Measuring the Competitive Effect of Charter Schools on Student Achievement in Ohio's Traditional Public Schools

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Abstract

This study examines whether charter schools are having the hypothesized positive competitive effect on traditional public school student achievement in Ohio. The research question for this evaluation is as follows: Does the increased competition for students that is created by an increased supply of charter schools in or near a traditional public school system lead to higher student achievement for traditional public school students in the form of higher math and reading scores on the state's standardized achievement tests? Ohio provides an ideal setting for a competitive effects study because the law allows for independently authorized charters. These schools are far more likely to create competition for students than conversion charters, which are authorized by local school boards. A pooled time series regression design is used to evaluate data from 2002 to 2006. The amount of competition faced by a traditional public school is measured three ways: a dummy variable for whether at least one charter school is located in the same district, the number of charter schools located in the same district, and the market share of charter schools within each district. The paper finds that charter school competition has a consistently small but significant negative effect on the proficiency passage rates of nearby traditional public schools. This finding may be due to a compositional selection effect from charter schools (as charter schools draw higher performing students, the passage rates at the traditional public schools decrease), or a direct negative impact on the quality of the education provided in the nearby traditional public schools (most likely due to decreased resources).

Introduction

One of the most contentious areas of debate in the continuing effort to reform America's K-12 education system is the introduction of school choice. The view of Moe (2003) is typical: "School choice has provoked more political conflict than any other reform…" (60) The use of school choice as a reform mechanism is widely traced to Milton Friedman's 1962 treatise *Capitalism and Freedom*, but efforts to use choice as a viable public policy prescription have only been extant within the past decade. During this time, two school choice policies in particular have gained traction – vouchers and charter schools.

Although voucher programs, which offer public funding for students to attend private schools, are the purer manifestation of the market reformers goals, they have proven to be the more politically limited of the two policy strains. Charter schools, public schools that face fewer regulations and that can be operated by independent, nonprofit organizations, are less controversial because public funds continue to go to public schools.[1] The rapid growth of charter school programs during the past decade is evidence of their growing popularity, not only among parents but also among reform-minded policymakers. Because these schools now stand as the focal point of current efforts to introduce the market incentives of choice and competition into the K-12 education system, evaluating their impacts is of the utmost importance.

According to the Center for Education Reform, nearly 4,000 charter schools now operate in 40 states and the District of Columbia. These schools enroll an estimated 1.15 million American schoolchildren (CER 2006). Charter schools present an opportunity

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[1] Because of the diversity in charter school laws across states, it is important not to be overly broad in their definition. A precise definition of charter schools in Ohio is provided in this report, but should not be considered the definition of all charter schools generally.

and a challenge to researchers who wish to study their effects due to the fact that they are state-level reforms, and no two states have charter school programs that are identical (Allen and Mitchell 2006, Wells et al 1999). The challenge is thus one of generalizability. What works in one state may not work in another. The opportunity that the existence of charter programs provides is that researchers can use these state policy laboratories to begin to identify best practices. Given these opportunities and limitations, it is critical that researchers evaluate the impact of these schools on a state-by-state basis.

It is also important that research in this field expand the scope of inquiry to include not only the impact of charter schools on those students who choose to attend them, but also the impact of these schools on the achievement of those students who remain in traditional public schools. Given that charter schools continue to educate only a small percentage of students in the states where they operate, it is critical that their impact on the larger traditional public school system be analyzed.

The basic economic theory of the systemic competitive effects of charter schools on their traditional public school counterparts holds that increased competition for students should create incentives for improvement in the quality of all schools. According to Holmes et al (2003): "When a charter school opens, the traditional school, which previously held a monopoly on public education in a feeder district, faces the prospect of losing students to the new competitor. To the extent that the school's agent (ostensibly a principal) experiences disutility from a decline in enrollment, this might lead to an increase in the traditional school's quality in order to retain students." (pg 2)

However, competition may also have a negative effect on student achievement in the traditional public schools. Bifulco and Ladd (2004) note that "Charter schools might

also diminish the quality of traditional public schools by drawing away funding, motivated students and/or quality teachers." (pg 5)

In an effort to contribute to these two goals, studying competitive effects and increasing the number of states examined, this evaluation will focus on the competitive effect that charter schools are having on traditional public school student achievement in Ohio. More specifically, does the increased competition for students that is created by an increased supply of charter schools in or near a traditional public school district lead to changes in those schools that ultimately lead to higher student achievement for traditional public school students, in the form of higher test scores on the state's standardized achievement tests?

The Existing Literature on Charter School Competitive Effects

To date, a small amount of research has been conducted on the question of whether charter schools create an 'education market' and the effects of that market on academic achievement in the traditional public schools. The result of this small body of work informs this study.

Systematic Literature Review Strategy

Due to the paucity of literature evaluating the competitive effects of charter schools on student achievement in traditional public schools in peer reviewed journals, several methods were used to conduct a systematic review of the evidence on this question. First of all, two electronic databases of peer-reviewed journals, EBSCOhost and ProQuest, were searched using the terms "charter schools" and "competitive and/or competition" in the first iteration and "charter schools" and "achievement" and "traditional" in the second iteration. In both iterations the term "charter school" was

searched in article's abstracts while all following terms were searched for occurrences in the full text of the article.

