

# **Effects of Charter School Laws on Charter School Performance**

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Capstone Project

## **EXECUTIVE SUMMARY**

### Problem Statement

Many issues exist in the public school system in the United States today. The main problems are: 1) American students are performing below their peers in other developed nations; 2) American high school graduates have trouble competing in the global economy; 3) Large achievement gaps exist between subgroups of American students. One of the many recommended policy solutions is to create charter schools to induce innovation and competition into the public school system.

### Research Question

While many researchers have looked at charter school outcomes, few consider the effects of charter school laws on student achievement. My research question asks how various components of charter school laws affect the performance of charter school students relative to a matched sample of their traditional public school counterparts.

### Literature Review

Research shows mixed reviews of charter school student performance. Comparability between states is often difficult due to variability between charter schools in each state. This study addresses that problem.

### Methodology

This study looks at a sample of 1,153 matched pairs of charter school schools and traditional public schools. Differences in reading and math proficiency levels are reported for fourth graders whenever possible. A regression was estimated using the difference in proficiency levels between charter school students and their matched public school counterparts as the dependent variable. Independent variables pertained to state law components and other important school level variables.

### Key Results

- Allowing for multiple issuing authorities and some non certified teachers is associated with positive outcomes for charter school students.
- Being very flexible in the number of charter schools making new starts (as opposed to converting public schools to charter schools) and not requiring local support is associated with negative outcomes for charter school students.
- Some state monitoring of charter school staffing improves student outcomes.

### Recommendations

- States should ensure that they are allowing for innovation in schools while providing a basic oversight function.
- Results from this study should be replicated in the future to verify policy implications. Charter school researchers should control for the effects of charter school laws in future evaluations of charter school performance.

## **PROBLEM STATEMENT**

Education reform is an important issue today for federal, state and local policymakers. Many theories exist about the best way to improve educational outcomes. Some feel that raising accountability standards such as those included in the No Child Left Behind act will promote high productivity and effectiveness in schools. Others feel that incremental funding is needed to increase teacher salaries or decrease class sizes. Still others believe that increasing competition between schools will lead to improved school performance if students are able to switch to higher performing schools in a relatively easy manner. Tax incentives, vouchers and charter schools are the main initiatives aimed at inducing this type of competition. With so many education reform alternatives out there, the first question to answer is why education needs to be reformed at all? The next question is what policy or bundle of policies is most effective at increasing educational outcomes? This paper briefly addresses the first question and then contributes to the second by taking a closer look at how charter school laws affect charter school performance.

The state of American education today is troubling and provides the rationale for education reform. Three of the biggest issues are: 1) American students are performing below their peers in other developed nations; 2) American high school graduates have trouble competing in the global economy; 3) large achievement gaps exist between subgroups of American students. Results from the 2000 Program for International Student Assessment (PISA) of 15-year-olds in reading, math and science indicate that American students are performing well below many of their international peers (NCES, *Outcomes*). The United State's reading literacy score was

504, just above the 27 country average of 500. Finland, Canada and New Zealand all scored significantly higher than the United States. On the math and science assessments, American students performed below average with scores of 493 and 499, respectively. Eight countries scored significantly higher than the United States in math and seven did the same in science. Please see Table 1 in the Appendix for a complete listing of reading, math and science scores by country. These assessment scores are important to America because intellectual property is a comparative advantage for the United States and this advantage may decrease if cognitive skills of students and workers in other countries surpass those in the United States. In response to this threat, President Bush issued the “American Competitiveness Initiative” and allocated more than \$136 billion over the next 10 years to strengthen education, promote research and development and encourage entrepreneurship.

The second issue listed above deals with American students’ ability to compete in today’s growing global economy. This issue is different from the first because it focuses on the effects of a changing marketplace, regardless of American assessment scores. Firms in the United States are now selecting their workforce from a dramatically increased global labor supply. This development has a profound effect on low skilled workers, generally defined as those without a college degree. International firms are often able to offer American companies better value for low skilled services than domestic firms (by offering acceptable services for lower prices). The effects of this globalization of labor, coupled with major technological advancements in the 90’s, caused the demand for low skilled American workers to decrease. The result has been a decline in real wages for workers without a post

secondary education (Blank 66). According to a report by the National Center for Education Statistics, college graduates in the United States earned 186% of high school graduate earnings in 2001. The relative advantage of a college degree was greater in the United States than in Canada, France, Germany, Italy or the United Kingdom (22). The situation of low income workers in the United States has made it to the federal agenda. A report issued by the Department of Education in January, 2006 states that “a high school diploma, once desirable, is now essential—and, increasingly, insufficient. About 80 percent of the fastest-growing jobs of the future will require some postsecondary education” (4). While it is not readily apparent how schools need to respond to this new trend, education reform is likely to be one piece of a comprehensive policy solution.

The final major issue prompting interest in education reform is the perseverance of achievement gaps in the United States. The National Assessment of Educational Progress (NAEP) is a national assessment that allows for comparability of students across the country. Table 2 shows 2005 fourth grade average scores and achievement gaps for reading, math and science by gender, income and race/ethnicity groups. For reading and math, achievement gaps hover around 10%, with students eligible for the school lunch program fairing worse than those who are not and with black, Hispanic and Native American students underperforming white students. These achievement gaps are even larger for students taking the science assessment, with gaps increasing to around 20%. On a positive note, achievement gaps have been decreasing in many states. According to a report by Education Trust, the gap between African American and white student reading scores shrank in 16 out of the 23 states

with three year data available. Reading achievement gaps between Latino and white students shrank in 14 states. Similarly, math achievement gaps between African American students and white students shrank in 17 out of the 24 states with available data. Math achievement gaps between Latino and white students shrank in 16 states. While these findings are encouraging, large achievement gaps still exist and cannot be ignored by educational policies (New Report).

## **RESEARCH QUESTION**

The previous section illustrates some of the major problems confronting students in America today. Charter schools are one type of educational reform that attempt to address these and other issues. The NAEP glossary defines a charter school as a publicly funded school that is granted a charter exempting it from selected state or local rules and regulations. The idea behind charter schools was popularized by Albert Shanker in 1988 during his discussion of needed education reform in the *Peabody Journal of Education*. Shanker stated that achievement levels were a “national disgrace” and made the following suggestion to facilitate district wide restructuring:

Why not devise a district policy mechanism to enable any school or any group of teachers...within a school to develop a proposal for how they could better educate youngsters and then give them a “charter” to implement that proposal (97-98).

Shanker intended these charters to encourage new ideas and methods in public schools and to challenge erroneous assumptions inherent in the U.S. public school system.

Charter schools attempt to address the key issues discussed in the previous section by inducing competition between different types of public schools and by granting flexibility to try different teaching methods and curriculum. Charter schools are also able to focus on specific population groups, such as at risk students, which may reduce achievement gaps. Author Joel Spring states that charter schools improve educational outcomes by allowing schools to function independently from state and local bureaucracy, decreasing government failure, and by achieving unique and innovative teaching techniques (Spring 459). Charter school advocates feel that traditional public schools will also adopt successful teaching practices that are formulated in the charter schools, increasing academic achievement for all students in the long run. Critics of charter schools disagree, stating that charter schools only benefit the students who attend them and that charter schools are difficult to expand on a large scale basis. Critics of school choice also argue that money spent implementing alternatives such as charter schools could otherwise be spent fixing the current public education system.

Minnesota enacted the first official charter school law in 1991. Today, 40 states and Washington D.C. have charter school laws. There are currently more than 3,600 charter schools operating in the U.S. serving approximately 800,000 students (Center for Ed Reform, *Charter*). Charter school laws vary widely from state to state and the effect of these laws on student outcomes is currently unknown. The seven components of charter school laws are outlined in the chart below.

| <u>7 Areas of Charter School Laws</u> | <u>Description</u>  |
|---------------------------------------|---|
| 1. Charter development                | Who may propose a charter, how charters are granted, the number of charter schools allowed, and related issues.                             |
| 2. School status                      | How the school is legally defined and related governance, operations, and liability issues.   |
| 3. Fiscal                             | The level and types of funding provided and the amount of fiscal independence and autonomy.   |
| 4. Students                           | How schools are to address admissions, non-discrimination, racial/ethnic balance, discipline, and special education                         |
| 5. Staffing and Labor Relations       | Whether the school may act as an employer, which labor relations laws apply, and other staff rights.  |
| 6. Instruction                        | The degree of control a charter school has over the development of its instructional goals and practices.                                   |
| 7. Accountability                     | Whether the charter serves as a performance-based contract, how assessment methods are selected, and charter revocation and renewal issues. |

*\*Source: US Charter Schools. Charter Laws.*

My research question goes beyond asking if charter schools are effective as established entities and asks how the various types of charter school laws throughout the country affect charter school student performance. Only by accounting for the differences between charter schools among states can we know how successful charter schools can be at addressing the problems facing students today. Assessing the effects of these laws on student achievement contributes knowledge to states that currently have charter school laws and helps the ten states without charter school laws to decide whether they should adopt a charter school law and if so, what characteristics the law should include.

