single grade at a campus. Thus if there is only one Hispanic student in fifth grade at a school in particular year, that student's ethnicity is listed as missing. In addition, while we have an indicator for participation in special education, we do not have information on the student's specific disability. Thus the special education indicator encompasses a very wide range of students, from those with speech difficulties or learning disabilities to the deaf or blind.

[4] Certain special education students and limited English proficiency students are exempted from the TAAS if a school committee determines that the test is not educationally appropriate for the student.

allows for evaluation of student progress. The TLI is a scaled score that ranges roughly from 0 to 100, with the passing standard fixed at 70. Raw scores are converted to TLI values by determining the score that would place the tested student in the reference year (1994) distribution, the year in which the passing standard was established. For example, if the passing standard had been set at the 40th percentile of the 1994 distribution, a student taking the test in 2002 scoring a raw score that would place him exactly at the 40th percentile of the reference distribution would be given a TLI score of 70. If instead that student's score placed him one standard deviation above the passing level in the reference distribution, then his TLI score would be set at 85, because the TLI is constructed such that one standard deviation in the reference population corresponds to 15 TLI points. TLI scores therefore have a norm-referenced character although, because each student's performance is evaluated by reference to an earlier year's population, it is possible for the entire population to show positive average TLI score growth.[5]

In addition to student level data we utilize data on the composition of the student body at each campus. We include in our model the percentage of students by ethnicity, limited English proficiency, disadvantaged status, and enrollment in special education in order to control for peer effects. This campus-level demographic data is based on the entire student body rather than only those grades in which the TAAS is administered.

It is useful to identify the characteristics of students who attend charter schools in Texas, if only as background to our analysis of the competitive impact of those students remaining in traditional public schools. Charter schools are particularly heterogeneous in terms of student characteristics, as there are charters for gifted students and charters for individuals in the juvenile justice system. Table 4 provides a comparison of students enrolled in charters schools with students enrolled in traditional public schools. Charter schools serve a substantially smaller share of Anglo students, and a substantially larger share of African-American students, than traditional public schools. Charters have a larger percentage of economically disadvantaged students (defined as those eligible for a free or reduced price school lunch)

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[5] See the *TEA Technical Digest* for a complete description of the method of computing the TLI.

than traditional public schools.[6] Finally, charters on average have lower percentages of their students labeled as special education students, a lower percentage of students labeled limited English proficiency, a lower proportion of gifted and talented, and a lower proportion of students in Career and Technology programs.

IV. Empirical Model and Results.

There are various methods of measuring student performance and school contribution to student performance. We have chosen to use a value-added measure, so that student – and school – performance is measured as the increase in a student's academic achievement. In our case we measure academic achievement as the scaled score on the annual TAAS exam, the TLI score, and our value added measure is the change in this TLI score. Our access to individual student data allows us to measure student performance as individual student change in TLI score, and to measure school performance as the school average of individual student change in TLI score. We call this measure TLI Gains. In contrast, many researchers have looked at changes over time in school average test scores. For us this would be calculated as first averaging the TLI scores at a school for each year, and then calculating the change in this average TLI score over time. We call this alternative measure TLI Changes.

Table 5 summarizes Math and Reading TLI Levels and TLI Gains at the district level, the campus level, and the student level. The district mean Math TLI Level is 85.2, which means that if you average the Math TLI Levels of all the 4 through 8th grade students in each district, then take the mean of those averages across districts, that mean is 85.2. Similarly the district mean Math TLI Gains is 1.54, meaning that the average district has a mean TLI Gain of 1.54 on the Math test. Similarly, the average campus has a mean Math TLI Gain of 2.27, and the average student has a Math TLI Gain of 1.54 in 2001-02.[7]

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[6]Note that this comparison treats as missing data the 31 charter schools that reported zero disadvantaged students. These are most likely schools that have chosen not to participate in the federal school lunch program, not schools that literally have zero economically disadvantaged students.

[7]The student TLI Gains are set to missing if a change of more than 30 points in TLI score is observed from one year to the next.

