FACTORS THAT INFLUENCE THE QUANTITY OF CHARTER SCHOOLS IN COLORADO SCHOOL DISTRICTS

by

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Factors that Influence the Quantity of Charter Schools in Colorado School Districts

Thesis directed by Associate Professor Michael Berry

ABSTRACT

In the 2012–2013 school year, 11 percent of all Colorado public school students (88,924) attended one of the state's 187 charter schools. The number of charter schools and the percentage of district students educated in charter schools vary considerably from district to district. Research in other states shows that variables related to the level of need (percentage of low income and minority students and district academic accreditation status), school choice environment (number of private schools, adjacency to districts with charter schools, and political affiliation), and district capacity (funding, enrollment, enrollment growth, and urbanicity) are associated with the number of charter schools authorized by districts. Using two statistical models, this thesis shows many of these variables correlate with greater chartering activity. Enrollment is the strongest predictor. Districts with higher student enrollments generally have higher charter enrollments and higher numbers of charter schools. Urbanicity and adjacency to a chartering district are correlated with greater chartering activity. Per pupil funding is negatively correlated and there does not appear to be a correlation between the number of charter schools and district academic achievement or political affiliation of district voters.

The form and content of this abstract are approved. I recommend its publication.

Approved: Michael Berry

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CHAPTER I

INTRODUCTION

Charter schools are public schools that are operated independently from a school district through a charter agreement with an authorizer—usually a school district, state governmental body, or university. Overseen by a governing board of parents and community members, charter schools have autonomy over daily operations, budgets, teacher contracts, training, and salary determinations, academic programs, school calendar, pedagogy, and curriculum. Like traditional public schools, charter schools must meet state academic standards and testing requirements, be tuition-free, and adhere to federal civil rights laws. Charter schools do not have entrance requirements. If a charter school fails to meet the terms of its contract, the authorizer may revoke the charter and close the school (National Alliance for Public Charter Schools, n.d.).

The concept of charter schools predates their existence by two decades. Ray Budde first suggested the idea at a conference in 1974 and published a paper about the concept in 1988 (Renzulli, 2005; Budde, 1988). That same year, Albert Shanker, (1988) former president of the American Federation of Teachers, advocated the idea in a paper published in the *Peabody Journal of Education*. Three years later, Minnesota adopted the first charter school law. Today, more than 6,000 charter schools in 42 states and the District of Columbia educate approximately two million students (National Alliance for Public Charter Schools, n.d.).

Purpose of Study

Since the adoption of the first charter school law in 1991, charter school growth across the country has been uneven. Most states have been chartering schools for decades, but some states, like Washington State, have just begun. Eight states do not have charter school laws. Even within states, charter school growth varies by district.

Several researchers have examined the reasons behind variations in charter school diffusion at the state and local level. Many have found associations between charter school diffusion and student demographic factors like race, achievement and poverty, as well as state/district characteristics such as size of enrollment, political climate, adjacency to states/districts with charter schools, and other factors. No such research, however, has been done in Colorado.

As Figure 1 shows, there is a strong correlation between student population and the number of charter schools. There are, however, outliers. The Cherry Creek School District, for example, has fewer charter schools than its population would predict while Denver Public Schools has more.

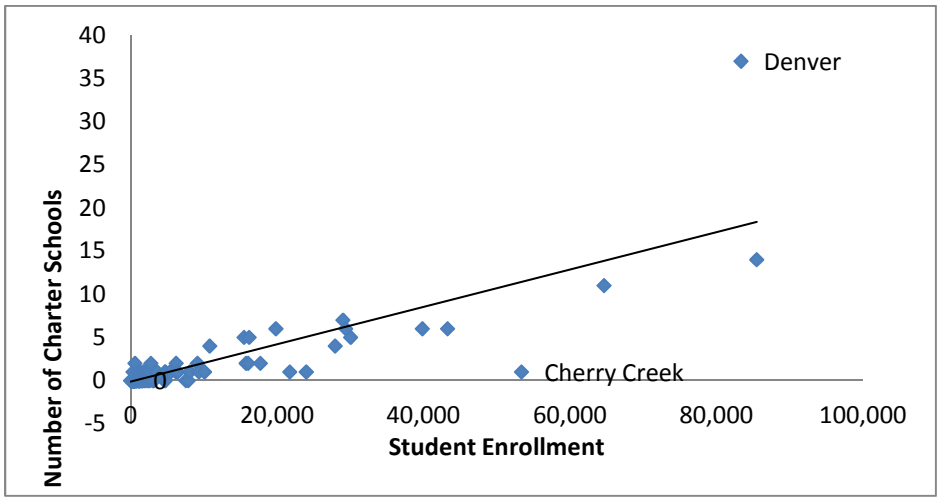

Figure 1: Distribution of charter schools in Colorado school districts.
Source: Colorado Department of Education Fall 2012 data.

