Evaluating the Impact of State Policies on Charter School Success

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Executive Summary

Since their inception in 1991, charter schools have become a widely-adopted school choice policy intended to increase educational outcomes through competition and innovation. The details of how states structure their charter school laws are diverse across states, which raises the question of whether certain law parameters are better than others at attracting and maintaining high-quality charter schools.

Charter schools are designed around the basis of market accountability; they must attract students in order to remain in operation. The threat of closure is an incentive built into the charter model that is intended to increase school performance. For this reason, I define charter school success across states in terms of charter school closures, with the understanding that the closure rate should not be zero (indicating a lack of enforcement) but it should also not be too high (indicating poor authorizing practices).

Charter school advocates have strong beliefs about which law parameters are most conducive to the health of a state's charter environment. I chose two law components that are recommended by two prominent advocacy groups and examined their effect on state charter school closures. Contrary to the claims of the interest groups, I did not find that these parameters impacted charter school closings.

Through a series of case studies, I further examined the advocacy groups' policy preferences by comparing their state charter school law ranking systems. The findings of this project demonstrate that state policymakers are being pulled in different directions over policies that may actually have no real impact on charter school outcomes.

Introduction

In 2017, Kentucky became the forty-fourth state to pass legislation authorizing the creation of charter schools. Charter schools are publicly funded schools that are operated by non-governmental entities. The US Department of Education's National Charter School Resource Center defines these schools as "public schools operating under a 'charter,' essentially a contract entered into between the school and its authorizing agency." Each school's contract establishes the conditions and timeframe of their funding from the state and frees them from many of the regulations that govern traditional public schools. Unlike traditional public schools (TPS), charter schools do not have designated geographic area from which their student population is mandated. Instead, charter school students and their families must actively choose for the student to attend the school.

Minnesota was the first state to adopt a charter school law in 1991, and since then states have varied greatly in their law design (National Conference of State Legislators 2012). Some of the law parameters include the amount of freedom given to charter schools, the funding structures, limits on numbers or types of allowed charters, and the process by which charter schools are opened and monitored. Charter schools are a widely adopted policy option intended to expand the education marketplace by increasing innovation and competition, thus helping families to better match with their educational preferences. Because there is diversity among the details of charter school laws across states, it is important to evaluate how various law components impact each state's ability to achieve that policy goal. My research question is as follows: What is the relationship, if any, between a state's charter school law and its charter school closures?

The statewide charter closure rate is a good indicator of the success of charter schools overall within each state. Charter schools are designed around the concept of market accountability. Therefore, the closure rate indicates the ability of the state to attract charter schools that meet market demand. School closures have negative consequences for affected students and the success of the charter movement as a whole. From this perspective, a high charter school closure rate is an undesirable policy outcome. However, there is an acknowledgement that a rate of zero is not necessarily a good outcome either. If states are unwilling to enforce the closure mechanisms of their charter school law, they diminish accountability for those schools. For this reason, my analysis also accounts for whether or not a state closed any charter schools in a given year. A state's law parameters establish the environment in which charter schools operate, and thus should theoretically influence both the presence of closures and the closure rate. By examining the effects of law components on charter school closures, I will add to the conversation about the influence of a state's charter policies on school success.

Literature Review

There is a growing body of research on how charter schools perform in educating children. Across the board, charter schools produce mixed results in terms of student outcomes on standardized tests (Zimmer et al. 2011). There are inherent challenges to evaluating the performance of charter schools as compared to their traditional public school counterparts because charters may attract a nonrandom group of students (Zimmer et al. 2009). The market conditions under which charter schools operate mean that they must differentiate themselves from other educational options in order to be competitive. Many charter schools find an educational niche, which may be anything from classical education to the education of students

who have dropped out of traditional public schools (Epple et al. 2015). This complicates the measurement of their success, because some charter schools may perform better or worse than their neighboring TPS solely based on their intended student population.

However, the self-sorting of students into schools based on their preferences is not necessarily a bad thing. Evaluating schools on the basis of academic achievement assumes that all families have the same goals of education, and that progress towards those goals is adequately captured by standardized test results. This may sound like a big assumption, but research has found that standardized test scores do serve as a good predictor of future financial outcomes along with larger economic and civic outcomes, holding all else equal (Hanushek 2006, Dee 2004). Despite these correlations, some parents and students may have educational goals that vary from the skills captured in math and reading test scores. The presence of charter schools on the education marketplace may allow families to find schools that better match their preferences.

There is evidence to suggest that some of the value that charter schools provide their students may not be evident when examining test results alone. When looking at longer-term student outcomes, such as graduation rates, college admission and persistence rates, and early-career earnings, one study of Florida students found those that attended a charter high school were more successful in all these measures on average (Sass et al. 2016). The study attempted to control for inherent selection bias by using a population of students that had all attended a charter school in eighth grade; the treatment group attended high school at a charter school, and the control group chose a traditional public school for high school. The findings of this study suggest that some charter schools may be better at instilling characteristics in their students that will help them to succeed in college or the workplace, such as resilience and work ethic, even if those characteristics do not translate directly into better test scores during their time in K-12 schools.

These results imply that research on charter schools as a policy option may need to expand its definition of success to include non-test score factors. My study attempts to do this by relying on a market-based measure of success, which represents how well charter schools within each state are able to match the population's education preferences.

Charter schools, like other school choice policy tools, are theoretically most impactful in increasing statewide education quality when they are able to induce positive competitive effects on traditional public schools. Advocates for the privatization of the education marketplace suggest that schools will perform at maximum capacity only when they are forced to compete for students (Friedman 1962). This is based on the assumption that the market force of competition will create incentives for schools to increase productive efficiency. Evidence has been mixed regarding the presence and magnitude of the competitive effect of charter schools in the education market. One notable study found that more choices within districts led to lower spending and improved educational attainment, wages, and standardized test scores (Hoxby 2000). A review of the research on the topic found "reasonably consistent" evidence that higher levels of competition led to increased educational outcomes, although the increase effect size was determined to be modest (Belfield and Levine 2002). Reviews of the existing literature have found mostly neutral or modest positive competitive effects (Epple et al. 2015, Gill 2016).

By increasing competition, charter schools allow people to better match their preferences and may have positive influences on traditional public school performance. State-level data on charter school closure rates should theoretically capture the market-based nature of charter school success. If states believe that a low charter school closure rate is a desirable outcome, they will want to create an environment that encourages that through their policy choices. I did not find studies in the literature that have linked the school closure rate per state to state law

components, as I have done in this analysis. However, several studies have evaluated the effect that various state law components have on school openings or student achievement, as discussed below.