Tables 6A and 6B present our first set of regressions. These initial regressions are based on campus-level data as the unit of analysis, and provide a specification most closely related to those in Hoxby (2003). We look at two value-added measures of performance, TLI Changes and TLI Gains, for 4^{th} grade students on the Math and Reading TAAS tests. Each regression is a campus-level regression of the value-added performance measure on an indicator variable that is non-zero when the level of charter competition reaches a specified level. We include campus fixed effects, as well as year indicators. We look at two different measures of charter competition and experiment with different threshold values for the indicator to switch on.

Table 6A measures charter competition using our district competition measure defined as the within-district enrollment in charters in grades 3 through 8 divided by the district level public school enrollment in grades 3 through 8 (including students in charter schools). Although we look at the performance of students in these grades, school districts may respond to competition from charter schools in all grades. We construct a similar measure of charter competition using enrollment in all grades. These results are presented in Table 6B.

In Table 6A, the first row of results is for TLI Changes for the Math test. The coefficient on the charter school competition indicator is 0.79 when the threshold value for the charter competition indicator switches at 3% charter enrollment, and 1.55 when the threshold value is 4% charter enrollment. When the actual charter competition enrollment percentage is used instead of an indicator, the coefficient is 12.9. All coefficient estimates are statistically significant.

The second row indicates results for TLI Changes for the Reading test. When the threshold value is 3% the coefficient is positive but statistically insignificant, while when the threshold value is 4% the coefficient is positive and significant.

We report results for TLI Gains for the Math and Reading tests in the third and fourth rows. Here the coefficients are positive and statistically significant when the indicator threshold is either 3% or 4% charter enrollment. For TLI Gains even the charter competition coefficient for the Reading test is positive and significant.

To provide perspective on the choice of threshold level, we also provide in the last row of Table 6 information on the number of campus-year observations included in the regression that provide a non-zero value for the indicator. When the threshold level is 3%, for example, there are 1,043 campus-year observations in which the indicator is one, out of 24,911 total 1995-2002 campus-year observations in our data. At a 4% threshold level, there are only 231 observations when the indicator is one.

For Table 6B we redo the estimation using enrollment in all grades to measure competition. In this case we have more observations when the indicator is unity for each threshold level, so we look at threshold levels of 3% through 5%. This is because many districts face more charter competition in the high school grades than in secondary grades. Even at 5% we have 569 year-campus observations with the indicator switched on. The charter competition coefficients in Table 6B are positive and statistically significant, with the exception of the TLI Changes - Reading coefficient when the threshold value is 4%, which is positive but statistically insignificant.

The results in Table 6 suggest that charter competition has a positive impact on the test scores of students remaining in traditional public schools. This is the systemic benefit of charter schools – they add to the competition facing traditional public schools and induce greater student performance from students remaining in the traditional public schools. Moreover, this effect appears to occur at fairly low levels of charter competition.

One problem with this indicator approach is that the critical or threshold level for the indicator switching on is unknown a priori.   In earlier work Hoxby (2003) has suggested that the minimal level of charter enrollment necessary to identify the positive competitive effect is likely to be 6%. Our results suggest that the effect can be identified even at the lower relative enrollment levels found in Texas.[8]

One limitation of some of the early work on the issue of charter competition is that the unit of observation was the campus. Thus regressions analyzing changes in the average test scores at a campus from one year to the next were the only option available to researchers. Our access to individual student

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[8]Hoxby's (2003) specification would be most similar to what we call TLI Changes, and with competition defined among all grades as in our Table 6B.

data allows us to look at individual student gains in test scores from one year to the next, and to evaluate schools on the basis of the average of these gains. Using individual student data allows us to better control for both observable and unobservable student characteristics.

In what follows we analyze student test score gains – actually TLI gains – using individual students as our unit of observation. Table 7 presents our first set of results using individual student data as the unit of observation. We regress each student's TLI gain on our measure of charter competition, on various student and program control variables, and on campus and district size measures. These regressions include all student observations in grades 4 through 8, and to control for differences over time and grade level each regression includes a complete set of year-by-grade indicators. For all our student level regressions we use a randomly selected sample of one-third of the student observations, in order to make the regressions computationally tractable.[9] We again look at TLI gains in both math and reading, and we look at both our district charter competition measure and our campus charter competition measure.