Emulating studies of other states, this research examines correlations between charter school distribution among Colorado school districts and student demographics (race and poverty) and district factors (accreditation level, school choice environment, adjacency to other districts with charter schools, political climate, enrollment and enrollment growth, urbanicity, and per pupil funding).

The study measures charter school diffusion using two dependent variables: the number of charter schools authorized by a district and the percentage of students enrolled in district charter schools. These represent two different ways of measuring charter school activity.

The first dependent variable is the predominant variable used in other diffusion studies. The second variable attempts to measure the charter school sector in a district irrespective of district size. There are vast differences in student population among districts. Agate 300, for example, has 10 students while Jefferson County has 85,808. While the percentage of students educated in charter schools in a district includes some students from other districts who transfer into the district, the bulk of students are assumed to be district students because of proximity. The purpose of using several variables is to see if they provide similar, and thus more valid, findings.

The study employs two statistical models. The first model examines ten independent variables using multivariate regression analysis and the second dependent variable, district charter school students as a percentage of all district students. Private schools, faith-based schools, and secular schools are tested separately because they are highly correlated. The second model uses Negative Binomial Regression to examine

associations between 10 independent variables and the number of charter schools (dependent variable).

The utility of conducting quantitative analysis is that it paves the way for qualitative research. Having singled out more easily measurable variables associated with charter school diffusion, one can then undertake research into variables that are less easily measured such as the qualities of superintendents and boards, the presence or absence of policy innovators, and the strength of advocates and opponents. Researchers have suggested that these variables have an impact on charter diffusion in other states. The quantitative research undertaken in this thesis lays a foundation for such qualitative research in Colorado.

Charter Schools in Colorado

History

Colorado became the third state to adopt a charter school law when Colorado Governor Roy Romer signed the Charter Schools Act in 1993 (Benigno, 2013). In the 2012–2013 school year, 11 percent of all Colorado public school students (88,924) attended one of the state's 187 charter schools (Colorado League of Charter Schools, n.d.).

In addition to charter schools, Colorado students may enroll in any public school within or outside of their district, or attend one of the many district or statewide online schools. Open enrollment was first introduced in Colorado when the legislature passed the Public Schools of Choice Act of 1990 to enable students to attend a public school outside of their attendance boundaries within or outside of their district (Mintrom, 2000). Today, 9 percent of Colorado students attended public schools outside of their district

compared to 8 percent in 2011 and 3 percent in 2001 (Mitchell, 2011 and Colorado Department of Education, 2013).

Colorado also has public option schools and magnet schools which are district-run schools of choice. Such schools generally have a unique pedagogical approach to other schools in the district. When parents choose a school other than their neighborhood school, be it an option school, charter school, magnet school, online school, or school in another neighborhood attendance zone, they must submit an application. Enrollment is subject to space availability.

Private schools are also an education option. There are 277 private schools listed in the Colorado Department of Education database (Colorado Department of Education, n.d.). One hundred and sixty-nine are faith-based and the remainder is secular private schools.

Table 1: School Type Definitions

Type of School	Definition
Traditional Public Schools	District-operated public schools that serve a designated neighborhood. Under Colorado law, students can attend, space permitting, traditional public schools other than their assigned school.
Charter Schools	Independent public school. Students can attend, space permitting, any charter school.
Option and Magnet Schools	District-operated public school of choice. Students can attend, space permitting, any option or magnet school.
Private Schools	Independent secular and faith-based schools. In general, these schools do not receive public funding. However, Douglas County has initiated a scholarship program. The program is currently suspended pending a Colorado Supreme Court decision.

Student enrollment in public schools in Colorado has grown every year since 1990 (Torres, 2014). In 1993, the year Governor Romer signed the Charter Schools Act, the state had 625,000 K-12 students. Today, there are nearly 877,000 students which marks a 40 percent increase.