## LITERATURE REVIEW<sup>1</sup>

My research question looks specifically at how charter school laws affect student performance. Before reviewing the literature on this specific question, it is valuable to understand what current research states about the effectiveness of charter schools in general. Research concerning the effectiveness of charter schools at increasing student outcomes has been mixed. A RAND research brief based on a 2001 study on charter schools found that charter schools in Arizona showed achievement advantages over conventional public schools. The report also showed that in Texas, charter schools that focus specifically on students at risk for poor academic performance showed an achievement advantage over conventional public schools. However, the brief also points out that charter schools in Texas not serving at-risk youth performed slightly worse than conventional public schools and that research from charter schools in Michigan indicated no difference from conventional public schools in 7<sup>th</sup> grade and underperformance of charter school students in 4<sup>th</sup> grade. Other studies analyzed reiterate the mixed findings discussed in the RAND brief. Caroline Hoxby's 2004 study found that the average charter school student benefited from having a charter school alternative (20). Charter students were 4.6% more likely to be proficient in reading and 2.3% more likely to be proficient in math. Also, charter schools that had been in operation longer had a greater proficiency advantage over the matched public schools. Finally, Hoxby found that charter school students had an advantage in states where charter schools are well established (1). These findings are important because this study looked at a large sample of charter

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<sup>1</sup> Many studies and findings in the Literature Review section of this paper are from research conducted during Dr. Toma's Policy Analysis class for a paper I wrote titled "Should Kentucky Adopt Charter School Laws?"

school students across the country and matched them with public school counterparts. On the other hand, Bettinger's 2005 study of charter schools in Michigan found that charter schools did not improve test scores as rapidly as public schools with similar pre-charter test scores (145). The difficulties in determining charter school success are not surprising. A 2005 RAND paper states that "measuring the effect of charter schools is complex and it is difficult to paint a single picture of the performance because charter schools vary from school to school" (RAND, *Getting 2*).

In addition to the mixed findings concerning educational outcomes, experts have also failed to reach consensus about charter school's ability to increase equity in the educational system. According to the U.S. Department of Education, charter schools serve a disproportionate and increasing number of poor and minority students. A 2006 study by RAND confirms that black students and Hispanic students are more likely than white students to attend a charter school (RAND, *Making 3*). But is this fact helping or hurting these groups? Hoxby found that charter schools are especially likely to raise the achievement of students who are poor or Hispanic, both groups who currently experience achievement gaps. However, other studies find that charter schools lead to segregation of students and often to lower academic outcomes. A study by Robert Bifulco found that black charter school students in North Carolina tended to end up in predominantly black charter schools primarily due to residential segregation (people want to go to school near their home), differing preferences by race concerning program offerings and a tipping phenomena such that charter schools with black populations above a certain threshold may only be attractive to black

families (27). Bifulco found that these circumstances had negative achievement effects in a majority of schools. Decreased diversity in public schools may result.

A 2006 RAND study addresses two additional concerns about charter schools. First, the study states that students who transfer from traditional public schools to charter schools have lower achievement scores prior to moving than peers who remain in public schools (RAND *Charter*, 3). This evidence refutes the claim some have about charter schools “cream-skimming” and taking the best students from traditional public schools. Researchers finding positive outcomes for charter schools may use this finding to support that charter schools improve educational outcomes and do not just transfer good students to new schools. On the contrary, it appears that charter schools attract lower performing students, on average. Secondly, the RAND study addresses whether or not competition induced by charter schools has affected the performance or operation of traditional public schools. The study finds that charter schools have no measurable impact on traditional public schools. This finding may be explained by the low share of students generally represented in a district. Perhaps a broader implementation of charter schools would exert enough pressure on public schools to improve performance? The RAND study indicates that at least in the short term, traditional public school students are unaffected by charter schools.

With such mixed feedback about charter schools, it leads one to believe that some other factor is affecting the outcomes of charter schools besides the simple fact that they are not public schools. One possible explanation is that charter school laws themselves have an effect on student achievement in a state. This is essentially my research question. There has not been much empirical research looking at this

question in the past. However, the Center for Education Reform has done a lot of research looking at charter school laws in the U.S. They have graded state laws based on how stringent the rules and regulations are. States with very flexible laws receive an “A” while states with the most restrictions on charter schools receive a “D”. Basically, the Center for Education Reform wants charter schools to have as much flexibility and autonomy as possible in the seven components listed in the chart in the previous section. Currently, 20 states have an “A” or “B” while 21 states have a “C” or “D”. Based on these grades, the Center for Education Reform conducted a study to see what effect laws had on achievement in the state. The major finding in this study was that 65% of the states with either an “A” or “B” grade saw significant gains in evaluations of test and No Child Left Behind data over two years. Likewise, of the states with either a “C” or “D” grade, only 2 of them demonstrated positive gains (CER, *Charter School Laws*). While these findings are interesting, this was not a rigorous study and the fact that overall student achievement increased in those states may be due to numerous other factors besides the flexibility of their charter school laws.

The 2006 RAND study mentioned previously provides some additional insights by looking at the relationship between specific operating procedures at charter schools and their academic achievements. Overall, the study found that “the greater autonomy given to charter schools does not lead to improved student achievement in core subjects like reading and mathematics” (RAND, *Charter* 5). The study took an in depth look at school operations and found few measures that predicted high performing schools. However, a greater emphasis in foreign

languages was correlated with poorer math and reading scores. Also, the greater the proportion of students instructed at home, the lower the test scores at the school. Finally, an emphasis on hiring teachers with full standard credentials had a negative effect in charter high schools.

In order to tell why there are mixed messages coming from various charter schools in various states, it is necessary to determine whether or not charter school laws affect outcomes for charter school students. This paper contributes to the current charter school literature by providing evidence as to whether or not charter school laws, which affect the environment in which charter schools function, are important determinants in charter school success relative to traditional public schools.

## **METHODOLOGY**

To analyze the effect of charter school laws on student outcomes, I estimated a linear regression using STATA. The objective of my analysis is to determine whether or not charter school laws are significant predictors of charter school performance relative to traditional public schools. The following paragraphs outline the details of this analysis:

### Data Set

I obtained the data set used by Caroline Hoxby, professor at Harvard University, in her paper, *Achievement in Charter Schools and Regular Public Schools in the United States: Understanding the Differences*. This data consists of 1,153 matched pairs of charter schools and traditional public schools. The unit of analysis

in this data set is schools. The data set includes assessment information on 99% of fourth graders enrolled in charter schools. Hoxby collected state assessment proficiency levels for fourth grade students when available. She collected third grade or fifth grade data when fourth grade data was not available. Hoxby then matched charter schools with a traditional public school based on both distance from one school to the other and on racial composition. The data I obtained from Hoxby includes the names of the schools, whether or not it is a charter school, the match group number, the city in which the schools are located, reading and math proficiency levels, the difference in proficiency levels from charter schools to public schools and the number of students who took the test. I collected all other variables in this analysis using public sources. I identified school level variables using the school name provided in Hoxby's data set. In her paper, Hoxby states that using a matched pair sample is beneficial because it simulates the scenario a parent would face when selecting a school in their neighborhood (4). Randomized studies, on the other hand, may produce unrealistic results if they compare charter schools to public schools that students were unlikely to attend in the first place. Matching is also important because schools in the matched sample share neighborhood and local circumstances and usually have a similar racial composition.

### Dependent Variables

The dependent variable used in this analysis is the difference in achievement between charter school students and students in regular public schools. Achievement is defined as the percent proficient in reading and math state assessment tests. I chose

this dependent variable for several reasons. First, this variable allows for results from the matched sample to be interpreted as what a charter school student would experience if he were to attend the regular public school that he would probably otherwise be assigned (Hoxby *Achievement*, 8). The purpose of using a matched sample is to understand the performance of charter schools relative to a similar school in the same geographic area. Therefore, using the difference in achievement between charter and public schools as the dependent variable is the best option for the data set used in this study. Finally, Hoxby used differences in achievement as the dependent variable in her paper and doing the same in this study is wise for comparability and consistency purposes since I used her data set as a starting point for this study.

### Independent Variables

The independent variables used include those associated with the seven areas of charter school laws, school level demographic variables and other school specific variables that are potential explainers of school performance. Each variable is listed below along with a data source. Variables listed below as coming from the Center for Education Reform indicate that they are rated on a scale from 0-5 by the Center for Education Reform based on how the state's provisions support or restrict the development of a significant number of autonomous charter schools. A rating of 5 is the most supportive (Center for Education Reform, *Scorecard*).

*Center for Education Reform Score:*

*I ran one regression using only the Center for Education Reform's aggregate score for the state law as an independent variable.*

*Charter School Development Variables:*

- Number of Schools Allowed: Rated 0-5 by the Center for Education Reform.  
Indicates the number of autonomous charter schools permitted in a state.
- Multiple Chartering Authorities: Rated 0-5 by the Center for Education Reform. Indicates the number of entities in addition to or instead of the local school board allowed to authorize charter schools.
- Eligible Charter Applicants: Rated 0-5 by the Center for Education Reform.  
Indicates if states permit a variety of individuals and groups both inside and outside the existing public school system to start charter schools.
- New Starts Allowed: Rated 0-5 by the Center for Education Reform.  
Indicates whether new starts are allowed as opposed to public school conversions.
- Not Requiring Local Support: Rated 0-5 by the Center for Education Reform.  
Indicates if charter schools are permitted to form without providing specific levels of local support.