In their 2006 study, Shober et al. evaluated the structure of charter school laws along two value dimensions: flexibility and accountability. They first examined the conditions that may influence a state's balance between those two factors, such as political and demographic makeup. In that area, they found that charters were more likely to open in states with higher minority populations and larger state populations (p. 580). Also, charter law revisions were likely to favor school operators more than the original law. Shober et al. point out that original charter laws were often structured to increase accountability in exchange for increased flexibility. The revisions, they found, granted more flexibility but also decreased accountability. The authors attributed this shift to the influence of interest groups and partisan factors (p. 581). Next, the authors examined the effect of various flexibility and accountability law components on charter school openings. Application and authorization design was found to be very influential on the state's number of charter openings. Unlike this previous study, I am interested the quality of the attracted schools, as defined by their market success, instead of just the quantity of schools entering the state. However, the opening rates used by this previous study and the closure rate used in my design are related due to the role of authorizers in both processes.

In her overview of charter school authorizers, Sandra Vergari (2001) discusses the three primary roles of authorizers. First, they must enter into charter agreements with potential schools. Essentially, groups or corporations that want to open a charter school within the state must present their case to an authorizing body, which either grants a charter contract or refuses to do so. A school's charter outlines the conditions of its operation, including performance

standards, managerial requirements, and the duration of the contract. Second, authorizers are responsible for monitoring charter schools and their boards of directors for compliance with the conditions of the charter. Noncompliance may warrant intervention by the authorizers, which can include sanctions or even school closure. Finally, authorizers are responsible for the renewal or revocation of charters at the conclusion of the designated charter timeframe.

Research has been done on the effect of authorizers on student achievement. A 2013 study by Zimmer et al. (2013) examined the effects of school authorizer type on student test score gains in a single-state analysis of Ohio. Ohio has four types of authorizers: districts, educational service centers, nonprofit organizations, and the state. That study found that students in schools authorized by nonprofit organizations have lower achievement gains in reading and math than students in other charter schools. In their discussion of these results, Zimmer et al. observe that the direction of the relationship between the authorizer and the schools is not clear. It could be that weaker schools are attracted to nonprofits as their authorizers; another possibility is that nonprofit organization have less ability to provide adequate oversight and accountability.

A similar study conducted in 2011 by Carlson et al. also examined the effect of charter school authorizers on student achievement. This research was conducted in Minnesota, which joins Ohio as one of the four states that allow nonprofit organizations to authorize charter schools. The authors of this study found that there was no statistically significant relationship between authorizer type and student achievement, although nonprofits were found to have the most within-type variation in performance.

Each state's charter school law parameters are only a piece of the puzzle when it comes to school success. However, there does seem to be an opportunity for research in this area when

it comes to comparing law structures across states. The examination of these trends could lead to the isolation of certain policy structures that foster good school design.

Methods

Background

A majority of US states now have a charter school law, and some states have had charter schools for over 25 years. Each state's ability to attract and maintain high-quality charter schools may be influenced by the parameters of its charter school law. Two prominent education groups release annual scorecards ranking each state's charter law in comparison to their determined "best practices." The first is the Center for Education Reform (CER), an advocacy group that places heavy emphasis on free market principles. Its scorecard has been released annually since 1996 and currently consists of 10 criteria which all favor school autonomy (Center for Education Reform 2017). This scorecard is grounded in theory, which can be a strength and a weakness. It does not list evidence that their model actually produces good school outcomes; however, less regulations may allow schools to be flexible in meeting market demands, which is the basis of accountability for charter schools. A second group, the National Alliance for Public Charter Schools (NAPCS), also releases an annual charter law scorecard. They compare states to their model law, which emphasizes growth of high-performing schools and accountability for low-performing schools (National Alliance for Public Charter Schools 2017). NAPCS released its original model law in 2009 and updated it in 2016. The law is based on their analysis of state charter school experiences and research. This model is much more systematic and detailed than its CER counterpart; the NAPCS scorecard has 21 law components that each have multiple subcomponents.

Research Question

The two scorecards can be helpful in providing frameworks for state policymakers to think about the merits of their law structure. By establishing best practices, these organizations attempt to set the path for states seeking to improve their charter environment. However, neither of these organizations provide empirical evidence linking better charter school outcomes with their preferred law components. There is some consensus between the groups on certain policy choices; however, there are also conflicting elements of the two scorecards (See Appendix A for full comparison). My analysis will contribute to this discussion by comparing state-level charter school performance data to components of each state's law structure. My research question is as follows: What is the relationship, if any, between a state's charter school law and its charter school closures?

Unit of analysis

The state-level analysis of my model is an important research decision. As previously noted, my research design is unique in the literature because it is comparing policy outcomes across states, which could be helpful in crafting or modifying charter school legislation. Research focused on academic achievement is generally limited to looking for differences between charter schools and traditional public schools within a single state. Previous studies that have done analysis on law component effects have also been limited to within-state, school level analysis. If done well, this provides a high degree of internal validity because all the schools in the analyses would be operating under the same conditions, allowing the researchers to better isolate the effects of the policy. However, they may have limited external validity; a policy that is effective in one state may not accomplish its goals in another.

Dependent Variable – Charter School Closures

My dependent variables are measures of charter school closures over time. Charter schools are designed to have to prove their merit in a market environment. The threat of closure is an incentive designed to hold charter schools accountable to high performance standards (Vergari 2001). With that in mind, school closures are not necessarily a "bad" thing. If charter schools could not fail, the basis of their accountability would be compromised. The movement of students from a low-quality school to a higher quality school is undoubtedly a good thing. When it comes to policy implications, I will not suggest that the presence of school closures indicate a failure in law design. For that reason, my first dependent variable is a simple dummy variable of whether or not a state with charter schools closed any of them in a given year.

However, a high statewide closure rate indicates that the details of the state's charter policies may need to be reevaluated. A high percentage of school closures can have negative direct and indirect effects on statewide education quality. Students who attended the closed school may be negatively affected by having to switch schools, sometimes in the middle of the academic year. The students attending nearby traditional public schools may also be negatively affected by an influx of displaced students, which can be disruptive or cause issues of overcrowding. On a broader scale, charter school closures can be detrimental to public perception of charter schools as a whole, which could weaken public support of charters as well as other school choice policies. Theoretically, an optimal charter school closure rate would be greater than zero percent but not too high as to indicate the over-authorization of ill-equipped schools.

I acknowledge that using school closures means that my analysis is looking only at extreme cases of failure. By classifying schools into "winners" which remained open and

"losers" which were closed, my model neglects the very diverse performance of charter schools across the nation that remain open. It is probable that there are poor-performing charter schools across the country that, for whatever reason, are staying open. There is potential that these schools could bias my analysis in favor of states with particularly lenient standards for performance-based closure. The validity of the state charter school closure rate as my dependent variable relies heavily on market accountability. Every charter school, regardless of performance, is open because it attracts an adequate number of students to remain in operation. My research question is not focusing on the performance of charters, but rather on the performance of the state's charter law in its ability to foster an environment for successful schools, where success is defined by their ability to meet market demands.