Between 2008 and 2013, 100 Colorado districts lost enrollment, five districts maintained the same level of enrollment, and 73 districts gained enrollment. The level of change ranges from a 79 percent drop in enrollment in the Agate 300 district to a 45 percent increase in the Mapleton 1 school district (Colorado Department of Education, n.d.). In general rural districts declined in enrollment while Front Range communities gained enrollment.

Student Demographics in Colorado Traditional and Charter Public Schools

As Figure 2 demonstrates, Colorado charter schools currently enroll the same percentage of minority students (44 percent) as do traditional public schools (44 percent) with charter schools enrolling slightly more Black and Asian students and traditional public schools enrolling slightly more Hispanic students (Colorado League of Charter Schools, n.d.). This was not always the case; in 2001, students of color were slightly less likely to enroll in charter schools than in traditional public schools. Twenty-seven percent of charter school enrollment was composed of racial minority students as compared to 33 percent in traditional public schools (Carpenter, and Kafer, 2013).

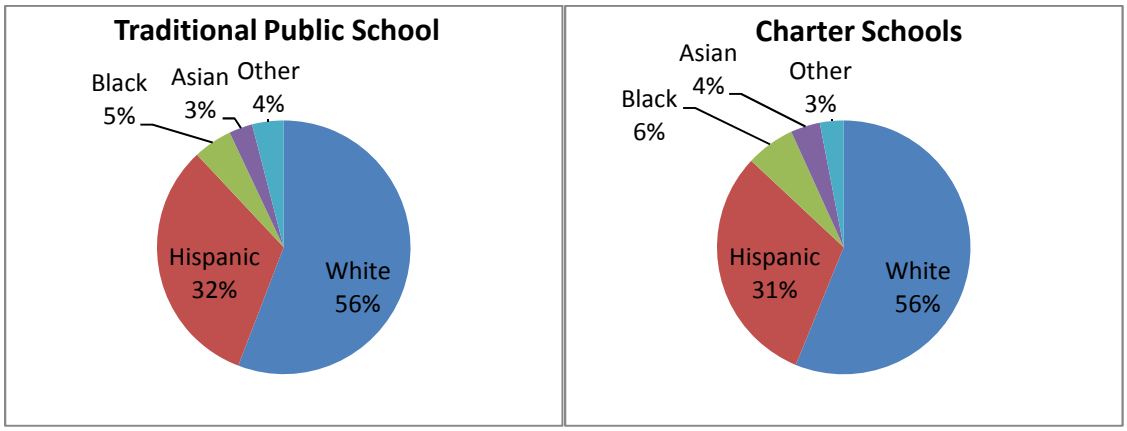

Figure 2: Racial Demographics at traditional and public charter schools.
Source: Colorado League of Charter Schools 2012–2013 data.

In contrast to national trends, traditional public schools in Colorado serve a higher percentage of low income students than charter schools (Carpenter, and Kafer 2013). The percentage of charter school students who qualify for the federal Free and Reduced Lunch program was 32 percent in 2012 as compared to 42 percent of traditional public schools. The percentage of low income students in charter schools, however, has increased significantly since 2001 when it stood at 18 percent.

The increase in the percentage of low income students served by Colorado charter coincides with the increase urban charter schools and charter school networks seeking to serve disadvantaged students. Charter school founders, often with the support of philanthropists, have responded to demand by opening charter schools to serve urban low income and minority students and by offering support such as tutoring, a longer school day, Saturday hours, smaller class sizes, access to social services, and home visits. Several successful charter operators such as KIPP, Denver School for Science and Technology and STRIVE Preparatory Schools have multiple inner-city campuses across the Denver Metro Area.

Achievement trends among minority and low income students in Colorado are similar to national trends. Low income students and Black and Hispanic students have lower proficiency levels in math and reading than more affluent students and White students. Poor Black, White, and Hispanic students in charter schools generally performed better than their peers in traditional public schools on reading and math state assessments (Carpenter, and Kafer, 2013). More affluent Black and Asian students in charter schools also achieved better outcomes than their peers in traditional public schools in reading while more affluent Hispanic students in traditional public schools generally performed better than their peers in charter schools. Findings were mixed for White students. In math, more affluent Black students in charter schools performed better than their peers in traditional public schools while findings for Hispanic, Asian, and White students were mixed by grade level.