*School Status Variable:*

- Legal Autonomy: Rated 0-5 by the Center for Education Reform. Indicates if states allow charter schools to be independent legal entities that can own property, sue, incur debt, control budget and contract for services.

*Fiscal Variables:*

- Fiscal Autonomy: Rated 0-5 by the Center for Education Reform. Indicates if states give charter schools control over their own budgets, without the district holding the funds.

- School Funding: Rated 0-5 by the Center for Education Reform. Indicates if 100 percent of per pupil funding automatically follows student enrolled in charter schools.

*Student Variable:*

*Initially, I used whether or not the state specifies the charter schools or the students that may be given preference as indicated by the Education Commission of the States. However, there was very little variability between states and therefore this variable was not included in the analysis.*

*Staffing Variables:*

- Exempt from Work Rules: Rated 0-5 by the Center for Education Reform. Indicates if states exempt charter school teachers from district work rules.
- Does not Require Teacher Certification: 0 indicates that all charter school teachers must be certified. 1 indicates that some charter school teachers are permitted to not be certified. Information from the Education Commission of the States.
- Retirement Benefits: Yes or No as to whether or not charter school teachers have access to public school retirement systems as indicated by the Education Commission of the States.
- Salary Determination: 0= state determines salary, 1= varies depending on situation, 2= charter determines salaries as indicated by the Education Commission of the States.

- Leave of Absence: Yes or No as to whether the state grants a leave of absence for a public school teacher to teach at a charter school as indicated by the Education Commission of the States.

*Instruction Variable:*

- Automatic Waiver: Rated 0-5 by the Center for Education Reform. Indicates if states provide waivers from most or all state and district education laws, regulations, and policies.

*Accountability Variables:*

*Initially, two additional variables were included in this section: Annual Reports and Charter School Termination. However, these variables were omitted because all states required these procedures. The remaining variables are:*

- Appeals Process: Yes or No as to whether the state provides an appeals process in the charter school renewal process as indicated by the Education Commission of the States.
- Effectiveness Report: Yes or No as to whether the state requires the state education agency or another entity to report on the effectiveness of charter schools as indicated by the Education Commission of the States.

*School Level Demographic Variables:*

- % Free/Reduced Lunch: This variable is listed twice in the analysis; first the percentage in the charter school and second the percentage in the traditional public school. Number obtained from the National Center for Education Statistics. For charter schools with incomplete information, the % Free/Reduced Lunch for the public school in the same match group was

used as a proxy for the charter school % Free/Reduced Lunch, when available. The same proxy was used when the public school had incomplete information but the charter school information was available.

*Other School Level Variables*

- # Students Enrolled in Grade Tested: This variable is listed twice in the analysis; first the number of students enrolled in the charter school in the grade tested and second the number for the traditional public school. Number obtained from the National Center for Education Statistics.
- Pupil/Teacher Ratio: This variable is listed twice in the analysis; first the number in the charter school and second the number in the traditional public school. Number obtained from the National Center for Education Statistics. For charter schools with incomplete information, the Pupil/Teacher Ratio for the public school in the same match group was used as a proxy for the charter school Pupil/Teacher Ratio, when available. The same proxy was used when the public school had incomplete information but the charter school information was available.
- Years Charter School Open: Number obtained from 2005 National Charter School Directory.
- If Charter School Serves At-risk Students: Yes or No as stated in the 2005 National Charter School Directory school description.
- If Charter School Serves Gifted Students: Yes or No as stated in the 2005 National Charter School Directory school description.

- If State Tested 3<sup>rd</sup> Grade Students: Yes or No depending on which grade tested in the state as indicated in Caroline Hoxby’s paper “Achievement in Charter Schools and Regular Public Schools in the United States: Understanding the Differences.”
- If State Tested 5<sup>th</sup> Grade Students: Yes or No depending on which grade tested in the state as indicated in Caroline Hoxby’s paper “Achievement in Charter Schools and Regular Public Schools in the United States: Understanding the Differences.”

#### Other Controls

In order to control for heteroskedasticity, I used analytic weights equal to the number of students taking the test in a given charter school. I also ran the analysis using robust standard errors. Finally, I ran the `_rmcoll` function in Stata to drop any collinear variables in the model. Stata reported no multi-collinear variables in my data set. I also ran a basic correlation matrix on my major variables to double check for highly correlated variables. Please see Table 3 in the Appendix for this correlation table. Because the variable “legal autonomy” was so highly correlated with “fiscal autonomy” and “school funding,” I excluded this variable from the model. The Center for Education Reform’s definition for “legal autonomy” is such that many of its components dealing with operations and financing are included in other, more specific variables in the model.

## RESULTS

On average, the difference in reading achievement between charter schools and traditional public schools is 4.8 percentage points when nothing else is controlled but analytical weights and robust standard errors are used. The difference in math achievement is 2.8 percentage points. Controlling for charter schools that target either at-risk or gifted students, the difference in reading achievement is 5.2 percentage points. The difference in math achievement with these controls is 2.7 percentage points. Finally, after controlling for all charter school law and school level variables, the constant remains positive, indicating that the effect of charter schools remain positive even after controlling for numerous variables. These findings are consistent with Hoxby's paper using the same data set. These base numbers provide a reference point as we look at more detailed results in the next section.

Before running all the detailed independent variables in this model, I ran a preliminary regression using the Center for Education Reform's aggregate score for each state law as an independent variable. This score sums all of the scores on variables assessed by the Center for Education Reform as reported in the independent variables section. The effect was that even after controlling for demographic and other school level variables, a one point increase in the Center for Education Reform state score led to a 0.4 percentage point decrease in the difference in reading achievement between charter schools and public schools. Similarly, a one point increase in the score led to a 0.3 percentage point decrease in the difference in math achievement between charter schools and public schools. Both effects were statistically significant. The interpretation of these results is that charter schools in

states with higher Center for Education Reform scores, which increase as the state grants more autonomy to charter schools and is more supportive of their development, are less likely to perform better than their traditional public school counterparts. The magnitude of the effect can be substantial given that scores range from 2 to 46. It is also important to study the effect of charter school laws in a more disaggregated fashion, as reported in the next sections. I first describe the effects of charter school laws on differences in reading achievement and then in math achievement.

### Reading Results

The complete regression results for differences in reading achievement between charter schools and traditional public schools are shown in Table 4 in the Appendix. Also, in order to test the robustness of my significant variables, I regressed differences in reading achievement in three different ways:

1. Ran the charter school law variables alone with no controls for school characteristics.
2. Ran the charter school law variables with all controls except the Free/Reduced Lunch Variables and the Pupil/Teacher Ratio variables. This is important because both of these variables included some proxy values as described in independent variables section.
3. Ran the charter school law variables with all controls including the proxy values for the two variables omitted in Regression 2.

A comparison of these three regressions is outlined in Table 5 of the Appendix. Only variables that were statistically significant across multiple regressions are discussed in the sections below.

*Charter School Development Variables:*

As charter school laws become more flexible in allowing new starts, as opposed to public school conversions, charter school reading achievement relative to public schools declines on average. The same decline is true as states become more flexible in allowing charter schools to develop without requiring local support. Both results are significant, as well as substantive. As the Center for Education Reform scores for both of these variables increases by one point, the difference in reading achievement between charter schools and public schools declines by about three percentage points. Thus, charter schools in states with more flexible laws on these variables tend to have less of an advantage over similar traditional public schools after controlling for other charter school law variables and school level variables.

*Staffing Variables:*

There is a substantial and significant finding indicating that the difference in reading achievement between charter schools and public schools increases in states that permit at least some teachers without certification to teach at charter schools. While the statistical significance of this finding decreased to the 81% Confidence Level when the Free/Reduced Lunch and Pupil/Teacher Ratio variables were included, the results were very significant in the other two regressions. In fact, in a state choosing not to require all teachers to be

certified, reading achievement relative to public schools improved seven percentage points. On the other hand, results indicate that reading achievement declines relative to traditional public schools when salaries are left up to the charter instead of the state. The magnitude of this effect is about a seven percentage point decline.

*Instruction Variable:*

As charter school laws grant automatic waivers from state and district laws, charter school reading achievement relative to traditional public schools declines. As the Center for Education Reform score for the extent to which states have an automatic waiver for charter schools increases by one point, the difference in reading achievement between charter schools and public schools declines by about two percentage points. These waivers affect instruction to the extent that charter schools do not have to abide my rules such as class size, length of day, length of school year and curriculum requirements.

*Accountability Variables:*

In states that require an effectiveness report to be done on the charter school, the difference in reading achievement between charter schools and public schools declines by between four to seven percentage points.

*School Level Demographic Variables:*

Charter school student achievement versus matched public schools decreases as the percentage of students eligible for free/reduced lunch increases. Consistently, as the percentage of students eligible for free/reduced lunch in the matched public school increases, charter school student reading

achievement relative to public schools increases. The effects are significant but not very substantial with a one percent increase leading to a 0.2 to 0.3 percentage point decrease or increase in relative achievement, respectively.

#### *Other School Level Variables*

As the number of years a charter school is open increases, reading achievement relative to traditional public schools increases by about one percentage point. Similarly, if the charter school serves gifted students, reading achievement differences improve dramatically. However, targeting at-risk students resulted in a decline in the charter school reading achievement relative to traditional public schools. Another substantial finding is that relative to testing fourth graders, testing 5<sup>th</sup> grade students resulted in an eight point increase in the difference between charter school and public school reading achievement levels.