The first column of results in Table 7 presents coefficient estimates for TLI Gains in math, with our district competition measure. The coefficient of 14.4 on the charter competition variable is positive and statistically significant. To interpret this coefficient, in a district facing five percent charter competition (e.g. Dallas and Houston in 2001-02), the districts average student Math TLI Gains would be 0.72 higher than if they faced no charter competition. The district average Math TLI growth is 1.54 with a standard deviation of 1.12 (from Table 5), so five percent charter competition would lead to a 0.64 standard deviation increase in the district's value-added output measure. We find similar results on Table 7 for the campus competition measure, and a slightly smaller but still positive and significant effect of charter competition on student Reading TLI Gains.

[9] The random selection was based off of students, not student-year observations, so the resulting sample has the same average number of year observations per student as the full sample, as well as having the same demographic distribution. The student-level OLS results from Table 7 yield numerically identical results if run with the full sample.

Although the OLS results in Table 7 do have controls for the observable characteristics of the students, they do not control for the characteristics of the campus the student is at. In Table 8 we report results using campus fixed effects to control for time-invariant characteristics of the public school campus. Because the location of charter schools likely depends on the quality of the surrounding public schools, it is important to control for this in the analysis. Campus fixed effects control for any time-invariant characteristics of the public school campuses, which may help to alleviate these concerns. Adding campus fixed effects increases the coefficient on the charter competition variable in all cases. For instance, for Math TLI Gains with the district competition measure the coefficient on charter competition increases from 14.4 to 19.6, so that now a district with five percent charter competition would increase its average Math TLI Gains by almost a full point, relative to a district with no charter competition.

One benefit of having a matched panel of students over time is that we can use student fixed effects to control for unobserved time-invariant student characteristics. Because student characteristics such as parental involvement and innate ability are believed to have strong effects on student performance, being able to control for these individual student characteristics is important. Additionally, controlling for student fixed effects allows us to address concerns that charter schools may be "cream-skimming," or any other concerns that the students leaving public schools for charters are, in some unobservable way, different from those remaining in the traditional public schools.

Table 9 presents the results of the regressions with student fixed effects. The coefficient on the charter competition measure remains positive and significant, and for Reading TLI Gains it is actually larger than in the campus fixed effects specification. The coefficient of 22.9 on the district competition measure in the Reading TLI Gains regression indicates that a five percent level of charter competition would correspond to over a one point increase in the value-added performance measure, relative to a district with no charter competition.

One possible concern is that charter schools may be locating in areas where students are poor performing, so that comparing districts with charter competition to those without also entails comparing districts with different levels of student achievement. In Table 10 we see that the average TLI scores in

Math and Reading are lower in those districts facing charter competition than in those that do not face charter competition. Because students with lower levels scores tend, on average, to have higher TLI Gains, this means that districts facing charter competition will tend to have higher TLI Gains than those districts not facing charter competition. Student and campus fixed effects are one way to address this concern, as these control for the unobservable time-invariant characteristics such as student ability and campus/district student composition.

A second stragegy would be to directly control for the student's prior year achievement level in the regression. Tables 11 and 12 show results when we include indicators for the student's prior year achievement quartile, where the achievement quartile is assigned off of the student's level TLI score in the prior year. Table 11 shows the OLS results without campus fixed effects. Compared to the results from Table 7, controlling for the student's achievement quartile decreases the coefficient on charter competition. Similarly, the campus fixed effects results in Table 12 show that adding the achievement quartile indicators cause the campus competition coefficients to decrease slightly, compared to the results in Table 8.

V. Conclusions

Although charter schools only accounted for 1.1% of total public school students in 2001-02, we find that charter school competition does have a significant positive effect on the performance of traditional public schools in Texas. This positive effect is consistent across both Math and Reading tests, both district and campus level competition measures, and across a variety of specifications. Although the estimated effect is relatively small, a persistent increase in value-added achievement by schools could lead to substantially higher student achievement levels. These findings are consistent with other studies that have found significant positive effects of competition on school performance, and suggest that even a relatively small program like Texas charter schools can have a significant impact on school performance. The evidence of a positive systemic effect of charter competition strengthens arguments in favor of expanding school choice.