This literature review employed one criterion for the inclusion or exclusion of results from these searches. Only articles that conducted a quantitative evaluation on the competitive effects, however defined, of charter schools on traditional public school student achievement were included. Qualitative studies on the subject were excluded from this review.

In EBSCOhost, the first search term returned 58 articles, one of which concerned the topic at hand. The second search term returned 47 articles, none of which met the criterion. ProQuest returned 74 articles for the first search term and 109 for the second, none of which met the criterion for inclusion. Because the peer reviewed journals did not provide much material, the literature review had to be expanded to non-peer reviewed sources.

Thus, the second phase of the systematic literature review was conducted through the National Charter School Research Project website. This organization maintains a thorough database of charter school research, providing access to literature published as working papers or through other non-peer reviewed outlets. Two additional impact evaluations meeting the inclusion criterion were collected from this site.

The third phase of this review was conducted by using the reference section of each report to find other relevant work on the subject. This phase provided six additional reports and/or studies that have been included as part of this review. It should be noted that this phase of the review was limited to those works that were available in electronic

format. However, this is not likely a major limitation as most non peer reviewed work in this area is published on the web sites of various organizations.

Appendix A provides a detailed table describing all of the evaluations that inform this review of the extant literature on this subject.

The results of the previous literature on the competitive effects of charter schools have been mixed due in large part to two major factors. First, studies of charter school competitive effects have been done in a number of different states. As noted previously, the diversity of charter school laws, and therefore of charter school systems, is expected to lead to a diversity of outcomes. For example, some states only allow local school districts to create charter schools. Smaller or nonexistent competitive effects from these systems are likely because they are designed more as an extension of the traditional system than as a means of injecting competition or building an education market.

Second, the extant literature has used multiple measures that attempt to capture the amount of competition being exerted by charters. Also, many of the competition measures created used arbitrary operational definitions leading to inconsistency even in similar measures. That these differences in how the primary independent variable has been designed and constructed have led to varying results is not surprising. Taking these two factors into account, special attention is given in this review to the states being evaluated and the method of constructing the primary independent variable (how competition is defined and measured).

The dependent variables used in all of these evaluations have been some measure of student achievement, typically test scores, in traditional public schools while the independent variable is the level of competition faced, defined in various ways.

Currently, evaluations of the competitive effects of charter schools have been limited to only a handful of states: Florida, Michigan, Texas, North Carolina, California, and Arizona. One study evaluated the city of Milwaukee, Wisconsin.

Result of the Literature Review

The two evaluations conducted on the competitive effects of charter schools in Texas both reached similar conclusions – small but statistically significant positive effects from charter school competition (Bohte 2004 and Booker et al 2005).

Bohte (2004) used a pooled time series regression method with district level student achievement data from 1996 to 2002 as the dependent variable. He examined the level of competition created by charter schools using three different measures. The first measure was simply a dummy variable for the existence of charter schools in a given county (a 1 if the traditional public school was located in a county with at least one charter school and a 0 if it was not). The second was the total number of charter schools in the same county as a given traditional public school district. The third measure was the 'market share' of charter schools in each county. This is described as "the total number of charter school students per county as a proportion of total school enrollments in traditional public schools." All three measures provided similar results. "A 1 percentage point increase in countywide charter school enrollments (as a proportion of total enrollments) is associated with a 0.10 percentage point increase in district pass rates on TAAS exams the following year," and "the presence of any charter schools in a county leads to a 0.58 percentage point increase in district pass rates on TAAS exams the following year." (pg 511)

Booker et al (2005) used a fixed effects regression method with student level achievement data from 1995 to 2002 as the dependent variable. Their evaluation only used charter school market share as the primary independent variable, but calculated that measure two different ways. The first measure examined the market share of charter schools within each school district. The second measure examined "campus penetration" by calculating the number of students that had left a given campus for a charter school. The small positive effect they found was consistent for both measures and for both math and reading achievement in the traditional public schools.

Two studies on the competitive effects from charter schools in North Carolina came to opposite conclusions. Bifulco and Ladd (2004) used a fixed effects regression method with student level achievement data which followed student cohorts (panels) from grades 3 to 8 between 1996 and 2002. To measure the level of competition created by charter schools, they created a composite score which combined both the number of charter schools and their proximity to traditional public schools. The result is three distinct measures of competition: the number of schools within 2.5 miles, the number between 2.5 and 5 miles, and the number of charters between 5 and 10 miles from a given traditional public school. Their analysis found no effect at the two larger proximities. At the closest proximity, however, they found that increased charter competition had a small negative impact on reading achievement and no effect on math achievement.

Holmes et al (2003), also studying North Carolina, employed panel models using both the Arellano-Bond procedure for dynamic panel models and a semi-parametric maximum likelihood estimator with building level student achievement scores from 1996 to 2000. They used the distance of the nearest charter school as their measure of

competition. Overall, they found that an increase in the proximity of a charter school has a small positive effect on the math and reading achievement of traditional public school students. When they analyzed the data in subgroups of those schools with a competitor within 6km and those with a competitor beyond 6km, they found that schools facing competition within 6km showed higher math achievement, but not reading; for those schools facing competition from beyond 6km the opposite was found, a positive impact on reading but not on math. These results indicate the difficulty in identifying systematic effects from charter school competition and that the use of arbitrary cut points, particularly in measures of proximity, can lead to conflicting results.