Charter School Diffusion

Under Colorado law, charter schools may be authorized by school districts or the Colorado Charter School Institute (CSI). CSI may authorize charter schools in school districts that do not have "exclusive chartering authority" given to them by the state board of education. The law grants districts that enroll fewer than 3,000 students exclusive chartering authority automatically and requires larger districts to apply for the privilege (Conlan, 2011). The state board can revoke exclusive chartering authority if the district fails to uphold the Charter Schools Act. In the 2012–2013 school year, nine districts lacked exclusive chartering authority (Colorado Department of Education, n.d.). CSI also charters schools in districts with exclusive chartering authority with the permission of the district. In the 2012–2013, CSI held charter agreements with 28 schools (Colorado

Charter School Institute, n.d.). Because CSI is not a district but a state-wide authorizer whose sole purpose is to charter schools, its schools are not included in this study. This study focuses exclusively on districts which may or may not authorize charter schools.

Forty-four of the state's 178 school districts have chartered schools. As Figure 3 shows, charter schools exist throughout the state but are more common along the urbanized Front Range where the population density is higher. The percentage of suburban and rural charter schools in Colorado is higher than the national average (National Association of Public Charter Schools, n.d.). Thirty-seven percent of Colorado charter schools are located in urban environments as compared to 52 percent nationwide. Twenty-six percent of Colorado charter schools are located in the suburbs. Only nine states have a higher percentage of suburban charter schools. Thirty percent of Colorado's charter school students attend a rural charter school (Stuit, and Doan, 2012). Only nine other states have an equal or greater percentage of charter school students in rural schools.

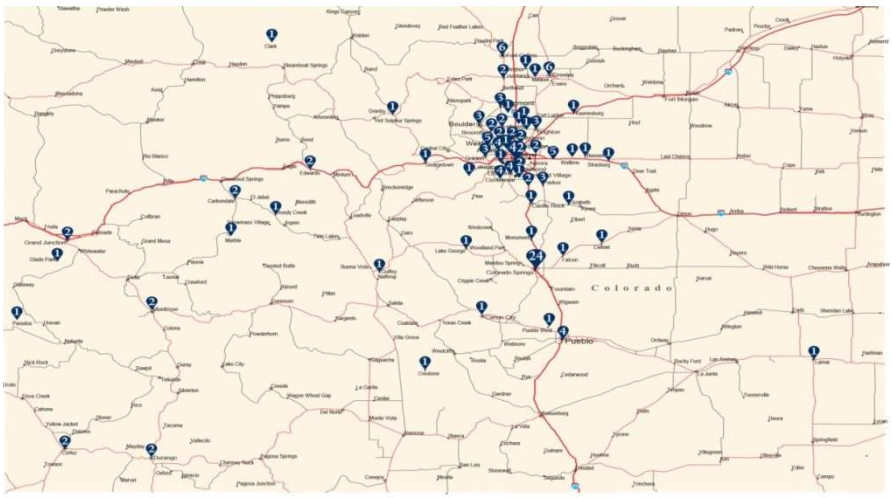

Figure 3: Distribution of Charter Schools in Colorado by City
Source: Colorado League of Charter Schools (n.d.). Facts and figures about Colorado charter schools. Copied with permission.

The Colorado Department of Education rates each school district according to its urban/rural setting on a scale of one to five: 1) Denver Metro; 2) Urban/Suburban; 3) Outlying City; 4) Outlying Town; and 5) Rural (Colorado Department of Education, n.d.). One hundred and five districts are either Denver Metro (19) or part of another urban/suburban area (86). The remainder is part of an outlying city (51), outlying town (18), or rural area (4). Figure 4 shows the relationship between urbanicity and the number of charter schools. Urban and suburban districts are more likely to have charter schools. There some interesting outliers, however; three urban districts, Adams County 14, Englewood 1 and Sheridan do not have charter schools while five rural districts, Elizabeth C-1, Keenesburg RE-3J, Strasburg 31J, and West End RE-2 have charter schools. On the other end of scale, Cherry Creek has only one charter school and Adams County 14, Sheridan and Englewood have no charter schools even though they all have a Denver Metro setting designation.