#### Math Results

The complete regression results for differences in math achievement between charter schools and traditional public schools are shown in Table 6 in the Appendix. Also, in order to test the robustness of my significant variables, I regressed differences in math achievement in three different ways:

1. Ran the charter school law variables alone with no controls for school characteristics.
2. Ran the charter school law variables with all controls except the Free/Reduced Lunch Variables and the Pupil/Teacher Ratio variables. This is important

because both of these variables included some proxy values as described in independent variables section.

3. Ran the charter school law variables with all controls including the proxy values for the two variables omitted in Regression 2.

A comparison of these three regressions is outlined in Table 7 of the Appendix. Only variables that were statistically significant across multiple regressions are discussed in the sections below.

*Charter School Development Variables:*

As charter school laws become more flexible in allowing multiple issuing authorities besides the school board, charter school math achievement relative to public schools improves. The effect is that as the Center for Education Reform score increases by one point for this variable, a three to four percentage point increase in the difference in achievement occurs. On the other hand, as charter school laws become more flexible in allowing new starts, as opposed to public school conversions, charter school math achievement relative to public schools declines on average. The same decline is true as states become more flexible in allowing charter schools to develop without requiring local support. Both results are significant, as well as substantive. As the Center for Education Reform score for new starts increases by one point, the difference in math achievement between charter schools and public schools declines by about 13 percentage points. Similarly, as the Center for Education Reform score for not requiring local support

increases by one point, the difference in math achievement between charter schools and public schools declines by about 6 percentage points.

*Accountability Variables:*

In states that require an effectiveness report to be done on the charter school, the difference in math achievement between charter schools and public schools declines by between four to seven percentage points.

*School Level Demographic Variables:*

Charter school math achievement relative to matched public schools decreases as the percentage of students eligible for free/reduced lunch increases.

Consistently, as the percentage of students eligible for free/reduced lunch in the matched public school increases, charter school math achievement relative to public schools increases. The effects are significant but not very substantial with a one percent increase leading to a 0.2 to 0.3 percentage point decrease or increase in relative achievement, respectively.

*Other School Level Variables*

As the number of years a charter school is open increases, math achievement relative to traditional public schools increases by about two percentage points.

Similarly, if the charter school serves gifted students, math achievement differences improve dramatically. However, targeting at-risk students results in a decline in the charter school math achievement relative to traditional public schools. Another substantial finding is that relative to testing fourth graders, testing 5<sup>th</sup> grade students results in a nine point increase in the difference between charter school and public school math achievement levels.

## LIMITATIONS

There are several limitations in this research. I discuss the limitations as they pertain to internal validity, external validity, construct validity and design validity.

### Internal Validity

In determining whether or not the charter school laws actually caused charter school changes in reading and math achievement relative to traditional public schools, it is important to consider if any other factors not accounted for in the model could have caused the observed changes. As discussed previously, selection bias is generally a concern when discussing charter schools because the opportunity exists that individuals with certain characteristics that allow them to do better in school, perhaps cognitive ability or parental involvement, may elect to enroll in a charter school. The result of this activity could be that charter school scores are higher simply because of the students who are enrolled in them. This study did not control for variables that attempt to directly account for these differences. However, based on evidence from the 2006 RAND study discussed in the literature review, it appears that, on average, charter school students are not higher performing students than their traditional public school counterparts. Based on this finding as well as the fact that this data set uses a matched sample that attempts to control for neighborhood characteristics, I feel that this limitation will not have a profound effect on the findings in this paper. The other apparent threat to internal validity is testing threat. The data set uses test scores from state assessment tests, which vary state to state. The effect of this limitation should be small because attempts are made to standardize

proficiency levels and because the matched group sample compares charter schools only to public schools taking the same state test.

### External Validity

While the intent of this study is to find results that are generalizable across the United States, there remain some threats to external validity. For example, do charter schools behave in a certain way based on the novelty of the idea? Are there threshold effects with any of our variables where the results will not be true in all times and in all places? Also, differences in how individuals implement new laws or changes to laws may be different than the behaviors inherent in the model.

### Construct Validity

A few variables in this study are difficult to define and measure. First of all, this study relies on the scoring system used by the Center for Education Reform. While their methodology appears meticulous, to the extent that their scoring does not accurately measure the variable it attempts to measure, these results will be biased. Second, the measure for instruction in this model is the extent to which states grant automatic waivers to state laws. While this measure encompasses large factors affecting instruction such as scheduling and curriculum guidelines, it does not address detailed classroom by classroom variances in instruction such as teacher style or learning aids.

## Design Validity

There are a few limitations to the study design used in this analysis. First, the study does not explicitly address the possibility that charter schools affect the performance of nearby public schools. While the 2006 RAND study indicated that charter schools have not had an effect on traditional public schools, if this is not true and they have had an effect, the results of this study may not truly reflect the extent that charter schools improve educational outcomes. Results for charter schools could be inflated or deflated depending upon the scenario. A second limitation of the design is that I used a linear regression method. There are a few potential problems with this method. First, it assumes that variables such as the ones scored on a scale from 0-5 by the Center for Education Reform represent a straight line with a constant slope. While this may be true, it is also conceivable that the scores could have a non linear shape where, for example the optimal score is in the middle of the scoring range and there are decreasing, or even negative, returns from there. Finally, to the extent other important variables are not included in the model, coefficients for specific independent variables may be misrepresented. For example, state spending on public education was not included in the model and may be important.

## **RECOMMENDATIONS**

### For Policymakers

The results of this study reinforce the theoretical rationale for charter schools but also indicate that certain guidelines should be used when creating a supportive environment for charter schools in a state. The laws surrounding charter schools can

either hurt or help charter school performance relative to similar traditional public schools. My first recommendation is for states to think of innovation as the cornerstone to the success of charter schools. This analysis indicates that one appropriate place for innovation is in the teaching staff. Many states in the data set mandate that only 50%-75% of charter school teachers need to be certified. This allows room for schools to attract unconventional teachers to their schools. It appears that this controlled level of flexibility can help improve reading achievement relative to other public schools. Another place for innovation may be in allowing multiple issuing authorities. By allowing more authorities than just the school board to approve charters, states allow for more innovation. This may be because school boards are predisposed to how the current system works and may be biased against new ideas. States that currently have charter school laws should look at if they are allowing for innovation in their teacher requirements and charter issuing authorities. These are both ways to support charter schools in their purpose of developing innovative and effective educational practices. Similarly, states with no charter school laws should pay attention to ensuring flexibility in these components of charter school laws.

My second recommendation to policymakers is that charter school laws provide the guidance and support necessary for charter schools to be successful. In developing charter schools, states should be cautious about how flexible their policies are regarding the allowance of new starts (schools not converted from public schools). States also tend to benefit from policies that require local support in the development in a new charter school. Thus, I recommend that states require

community support or other types of evidence of effectiveness before allowing new charter schools to start up. Because charter schools are premised on the idea that communities get together and implement ideas they believe in, it follows that gaining this type of support prior to charter development will be beneficial to school operations. I do not recommend outlawing new starts; rather that these new starts should be granted only if people believe in the charter and there is a theoretical premise for the charter's effectiveness. States should also provide a basic oversight function to charter schools. States should play a role in determining charter school teacher salaries and in providing some basic laws concerning instruction and school operations. This recommendation is consistent with a finding in the 2006 RAND study that found decreased student outcomes among charter schools with greater at home instruction. Overall, states should ensure that they are allowing for innovation in schools while providing a basic oversight function to weed out poorly performing charter schools. States should approach this oversight with caution, as evidenced by the result that charter schools in states that require an effectiveness report have lower achievement relative to matched public schools. It is also important to keep in mind that charter school performance improves with life of the school and long term thinking is essential.

### For Researchers

There are numerous ways to further the research conducted in this paper. First of all, results should be replicated for students in other grades and using varying statistical methods. For example, using a non linear method will be beneficial in

capturing effects not included in this linear model. Furthermore, law variables may be improved upon through additional research that may improve their construct validity. It would also be beneficial to vary the dependent variables used in the analysis. For example, more sophisticated statistical methods may allow proficiency scores to be used by grouping matched schools in a regression with both public and charter school observations. Furthermore, running a similar study on a random sample will help generalize results. All of these improvements will provide more insight into the effects of charter school laws on student outcomes and how policymakers should formulate future laws. Finally, I recommend that researchers include charter school laws as important variables in their analyses. I agree with Ron Zimmer that there is a great need for longitudinal, student level research that looks at instructional and education designs of schools to examine the impact charter schools have under differing charter laws, environments and instructional and educational designs (RAND, Making 6). More precise information about what goes on in the classroom while controlling for charter school laws will improve what we know about the effectiveness of charter schools and if they generate any policy ideas that can be used to improve educational outcomes in the United States for all students.

## **CONCLUSION**

Currently, there is so much variability between charter schools, especially across different states, that it is difficult to assess if charter schools in general are effective. Perhaps some are and some aren't? This study improved charter school research because it identified the importance of charter school laws on charter school

performance. These findings are important both from a policy and a research perspective. Replicating these results and including more information about school level variability will clarify questions about the role charter schools should play in today's education reform and how state laws can create positive environments for charter schools. Also, controlling for variance in state laws in future research will increase researchers' abilities to assess the effectiveness of charter schools at increasing student outcomes.