Hoxby (2001) evaluated the impact of charter school achievement in Arizona and Michigan. She defined the method as a difference-in-difference means analysis on building level student achievement. Measuring competition as whether a school district had at least 6% of its students in a charter school (a market share method), she compared those schools facing competition above the 6% threshold to those below it. In Michigan, 4th grade reading and math increased 1.21 and 1.11 scale points respectively. In 8th grade, reading and math increased 1.37 and .96 scale points respectively. In Arizona, increased competition was related to percentile rank increases of 2.31 in 4th grade reading, 2.68 in 4th grade math, and 1.59 on 7th grade math.

Evaluating the competitive effect in Michigan, Bettinger (1999) came to the opposite result. Using both a difference-in-difference means analysis and a fixed effects regression method on building level student achievement, he found a small but statistically significant negative effect from charter competition. The primary independent variable was the number of charter schools within a 5 mile radius.

In Florida, Sass (2006) used a fixed effects regression method with student level achievement data from 1999 to 2003. The analysis used two different measures of competition across three strata – the proximity of the nearest charter school and the market share of charter schools within 2.5-, 5-, and 10-mile radii of each traditional public school. No effect was found for any of those measures on reading achievement. However, a small but statistically significant impact was found for the number of charter schools within 2.5 and 5 miles, as well as for the market share of charters within 2.5 miles on math achievement.

Buddin and Zimmer (2005) analyzed charter school competitive effects in California. Using a fixed effects regression method on student level achievement data in six school districts from 1997 to 2002, they found no effect. Their measures of charter school competition are the most comprehensive in any the work done to date. Charter school competition was measured by: the proximity of the nearest charter school, the presence of a charter within 2.5 miles, the number of charters within 2.5 miles, the market share of charters within 2.5 miles, and the number of students lost to charters within 2.5 miles.

Finally, Greene and Forster (2002) analyzed the effects of charter school competition in Milwaukee, Wisconsin using an OLS regression method on building level student achievement data from 1996 to 2001. Their measure of competition was an index of the proximity of the three closest charter schools to each traditional public school building. They found no effect in 4th and 8th grade and a 9-point gain on the Wisconsin Knowledge and Concepts Examination for 10th grade students with a charter index of 1 km or less. The 9-point gain represented an effect of roughly 0.6 standard deviations.

This review of the literature clearly shows the diversity of approaches that have been used. A variety of methodologies have been chosen, various levels of student achievement data analyzed, and a multiplicity of measures to determine the competition created by charter schools. No clear pattern emerged between findings and the operational definition of competition. Texas, the only state to have been analyzed more than once with consistent findings, showed a positive effect from competition. The two other states analyzed more than once, North Carolina and Michigan, both had mixed findings. It is possible that the lack of consistency in findings results from the use of arbitrary competition measures. For example, no author that used the distance of the nearest charter school to measure the level of competition offered an explanation for choosing the cutoff points. For example, there is no plausible reason why Holmes et al (2003) chose a cutoff of 6 km while Sass (2006) and Buddin and Zimmer (2005) chose 2.5 and 5 miles. Similarly, Hoxby's (2001) choice of a 6% marketshare cutoff requires some explanation. This lack of consistency in measuring competition decreases our confidence in drawing strong conclusions from the previous literature.

Charter Schools in Ohio

The charter school system in Ohio was created in 1997. The growth in the number of these schools and the number of students enrolled in them is presented in Table 1 below. The Ohio Department of Education defines charter schools[2] as:

> public nonprofit, nonsectarian schools that operate independently of any school district but under a contract with an authorized sponsoring entity that is established by statute or approved by the State Board of Education. Community Schools are public schools of choice and are state and federally funded (ODOE 2006).

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[2] In Ohio, charter schools are called Community Schools, but for the sake of consistency they will be referred to as charter schools in this proposal.

While charter schools in Ohio are generally exempt from state requirements placed on traditional public schools, there are some basic regulations placed on these schools. Except for those charter schools whose stated mission is serving at-risk student populations, they cannot discriminate in admission policies, they cannot charge tuition, and their students must take the state's standardized achievement exams. Also, the racial balance of charter schools in Ohio cannot differ from that of the school district within which they reside (Allen and Mitchell 2006).

The reason these institutions are called 'charter schools' is because most of their regulations are determined by the authorizing entity that grants them their charter. In Ohio, the authorizing organization determines all the following standards (Carr and Staley 2005):

- the academic standards used by the school;
- the academic goals of the curriculum, and the means by which efforts to achieve such goals are measured, including the use of statewide achievement tests;
- performance standards established by the authorizer to determine the success of the community school;
- admission standards;
- financial auditing standards and procedures;
- achievement of racial and ethnic balance that reflects the local community; and
- qualifications of teachers, including any requirements that teachers be licensed.

It is expected that the independence and autonomy granted to these schools should enable them to be more innovative in their operations and pedagogy. Combined with the inherent market incentive of competition for students, higher levels of performance for those students enrolled in them should follow. In addition, the competition paradigm holds that these same market incentives should also serve as a catalyst for reforms that will increase student achievement in the traditional public schools as well (Chubb and Moe 1990). This question, which has not yet been addressed empirically in Ohio, is the focus of this evaluation.