This framework is complicated by the fact that charter schools sometimes close despite their market enrollment success due to other breaches of their charter, such as financial mismanagement. This can be reconciled with my market accountability perspective by viewing the situation as a principal-agent relationship. In a market accountability model, families are the principals and schools are the agents in the education exchange. The basis of the principal-agent problem is that an information asymmetry exists between the two parties (Pratt and Zechhauser 1985). One way that the principal can remedy this is through monitoring mechanisms. In this situation, charter school authorizers – or other entities responsible for the closure of schools – serve as a monitoring mechanism. The closure rate captures the true preferences of the market because if an authorizer closes a school for financial mismanagement, it is acting on behalf of the preferences of the families. This rests on the assumption that if families had better information about the practices of those mismanaged schools, they would not have chosen them.

Independent Variables – Charter Law Components

One element of a state's charter school law is its creation of charter school authorizing entities. Authorizers are responsible for overseeing charter schools and their boards of directors. Some states have multiple types of authorizers while others only have one. I am interested in how the type and number of types of authorizers affect the charter landscape for that state. As previously noted, states with high charter school closure rates may have a problem with their authorization process being too lenient. My hypothesis is that a higher number of authorizer types will lead to a higher charter school closure rate. A variety of authorizer types could lead to schools "shopping around" until they were able to find a willing authorizer, regardless of flaws in their school proposal. This component has implications because there are significant barriers that authorizers face in closing schools, so it is generally better for authorizers to have a rigorous application process than to have to close failing schools (Vergari 2001). Both advocacy organizations agree that states should have multiple types of authorizers.

My data on authorizers is from 1995 to 2013 and includes the six types of authorizers as categorized by the National Association of Charter School Authorizers (2018): higher education institution (HEI), independent charter board (ICB), local education agency (LEA), non-educational government entity (NEG), not-for-profit organization (NFP), and state education agency (SEA). My primary model examines the effect of the number of types of authorizers on charter school closures. I also conducted some basic analysis to examine the relationships between the specific types of authorizers.

The organizations that produce annual scorecards also agree that state laws should not cap the number of charter schools that are permitted. I am including the presence of a charter cap in my analysis because it may have an effect on the school closure rate. If a state has a school

cap, its closure rate is likely to be low once the state is at capacity. Artificially suppressing the

market through a cap may limit the closure rate, but this is not necessarily a policy success if

there is demand in the market that is not being met. This is a policy option that some states

initially adopted but have since abolished; those states could provide insight into the effect of

removing a cap. NAPCS has been collecting this data on an annual basis since the beginning of

its model law report cards in 2010. The Education Commission of the States has collected this

data since 1996 but not on an annual basis. Using these data sources along with original research,

I complied data on charter cap policies for all the years present in my analysis.

Control Variables

There are several additional factors that may also influence a state's charter school

closures besides its charter school law structure. The amount of time that a state has had charter

schools could affect the closure rate as the market simply leveled out over time. For example, a

state's first few years after charter adoption could be characterized by various charters trying to

find their place in the market, with some succeeding and others failing. Once a state has had

charter schools for a significant time, some of that turmoil may have subsided, making its closure

rate lower than a recent adopter who is still in the trial period. For this reason, my model controls

the number of years since charter law adoption Additionally, I conducted a sensitivity analysis

including only states that have had their charter school laws for more than five years.

My model also includes the Fording revised 1960-2013 citizen ideology series as a

control (Berry et al. 1998). Charter schools are not necessarily a clear-cut partisan policy option;

they have historically had support and opposition from both sides of the aisle. However, state

ideology serves as a good indicator for other policies that could influence charter schools. In

particular, ideology is highly correlated with a state's right to work policies, which could influence charter school success due to the historical strength of unions within public education.

A related variable that could also influence charter market success in a given state is the quality of each state's traditional public schools. To control for this, I have included statewide average scores on the National Assessment of Education Progress (NAEP) for 8th grade math. This variable was not available for every year in my model, so I assumed that changes are linear and constant between observed values in order to generate missing year data. Each state has its share of high-quality and low-quality schools. This variable does not capture within-state differences in TPS quality, but it is helpful in teasing out the quality of the education marketplace in which charters are competing across states.

Another variable that could influence charter school closure rates from state to state is the amount of funding that charter schools receive in comparison to traditional public schools. One comparative variable would be the amount of funding charter schools receive per dollar spent on traditional public schools in each state. This controls for the relative disadvantage that charter schools face in educating their students. I was able to find data for the years 2003, 2007, and 2011 for a maximum of 31 states from reports done by the University of Arkansas and Ball State University. Again, I estimated the missing years within that timeframe on the assumption that changes are linear and constant between observed values over time. Those studies weighted the statewide TPS district funding amount to account for differences in charter school concentration in urban areas across states. I used their numbers for weighted district per pupil funding and charter school per pupil funding to generate a variable that conveys the amount charter schools received per dollar received by traditional public schools.

Model Design

My data consists of state-level data from the period of 1991 to 2013. My goal is to isolate the effects of my specified law components on each state's charter school closures over time. For this reason, I will use an OLS regression model on panel data with a state fixed effect estimation.

Some states in my model have had charter schools for 26 years. States that adopted their charter school law since 2013 are not included within my model. Additionally, states were not included in years during which they had no open charter schools. Once I applied these parameters, I had a total of 629 observations on 40 states plus the District of Columbia across a maximum of 23 years. Due to limited data availability for my funding control, I ran multiple versions of my model to include and exclude this variable. This was a trade-off between sample size – both in number of observations and number of included states – and controlling for what is likely an influential factor. I also conducted a second set of analyses looking only at states that had their charter schools for five years or more.

My model includes a fixed effects estimator to control for time invariant characteristics of each state over time. This is necessary because each state has a unique set of laws and culture, which are unmeasurable but still need to be accounted for in my model.

Results

*Descriptive Statistics*

Although there is no established standard of what a state's charter school closure rate should be, it can be helpful to compare each state to the national average. Interestingly, my data had no recorded charter school closings until 1998, which is six years after the first charter schools opened. To put this in perspective, there were 18 states with open charter schools in

1997, the previous year. Some states had only one open charter that year, but some had as many as 62 in Michigan or 87 in California.