References

Alexander, Celeste D., Timothy J. Gronberg, Dennis W. Jansen, Harrison Keller, Lori L. Taylor, and Philip Uri Treisman. *A Study of Uncontrollable Variations in the Costs of Texas Public Education: A Summary Report Prepared for the 77th Texas Legislature.* The Charles A. Dana Center, University of Texas at Austin, November 2000.

Baltagi, Badi H, 1995. *Econometric Analysis of Panel Data.* Chichester: John Wiley & Sons.

Belfield, Clive. R. and Henry. M. Levin, 2001. "The effects of competition on educational outcomes: A review of the U.S. evidence," Occasional Paper 35, Teachers College, National Center for the Study of Privatization in Education, Columbia University.

Bifulco, Robert and Helen F. Ladd, 2003. "The impacts of charter schools on student achievement: Evidence from North Carolina," paper prepared for the Association of Public Policy Analysis and Management Annual Meeting on November 6-8, Washington, D.C.

Cullen, Julie B., Brian A. Jacob and Steven D. Levitt, 2000. "The impact of school choice on student outcomes: An analysis of the Chicago public schools," Working Paper No. 7888, National Bureau of Economic Research.

Dee, Thomas S., 1998. "Competition and the Quality of Public Schools," *Economics of Education Review* 17: 419-28.

Duncombe, William, John Ruggiero, and John Yinger, 1996. "Alternative Approaches to Measuring the Cost of Education," in *Holding Schools Accountable: Performance-Based Reform in Education*, Helen F. Ladd, editor. Washington, D.C.: The Brookings Institution.

Epple, Dennis and Richard Romano, 1998. "Competition between private and public schools, vouchers, and peer-group effects," *American Economic Review* 88: 33-62.

Gronberg, Timothy J. and Dennis W. Jansen, 2001. *Navigating newly chartered waters: An analysis of Texas charter school performance.* Austin, Texas: Texas Public Policy Foundation.

Grosskopf, Shawna, Kathy J. Hayes and Lori L. Taylor, 2004. "Competition and Efficiency: The Impact of Charter Schools on Public School Performance," *manuscript*.

Hanushek, Eric A., John F. Kain and Steven G. Rivkin, 2002. "The Impact of Charter Schools on Academic Achievement," paper presented at the Annual Meetings of the Association of Public Policy and Management in November 2003, Washington D.C.

Hanushek, Eric A., Steven Rivkin, and Lori L. Taylor, 1996. "Aggregation and the Estimated Effects of School Resources," *Review of Economics and Statistics*: 611-27.

Heckman, James J., 1979. "Sample selection bias as a specification error," *Econometrica* 47: 153-161.

Holmes, George M., Jeff DeSimone and Nicholas G. Rupp, 2003. "Does School Choice Increase School Quality?," Working Paper No. 9683, National Bureau of Economic Research.

Hoxby, Caroline M., 2000. "Does Competition Among Public Schools Benefit Students and Taxpayers?," *American Economic Review*: 1209-38.

Hoxby, Caroline M., 2003. "School Choice and school productivity (or could school choice be the tide that lifts all boats?)," in *The Economics of School Choice*, edited by Caroline M. Hoxby. Chicago: University of Chicago Press.

Hoxby, Caroline M., 2003. "School Choice and School Competition: Evidence from the United States," *Swedish Economic Policy Review* 10: 11-67.

Kain, John F. and Daniel M. O'Brien, 1998. "A longitudinal assessment of reading achievement: Evidence from the Harvard/UTD Texas Schools Project," UTD Texas Schools Project, University of Texas at Dallas.

Rouse, Cecilia Elena, 1998. "Private School Vouchers and Student Achievement: an Evaluation of the Milwaukee Parental Choice Program," *Quarterly Journal of Economics*: 554-602.

RPP International, 2001. *A National Study of Charter Schools: Fifth Year Report.* Washington D.C.: U.S. Department of Education.

Salmon, Lewis, Kern Paark and David Garcia, 2001. *Does Charter School Attendance Improve Test Scores? The Arizona Results.* Phoenix: The Goldwater Institute.

Texas Education Agency, 1997. "A Study of Student Mobility in Texas Public Schools," Austin, Texas: Texas Education Agency.