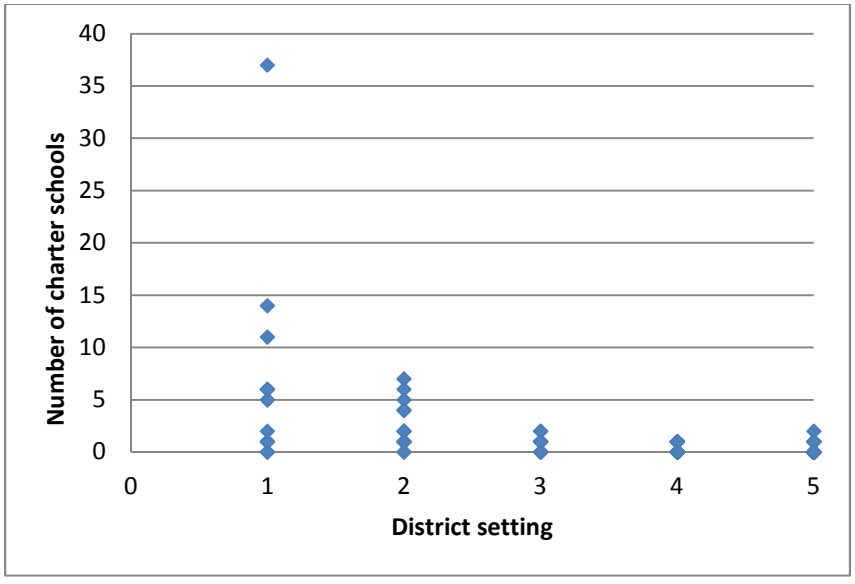

Figure 4, Distribution of charter schools in Colorado school districts by district setting. Source: Colorado Department of Education Fall 2012 data.

While the urban-rural difference in chartering rates is clear, the pattern of distribution of charter schools within urban and suburban school districts is not as easily apparent. Table 2 shows the top 10 districts by student population along with the number of charter schools. The table shows that the size of the district in terms of student enrollment is not a completely reliable predictor of charter school presence. For example, Colorado Springs 11 ranks ninth in student population but has the fourth highest number of charter schools. Denver Public Schools, the second largest district by enrollment, has more than twice as many charter schools as the largest district, Jeffco Public Schools.

Table 2: Top 10 Colorado school districts by student enrollment and number of charter schools

School District	Total Enrollment	Number of Charter Schools
1. Jeffco Public Schools	85,508	14
2. Denver Public Schools	83,377	37
3. Douglas County School District	64,657	11
4. Cherry Creek Public Schools	53,368	1
5. Adams 12 Five Star Schools	43,268	6
6. Aurora Public Schools	39,835	6
7. Boulder Valley Public Schools	30,041	5
8. St Vrain Valley School District	29,382	6
9. CO Springs School District 11	28,993	7
10. Poudre School District	27,909	4

Source: Colorado Department of Education Fall 2012 data.

When viewed as a scatterplot in Figure 5, it appears that student enrollment alone does not predict the number of charter schools.

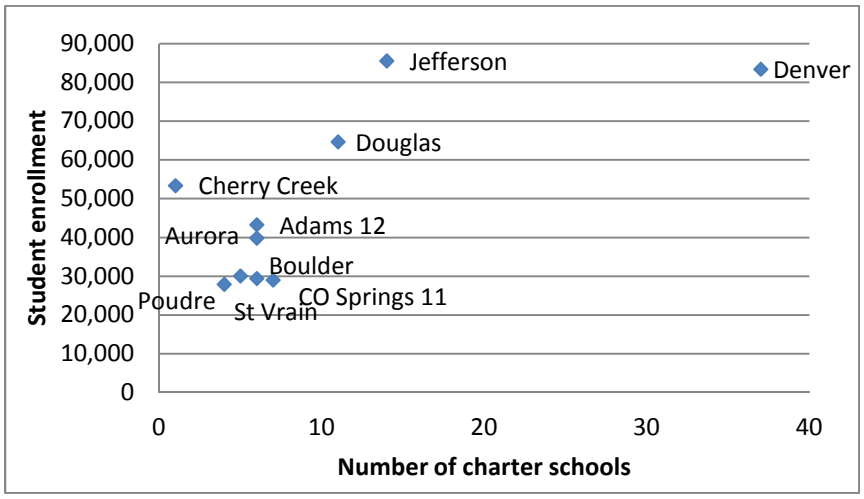

Figure 5, Distribution of charter schools in top 10 largest Colorado school districts. Source: Colorado Department of Education Fall 2012 data.