Figure 1: National Average of State Charter School Closure Rates, 1991-2013
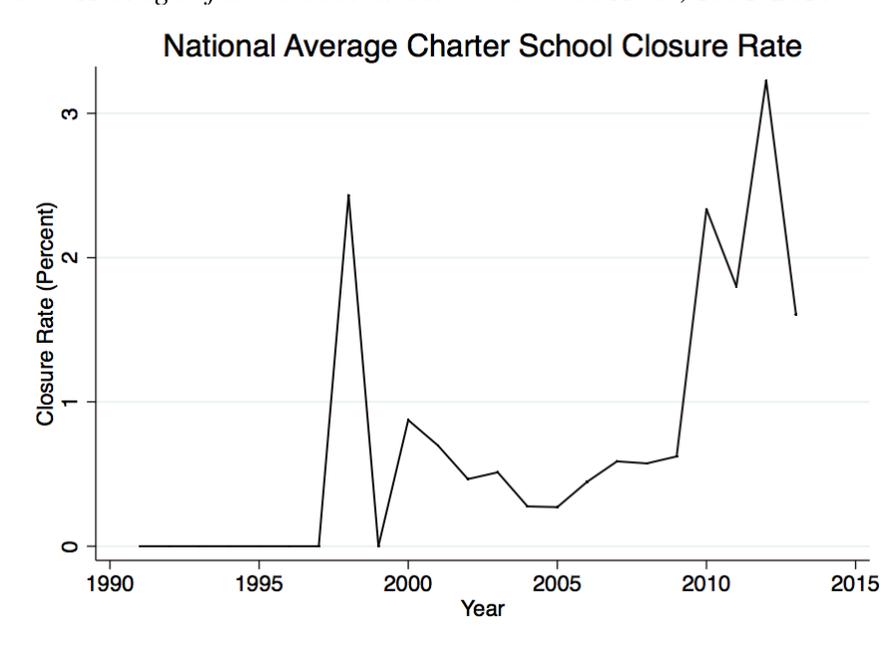
As shown in Figure 2, the percent of states with charter schools that close any schools within a given year has dramatically increased over time. Despite this overall trend, there were 8 states that had never closed a charter school as of 2013.

Number of Authorizer Types

As previously discussed, there are six types of authorizers, which include local education agencies, state education agencies, higher education institutions, not-for-profits, non-education governmental entities, and independent charter boards. LEAs are the most popular type of authorizer, and having two authorizers is the most popular trend in authorizing types. Figure 3 shows the number of states with each number of authorizing types by year.

To better understand the authorizing landscape across states, I first conducted correlation tests to see if there were any patterns authorizer composition and how they relate to one another.

There is a significant and strong positive correlation between local education agencies (LEA) and higher education institutions. On the other hand, state education agencies have a significant

Figure 2: Percent of States with Charter Schools that Closed Any Charters, 1991-2013

Percent of States with Charters that Closed Schools
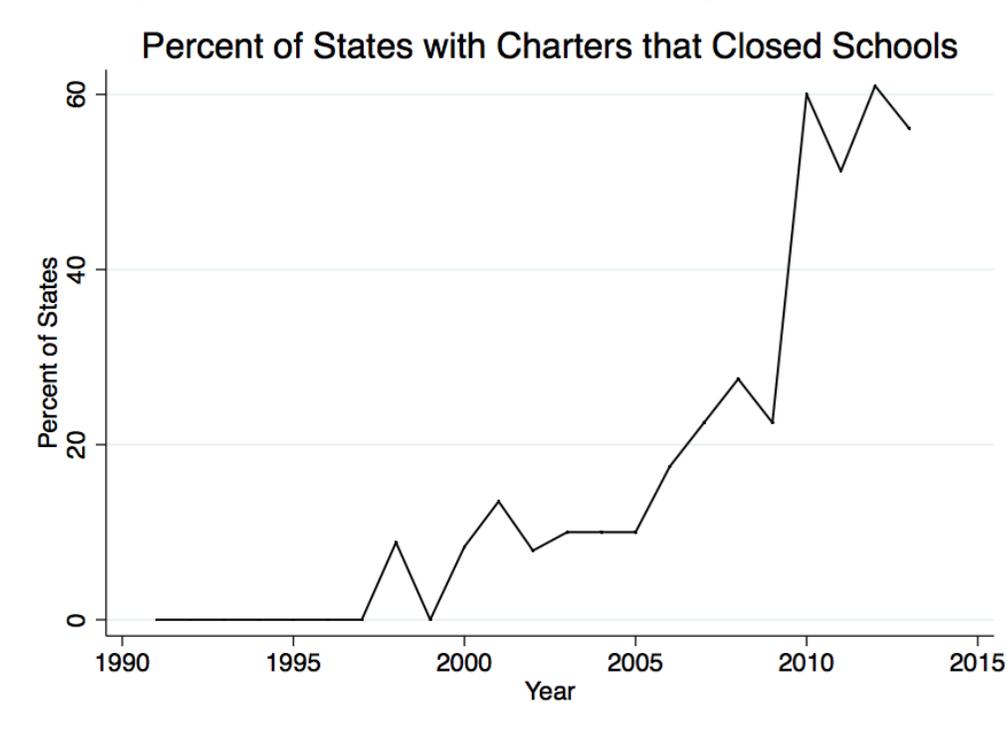
negative correlation with higher education institutions, non-education government entities, and independent charter boards. These relationships could be due to the power dynamics at play between these groups. Because charter school laws are constructed at the state level, states that grant authorizing authority to the SEAs may not want to weaken the state's power by allowing for competing authorizers. On the other hand, there is no significant correlation between SEAs and LEAs as authorizers. It is possible that this stems from the state not viewing LEAs as competition since the state has control over them. Some states structure their authorizing process so that charter applications are originally proposed to LEAs, but denied applications can appeal to the SEA as a secondary authorizer. This system maintains the state as the ultimate authorizing authority.

Models including the funding control were limited in scope to the years of 2003 to 2011. During that time, few states changed the number of authorizing types that they had. This resulted in my independent variable being engulfed into the state fixed effects estimator. In order to isolate the effects of the number of authorizing types, I examined the relationship of that variable on the fixed effects estimator itself. This reveals the true relationship between number of authorizing types on my original model.

Figure 3: Number of States per Number of Authorizing Types, 1995-2013

Authorizing Types	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13
1	17	17	17	17	17	17	17	17	11	11	11	11	11	11	11	11	11	11	11
2	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
3	3	3	3	3	3	3	3	3	7	7	7	7	7	7	7	7	7	7	7
4									5	5	5	5	5	5	5	5	5	5	5
5									1	1	1	1	1	1	1	1	1	1	1

The number of authorizing types was not statistically significantly related to the fixed effect estimator. However, some categories within the variable had a negative statistically significant effect on the school closure rate. States that have two or three types of authorizers are less likely to close schools than states with one type or four types (only one state, Louisiana, has five types, so that category was dropped from the analysis). This finding was consistent with models that did not include the funding control and thus had a larger sample size.

There are two possible explanations for this trend. The first relates to the perspective of states that choose only one authorizer or four authorizers. One authorizing type indicates that the state may desire stronger control over charter school openings and closings. This theory is supported by the previously discussed negative correlation between SEAs and certain other types of authorizers. On the other hand, states that allow four authorizers may create a sense of

competition amongst authorizers. They may be held accountable if they do not close poor-performing schools by the threat of being a replaceable authorizer.