Texas Education Agency, 2001. Technical Digest; http://www.tea.state.tx.us/student.assessment/resources/techdig/index.html

Texas Center for Educational Research and others, 2002. "Texas Open-Enrollment Charter Schools: Fifth Year Evaluation," Austin, Texas: Texas Center for Educational Research.

Table 1. Number and Enrollment of Charter Schools in Texas

	Charter Schools		Percent of Public School Students
Year	Number in Operation	Enrollment	
2001-2002	179	46,939	1.13 %
2002-2001	158	37,956	0.93 %
1999-2000	142	25,687	0.64 %
1998-1999	61	12,226	0.31 %
1997-1998	19	3,856	0.10 %
1996-1997	16	2,412	0.06 %
1995-1996	0	0	--

Table 2. Charter Schools by County and County Population, 2001-2002

County or Set of Counties	Number of Charter Schools	Population in County (or Counties)*	Percent of Texas Population
Charters in Major Metropolitan Counties:			
Bexar (San Antonio)	21	1,392,931	6.7 %
Dallas (Dallas)	28	2,218,899	10.6 %
El Paso (El Paso)	4	679,622	3.2 %
Harris (Houston)	43	3,400,578	16.3 %
Tarrant (Ft. Worth)	8	1,446,219	6.9 %
Travis (Austin)	10	812,280	3.9 %
Charters in Other Counties:			
Hidalgo	7	569,463	2.7 %
Jefferson, Nueces	5 each	565,696	2.7 %
Lubbock	4	242,628	1.2 %
Bell, McLennan, Midland, Smith	3 each	742,206	3.6 %
Brazos, Cameron, Galveston, Hays, Webb	2 each	1,028,506	4.9 %
Angelina, Bee, Bowie, Brooks, Comal, Denton, Ellis, Erath, Gregg, Hunt, Lampasas, Montgomery, Panola, Potter, Real, Somervell, Taylor, Uvalde, Val Verde, Van Zandt, Walker, Wichita	1 each	1,949,691	9.4 %
Total Population of Texas		20,851,820	100 %
TX Counties with Charters - 41 counties	179 charters	14,965,719	72.8 %
TX Counties without Charters - 213 counties	0 charters	5,886,101	28.2 %

* Source: Bureau of the Census, GCT-PH1: Population, Housing Units, Area, and Density: 2000 Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data, Geographic Area: Texas

Table 3. Charter Penetration of School Districts

Academic Year	Districts with Charters	Enrollment in Public School Districts with Charters	Percent of Overall Public School Enrollment
2001-2002	67	1,738,360	41.9 %
2000-2001	59	1,587,469	39.1 %
1999-2000	40	963,714	24.2 %
1998-1999	21	940,460	23.9 %
1997-1998	10	632,311	16.3 %
1996-1997	5	158,765	4.2 %
1995-1996	0	0	0

Table 4. Student Demographics: Charters vs. Traditional Public Schools, 2001-2002

Student Group	Charter Schools (179)	Traditional Public School Districts (1,041)	Public School Districts facing Charter Competition (67)
Anglo	20.4 %	41.1 %	27.7 %
African-American	39.7 %	14.1 %	18.9 %
Hispanic	38.3 %	41.7 %	50.4 %
Asian	1.3 %	2.8 %	2.6 %
Native American	0.2 %	0.3 %	0.3 %
Economically Disadvantaged	57.6 %	50.4 %	59.5 %
Limited English Proficiency	6.7 %	14.6 %	19.6 %
Special Education	9.0 %	11.7 %	11.3 %
Career & Technology	11.7 %	19.4 %	18.5 %
Gifted & Talented	1.7 %	8.3 %	8.9 %
At-Risk	47.3 %*	32.0 %*	35.4 %*

* At-Risk percentages taken from campus level TAAS data, and reflect % at-risk in grades 3-8 and 10