## APPENDIX

**Table 1:** Results from the 2000 Program for International Student Assessment (PISA) of 15-Year-Olds in Reading, Mathematics, and Science Literacy

*\*Yellow shading indicates that the country's average was statistically higher than the U.S. average.  
Blue shading indicates that the country's average was statistically lower than the U.S. average.*

|     | <b>Reading Literacy Ranking (Score)</b> | <b>Math Literacy Ranking (Score)</b> | <b>Science Literacy Ranking (Score)</b> |
|-----|---|--------------------------------------|---|
| 1.  | Finland (546)                           | Japan (557)                          | Korea, Republic of (552)                |
| 2.  | Canada (534)                            | Korea, Republic of (547)             | Japan (550)                             |
| 3.  | New Zealand (529)                       | New Zealand (537)                    | Finland (538)                           |
| 4.  | Australia (528)                         | Finland (536)                        | United Kingdom (532)                    |
| 5.  | Ireland (527)                           | Australia (533)                      | Canada (529)                            |
| 6.  | Korea, Republic of (525)                | Canada (533)                         | New Zealand (528)                       |
| 7.  | United Kingdom (523)                    | Switzerland (529)                    | Australia (528)                         |
| 8.  | Japan (522)                             | United Kingdom (529)                 | Austria (519)                           |
| 9.  | Sweden (516)                            | Belgium (520)                        | Ireland (513)                           |
| 10. | Austria (507)                           | France (517)                         | Sweden (512)                            |
| 11. | Belgium (507)                           | Austria (515)                        | Czech Republic (511)                    |
| 12. | Iceland (507)                           | Denmark (514)                        | France (500)                            |
| 13. | Norway (505)                            | Iceland (514)                        | Norway (500)                            |
| 14. | France (505)                            | Sweden (510)                         | <b>United States (499)</b>              |
| 15. | <b>United States (504)</b>              | Ireland (503)                        | Hungary (496)                           |
| 16. | Denmark (497)                           | Norway (499)                         | Iceland (496)                           |
| 17. | Switzerland (494)                       | Czech Republic (498)                 | Belgium (496)                           |
| 18. | Spain (493)                             | <b>United States (493)</b>           | Switzerland (496)                       |
| 19. | Czech Republic (492)                    | Germany (490)                        | Spain (491)                             |
| 20. | Italy (487)                             | Hungary (488)                        | Germany (487)                           |
| 21. | Germany (484)                           | Spain (476)                          | Poland (483)                            |
| 22. | Hungary (480)                           | Poland (470)                         | Denmark (481)                           |
| 23. | Poland (479)                            | Italy (457)                          | Italy (478)                             |
| 24. | Greece (474)                            | Portugal (454)                       | Greece (461)                            |
| 25. | Portugal (470)                          | Greece (447)                         | Portugal (459)                          |
| 26. | Luxembourg (441)                        | Luxembourg (446)                     | Luxembourg (443)                        |
| 27. | Mexico (422)                            | Mexico (387)                         | Mexico (422)                            |
|     |   |                                      |   |
|     | Average = 500                           | Average = 500                        | Average = 500                           |

Source: NCES, *Outcomes*

**Table 2:** Average Scores and Achievement Gaps for Reading, Math and Science by Gender, Income and Race/Ethnicity Groups: 2005, Grade 4

|  | <b>Reading</b> | <b>Math</b> | <b>Science</b> |
|--|----------------|-------------|----------------|
| <b>Gender</b>                                    |                |             |                |
| Male   | 214            | 238         | 151            |
| Female   | 220            | 236         | 146            |
| <i>Female Achievement Gap (%)</i>                | 2.8%           | -0.8%       | -3.3%          |
| <b>School Lunch Program Eligibility</b>          |                |             |                |
| Not Eligible                                     | 230            | 248         | 159            |
| Eligible   | 203            | 225         | 129            |
| <i>School Lunch Eligible Achievement Gap (%)</i> | -11.7%         | -9.3%       | -18.9%         |
| <b>Race/Ethnicity</b>                            |                |             |                |
| White  | 228            | 246         | 159            |
| Black  | 199            | 220         | 122            |
| Hispanic   | 201            | 225         | 125            |
| Asian  | 227            | 251         | n/a            |
| American Indian                                  | 205            | 227         | n/a            |
| <i>Black/White Achievement Gap (%)</i>           | -13%           | -11%        | -23%           |
| <i>Hispanic/White Achievement Gap (%)</i>        | -12%           | -9%         | -21%           |
| <i>American Indian/White Achievement gap (%)</i> | -10%           | -8%         | n/a            |

\* Achievement gaps are not necessarily statistically significant.

\*\* Source: NAEP

**Table 3: Correlation Matrix for Independent Variables**

|  | # Schools Allowed | Multiple Authorities | Eligible Applicants | New Starts | Not Requiring Local Support | Legal Autonomy | Fiscal Autonomy | School Funding | Exempt from Rules | Does Not Require Teacher Certification | Retirement Benefits | Salary Determination | Leave of Absence | Automatic Waiver |
|--|-------------------|----------------------|---------------------|------------|-----------------------------|----------------|-----------------|----------------|-------------------|--|---------------------|----------------------|------------------|------------------|
| # Schools Allowed                      | 1.00              |                      |                     |            |                             |                |                 |                |                   |  |                     |                      |                  |                  |
| Multiple Authorities                   | 0.28              | 1.00                 |                     |            |                             |                |                 |                |                   |  |                     |                      |                  |                  |
| Eligible Applicants                    | 0.60              | 0.28                 | 1.00                |            |                             |                |                 |                |                   |  |                     |                      |                  |                  |
| New Starts                             | 0.28              | 0.30                 | 0.33                | 1.00       |                             |                |                 |                |                   |  |                     |                      |                  |                  |
| Not Requiring Local Support            | 0.13              | 0.61                 | 0.24                | 0.05       | 1.00                        |                |                 |                |                   |  |                     |                      |                  |                  |
| Legal Autonomy                         | 0.19              | 0.49                 | 0.32                | 0.07       | 0.77                        | 1.00           |                 |                |                   |  |                     |                      |                  |                  |
| Fiscal Autonomy                        | 0.28              | 0.30                 | 0.30                | 0.06       | 0.50                        | 0.80           | 1.00            |                |                   |  |                     |                      |                  |                  |
| School Funding                         | 0.04              | 0.16                 | 0.39                | 0.08       | 0.39                        | 0.63           | 0.71            | 1.00           |                   |  |                     |                      |                  |                  |
| Exempt from Rules                      | 0.47              | 0.25                 | 0.45                | 0.04       | 0.27                        | 0.38           | 0.54            | 0.26           | 1.00              |  |                     |                      |                  |                  |
| Does Not Require Teacher Certification | (0.34)            | (0.19)               | (0.26)              | (0.09)     | 0.09                        | 0.09           | 0.00            | (0.16)         | 0.08              | 1.00                                   |                     |                      |                  |                  |
| Retirement Benefits                    | (0.14)            | (0.01)               | (0.22)              | (0.07)     | (0.21)                      | (0.43)         | (0.37)          | (0.56)         | 0.02              | 0.41                                   | 1.00                |                      |                  |                  |
| Salary Determination                   | 0.17              | (0.02)               | 0.36                | (0.02)     | 0.28                        | 0.53           | 0.51            | 0.48           | 0.45              | 0.34                                   | (0.36)              | 1.00                 |                  |                  |
| Leave of Absence                       | (0.20)            | (0.08)               | (0.11)              | (0.20)     | (0.03)                      | 0.03           | 0.12            | (0.01)         | (0.03)            | 0.18                                   | 0.41                | (0.02)               | 1.00             |                  |
| Automatic Waiver                       | (0.00)            | 0.18                 | 0.18                | (0.10)     | 0.29                        | 0.60           | 0.47            | 0.34           | 0.21              | 0.07                                   | (0.02)              | 0.17                 | 0.35             | 1.00             |
| Appeals Process                        | 0.18              | (0.08)               | 0.48                | (0.08)     | (0.14)                      | (0.07)         | 0.02            | 0.09           | 0.49              | (0.12)                                 | 0.30                | (0.05)               | 0.17             | 0.39             |
| Effectiveness Report                   | (0.06)            | (0.06)               | 0.01                | (0.09)     | (0.14)                      | (0.27)         | (0.06)          | 0.15           | 0.01              | (0.21)                                 | (0.12)              | (0.07)               | 0.05             | (0.40)           |
| Charter School: # Students in Grade    | 0.19              | 0.03                 | 0.12                | (0.01)     | (0.02)                      | (0.03)         | (0.04)          | (0.01)         | 0.01              | (0.05)                                 | (0.01)              | (0.02)               | (0.06)           | (0.06)           |
| Charter School: % Free/Reduced Lunch   | (0.18)            | 0.18                 | (0.16)              | (0.04)     | 0.22                        | 0.13           | 0.05            | (0.01)         | (0.08)            | 0.02                                   | (0.06)              | (0.06)               | (0.04)           | (0.03)           |
| Charter School: Pupil/Teacher Ratio    | 0.01              | (0.07)               | 0.04                | (0.01)     | (0.04)                      | 0.01           | 0.04            | 0.08           | 0.04              | (0.06)                                 | (0.10)              | 0.01                 | (0.07)           | 0.01             |
| Charter School: Years Open             | 0.26              | 0.21                 | 0.22                | 0.15       | 0.14                        | 0.18           | 0.22            | 0.23           | 0.13              | (0.13)                                 | (0.07)              | 0.10                 | (0.11)           | 0.05             |
| Charter School: Serves At-Risk         | (0.15)            | (0.02)               | (0.08)              | (0.07)     | 0.03                        | (0.00)         | (0.02)          | (0.02)         | 0.01              | 0.07                                   | 0.02                | 0.01                 | (0.02)           | (0.01)           |
| Charter School: Serves Gifted          | (0.02)            | 0.00                 | 0.01                | 0.02       | (0.01)                      | (0.01)         | 0.00            | 0.01           | 0.02              | 0.05                                   | 0.04                | 0.03                 | 0.02             | 0.01             |
| Public School: # Students in Grade     | 0.10              | (0.08)               | 0.08                | 0.11       | (0.10)                      | (0.09)         | (0.02)          | (0.01)         | 0.16              | 0.07                                   | 0.06                | 0.03                 | (0.16)           | (0.09)           |
| Public School: % Free/Reduced Lunch    | (0.12)            | 0.03                 | (0.14)              | (0.09)     | 0.07                        | (0.02)         | (0.04)          | (0.09)         | (0.03)            | 0.07                                   | 0.06                | (0.12)               | 0.03             | (0.03)           |
| Public School: Pupil/Teacher Ratio     | 0.06              | 0.11                 | 0.06                | 0.06       | 0.10                        | 0.12           | 0.08            | 0.12           | (0.02)            | (0.07)                                 | (0.15)              | 0.05                 | (0.12)           | 0.00             |
| Tested 3rd Grade Students              | (0.19)            | 0.06                 | (0.19)              | (0.51)     | 0.02                        | 0.03           | 0.06            | 0.01           | 0.01              | 0.17                                   | 0.07                | 0.01                 | (0.01)           | 0.16             |
| Tested 5th Grade Students              | 0.16              | (0.16)               | 0.02                | (0.08)     | 0.13                        | 0.21           | 0.18            | (0.11)         | 0.30              | 0.23                                   | 0.31                | 0.21                 | 0.28             | 0.46             |