Figure 4: Regression Results, All States

Variables	Any Closings	Any Closings	Closure Rate	Closure Rate
Number of Observations	215	604	215	604
Law Components				
Number of Authorizer Types	---	-.0137	---	-.1556
		(.0287)		(.1886)
Presence of Charter Cap	-.2034	-.0238	.4933	-.6729
	(.1387)	(.0780)	(.5581)	(.8138)
Controls				
Ideology Scores	-.0069	-.0106***	-.0399*	-.0550***
	(.0043)	(.0027)	(.0196)	(.0169)
NAEP 8th Grade Math Scores	-.0088	.0021	-.1191*	-.1451
	(.0173)	(.0101)	(.0693)	(.1339)
Law Age	.0887***	.0431***	.3580***	.2299**
	(.0218)	(.0094)	(.0861)	(.0942)
Funding Control Included	**Yes**	**No**	**Yes**	**No**
	.6268		1.645	
	(.5570)		(1.904)	

*Indicates significance at the 90% confidence level
** Indicates significance at the 95% confidence level
*** Indicates significance at the 99% confidence level

The other explanation is tied to the composition authorizing type. For example, single-authorizers are exclusively LEAs (17 states), SEAs (5 States), and ICBs (3 states). It could be that certain authorizing types are more likely to close schools. If that is the case, those that are typically single-authorizers may be more likely to close schools, and having four types may mean that you are more likely to include a high-closure type within your authorizing portfolio.

Charter School Cap

No version of my model found a significant relationship between the presence of a charter school cap and state charter school closures. This is an interesting finding because charter caps are strongly opposed by many charter school supporters, including both organizations that release charter law rankings.

Duration Variables

The results of my original analysis showed a significant and positive relationship between state charter school closures and the length of time that the state has had its charter school law. This suggests that the longer a state has had charter schools, the more likely it is to have school closures and the higher its closure rate will be. Although this contradicts my original hypothesis, there are several possible factors that could contribute to this relationship. First, it is not unreasonable for states to give their first charter schools adequate time to demonstrate their performance in one direction or another. So, it may be expected that the first three to five years have less closures as states or authorizers allow charter school results to unfold. It could also be the case that authorizers are more lenient on schools during the early years of charter adoption due to a learning curve on the authorizer's part. For this reason, I conducted a sensitivity analysis, where I ran my models again using only states that had their charter law for five years or more.

This model does not include a funding variable because by 2003, the first year for which I have funding data, 40 of the 41 states had adopted their charter law already. Of those, only 6 states had had their law less than 5 years. It happens to be that my funding variable does not contain data for any of those 6 states, meaning any model including my funding variable was looking only at veteran states anyway.

Figure 5: Regression Results, Veteran States Only

Variables	Any Closings	Closure Rate
Number of Observations	604	604
Law Components		
Number of Authorizer Types	.0130	-.0090
	(.0352)	(.1256)
Presence of Charter Cap	-.0773	-.9593
	(.0727)	(.8861)
Controls		
Ideology Scores	-.0104***	-.0539***
	(.0024)	(.0158)
NAEP 8th Grade Math Scores	.0440***	.0799
	(.0070)	(.0524)
Veteran Status	-.0590	-.3502
	(.0510)	(.6059)

*Indicates significance at the 90% confidence level
** Indicates significance at the 95% confidence level
*** Indicates significance at the 99% confidence level

Future research could compare the academic achievement success of early opening charter schools with those that open later to see if approval standards become more rigorous over time. Public awareness and scrutiny of charter performance may also increase over time, leading to more school closures as information becomes available in the education marketplace and parents make different decisions about where to send their children. This trend could also be a consequence of the time period over which it occurred. There was a huge difference in the availability of information between the 1990s and the early 2010s due to technological advances. The public in general could be holding charter schools – and perhaps all schools – to a higher standard based on easily-accessible information. Another possible explanation for the increase in school closings over time could be tied to the market viability of charter schools that open right when a law is passed versus those that open later. If a local market has a high demand for a certain education preference, that market may attract a charter school soon after the state's law

adoption. Charters that open later may not be as aligned with market demand. This time variable may need to be explored more in future research. States who are new adopters or have yet to pass charter legislation may benefit from looking to their veteran counterparts for best practices in authorizing and monitoring of early schools.

Control Variables

Citizen ideology was found to be significant when the model did not control for differences in funding across states. Once the relative funding of charter schools was taken into account, ideology did not have an effect on whether or not a state closed any schools. However, it still did have a modest negative effect on the state's closure rate. This means that, among states that close schools, being more liberal is correlated with a lower school closure rate, all else equal. As previously mentioned, one possible explanation could be the increased strength of unions in more liberal states. Unions tend to be strongly associated with traditional public schools, and may be skeptical of alternative models such as charter schools. If this is the case, charter schools that are able to open in those states may be more likely to stay open because they were more thoroughly vetted than charter schools in more conservative states without union influence.

Once accounting for differences in charter school funding, NAEP scores were also found to have a negative statistically significant relationship on the school closure rate, with no effect on whether or not a state closed any schools. This means that, among states that actually close schools, those with higher 8th grade math NAEP scores in traditional public schools have a lower charter school closure rate. In my model with only veteran states, NAEP scores were found to have a statistically significant and positive relationship on a state's likelihood of closing any schools, with no effect on the actual closure rate. This variable was intended to control for the

quality of the traditional public schools against which charter schools in the state have to compete. I expected that high-quality traditional public schools would lead to more charter school closures because parents would be more willing to move their children to the neighboring TPS if the charters do not perform well.

The negative relationship from my original analysis could be revealing information about state ability to attract high quality charter schools, instead of their ability to maintain the ones they have. If higher TPS quality is driving up market expectations, charter schools may understand that they have to raise their performance in order to be competitive in those markets. This could deter certain potential charter schools from opening, leading to a lower closure rate as those that actually enter the market are the ones most likely to succeed anyway. This has negative policy implications for the effectiveness of charter schools as an alternative to low-quality traditional public schools. States with poor-performing traditional public schools may be more likely to attract low-quality charter schools than states with high-performing traditional public schools. This is not good news for parents and students within those states because the quality of their educational choices does not necessarily increase.

There is an alternative possibility that some reverse causality is at play. States with a low charter school closure rate have schools that are more successful at meeting market demand. If charter schools are having a competitive effect on the state's traditional public schools, then they could be driving the NAEP scores upwards for that state.

Case Study

When it comes to charter school law components, there is not a definitive set of best practices that will ensure a healthy charter school environment. As previously discussed, there are two prominent interest groups that release annual rankings of state laws in comparison to

their own model laws: The National Alliance for Public Charter Schools (NAPCS) and the Center for Education Reform (CER). In order to see how these two model laws differ in their recommendations, I compared how each state ranked on the 2012 version of the reports from both organizations. Nineteen states ranked higher on the CER model while twenty states fared better on the NAPCS model (See Appendix B for full list). The average state ranking difference between the two models was approximately 7 spots, with a median of 5 spots.