Ranking districts of different sizes (according to the number of students) by the number of charter schools provides an interesting comparison but it does not take into account the impact of size. One would expect larger districts to have more charter schools because they have more students thus more demand and more per-pupil funds. A smaller district may have a large proportion of students in charter schools but fewer charter schools overall simply by virtue of its size. By viewing district chartering activity as a ratio of students per charter school, one can compare charter activity among districts of different student enrollment sizes.

Table 2, provides just such a comparison. The fourth largest school district, Cherry Creek Public Schools, has 53,368 students per charter school, while Colorado Springs 11, the ninth largest district by population, has 4142 students per charter school. Jeffco Public Schools has 35,000 more students than the Boulder Valley School District but a similar sized charter schools sector.

Table 3: Top 10 CO school districts by ratio of students per charter school

School District	District Students per Charter School	Percent of District Students Enrolled in Charter Schools
1. Denver Public Schools	2253/1	14%
2. CO Springs School District 11	4142/1	8%
3. St Vrain Valley School District	4897/1	11%
4. Douglas County School District	5878/1	15%
5. Boulder Valley Public Schools	6008/1	8%
6. Jeffco Public Schools	6108/1	8%
7. Aurora Public Schools	6639/1	10%
8. Poudre School District	6977/1	6%
9. Adams 12 Five Star Schools	7211/1	20%
10. Cherry Creek Public Schools	53,368/1	Less than 1%

Source: Colorado Department of Education Fall 2012 data

Another way to look at the size of the size of a school district's charter school sector is to examine the percentage of students that are enrolled in charter schools in a district. Table 3 also shows the percentage of students educated in charter schools in each district. While some of the students educated in the districts' charter schools are not from the district, the same is true for the district's traditional public schools. Under Colorado law, students may transfer to other district charter and traditional public schools, space permitting.

In the top ten largest school districts, as few as 1 percent and as many as 20 percent of students educated in a district are enrolled in a charter school. Adams 12, the fifth largest school by total district population, enrolls the highest percentage of students in charter schools. Though not in the top 10 districts by enrollment, Brighton 27, Falcon 49, and Greeley school districts have a higher proportion students enrolled in charter schools—21 percent, 17 percent, and 17 percent respectively—than nine of the 10 largest

school districts. Several rural districts have a high proportion of students enrolled charter schools: Park County (25 percent), West End (15 percent), Elizabeth (17 percent) and Clear Creek (13 percent).

While there is a positive correlation between district size and charter school presence, there are other factors that likely exert an influence on the prevalence of charter schools. As the following analysis will show, student demographics (race and poverty) and district factors (accreditation level, school choice environment, adjacency to other districts with charter schools, political climate, enrollment and enrollment growth, urbanicity, and per pupil funding) impact the degree of charter school diffusion.

CHAPTER II

REVIEW OF THE LITERATURE

Most of the researchers found positive associations between charter diffusion and non-white students, low district achievement, adjacency to districts with charter schools, and district student density. Some researchers found correlations between charter school diffusion and enrollment of low income students, percentage of district private schools, and political climate. Others, however, did not. Table 4 provides a summary of the current state of knowledge in this field. The literature review that follows provides a discussion of most of these variables studies have associated with charter school diffusion.