Table 5. Summary of Achievement Measures, 2001-2002

	Mean	Std. Dev.	Min	Median	Max
District Means					
TLI Level - Math	85.2	2.16	71.4	85.4	90.1
TLI Gains - Math	1.54	1.12	-3.0	1.46	10.0
TLI Level - Reading	89.3	2.94	70.0	89.6	97.5
TLI Gains - Reading	2.16	1.37	-5.0	2.08	19.0
Campus Means					
TLI Level - Math	83.8	3.09	62.3	83.9	90.8
TLI Gains - Math	2.27	2.06	-10.5	2.21	18.0
TLI Level - Reading	87.1	4.17	47	87.5	96.9
TLI Gains - Reading	2.73	1.82	-28.0	2.59	19.0
Student Means					
TLI Level - Math	84.9	7.34	25	87	93
TLI Gains - Math	1.54	5.84	-30	1	30
TLI Level - Reading	88.9	10.7	15	92	101
TLI Gains - Reading	2.37	7.71	-30	2	30

Table 6A. Campus - Level Regressions with Indicator for Level of Charter Competition (Charter Competition is Measured for 3rd-8th Grade Enrollments Only)

Table entries are coefficients and standard errors on indicator for charter competition			
Achievement Measures	Level at which Indicator is non-zero		Using actual percentage instead of indicator
	3%	4%	
Change in Average Level of TLI - Math	0.79 (.16)	1.55 (.30)	12.9 (3.93)
Change in Average Level of TLI - Reading	0.18 (.16)	1.66 (.30)	5.72 (4.03)
Average of Individual Student TLI Gains - Math	1.17 (.12)	1.07 (.22)	25.5 (2.88)
Average of Individual Students TLI Gains - Reading	0.47 (.10)	0.85 (.18)	6.89 (2.34)
Number of Campus-Year Observations Included (out of 24,911)	1,043	231	

Table 6B. Campus - Level Regressions with Indicator for Level of Charter Competition (Charter Competition is Measured by Enrollment in all Grades)

Table entries are coefficients and standard errors on indicator for charter competition				
Achievement Measures	Level at which Indicator is non-zero			Using actual percentage instead of indicator
	3%	4%	5%	
Change in Average Level of TLI - Math	0.73 (.14)	0.82 (.17)	0.80 (.20)	10.8 (2.93)
Change in Average Level of TLI - Reading	0.60 (.15)	0.25 (.17)	0.56 (.20)	5.28 (3.04)
Average of Individual Student TLI Gains - Math	1.20 (.11)	1.27 (.12)	1.20 (.14)	22.0 (2.18)
Average of Individual Students TLI Gains - Reading	0.43 (.09)	0.41 (.10)	0.62 (.12)	5.42 (1.78)
Number of Campus-Year Observations Included (out of 24,911)	1,388	854	569	

Table 7. Student-Level OLS Regressions Indicating Effect of Charter Competition

Dependent Variable:	Student Math TLI Gain		Student Reading TLI Gain	
Explanatory Variables	District Competition Measure	Campus Competition Measure	District Level Competition Measure	Campus Competition Measure
measure of charter competition	14.4 (.57)	12.8 (.68)	8.09 (.69)	5.87 (.81)
female	0.14 (.0087)	0.13 (.0091)	0.055 (.010)	0.062 (.011)
black	0.59 (.014)	0.58 (.015)	0.12 (.017)	0.12 (.018)
Hispanic	0.27 (.011)	0.27 (.012)	0.078 (.014)	0.076 (.014)
disadvantaged	0.14 (.010)	0.15 (.011)	-0.050 (.012)	-0.040 (.013)
special educ.	0.58 (.018)	0.59 (.019)	0.39 (.023)	0.39 (.024)
limited English proficiency	1.77 (.023)	1.75 (.024)	2.85 (.028)	2.82 (.029)
moved district (public - public)	0.036 (.018)	0.048 (.018)	-0.15 (.021)	-0.14 (.022)
moved campus within district	-0.33 (.019)	-0.32 (.020)	-0.36 (.022)	-0.38 (.024)
campus enrollment	-.00049 (1.5e-5)	-.00052 (1.6e-5)	-.00039 (1.8e-5)	-.00041 (1.9e-5)
district enrollment	-1.4e-6 (1.1e-7)	-6.9e-7 (1.1e-7)	1.2e-6 (1.3e-7)	1.7e-6 (1.3e-7)
observations	2,770,479	2,567,295	2,743,224	2,542,696