Three states scored exactly the same on both rankings. Minnesota was ranked as the second best law in the nation by both systems, behind Maine in the NAPCS system and DC in the CER model. Kansas ranked 39th in both models. Interestingly, Mississippi was labeled as the worst law by both organizations. Mississippi was not included in my original analysis because it did not have any charter schools during the 1991-2013 period of my study. An additional nine states (Colorado, Iowa, Oregon, Louisiana, Wyoming, Oklahoma, California, New York, and Utah) scored within 2 points of the same ranking on both systems.

The 12 states that rank within 2 points of each other on both organization's list suggest that there is consensus among the interest groups regarding best practices. In fact, the two systems do have some elements in common. They both agree that states should not cap charter schools, there should be multiple authorizing entities, and that charter school should be provided with equitable operational and facility funding. Other elements of the two scorecards are similar, but have a slightly different emphasis, tone, or intention. Some elements of the two scorecards seem to be in direct opposition to one another. CER advocates for authorizer independence while NAPCS favors the requirement of an authorizer accountability system. Additionally, there are some components of each scorecard that the other does not directly consider. The 2017 CER scorecard weighs a law's provision of Pre-K funds, for which there is no NAPCS equivalent.

NAPCS has 8 components that do not fit neatly into one of the CER categories. That being said, CER's scorecard has 10 categories that are relatively broad compared to the detailed components of the NAPCS system. The matching of components (Appendix A) across the two systems was an original assessment based on the descriptions provided by each organization.

Despite the significant number of states that scored similarly on the two rankings in 2012, there are 17 states that had more than a 5-place difference in ranking across the two organizations. Notably, that includes four outlying states, the rankings for which varied by 15 places or more on the two systems. Two of these states were ranked higher by CER; Idaho and Wisconsin each ranked 20 places higher on that list than they did on the NAPCS rankings. On the other end of the spectrum, New Mexico and Maine ranked 18 and 26 spots higher respectively on the NAPCS model than they did on the CER equivalent.

The states with huge ranking differences would be rightly confused about the quality of their charter school law and what improvements could be made to it. In the following sections, I will examine each outlier's rankings and discuss possible reasons for the different judgements of the two organizations.

Idaho

Idaho scored 20 places better in the CER model than the NAPCS in 2012. It was ranked twelfth on the CER list and thirty-second on the NAPCS list. The largest difference in score between the two models was as it relates to CER's district autonomy component. This is in direct opposition to the NAPCS performance-based charter contract requirement, which trades school autonomy for more accountability. Thus, it makes sense that Idaho did much better in CER's model for that variable.

Figure 6: Idaho Scorecard Comparison

IDAHO				
CER Measure	**Percent Score**	**NAPCS Measure**	**Percent Score**	**Percentage Point Difference**
Independent/ Multiple Authorizers	33%	Multiple Authorizers Available	50%	**-17**
		Authorizer and Overall Program Accountability System Required	0%	**33**
Number of Schools Allowed**	100%	No Caps**	25%	**75**
State Autonomy	60%	Automatic Exemption from Many State and District Law and Regulations (12)	50%	**10**
District Autonomy	80%	Performance-Based Charter Contract Required	0%	**80**
		Comprehensive Charter School Monitoring and Data Collection Processes	75%	**5**
		Fiscally and Legally Autonomous Schools, with Independent Public Charter School Boards	100%	**-20**
Teacher Freedom	80%	Automatic Collective Bargaining Exemption	100%	**-20**
		Access to Relevant Employee Retirement Systems	50%	**30**
100% Funding*	50%	Equitable Operational Funding and Equal Access to All State and Federal Categorical Funding	50%	**0**
Facilities Funds*	0%	Equitable Access to Capital Funding and Facilities	25%	**-25**
Total Score	**56%**	**Total Score**	**44%**	**12**

*CER does not specify point value maximums for these two individual components; they are worth a combined 15 points, and I assumed that the operational funding was worth 10 points and the facility funding was worth 5 points.
**Idaho repealed its charter cap in 2012; the CER score reflects this while the NAPCS score does not.

Interestingly, Idaho has several components for which they received a higher percentage score on the NAPCS component than the corresponding CER one, despite their overall higher ranking from CER. One such category was the area of teacher freedom; however, the CER point deduction appears to come solely from charter teachers being forced into the state retirement system, meaning CER did not penalize an aspect of their collective bargaining exemption.

Idaho also scored higher on the NAPCS component of multiple authorizers than the CER equivalent. Idaho has two types of authorizers: local school boards and an independent charter board. However, the ICB can only authorize virtual schools or schools whose applications were previously rejected by an LEA. Both organizations deduct points for this feature, since the ICB is severely limited in its authorizing power.

Wisconsin

Like Idaho, Wisconsin also placed 20 points better on the CER ranking than the NAPCS one, with rankings of 16 and 36, respectively.

Figure 7: Wisconsin Scorecard Comparison

WISCONSIN				
CER Measure	**Percent Score**	**NAPCS Measure**	**Percent Score**	**Percentage Point Difference**
Independent/ Multiple Authorizers	20%	Multiple Authorizers Available	50%	**-30**
		Authorizer and Overall Program Accountability System Required	0%	**20**
Number of Schools Allowed	100%	No Caps	75%	**25**
State Autonomy	100%	Automatic Exemption from Many State and District Law and Regulations (12)	50%	**50**
District Autonomy	60%	Performance-Based Charter Contract Required	50%	**10**
		Comprehensive Charter School Monitoring and Data Collection Processes	25%	**35**
		Fiscally and Legally Autonomous Schools, with Independent Public Charter School Boards	25%	**35**
Teacher Freedom	60%	Automatic Collective Bargaining Exemption	50%	**10**
		Access to Relevant Employee Retirement Systems	25%	**35**
100% Funding*	40%	Equitable Operational Funding and Equal Access to All State and Federal Categorical Funding	25%	**15**
Facilities Funds*	0%	Equitable Access to Capital Funding and Facilities	25%	**-25**
Total Score	**51%**	**Total Score**	**33%**	**18**

Wisconsin scored slightly better on the CER model in their charter cap component. NAPCS probably withholds points in this category due to Wisconsin's limit on the number of virtual charter students as well as its limit on one of its University authorizers (Education Commission of the States 2010). The University of Wisconsin-Parkside can only authorize one charter school. CER penalizes the state for this in its category dealing with independent authorizers instead of considering it to be a "cap."

New Mexico

New Mexico was ranked as the fourth-best law by NAPCS, but placed right around the middle of the pack at number 22 with the CER report. This is an 18-spot difference between the two systems for 2012.

New Mexico has two authorizer types – local school boards and the state board of education. They receive full credit under the NAPCS model for this; however, on the CER equivalent they score a mere 27 percent. CER does not provide an explanation for this deduction (page 57).

In the area of state autonomy, New Mexico scores higher on the CER component. This is due to differences in how the two organizations view the state's approach to operational exemptions. New Mexico does not automatically exempt charter schools from state requirements, but instead issues waivers, some of which have to be requested on a case-by-case basis. CER seems to believe this gives schools adequate autonomy, while NAPCS does not seem to feel the same.