One final distinction needs to be made about the type of charter school system

that operates in Ohio. There are two types of charter schools in Ohio, conversion charters

and start-up charters. Conversion charters are those sponsored by an existing traditional

public school system. These schools are free to open in any part of the state. Start-up

charter schools, by contrast, are those sponsored by an entity other than a local school

system. These schools can only be opened in Ohio's eight large urban cities (Akron,

Canton, Cincinnati, Cleveland, Columbus, Dayton, Toledo, and Youngstown) or in a

school district that has been labeled as being in academic distress.[3] Because one would

not expect local school systems to create charter schools that would compete with them

directly, this study focuses on the competitive effect of start-up charters only. Also, the

number of conversion charters in Ohio is relatively small, fewer than 20 of the nearly 300

charter schools in the state are conversions. Furthermore, because charter schools that

only serve high school dropouts are not directly competing with traditional public schools

for their students, they were also excluded from this analysis. Finally, the small number

of virtual charter schools in the state were also excluded because they, at least

theoretically, compete with every school in the state for their students given that they are

not bound by geography by their nature.

Evaluating the competitive effects of charter schools in Ohio is vitally important

given the fact that over 242,000 students remain in the traditional public schools in the

eight large urban areas where most of these schools are located. Even if the charter

school program is beneficial for the roughly 60,000 students that attend them, any

indication that these schools are detrimental to the achievement of those 242,000 that do

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[3] For more information on the rules governing start-up charter schools visit the Ohio Department of
Education's Office of Community Schools.

not would be cause for grave concern. On the other hand, if there is reason to believe that these schools are benefiting not only those students who attend them but those students in the surrounding traditional public schools as well, then serious thought should be given to expanding the program. Such a decision should not be made until some empirical evidence has been brought to bear on this question.

Figure 1: Charter Schools and Charter Enrollment in Ohio 1998 to 2005
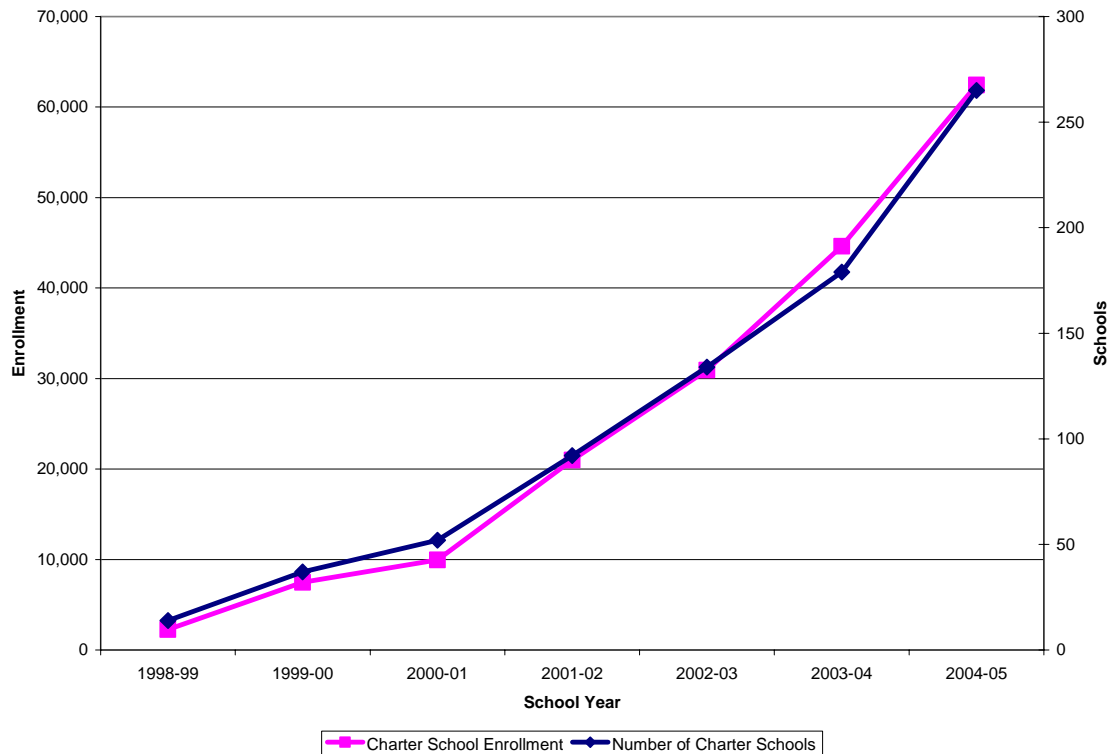
Studying the Competitive Effect of Ohio's Charter Schools

This evaluation uses publicly available data collected from the Ohio Department of Education through its online interactive report card database. The database provides data on building-level student achievement on the state's standardized math and reading achievement exams in the traditional public schools, data on the location and size of charter schools, and control data for the traditional public schools such as student

demographics, spending, and school and teacher characteristics. The analysis will cover roughly 3,500 traditional public school buildings over four years.

Because the state adopted a new standardized student achievement exam in 2001, the data analyzed in this evaluation will be from 2002 to 2006. Also, given that the state has phased in the new exams across grade levels, only the results on the 4th and 6th grade exams, and the high school graduation exit exam contain data across all years of interest. Taking this into account, the dependent variable will be the change in average school building proficiency passing rates in reading and math from year to year from 2002 to 2006. Thus, each school building's passage rates are the average of the results for the grades tested in their building.