* also includes year by grade dummies

Table 8. Student-Level Regressions Indicating Effect of Charter Competition; Includes Campus Fixed Effects

Dependent Variable:	Student Math TLI Gain		Student Reading TLI Gain	
Explanatory Variables	District Competition Measure	Campus Competition Measure	District Level Competition Measure	Campus Competition Measure
measure of charter competition	19.6 (.71)	14.8 (.93)	12.1 (.86)	8.21 (1.11)
female	0.14 (.0086)	0.13 (.0090)	0.056 (.010)	0.064 (.011)
black	0.62 (.016)	0.61 (.017)	0.12 (.020)	0.11 (.021)
Hispanic	0.24 (.013)	0.25 (.014)	-0.021 (.016)	-0.028 (.017)
disadvantaged	0.095 (.011)	0.096 (.011)	-0.060 (.013)	-0.056 (.014)
special educ.	0.59 (.018)	0.60 (.019)	0.40 (.023)	0.40 (.024)
limited English proficiency	1.78 (.024)	1.77 (.025)	2.86 (.029)	2.83 (.030)
moved district (public - public)	0.021 (.018)	0.033 (.018)	-0.15 (.021)	-0.14 (.022)
moved campus within district	-0.13 (.019)	-0.12 (.020)	-0.21 (.023)	-0.22 (.024)
campus enrollment	-.00034 (5.1e-5)	-.00040 (5.5e-5)	-.00046 (6.1e-5)	-.00046 (6.6e-5)
district enrollment	4.9e-5 (2.5e-6)	5.3e-5 (2.5e-6)	2.0e-5 (2.9e-6)	2.4e-5 (3.0e-6)
campus fixed effects statistically significant?	yes	yes	yes	yes
observations	2,770,479	2,567,295	2,743,224	2,542,696

* also includes year by grade dummies

Table 9. Student-Level Regressions Indicating Effect of Charter Competition; Includes Student Fixed Effects

Dependent Variable:	Student Math TLI Gain		Student Reading TLI Gain	
Explanatory Variables	District Competition Measure	Campus Competition Measure	District Competition Measure	Campus Competition Measure
measure of charter competition	12.1 (1.26)	12.2 (1.46)	22.9 (1.54)	12.8 (1.78)
moved district (public - public)	-0.011 (.026)	-0.0029 (.028)	-0.098 (.032)	-0.085 (.034)
moved campus within district	-0.36 (.026)	-0.36 (.029)	-0.42 (.032)	-0.42 (.035)
campus enrollment	-.0012 (3.2e-5)	-.0013 (3.6e-5)	-.0014 (3.9e-5)	-.0015 (4.4e-5)
district enrollment	-6.0e-7 (4.8e-7)	1.6e-7 (5.0e-7)	-1.8e-6 (5.9e-7)	-4.3e-7 (6.1e-7)
student fixed effects statistically significant?	no	no	no	no
observations	2,778,927	2,575,001	2,751,275	2,550,042

* also includes year by grade dummies

Table 10. Distribution of Math and Reading TLI, 2001-2002

	Grades 4-8			
	Math		Reading	
	Facing Some Charter Competition	Not Facing Charter Competition	Facing Some Charter Competition	Not Facing Charter Competition
TLI Levels				
Mean	84.0	85.3	87.8	89.6
Std. Dev.	8.0	7.0	11.4	10.2
25th percentile	81	83	83	86
Median	87	88	92	93
75th percentile	89	90	96	96
# of obs.	397,198	738,595	391,331	729,505
TLI Gains				
Mean	1.69	1.41	2.59	2.17
Std. Dev.	6.40	5.62	8.18	7.42
25th percentile	-2	-1	-2	-2
Median	1	1	2	2
75th percentile	4	4	7	6
# of obs.	397,198	738,595	391,331	729,505