Figure 8: New Mexico Scorecard Comparison

NEW MEXICO				
CER Measure	**Percent Score**	**NAPCS Measure**	**Percent Score**	**Percentage Point Difference**
Independent/ Multiple Authorizers	27%	Multiple Authorizers Available	100%	**73**
		Authorizer and Overall Program Accountability System Required	50%	**23**
Number of Schools Allowed	40%	No Caps	50%	**10**
State Autonomy	80%	Automatic Exemption from Many State and District Law and Regulations	25%	**-55**
District Autonomy	60%	Performance-Based Charter Contract Required	75%	**15**
		Comprehensive Charter School Monitoring and Data Collection Processes	100%	**40**
		Fiscally and Legally Autonomous Schools, with Independent Public Charter School Boards	100%	**40**
Teacher Freedom	80%	Automatic Collective Bargaining Exemption	100%	**20**
		Access to Relevant Employee Retirement Systems	50%	**-30**
100% Funding*	70%	Equitable Operational Funding and Equal Access to All State and Federal Categorical Funding	50%	**-20**
Facilities Funds*	0%	Equitable Access to Capital Funding and Facilities	50%	**50**
Total Score	**47%**	**Total Score**	**65%**	**18**

See note on Figure 6

Maine

Maine was the state with the most dramatic difference in rankings. It was considered by NAPCS to be the number one charter school law in the country. CER ranked it well below the median at twenty-seventh, a 26-spot difference.

The two scorecards give Maine similar rankings on many of their shared components. They each penalize it for its restrictive caps on the number of schools as well as student enrollment. They positively score the state's choice to allow teachers to opt out of collective bargaining.

Figure 9: Maine Scorecard Comparison

MAINE				
CER Measure	**Percent Score**	**NAPCS Measure**	**Percent Score**	**Percentage Point Difference**
Independent/ Multiple Authorizers	27%	Multiple Authorizers Available	50%	**23**
		Authorizer and Overall Program Accountability System Required	75%	**48**
Number of Schools Allowed	30%	No Caps	25%	**5**
State Autonomy	60%	Automatic Exemption from Many State and District Law and Regulations (12)	75%	**15**
District Autonomy	60%	Performance-Based Charter Contract Required	100%	**40**
		Comprehensive Charter School Monitoring and Data Collection Processes	75%	**15**
		Fiscally and Legally Autonomous Schools, with Independent Public Charter School Boards	100%	**40**
Teacher Freedom	80%	Automatic Collective Bargaining Exemption	75%	**-5**
		Access to Relevant Employee Retirement Systems	100%	**20**
100% Funding*	70%	Equitable Operational Funding and Equal Access to All State and Federal Categorical Funding	100%	**30**
Facilities Funds*	0%	Equitable Access to Capital Funding and Facilities	25%	**25**
Total Score	**44%**	**Total Score**	**76%**	**32**

See note on Figure 6

Despite these similarities, there are large differences in the outcomes of the two ranking systems. Most notable is the difference between the authorizing components. Although Maine does have two different types of authorizers – LEAs and an Independent Charter Board – CER attributes their low score in this area to the state's lack of an appeal process and the fact that the ICB is subject to state board oversight. NAPCS, on the other hand, acknowledges the state's multiple authorizers but withholds points due to limits placed on those authorizers. The second

NAPCS authorizing component directly opposes its CER equivalent. While CER favors independence, NAPCS values accountability, leading to a large difference in points on that component. Maine is rewarded in the NAPCS system for requiring authorizers to submit annual report to the state commissioner of education and for allowing the commissioner to have oversight of authorizers through sanctions.

Although CER scores Maine at only 60 percent on the category of district autonomy, the report gives no real explanation for that decision besides saying that autonomy is "limited." On the other hand, NAPCS gives Maine perfect scores on two of the three district autonomy components, and only deducts points on the third component because Maine does not official require authorizers to publish annual school performance reports. This reveals a difference in emphasis on these categories; NAPCS is less committed to autonomy, but more committed to accountability than CER.

Conclusion: Policy Implications and Limitations

With the conflicting messages being sent from prominent charter school advocacy organizations, state leaders are being pulled in different directions when it comes to how their charter laws should be improved going forward. Some charter advocates argue for autonomy above all else; this is a very market-centered approach. On the other hand, groups like NAPCS tend to be more willing to trade some autonomy for increased accountability. As evidenced by the case studies, these different perspectives can lead to very different ideas about which policy options are best. In light of this, the question may become: which approach produces better outcomes?

Ideally, policymakers should be able to look across state lines for ideas about what law components have been successful and which have not. When it comes to charter school policies,

however, there are many barriers to cross-state comparisons. My project attempted to navigate some of those barriers by using charter school closings as the measure of success.

Using school closings frames charter school success from a market perspective. This can raise red flags if the closure rate is high or if there are no closings whatsoever. It is possible that a state may close no charter schools in a given year because all of their schools are meeting the performance and operational requirements while also attracting enough students to remain open. For this reason, states should assess if their closure rate of zero indicates a policy success or a lack of enforcement of their authorizing and monitoring standards. Further research could include a detailed analysis the details of closed schools, including the length of time they were in operation and the reason for their closure. If a charter school closes at the time of its first charter renewal period or before, it may be argued that that school should not have been authorized in the first place.

The law components included in my analysis did not have a statistically significant effect on a state's likelihood to close charter schools or its charter school closure rate. Both of my included components, the presence of a charter school cap and multiple authorizing types, are policy choices for which both prominent organizations advocate. Despite this consensus, these components were not found to have an impact on outcomes. As previously discussed, some categories of authorizing types did have an effect, even though the overall component did not.

Going forward, further research could do a full comparison of scorecard rankings on charter school outcomes. One ranking system may better correlate with overall results than the other. As further data becomes available on charter school funding, my research could be expanded to include more years with a funding control. For now, this analysis indicates that

those advocating for charter school caps and multiple authorizing types may be fighting for

policies that, contrary to previous belief, have no impact on charter school outcomes.

References

Belfield, Clive R. & Levin, Henry M. 2002. "The Effects of Competition Between School on

    Educational Outcomes: A Review for the United States." *Review of Educational*

    Research. Summer 2002, Vol. 72., No. 2, pp. 279-341

Berry, William D., Evan J. Ringquist, Richard C. Fording and Russell L. Hanson. 1998.

    "Measuring Citizen and Government Ideology in the American States, 1960-93."

    American Journal of Political Science 42:327-48.

Calrson, Deven, Lesley Lavery, and John F. Witte 2011. "Charter School Authorizers and

    Student Achievement." *Economics of Education Review*. April 2012, Volume 31, Issue 2.

    Pages 254-267.