Given the fact that this evaluation is limited to building-level data, a pooled time series regression analysis will be employed. The pooled time series regression provides the best method for examining longitudinal changes in the dependent variable, school proficiency passage rates, based on lagged changes on the primary independent variable, charter school competition, while controlling for confounding factors across the same time period. As such, any lagged effects from charter school competition on the general student achievement in traditional public schools over time can be ascertained, while controlling for various factors that may also influence the outcome of interest. In effect, the method allows for an examination of whether the amount of charter school competition in one year will have an impact on improvements in student achievement in the traditional public schools the following year.

Three primary independent variables will be analyzed to capture the competition created by charter schools.

- The first measure is a dummy variable for whether at least one charter school is located in the same district as the traditional public school.

- The second measure is the number of charter schools located within the same district as the traditional public school.

- The third measure will be the market share of charter schools within the district that any given school building resides.

The literature suggests that the two latter measures are the ones most likely to accurately capture a competitive effect given the level of data being analyzed. To be thorough, the dummy variable provides an additional check on the results of the other two models - as consistency among the models bolsters confidence in the reliability of the results. The variables for the number of charter schools and the charter school market share are logged to create a better fit in the models because the relationship is hypothesized to be nonlinear.

Isolating an independent effect from charter school competition requires statistically controlling for as many competing factors as possible that also are known to influence student achievement. Such controls guard against threats to internal validity, or factors beyond the primary independent variable that may be influencing the phenomenon under examination. The competing influences on student achievement to be controlled for fall into several general categories.

Passage Rate = α + $\beta_1$charter + $\beta_2$prev + $\beta_3$spend + δSchool + γDemog

where:
Passage Rate is the proficiency passage rate and β is the corresponding coefficient;
charter is competition from charter schools and β is the corresponding coefficient;
prev is the proficiency passage rate in the previous year and β is the corresponding coefficient;
spend is school expenditure level and β is the corresponding coefficient;
Demog is a vector of demographic characteristics and γ is a vector of corresponding coefficients;
School is a vector of school characteristics δ is a vector of corresponding coefficients.

The first control variable included is the proficiency passage rate of the school in the previous year. A set of control variables for student demography are also included for: the racial composition of the school, student attendance rates, the proportion of students labeled as disadvantaged, and the proportion of students labeled as disabled. Changes to a school's student population can potentially manifest in changes in proficiency rates. A school that is enrolling an increasing number of disadvantaged or disabled students may see proficiency rates decreasing even though no other changes occurred in the operation of the school from one year to the next. Conversely, if a school experiences a decrease in such students, proficiency rates may be artificially raised by the population taking the tests rather than effects from charter school competition. Finally, student attendance rates, which may serve as a proxy for student motivation, might also be expected to influence student achievement.

The second category involves resources, including the amount of instructional or classroom spending. Given the importance of funding for school operations, and the

wide variation in spending capacity across schools both within and between districts, it is necessary to control for the impact of differences in school spending.

The third category is school and teacher characteristics. To control for the influence of teachers, a variable will be included for teacher experience. Urban schools are particularly prone to teacher turnover and have difficulty competing for high quality teachers that may be lured to positions in suburban school systems. Because teachers are a well known determinant of student success, it is important to control for their effect, even if available data only allow for an imperfect proxy. The student-teacher ratio also serves as a control for changes in the teacher corps as schools may hire more teachers in an effort to create smaller class sizes, in this case evidenced by a lower student teacher ratio. If schools are losing teachers, that would lead to a larger ratio. Also, the size of the school is also included as a control. There is a wide variation in the size of traditional public schools across the state.

In sum, six models will be tested so that we may examine two outcomes and three measures of competition. The first model will use reading proficiency passage rates as the dependent variable, with the number of competing charter schools located in the same city as the primary independent variable, and the eight control variables described above. The second model will replace reading proficiency rates with math. The third and fourth models will cover reading and math proficiency rates using the charter market share primary independent variable. The fifth and sixth models will cover reading and math proficiency rates using the charter dummy variable. Table 1 below provides an outline of the variables used and Table 2 presents the descriptive statistics for the dependent variables and the charter number and market share variables for each year in the analysis.

Finally, because the methodology will create a dataset with an extremely large *n*, the

results of the models will be examined in terms of both statistical significance and

practical significance.

Table 1: List of Variables Used to Create Six Unique Statistical Models

Dependent Variables
Building-level proficiency passage rates from 2002 to 2006 in Reading Building-level proficiency passage rates from 2002 to 2006 in Math

Primary Independent Variables
Number of charter schools in the district Market share of charter schools in the district Dummy variable for the existence of at least one charter school in the district

Control Variables
Previous year proficiency passage rate Percentage of white students Percentage of disadvantaged students Percentage of disabled students Classroom spending Average level of teacher experience Student-teacher ratio Attendance rate School size

Table 2: Descriptive Statistics of the Dependent and Primary Independent Variables in each School Year