CONTINUED ON NEXT PAGE

**Table 3 Continued: Correlation Matrix for Independent Variables**

|                                      | # Schools Allowed | Multiple Authorities | Eligible Applicants | New Starts | Not Requiring Local Support | Legal Autonomy | Fiscal Autonomy | School Funding | Exempt from Rules | Does Not Require Teacher Certification | Retirement Benefits | Salary Determination | Leave of Absence | Automatic Waiver |
|--------------------------------------|-------------------|----------------------|---------------------|------------|-----------------------------|----------------|-----------------|----------------|-------------------|--|---------------------|----------------------|------------------|------------------|
| Charter School: % Free/Reduced Lunch | (0.18)            | 0.18                 | (0.16)              | (0.04)     | 0.22                        | 0.13           | 0.05            | (0.01)         | (0.08)            | 0.02                                   | (0.06)              | (0.06)               | (0.04)           | (0.03)           |
| Charter School: Pupil/Teacher Ratio  | 0.01              | (0.07)               | 0.04                | (0.01)     | (0.04)                      | 0.01           | 0.04            | 0.08           | 0.04              | (0.06)                                 | (0.10)              | 0.01                 | (0.07)           | 0.01             |
| Charter School: Years Open           | 0.26              | 0.21                 | 0.22                | 0.15       | 0.14                        | 0.18           | 0.22            | 0.23           | 0.13              | (0.13)                                 | (0.07)              | 0.10                 | (0.11)           | 0.05             |
| Charter School: Serves At-Risk       | (0.15)            | (0.02)               | (0.08)              | (0.07)     | 0.03                        | (0.00)         | (0.02)          | (0.02)         | 0.01              | 0.07                                   | 0.02                | 0.01                 | (0.02)           | (0.01)           |
| Charter School: Serves Gifted        | (0.02)            | 0.00                 | 0.01                | 0.02       | (0.01)                      | (0.01)         | 0.00            | 0.01           | 0.02              | 0.05                                   | 0.04                | 0.03                 | 0.02             | 0.01             |
| Public School: # Students in Grade   | 0.10              | (0.08)               | 0.08                | 0.11       | (0.10)                      | (0.09)         | (0.02)          | (0.01)         | 0.16              | 0.07                                   | 0.06                | 0.03                 | (0.16)           | (0.09)           |
| Public School: % Free/Reduced Lunch  | (0.12)            | 0.03                 | (0.14)              | (0.09)     | 0.07                        | (0.02)         | (0.04)          | (0.09)         | (0.03)            | 0.07                                   | 0.06                | (0.12)               | 0.03             | (0.03)           |
| Public School: Pupil/Teacher Ratio   | 0.06              | 0.11                 | 0.06                | 0.06       | 0.10                        | 0.12           | 0.08            | 0.12           | (0.02)            | (0.07)                                 | (0.15)              | 0.05                 | (0.12)           | 0.00             |
| Tested 3rd Grade Students            | (0.19)            | 0.06                 | (0.19)              | (0.51)     | 0.02                        | 0.03           | 0.06            | 0.01           | 0.01              | 0.17                                   | 0.07                | 0.01                 | (0.01)           | 0.16             |
| Tested 5th Grade Students            | 0.16              | (0.16)               | 0.02                | (0.08)     | 0.13                        | 0.21           | 0.18            | (0.11)         | 0.30              | 0.23                                   | 0.31                | 0.21                 | 0.28             | 0.46             |

|                                      | Appeals Process | Effectiveness Report | Charter School: # Students in Grade | Charter School: % Free/Reduced Lunch | Charter School: Pupil/Teacher Ratio | Charter School: Years Open | Charter School: Serves At-Risk | Charter School: Serves Gifted | Public School: # Students in Grade | Public School: % Free/Reduced Lunch | Public School: Pupil/Teacher Ratio | Tested 3rd Grade Students | Tested 5th Grade Students |
|--------------------------------------|-----------------|----------------------|-------------------------------------|--------------------------------------|-------------------------------------|----------------------------|--------------------------------|-------------------------------|------------------------------------|-------------------------------------|------------------------------------|---------------------------|---------------------------|
| Charter School: % Free/Reduced Lunch | (0.20)          | (0.03)               | (0.01)                              | 1.00                                 |                                     |                            |                                |                               |                                    |                                     |                                    |                           |                           |
| Charter School: Pupil/Teacher Ratio  | 0.06            | 0.02                 | 0.00                                | (0.02)                               | 1.00                                |                            |                                |                               |                                    |                                     |                                    |                           |                           |
| Charter School: Years Open           | 0.05            | (0.05)               | 0.08                                | (0.08)                               | (0.02)                              | 1.00                       |                                |                               |                                    |                                     |                                    |                           |                           |
| Charter School: Serves At-Risk       | (0.02)          | 0.03                 | (0.08)                              | 0.15                                 | (0.02)                              | (0.00)                     | 1.00                           |                               |                                    |                                     |                                    |                           |                           |
| Charter School: Serves Gifted        | 0.03            | 0.01                 | (0.03)                              | 0.02                                 | (0.01)                              | 0.02                       | 0.04                           | 1.00                          |                                    |                                     |                                    |                           |                           |
| Public School: # Students in Grade   | 0.14            | 0.06                 | 0.13                                | (0.10)                               | 0.03                                | 0.03                       | (0.01)                         | 0.03                          | 1.00                               |                                     |                                    |                           |                           |
| Public School: % Free/Reduced Lunch  | (0.05)          | 0.06                 | 0.01                                | 0.53                                 | 0.04                                | (0.14)                     | 0.11                           | 0.02                          | (0.07)                             | 1.00                                |                                    |                           |                           |
| Public School: Pupil/Teacher Ratio   | (0.06)          | 0.04                 | 0.04                                | 0.05                                 | 0.01                                | 0.05                       | (0.03)                         | (0.01)                        | 0.01                               | 0.00                                | 1.00                               |                           |                           |
| Tested 3rd Grade Students            | 0.00            | (0.05)               | (0.00)                              | 0.11                                 | (0.00)                              | (0.10)                     | 0.03                           | (0.01)                        | (0.07)                             | 0.09                                | (0.02)                             | 1.00                      |                           |
| Tested 5th Grade Students            | 0.33            | (0.48)               | (0.08)                              | (0.13)                               | (0.04)                              | 0.09                       | (0.05)                         | 0.01                          | 0.02                               | (0.09)                              | (0.02)                             | (0.08)                    | 1.00                      |