Center for Education Reform. 2012. "Charter School Laws Across the States: Ranking and

    Scorecard, 13th edition." https://www.edreform.com/wp-

    content/uploads/2012/04/CER_2012_Charter_Laws.pdf

Center for Education Reform. 2017. "National Charter School Laws Across the States: Rankings

    and Scorecard." https://www.edreform.com/issues/choice-charter-schools/laws-

    legislation/

Dee, T. S. 2004. "Are there civic returns to education?" *Journal of Public Economics*, 88(9),

    1697-1720

Education Commission of the States. 2010. "50-State Comparison: Does the State have any Caps

    on the Number of Charter Schools?"

Epple, Dennis, Richard Romano, Ron Zimmer. 2015. "Charter Schools: A Survey of Research

    on their Characteristics and Effectiveness." NBER Working Paper 21256. June 2015.

Friedman, M. 1962. "The role of government in education" in *Capitalism and Freedom,*

    Chicago: University of Chicago Press.

Gill, Brian P. 2016."The Effect of Charter Schools on Students in Traditional Public Schools: A

    Review of the Evidence." Published 2 November 2016. EducationNext.

    tp://educationnext.org/the-effect-of-charter-schools-on-students-in-traditional-public-

    schools-a-review-of-the-evidence/

Hanushek, E. A. 2006. "School Resources." Chapter 14. *Handbook of the Economics of*

    Education, 2, 865-908

Hoxby, C.M. 2000. "Does competition among public schools benefit students and taxpayers."

    American Economic Review, 1209-1238.

National Alliance for Public Charter Schools. 2012. "Measuring up to the Model: A Ranking of

    State Charter School Laws, Third Edition."

    https://www.publiccharters.org/sites/default/files/migrated/wp-

    content/uploads/2014/01/NAPCS_2012_StateLawRankings_Final_20120117T162953.pd

    f

National Alliance for Public Charter Schools. 2017. "Charter Law Database – Components"

    https://www.publiccharters.org/our-work/charter-law-database/components

National Association of Charter School Authorizers. 2018. "Types of Authorizers"

    http://www.qualitycharters.org/authorizer-types/

National Conference of State Legislators. 2012. *"Charter Schools in the States."*

    http://www.ncsl.org/research/education/charter-schools-in-the-states.aspx

Pratt, John W. and Richard J. Zechhauser. 1985. "Principal and Agents: An Overview" in

    Principals and Agents: The Structure of Business, pgs 1-11 & 22-24

Sass, Tim, Ron Zimmer, Brian Gill, and Kevin Booker. 2016. "Charter High School's Effect on

    Educational Attainment and Earnings", *Journal of Policy Analysis and Management*, Vol

    35(3): 683-706.

Shober, Arnold, Paul Manna and John F. Witte. 2006. "Flexibility Meets Accountability: State

    Charter School Laws and Their Influence on the Formation of Charter Schools in the

    United States." *The Policy Studies Journal*. Vol. 34, No. 4 2006.

US Department of Education's National Charter School Resource Center. 2017. "What is a

    Charter School?" https://charterschoolcenter.ed.gov/what-is-a-charter-school#

Vergari, Sandra. 2001. Charter School Authorizers: Public Agents for Holding Charter Schools

    Accountable. *Education and Urban Society*, v33 n2 p129-40.

Zimmer, Ron, Brian Gill, Kevin Booker, Stephane Lavertu, Tim Sass, and John Witte. 2009.

    "Charter Schools in Eight States: Effects on Achievement, Attainment, Integration, and

    Competition." Chapter 2. RAND: MG-869.

Zimmer, Ron, Brian Gill, Kevin Booker, Stéphane Lavertu, and John Witte. 2011. "Examining

    charter school achievement in seven states." *Economics of Education Review*, Vol. 31

    (2): 213-224.

Zimmer, Ron, Brian Gill, Jonathon Attridge, and Kaitlin Obenauf. 2013. "Charter School

    Authorizers and Student Achievement." http://ncspe.tc.columbia.edu/working-

    papers/OP219.pdf

Appendix A – 2017 Scorecard Comparisons, Matched and Unique Components

Matching Components –

CER	Status	NAPCS
Multiple Authorizers	Similar	Non-District Authorizers Available
Authorizer Independence of Local/State Authority	Opposed	Authorizer and Overall Program Accountability System Required
No Charter Caps	Same	No Caps
Scaling Up	Similar	Multischool Charter Contracts and/or Multicharter Contract Boards Allowed
School Autonomy	Similar	Fiscally and Legally Autonomous Schools with Independent Charter Public Schools Boards
	Opposed	Performance-Based Charter Contracts Required
	Opposed	Comprehensive Charter Public School Monitoring and Data Collection Processes
State Allows Freedom to Innovate	Similar	Automatic Exemptions from Many State and District Laws and Regulations
	Similar	A Variety of Charter Public Schools Allowed
Teacher Freedom	Similar	Automatic Collective Bargaining Exemption
	Opposed	Access to Relevant Employee Retirement Systems
Operating Funds	Same	Equitable Operational Funding and Equal Access to All State and Federal Categorical Funding
Facility Funds/Financing	Same	Equitable Access to Capital Funding and Facilities

Unique Components –

Component	Organization
Pre-K Funds	CER Only
Adequate Authorizer Funding	NAPCS Only
Transparent Charter Application, Review, and Decision-making Process	NAPCS Only
Clear Processes for Renewal, Nonrenewal, and Revocation Decisions	NAPCS Only
Transparency Regarding Educational Service Providers (ESPs) Allowed	NAPCS Only
Clear Student Enrollment and Lottery Procedures	NAPCS Only
Extracurricular and Interscholastic Activities Eligibility and Access	NAPCS Only
Clear Provisions Regarding Special Education Responsibilities	NAPCS Only
Full-Time Virtual Charter School Provisions	NAPCS Only

Appendix B –2012 Scorecard Ranking Comparisons

State	CER	NAPCS	Rank Difference
ME	27	1	26
NM	22	4	18
AR	31	17	14
MA	19	5	14
NH	33	19	14
GA	20	14	6
IL	30	24	6
RI	32	26	6
CT	34	29	5
FL	8	3	5
NV	25	20	5
TX	28	23	5
VA	41	37	4
HI	38	35	3
CO	9	7	2
IA	40	38	2
OR	23	21	2
LA	14	13	1
WY	35	34	1
KS	39	39	0
MN	2	2	0
MS	42	42	0
OK	26	27	-1
CA	7	9	-2
NY	6	8	-2
UT	10	12	-2
IN	3	6	-3
PA	13	16	-3
AK	36	40	-4
DE	18	22	-4
MD	37	41	-4
NC	29	33	-4
MI	5	10	-5
MO	11	18	-7
NJ	24	31	-7
SC	17	25	-8
TN	21	30	-9
DC	1	11	-10
AZ	4	15	-11
OH	15	28	-13
ID	12	32	-20
WI	16	36	-20