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
2002-03 School Year				
Reading Proficiency Passage	72.8	18.3	10.0	100.0
Math Proficiency Passage	62.6	20.6	1.0	100.0
Charter Number	1.5	3.9	0.0	14.0
Charter Market Share	1.0	3.2	0.0	21.9
At Least One Charter	.18	.38		
2003-04 School Year				
Reading Proficiency Passage	76.1	15.6	15.0	100.0
Math Proficiency Passage	69.3	17.8	3.0	100.0
Charter Number	2.2	5.5	0.0	20.0
Charter Market Share	1.4	4.5	0.0	34.6
At Least One Charter	.20	.40		
2004-05 School Year				
Reading Proficiency Passage	80.2	18.4	27.0	100.0
Math Proficiency Passage	69.1	20.7	8.0	100.0
Charter Number	2.0	3.9	0.0	19.0
Charter Market Share	1.6	3.2	0.0	35.4
At Least One Charter	.20	.40		
2005-06 School Year				
Reading Proficiency Passage	81.2	14.1	25.0	100.0
Math Proficiency Passage	74.6	17.0	11.0	100.0
Charter Number	4.1	10.1	0.0	37.0
Charter Market Share	2.4	6.3	0.0	40.0
At Least One Charter	.24	.43		

Findings

The results of this analysis show that the competition created by charters schools is having a small negative effect on Ohio's public schools. The table below shows the estimated impact of increased charter competition on the academic achievement levels of students in traditional public schools for each of the subjects tested and each operationalization of charter school competition. The results of the full regression models are provided in Appendix B.

Table 3: Estimates of the Average Effect of Charter Schools on Traditional Public Schools' Proficiency Passage Rates between 2002 and 2006

Competition Measure	Subject	
	Reading	Math
Number of Charters	-.359	-.794
	(2.91)	(4.79)
Market Share of Charters	-.610	-.912
	(4.22)	(4.62)
Charter Dummy	-1.396	-1.914
	(5.29)	(5.31)

All coefficients are statistically significant at p<0.01.
Absolute values of t-ratios are in parentheses.

The results of the regression models all show a small, negative effect of charter school competition on the proficiency passage rates of traditional public schools located in the same district. These results are also consistent across reading and math passage rates. All of the charter competition coefficients are statistically significant. However, this is expected due to the large *n* created by pooling multiple cross-sections of data. As such, it is important to examine the practical significance of these findings.

The first two models examined the impact of the number of charter schools located in the same district. The slope coefficients indicate a negative relationship whereby an increase of one charter school in the same district is associated with a .30 percentage point decrease in building reading passage rates and a .55 percentage point decrease in building math passage rates.[4] Practically speaking, this is a small, but certainly not insignificant, effect.

The two models examining the impact of the market share held by charter schools in a district also indicated a negative association with traditional public school proficiency passage rates. The slope coefficients indicate that a 1 percentage point

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[4] The percentage change of a slope coefficient for a log transformed variable is determined by taking exp(β) and subtracting 1.

increase in charter school enrollments as a proportion of district enrollments is associated with a .46 percentage point decrease in building reading passage rates and a .60 percentage point decrease in building math passage rates. These coefficients also reveal a small but nontrivial effect from charter competition. To put this relationship into context, in the 2004-2005 school year the Cleveland Municipal School District had 61,750 students and roughly 7,200 charter school students. This leads to a charter market share score of 11.6%. In the following year, the district contained 61,823 students and 10,130 charter school students for a market share score of 16.4%. Charter school enrollments increased by nearly 3,000 students, and the resulting change in the market share was about 5 percentage points. This would lead to a test score decline of 2.3 percentage points in reading and 3.0 percentage points in math for students remaining in traditional public schools.

A third set of models was examined using a dummy variable for the existence of charter schools as the proxy for competition. The results from these models also indicate a small negative relationship between the existence of at least one charter school and traditional public school proficiency passage rates. The coefficients from the final two models reveal that the existence of at least one charter school is related to a 1.4 percentage point decrease in building reading passage rates and a 1.9 percentage point decrease in building math passage rates.

Despite including previous year academic performance as a way to control for potential endogeneity in the sample, because charter schools are only opened in poor performing school districts, several other models were used which addressed this concern in different ways. As such, we examined the relationship between the charter

competition variables and the change in proficiency passage rates in the traditional public schools, as opposed to the absolute passage rate. Models were also analyzed using longer lags on the primary independent variable as well. The results of each of these alternative analytic strategies were consistent with those presented above. The coefficients were all negative, although not always statistically significant.

Conclusion

Our analyses reveal a consistent and negative relationship between charter school competition and the academic achievement rates of students remaining in traditional public schools. However, this analysis does not enable us to determine what exactly is causing this relationship.

There are two equally plausible hypotheses to explain these findings: a compositional effect and a direct performance effect. It is possible that the result we observe is an artifact of the composition effect, whereby charter schools in the state are capturing some of the better students in nearby traditional public schools, resulting in lower quality students and accordingly lower passage rates in the traditional public schools. If this interpretation is correct, the actual performance of the traditional public school in raising individual student achievement may not be changing at all, in spite of the lower passage rates. A second possible explanation of the results we observe is that charter schools are, in fact, having a direct and small negative effect on the traditional public schools. By drawing away resources such as funding or motivated students (peer effects), charter schools may be diminishing the ability of traditional public schools to provide a quality education.