**Table 4:** Regression Output for Difference in Reading Proficiency Levels Between Charter School and Matched Traditional Public School

| Regression with robust standard errors                                    |             |                  |         | Number of obs= 930      |        |
|---|-------------|------------------|---------|-------------------------|--------|
|   |             |                  |         | F( 26, 903)= 8.07       |        |
|   |             |                  |         | Prob > F= 0.0000        |        |
|   |             |                  |         | R-squared= 0.2226       |        |
|   |             |                  |         | Root MSE= 20.003        |        |
| Read Difference   | Coefficient | Robust Std Error | p-value | 95% Confidence Interval |        |
| <i>Charter Development Variables</i>                                      |             |                  |         |                         |        |
| # Schools Allowed ( <i>Rating`</i> )                                      | (0.99)      | 1.52             | 0.52    | (3.98)                  | 2.00   |
| Multiple Authorities ( <i>Rating`</i> )**                                 | 3.00        | 1.39             | 0.03    | 0.27                    | 5.73   |
| Eligible Applicants ( <i>Rating`</i> )                                    | (0.19)      | 2.77             | 0.94    | (5.63)                  | 5.25   |
| New Starts ( <i>Rating`</i> )   | (7.19)      | 4.78             | 0.13    | (16.57)                 | 2.18   |
| Not Requiring Local Support ( <i>Rating`</i> )***                         | (4.77)      | 1.38             | 0.00    | (7.49)                  | (2.06) |
| <i>Fiscal Variables</i>   |             |                  |         |                         |        |
| Fiscal Autonomy ( <i>Rating`</i> )  | 0.99        | 1.51             | 0.51    | (1.97)                  | 3.95   |
| School Funding ( <i>Rating`</i> )   | 1.44        | 1.80             | 0.43    | (2.10)                  | 4.98   |
| <i>Staffing Variables</i>   |             |                  |         |                         |        |
| Exempt from Rules ( <i>Rating`</i> )                                      | 0.30        | 1.61             | 0.85    | (2.86)                  | 3.45   |
| Does not Require Teacher Certification<br>(0=Requires; 1=Doesn't Require) | 3.90        | 2.96             | 0.19    | (1.92)                  | 9.72   |
| Retirement Benefits (0=N, 1=Y)  | (3.95)      | 3.94             | 0.32    | (11.68)                 | 3.78   |
| Salary Determination (0=State; 1=Varies;<br>2= Charter)***                | (6.23)      | 2.34             | 0.01    | (10.82)                 | (1.64) |
| Leave of Absence (0=N; 1=Y)   | (1.73)      | 2.36             | 0.46    | (6.35)                  | 2.90   |
| <i>Instruction Variable</i>   |             |                  |         |                         |        |
| Automatic Waiver ( <i>Rating`</i> )*                                      | (1.87)      | 1.04             | 0.07    | (3.92)                  | 0.18   |
| <i>Accountability Variables</i>   |             |                  |         |                         |        |
| Appeals Process (0=N; 1=Y)  | 0.09        | 4.10             | 0.98    | (7.96)                  | 8.15   |
| Effectiveness Report (0=N; 1=Y)**   | (7.50)      | 3.15             | 0.02    | (13.70)                 | (1.31) |
| <i>Charter School Other Variables</i>                                     |             |                  |         |                         |        |
| # Students In Grade**   | 0.06        | 0.02             | 0.02    | 0.01                    | 0.10   |
| % Free/Reduced Lunch***   | (0.21)      | 0.03             | 0.00    | (0.28)                  | (0.15) |
| Pupil/Teacher Ratio*  | (0.02)      | 0.01             | 0.09    | (0.04)                  | 0.00   |
| Years Open***   | 1.02        | 0.34             | 0.00    | 0.35                    | 1.69   |
| Serves At-risk (0=N; 1=Y)*  | (6.77)      | 3.85             | 0.08    | (14.33)                 | 0.78   |
| Serves Gifted (0=N; 1=Y)*   | 21.06       | 11.86            | 0.08    | (2.22)                  | 44.34  |
| Tested 3 <sup>rd</sup> Grade Students (0=N; 1=Y)                          | (9.43)      | 6.97             | 0.18    | (23.11)                 | 4.25   |
| Tested 5 <sup>th</sup> Grade Students (0=N; 1=Y)**                        | 7.90        | 3.65             | 0.03    | 0.73                    | 15.07  |
| <i>Public School Other Variables</i>                                      |             |                  |         |                         |        |
| # Students in Grade Tested***   | (0.05)      | 0.02             | 0.01    | (0.09)                  | (0.01) |
| % Free/Reduced Lunch***   | 0.31        | 0.03             | 0.00    | 0.25                    | 0.38   |
| Pupil/Teacher Ratio**   | (0.15)      | 0.06             | 0.02    | (0.27)                  | (0.03) |
| _Cons   | 50.41       | 22.08            | 0.02    | 7.08                    | 93.73  |

\* indicates statistically significant at the 90% Confidence Level  
 \*\*\* indicates statistically significant at the 99% Confidence Level  
 ` Rating indicates that the variable has been scored by the Center for Education Reform on a scale of 0-5. The higher the score, the more flexible the states laws are and the more autonomy given to the charter schools.

**Table 5:** Comparison of Regression Output for Difference in Reading Proficiency Levels between Charter School and Matched Traditional Public School when run 1) Without Controls 2) With All Controls Except Free/Reduced Lunch and Pupil/Teacher Ratio and 3) With All Controls

| <b>Read Difference</b>   | <b>With No Controls (n=1125)</b> | <b>With Controls EXCEPT Free/Reduced Lunch and Pupil/Teacher Ratio (n=959)</b> | <b>With Controls INCLUDING Free/Reduced Lunch and Pupil/Teacher Ratio (n=930)</b> |
|--|----------------------------------|--|---|
| <i>Charter Development Variables</i>                                   |                                  |  |   |
| # Schools Allowed (Rating <sup>`</sup> )                               | 4.11***                          | 0.11   | (0.99)  |
| Multiple Authorities (Rating <sup>`</sup> )                            | 0.14                             | 1.87 <sup>p=.20</sup>  | 2.99**  |
| Eligible Applicants (Rating <sup>`</sup> )                             | (3.41)                           | 0.03   | (0.19)  |
| New Starts (Rating <sup>`</sup> )                                      | (2.59)                           | (7.83)**   | (7.19) <sup>p=.13</sup>   |
| Not Requiring Local Support (Rating <sup>`</sup> )                     | (3.39)**                         | (4.78)***  | (4.77)***   |
| <i>Fiscal Variables</i>  |                                  |  |   |
| Fiscal Autonomy (Rating <sup>`</sup> )                                 | (0.21)                           | 0.48   | 0.99  |
| School Funding (Rating <sup>`</sup> )                                  | 1.63                             | 0.86   | 1.44  |
| <i>Staffing Variables</i>  |                                  |  |   |
| Exempt from Rules (Rating <sup>`</sup> )                               | 0.89                             | 0.71   | 0.30  |
| Does not Require Teacher Certification (0=Requires; 1=Doesn't Require) | 7.68**                           | 7.22**   | 3.89 <sup>p=.19</sup>   |
| Retirement Benefits (0=N; 1=Y)   | (5.32)                           | (6.04)   | (3.95)  |
| Salary Determination (0=State; 1=Varies; 2= Charter)                   | (7.19)***                        | (8.27)***  | (6.23)**  |
| Leave of Absence (0=N; 1=Y)  | 3.27                             | 0.20   | (1.73)  |
| <i>Instruction Variable</i>  |                                  |  |   |
| Automatic Waiver (Rating <sup>`</sup> )                                | (0.49)                           | (1.86)*  | (1.87)*   |
| <i>Accountability Variables</i>  |                                  |  |   |
| Appeals Process (0=N; 1=Y)   | 4.13                             | 2.22   | 0.09  |
| Effectiveness Report (0=N; 1=Y)  | (3.84)*                          | (3.79)*  | (7.50)**  |
| <i>Charter School Other Variables</i>                                  |                                  |  |   |
| # Students In Grade  |                                  | 0.04*  | 0.06**  |
| % Free/Reduced Lunch   |                                  |  | (0.21)***   |
| Pupil/Teacher Ratio  |                                  |  | (0.02)*   |
| Years Open   |                                  | 0.90**   | 1.02***   |
| Serves At-risk (0=N; 1=Y)  |                                  | (5.49)   | (6.77)*   |
| Serves Gifted (0=N; 1=Y)   |                                  | 22.82*   | 21.06*  |
| Tested 3 <sup>rd</sup> Grade Students (0=N; 1=Y)                       |                                  | (7.78)   | (9.43)  |
| Tested 5 <sup>th</sup> Grade Students (0=N; 1=Y)                       |                                  | 8.33**   | 7.90**  |
| <i>Public School Other Variables</i>                                   |                                  |  |   |
| # Students in Grade Tested   |                                  | (0.07)***  | (0.05)***   |
| % Free/Reduced Lunch   |                                  |  | 0.31***   |
| Pupil/Teacher Ratio  |                                  |  | (.15)**   |
| _Cons  |                                  |  |   |

\*significant at 90% Confidence Level. \*\*significant at 95% Confidence Level. \*\*\*significant at 99% Confidence Level.  
<sup>`</sup> Rating indicates that the variable has been scored by the Center for Education Reform on a scale of 0-5. The higher the score, the more flexible the states laws are and the more autonomy given to the charter schools.