Table 11. Student-Level OLS Regressions Indicating Effect of Charter Competition

Dependent Variable:	Student Math TLI Gain		Student Reading TLI Gain	
Explanatory Variables	District Competition Measure	Campus Competition Measure	District Competition Measure	Campus Competition Measure
measure of charter competition	6.17 (.53)	8.16 (.62)	1.46 (.64)	3.48 (.76)
female	0.058 (.0079)	0.053 (.0083)	0.37 (.0097)	0.38 (.010)
black	-1.35 (.014)	-1.38 (.014)	-1.68 (.016)	-1.70 (.017)
Hispanic	-0.58 (.011)	-0.59 (.011)	-0.96 (.013)	-0.97 (.013)
disadvantaged	-0.77 (.0096)	-0.76 (.010)	-1.25 (.012)	-1.24 (.012)
special educ.	-2.00 (.017)	-2.03 (.018)	-2.25 (.022)	-2.28 (.023)
limited English proficiency	-0.38 (.022)	-0.39 (.023)	-0.32 (.027)	-0.35 (.028)
moved district (public - public)	-0.57 (.016)	-0.57 (.017)	-0.71 (.020)	-0.71 (.021)
moved campus within district	-0.50 (.017)	-0.51 (.018)	-0.54 (.021)	-0.57 (.022)
campus enrollment	-.00022 (1.4e-5)	-.00024 (1.5e-5)	-1.3e-6 (1.7e-5)	-2.3e-6 (1.8e-5)
district enrollment	-1.2e-6 (1.0e-7)	-9.5e-7 (9.8e-8)	1.9e-6 (1.3e-7)	1.9e-6 (1.2e-7)
constant	10.1 (.030)	10.1 (.031)	8.13 (.036)	8.18 (.037)
indicator 2nd quartile	-4.89 (.012)	-4.88 (.013)	-4.90 (.015)	-4.92 (.016)
indicator 3rd quartile	-6.99 (.012)	-.700 (.013)	-7.03 (.015)	-7.08 (.016)
indicator 4th quartile	-8.73 (.012)	-8.76 (.013)	–9.33 (.015)	-9.38 (.016)
observations	2,770,789	2,567,295	2,743,224	2,542,696

* also includes year by grade dummies

Table 12. Student-Level Regressions Indicating Effect of Charter Competition; Includes Campus Fixed Effects

Dependent Variable:	Student Math TLI Gain		Student Reading TLI Gain	
Explanatory Variables	District Competition Measure	Campus Competition Measure	District Competition Measure	Campus Competition Measure
measure of charter competition	16.8 (.65)	14.1 (.84)	9.40 (.80)	7.89 (1.03)
female	0.055 (.0079)	0.050 (.0082)	0.38 (.0096)	0.39 (.010)
black	-1.27 (.015)	-1.29 (.016)	-1.61 (.019)	-1.64 (.019)
Hispanic	-0.63 (.012)	-0.64 (.013)	-1.05 (.015)	-1.07 (.016)
disadvantaged	-0.68 (.010)	-0.68 (.011)	-1.09 (.012)	-1.09 (.013)
special educ.	-2.08 (.017)	-2.11 (.018)	-2.38 (.022)	-2.41 (.023)
limited english proficiency	-0.39 (.022)	-0.39 (.023)	-0.35 (.028)	-0.39 (.029)
moved district (public - public)	-0.54 (.016)	-0.54 (.017)	-0.68 (.020)	-0.68 (.021)
moved campus within district	-0.35 (.017)	-0.35 (.019)	-0.44 (.021)	-0.46 (.023)
campus enrollment	-.00061 (4.7e-5)	-.00071 (5.0e-5)	-.00055 (5.7e-5)	-.00057 (6.1e-5)
district enrollment	3.2e-5 (2.2e-6)	3.4e-5 (2.3e-6)	1.3e-5 (2.7e-6)	1.5e-5 (2.8e-6)
constant	8.02 (.083)	8.00 (.087)	6.99 (.101)	6.93 (.106)
indicator 2nd quartile	-5.00 (.012)	-4.98 (.012)	-5.04 (.015)	-5.06 (.016)
indicator 3rd quartile	-7.16 (.012)	-7.17 (.013)	-7.24 (.015)	-7.29 (.016)
indicator 4th quartile	-8.96 (.012)	-8.99 (.013)	-9.63 (.015)	-9.68 (.016)
campus fixed effects statistically significant?	yes	yes	yes	yes
observations	2,770,479	2,567,295	2,743,224	2,542,696

* also includes year by grade dummies