There is a third competing explanation. It may be the case that the observed negative relationship, due to either the composition effect or direct performance effect described above, is a short term phenomenon. A competition effect may truly exist, but not in the short run of three years or fewer which we were able to examine here. This explanation is also plausible because operational changes in large social institutions may require several years to take effect, with no results appearing in the short run.

Ultimately, more research needs to be done to sort out the cause of the relationship observed in this analysis. Given that charter schools exist in unique policy environments in each of the state's that have enacted this reform, future research should focus both on the effects of charter schools but also the interaction of these effects and the policy environment context. The complexities of this interaction are daunting, but they stand as a critical piece of the policy theory that requires more attention.

There is one firm conclusion, however, that can be drawn from these findings. Consistent with the lack of a pattern we observed in our systematic review of previous work on this issue, we also do not find that charter school competition is having a large effect, in one direction or the other, on traditional public schools in Ohio. Charter schools do not appear to be either helping or harming the traditional public schools, a situation that could be exploited by proponents and opponents of this reform policy alike. Those in favor of these schools can point to the fact that they do little to no harm while empowering parents with the right to choose their child's school. Those opposed will note that such schools are only fragmenting the public education system with no appreciable positive effects for student learning. Hopefully, policymakers will review the

actual evidence when making important decisions about charter schools and not be

swayed by zealous advocates on either side of the issue.

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Appendix A: Results of Systematic Literature Review on the Competitive Effects of Charter Schools

Note: This review includes only studies quantitatively evaluating the impact of charter school competition on student achievement in traditional public schools

Year	Citation	Conclusions	State	Data	Competition Measure	Method
2005	Booker, K., Gilpatric, S., Gronberg, T., & Jansen, D. (2005). The Effect of Charter Schools on Traditional Public School Students in Texas: Are Children Who Stay Behind Left Behind? *National Center for the Study of Privatization in Education*.	A small but statistically significant positive effect of charter school penetration.	Texas	Student-level standardized test score data (reading and math grades 3-8) 1995 to 2002	Charter school market share	Fixed Effects Regression
2004	Bohte, J. (2004). Examining the Impact of Charter Schools on Performance in Traditional Public Schools. *Policy Studies Journal, 32*(4), 501-520.	A 1 percent increase in the charter school market share is associated with a .1 percent increase in district passing rates the following year.	Texas	District-level standardized test score data (reading, writing, and math grade 10) from 1996 to 2002	Existence of a nearby charter; number of nearby charters; and charter school market share	Pooled Time Series Regression Analysis
2004	Bifulco, R. & Ladd, H. F. (2004). The Impacts of Charter Schools on Student Achievement: Evidence from North Carolina. *Sanford Institute Working Paper Series*.	No effect on math achievement and a negative impact on reading for charters within 2.5 miles. No effect on reading beyond 2.5 miles.	North Carolina	Student-level standardized test scores (reading and math) following cohorts from grades 3 to 8 from 1996 to 2002	An composite variable combining proximity and the number of charter schools within that area	Fixed Effects Regression
2003	Holmes, G. M., DeSimone, J., & Rupp, N. G. (2003). Does School Choice Increase School Quality? *National Bureau of Economic Research Working Paper Series, 9863*.	Charter school competition causes an approximate one percent increase in the composite score.	North Carolina	Building-level composite test scores (formed from reading, writing, and math scores) for grades 3-8 from 1996 to 2000	Proximity of the nearest charter school	Panel models using both the Arellano-Bond procedure for dynamic panel models and a semi-parametric maximum likelihood estimator
2001	Hoxby, C. M. (2001). How School Choice Affects the Achievement of Public School Students. *Hoover Institution, Koret Task Force*.	MI: 4th grade reading and math increased 1.21 and 1.11 scale points respectively. 8th grade reading and math increased 1.37 and .96 scale points respectively. AZ: Percentile rank increases of 2.31 in 4th grade reading, 2.68 in fourth grade math, and 1.59 on seventh grade math.	Michigan and Arizona	Building-level standardized test scores for grades 4 and 7 for 1992 to 2000.	Schools facing competition (6% market share for charters or higher) compared to those not facing competition.	Difference in Difference Means Test
1999	Bettinger, E. (1999). The Effect of Charter Schools on Charter Students and Public Schools. *National Center for the Study of Privatization in Education*.	A small but statistically significant negative effect or no effect.	Michigan	School-level data, standardized test scores (math and reading) for grades 4 and 7 for 1996-97 school year	Number of charters within a five mile radious	Difference in Difference Means Test and fixed effects regression
2006	Sass, T. R. (2006). Charter Schools and Student Achievement in Florida. *American Education Finance Association*, 91-122.	No effect on reading and a small effect on math achievement	Florida	Student-level standardized test scores (reading and math) for grades 3 to 10 from 1999 to 2003.	Both market share and proximity	Fixed Effects Regression

2005	Buddin, R. & Zimmer, R. (2005). Is Charter School Competition in California Improving the Performance of Traditional Public Schools? *RAND Working Paper*.	No effect found	California	Student-level data in six districts, standardized test scores (reading and math) aggregated to elementary, middle, and high schools from 1997 to 2002	Proximity of the nearest charter school; Presence of a charter within 2.5 miles; number of charters within 2.5 miles; market share of charters within 2.5 miles; and students lost to charters within 2.5 miles	Fixed Effects Regression
2002	Greene, J. P. & Forster, G. (2002). Rising to the Challenge: The Effect of School Choice on Public Schools in Milwaukee and San Antonio. *Manhattan Institute Civic Bulletin*.	No effect in 4th and 8th grade. A 9-point gain for 10th grade students with a charter 1 km or less away.	Milwaukee, Wisconsin	Building-level standardized test scores from 1996 to 2001	Index of the Proximity of the nearest three charter schools	Regression with controls for race, poverty, and spending