**Table 6:** Regression Output for Difference in Math Proficiency Levels Between Charter School and Matched Traditional Public School

| Regression with robust standard errors                                 |             |                  |         | Number of obs=          | 936    |
|--|-------------|------------------|---------|-------------------------|--------|
|  |             |                  |         | F( 26,909)=             | 6.29   |
|  |             |                  |         | Prob > F=               | 0.0000 |
|  |             |                  |         | R-squared=              | 0.1820 |
|  |             |                  |         | Root MSE=               | 22.449 |
| Math Difference  | Coefficient | Robust Std Error | p-value | 95% Confidence Interval |        |
| <i>Charter Development Variables</i>                                   |             |                  |         |                         |        |
| # Schools Allowed ( <i>Rating`</i> )                                   | (2.54)      | 1.60             | 0.11    | (5.69)                  | 0.61   |
| Multiple Authorities ( <i>Rating`</i> )***                             | 4.17        | 1.56             | 0.01    | 1.11                    | 7.23   |
| Eligible Applicants ( <i>Rating`</i> )                                 | 1.38        | 2.83             | 0.63    | (4.18)                  | 6.94   |
| New Starts ( <i>Rating`</i> )***                                       | (13.25)     | 4.52             | 0.00    | (22.13)                 | (4.38) |
| Not Requiring Local Support ( <i>Rating`</i> )***                      | (6.83)      | 1.46             | 0.00    | (9.69)                  | (3.97) |
| <i>Fiscal Variables</i>  |             |                  |         |                         |        |
| Fiscal Autonomy ( <i>Rating`</i> )                                     | 2.44        | 1.75             | 0.16    | (1.00)                  | 5.87   |
| School Funding ( <i>Rating`</i> )                                      | 0.68        | 2.29             | 0.77    | (3.83)                  | 5.18   |
| <i>Staffing Variables</i>  |             |                  |         |                         |        |
| Exempt from Rules ( <i>Rating`</i> )                                   | (1.35)      | 1.88             | 0.47    | (5.05)                  | 2.34   |
| Does not Require Teacher Certification (0=Requires; 1=Doesn't Require) | 2.76        | 3.40             | 0.42    | (3.92)                  | 9.44   |
| Retirement Benefits (0=N, 1=Y)   | (4.94)      | 4.65             | 0.29    | (14.07)                 | 4.18   |
| Salary Determination (0=State; 1=Varies; 2= Charter)                   | (1.25)      | 2.79             | 0.65    | (6.73)                  | 4.23   |
| Leave of Absence (0=N; 1=Y)  | (1.72)      | 2.50             | 0.49    | (6.63)                  | 3.20   |
| <i>Instruction Variable</i>  |             |                  |         |                         |        |
| Automatic Waiver ( <i>Rating`</i> )                                    | (1.32)      | 1.23             | 0.29    | (3.74)                  | 1.10   |
| <i>Accountability Variables</i>  |             |                  |         |                         |        |
| Appeals Process (0=N; 1=Y)   | 0.40        | 4.32             | 0.93    | (8.09)                  | 8.89   |
| Effectiveness Report (0=N; 1=Y)**                                      | (7.72)      | 3.50             | 0.03    | (14.60)                 | (0.84) |
| <i>Charter School Other Variables</i>                                  |             |                  |         |                         |        |
| # Students In Grade***   | 0.08        | 0.02             | 0.00    | 0.04                    | 0.12   |
| % Free/Reduced Lunch***  | (0.15)      | 0.03             | 0.00    | (0.21)                  | (0.08) |
| Pupil/Teacher Ratio  | (0.01)      | 0.01             | 0.48    | (0.04)                  | 0.02   |
| Years Open***  | 1.86        | 0.41             | 0.00    | 1.05                    | 2.67   |
| Serves At-risk (0=N; 1=Y)*   | (5.99)      | 3.65             | 0.10    | (13.16)                 | 1.18   |
| Serves Gifted (0=N; 1=Y)**   | 25.60       | 12.29            | 0.04    | 1.47                    | 49.73  |
| Tested 3 <sup>rd</sup> Grade Students (0=N; 1=Y)***                    | (21.96)     | 6.74             | 0.00    | (35.19)                 | (8.74) |
| Tested 5 <sup>th</sup> Grade Students (0=N; 1=Y)**                     | 8.88        | 4.18             | 0.03    | 0.66                    | 17.09  |
| <i>Public School Other Variables</i>                                   |             |                  |         |                         |        |
| # Students in Grade Tested**   | (0.04)      | 0.02             | 0.03    | (0.08)                  | (0.00) |
| % Free/Reduced Lunch***  | 0.28        | 0.04             | 0.00    | 0.21                    | 0.35   |
| Pupil/Teacher Ratio*   | (0.14)      | 0.08             | 0.10    | (0.30)                  | 0.03   |
| _Cons  | 64.94       | 20.62            | 0.00    | 24.47                   | 105.41 |

\* indicates statistically significant at the 90% Confidence Level      \*\* indicates statistically significant at the 95% Confidence Level  
\*\*\* indicates statistically significant at the 99% Confidence Level  
` Rating indicates that the variable has been scored by the Center for Education Reform on a scale of 0-5. The higher the score, the more flexible the states laws are and the more autonomy given to the charter schools.

**Table 7:** Comparison of Regression Output for Difference in Math Proficiency Levels between Charter School and Matched Traditional Public School when run 1) Without Controls 2) With All Controls Except Free/Reduced Lunch and Pupil/Teacher Ratio and 3) With All Controls

| <b>Math Difference</b>  | <b>With No Controls (n=1132)</b> | <b>With Controls EXCEPT Free/Reduced Lunch and Pupil/Teacher Ratio (n=965)</b> | <b>With Controls INCLUDING Free/Reduced Lunch and Pupil/Teacher Ratio (n=936)</b> |
|---|----------------------------------|--|---|
| <i>Charter Development Variables</i>  |                                  |  |   |
| # Schools Allowed (Rating <sup>`</sup> )  | 3.94**                           | (1.77)   | (2.54) <sup>p=.11</sup>   |
| Multiple Authorities (Rating <sup>`</sup> )   | 1.41                             | 3.32**   | 4.17***   |
| Eligible Applicants (Rating <sup>`</sup> )  | (3.07)                           | 0.94   | 1.38  |
| New Starts (Rating <sup>`</sup> )   | (3.99)                           | (12.64)***   | (13.25)***  |
| Not Requiring Local Support (Rating <sup>`</sup> )  | (4.45)***                        | (6.25)***  | (6.83)***   |
| <i>Fiscal Variables</i>   |                                  |  |   |
| Fiscal Autonomy (Rating <sup>`</sup> )  | 1.14                             | 2.14   | 2.44  |
| School Funding (Rating <sup>`</sup> )   | 1.00                             | (0.37)   | 0.68  |
| <i>Staffing Variables</i>   |                                  |  |   |
| Exempt from Rules (Rating <sup>`</sup> )  | (1.16)                           | (1.17)   | (1.35)  |
| Does not Require Teacher Certification (0=Requires; 1=Doesn't Require)  | 5.80                             | 5.26   | 2.76  |
| Retirement Benefits (0=N, 1=Y)  | (5.80)                           | (7.65)*  | (4.94)  |
| Salary Determination (0=State; 1=Varies; 2= Charter)  | (2.04)                           | (3.10)   | (1.25)  |
| Leave of Absence (0=N; 1=Y)   | 3.01                             | (0.14)   | (1.72)  |
| <i>Instruction Variable</i>   |                                  |  |   |
| Automatic Waiver (Rating <sup>`</sup> )   | (0.19)                           | (1.58)   | (1.32)  |
| <i>Accountability Variables</i>   |                                  |  |   |
| Appeals Process (0=N; 1=Y)  | 5.47                             | 3.48   | 0.40  |
| Effectiveness Report (0=N; 1=Y)   | (4.15)*                          | (3.87)   | (7.72)**  |
| <i>Charter School Other Variables</i>   |                                  |  |   |
| # Students In Grade   |                                  | 0.07***  | 0.08***   |
| % Free/Reduced Lunch  |                                  |  | (0.15)**  |
| Pupil/Teacher Ratio   |                                  |  | (0.01)  |
| Years Open  |                                  | 1.69**   | 1.86***   |
| Serves At-risk (0=N; 1=Y)   |                                  | (4.48)   | (5.99)*   |
| Serves Gifted (0=N; 1=Y)  |                                  | 27.55**  | 25.60**   |
| Tested 3 <sup>rd</sup> Grade Students (0=N; 1=Y)  |                                  | (17.74)***   | (21.96)***  |
| Tested 5 <sup>th</sup> Grade Students (0=N; 1=Y)  |                                  | 9.40**   | 8.88**  |
| <i>Public School Other Variables</i>  |                                  |  |   |
| # Students in Grade Tested  |                                  | (0.05)**   | (0.04)***   |
| % Free/Reduced Lunch  |                                  |  | 0.28***   |
| Pupil/Teacher Ratio   |                                  |  | (.14)*  |
| <b>_Cons</b>  |                                  |  |   |
| *significant at 90% Confidence Level. **significant at 95% Confidence Level. ***significant at 99% Confidence Level.<br><sup>`</sup> Rating indicates that the variable has been scored by the Center for Education Reform on a scale of 0-5. The higher the score, the more flexible the states laws are and the more autonomy given to the charter schools. |                                  |  |   |

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