Appendix B: Results of Regression Analyses

The Effect of the Number of Charter Schools on Reading Proficiency Passage Rates on the Ohio Achievement Test from 2003 to 2006

Variable	B (se)	t-score
Charter Schools*	-.354 (.121)	-2.91
Percent Disabled	-.078 (.016)	-4.87
Percent Disadvantaged	-.098 (.005)	-20.88
Percent White Students	.048 (.004)	9.78
Instruction Expenditure	.000 (.000)	5.30
Teacher Experience	.071 (.019)	3.81
Attendance Rate	.234 (.050)	4.66
Student-Teacher Ratio	-.024 (.017)	-1.42
Enrollment*	.524 (.142)	3.70
Previous Performance	.614 (.006)	102.18
Adjusted R²	.80	
F-statistic	3,448	
N	8,669	

*Log transformed to achieve linearity

The Effect of the Number of Charter Schools on Math Proficiency Passage Rates on the Ohio Achievement Test from 2003 to 2006

Variable	B (se)	t-score
Charter Schools*	-.794 (.166)	-4.79
Percent Disabled	-.119 (.022)	-5.40
Percent Disadvantaged	-.126 (.006)	-19.99
Percent White Students	.065 (.006)	10.74
Instruction Expenditure	.001 (.000)	7.58
Teacher Experience	.018 (.026)	0.70
Attendance Rate	.525 (.069)	7.63
Student-Teacher Ratio	.018 (.029)	0.81
Enrollment*	.941 (.195)	4.83
Previous Performance	.552 (.007)	77.02
Adjusted R²	.74	
F-statistic	2,393	
N	8,582	

*Log transformed to achieve linearity

The Effect of the Charter School Market Share on Reading Proficiency Passage Rates on the Ohio Achievement Test from 2003 to 2006

Variable	B (se)	t-score
Charter Schools*	-.610 (.145)	-4.22
Percent Disabled	-.076 (.016)	-4.74
Percent Disadvantaged	-.098 (.005)	-21.08
Percent White Students	.040 (.004)	9.28
Instruction Expenditure	.000 (.000)	9.635.40
Teacher Experience	.076 (.019)	4.08
Attendance Rate	.224 (.050)	4.46
Student-Teacher Ratio	-.027 (.017)	-1.65
Enrollment*	.534 (.141)	3.78
Previous Performance	.614 (.006)	102.23
Adjusted R²	.80	
F-statistic	3,453	
N	8,669	

*Log transformed to achieve linearity

The Effect of the Charter School Market Share on Math Proficiency Passage Rates on the Ohio Achievement Test from 2003 to 2006

Variable	B (se)	t-score
Charter Schools*	-.912 (.198)	-4.62
Percent Disabled	-.113 (.022)	-5.75
Percent Disadvantaged	-.129 (.006)	-20.70
Percent White Students	.065 (.006)	10.89
Instruction Expenditure	.001 (.000)	7.74
Teacher Experience	.023 (.026)	0.89
Attendance Rate	.518 (.069)	7.52
Student-Teacher Ratio	.009 (.023)	0.38
Enrollment*	.931 (.195)	4.78
Previous Performance	.551 (.007)	76.91
Adjusted R²	.74	
F-statistic	2,393	
N	8,582	

*Log transformed to achieve linearity

The Effect of the Charter School Dummy Variable on Reading Proficiency Passage Rates on the Ohio Achievement Test from 2003 to 2006

Variable	B (se)	t-score
Charter Schools*	-1.40 (.264)	-5.29
Percent Disabled	-.081 (.016)	-5.06
Percent Disadvantaged	-.095 (.005)	-20.11
Percent White Students	.039 (.004)	9.12
Instruction Expenditure	.000 (.000)	5.53
Teacher Experience	.080 (.019)	4.27
Attendance Rate	.231 (.050)	4.61
Student-Teacher Ratio	-.025 (.017)	-1.48
Enrollment*	.574 (.142)	4.05
Previous Performance	.612 (.006)	101.80
Adjusted R²	.80	
F-statistic	3,458	
N	8,669	

*Log transformed to achieve linearity

The Effect of the Charter School Dummy Variable on Math Proficiency Passage Rates on the Ohio Achievement Test from 2003 to 2006

Variable	B (se)	t-score
Charter Schools*	-1.91 (.360)	-5.31
Percent Disabled	-.120 (.022)	-5.46
Percent Disadvantaged	-.125 (.006)	-19.62
Percent White Students	.065 (.006)	10.90
Instruction Expenditure	.001 (.000)	7.83
Teacher Experience	.026 (.026)	1.01
Attendance Rate	.530 (.069)	7.72
Student-Teacher Ratio	.012 (.023)	0.53
Enrollment*	.973 (.195)	4.98
Previous Performance	.550 (.007)	76.73
Adjusted R²	.74	
F-statistic	2,395	
N	8,582	

*Log transformed to achieve linearity