Table 4: Summary Table of Literature Review

Vari-able	Percentage of Minority Students	Percentage of Low Income Students	District Academic Quality	Percentage of Private Schools	Adjacency	Political Factors	District Capacity	Other Variables
	Renzulli and Roscigno (2005) + to number of charters in state	Renzulli (2005) - to charter application submissions.	Renzulli (2002) + to application submissions.	Renzulli and Roscigno (2005) + to a point, then negative.	Rincke (2007) + to district charter adoption.	Renzulli (2002) + between Democratic registration and charter application submissions.	Renzulli's (2005) + between urbanicity and charter school submissions.	Renzulli (2005) + special education students and charter application submissions
	Renzulli (2005) + to charter application submissions.	Rincke (2007) - with district charter adoption	Rincke (2007) + to district charter adoption.	Renzulli (2005) + secular schools only.	Witte, Schlomer, and Shober (2007) + to district charter school adoption.	Renzulli and Roscigno (2005) - between Republican governor and charter submissions.	Witte, Schlomer, and Shober (2007) + between district enrollment and charter schools.	Rincke (2007) + with magnet schools and charter school adoption.
	Rincke (2007) - with district charter adoption. Hispanic only.	Witte, Schlomer, and Shober (2007) + to district adoption.	Minstrom (1997) + between decrease in test scores and charter law adoption.	Wong, K.K. and Langevin (2007) + to charter law adoption.	Zhang and Yang (2008) + to charter schools openings	Shober, Manna, and Witte (2006) + correlation between state charter schools and Republican governor or legislature.	Renzulli (2005) + between district size and charter application submissions.	Renzulli and Roscigno (2005) + between open enrollment law and charters in state.
	Witte, Schlomer, and Shober (2007) + to charter school openings	Stoddard and Corcoran (2006) + between higher dropout rates and charter school enrollments in districts.	Stoddard and Corcoran (2006) + states with low achievement and higher charter enrollments.	Zhang and Yang's (2008) - correlation with charter school creation.		Wong and Langevine (2007) + between Republican governor and adopting a charter law.	Witte, Schlomer and Shober (2007) + between district chartering and federal funds.	Minstrom (1997) - between union strength and state adoption of charter law.
	Wong, K.K. and Langevin (2007) + to state adoption of charter law	Wong and Shen (2002) + between state dropout rates and charter law adoption.				Zhang and Yang (2008) + Democratic registration and district chartering to a point, then negative.	Wong, and Langevin (2007) + between lower state funding and law adoption.	Minstrom (1997) + between presence of policy entrepreneurs and policy adoption.
	Wong, K.K. and Langevin (2007) + to state adoption of charter law	Wong and Shen (2002) + between state dropout rates and charter law adoption.				Zhang and Yang (2008) + Democratic registration and district chartering to a point, then negative.	Wong, and Langevin (2007) + between lower state funding and law adoption.	Minstrom (1997) + between presence of policy entrepreneurs and policy adoption.

Variable	Percentage of Minority Students	Percentage of Low Income Students	District Academic Quality	Percentage of Private Schools	Adjacency	Political Factors	District Capacity	Other Variables
	Wong, K.K. and Langevin (2007) + to state adoption of charter law	Wong and Shen (2002) + between state dropout rates and charter law adoption.				Zhang and Yang (2008) + Democratic registration and district chartering to a point, then negative.	Wong, and Langevin (2007) + between lower state funding and law adoption.	Minstrom (1997) + between presence of policy entrepreneurs and policy adoption.
	Zhang and Yang (2008) + to charter schools openings. Black students only.	Zhang and Yang (2008) – to charter school openings.					Renzulli (2002) + between lower funding and higher charter submissions	Renzulli and Roscigno (2005) - between union strength and state adoption of charter law.
	Stoddard and Corcoran (2006) + to charter schools openings. Black students only.	Zhang and Yang (2008) - to charter schools openings.						Zhang and Yang's (2008) + between appointed superintendent and chartering in districts.
								Renzulli (2005) + between number of district administrators and charter submissions.
Overall	Mostly positive	Mixed	Positive	Mixed	Positive	Mixed	Positive	N/A

Researchers have examined variables that correlate with charter school diffusion across the country in terms of passage of charter school enabling laws and charter school openings (or charter school application submissions). Although this thesis focuses on variables that influence charter diffusion in districts, findings of both types of existing diffusion research are reviewed here for two reasons: There are few studies that analyze

factors that influence district chartering rates so it is useful to broaden the analysis to include other diffusion analysis. Secondly, both types of research examine similar variables. The main factors that influence charter school adoption at the state and district level are related to student demographics, district school quality, political environment, district size, proximity to other districts or states with charter schools, union strength, and revenue. The subheadings below provide a discussion of extant research as it applies to each of these characteristics.

Disadvantaged Students

"There is good reason to believe that minorities are attracted to school-choice options precisely because they have been so disadvantaged in the public education system" observed Renzulli and Roscigno in their 2005 study (350). Students of color and low income students have traditionally performed at lower academic levels than White students and more affluent students (Barton, 2004). For these traditionally underserved populations, charter schools have become a popular alternative education environment. Nationwide charter schools enroll, on average, a greater percentage of Black and Latino students (27 percent and 26 percent, respectively) than traditional public schools (15 percent and 22 respectively) (National Alliance of Public Charter Schools, n.d.). Charter schools also enroll a higher percentage of low income students (53 percent) than traditional public schools (47 percent) (Lake, 2012).

Although there is considerable diversity within the charter school sector, several studies suggest that charter schools, in general, produce positive academic impacts for disadvantaged student populations. A 2011 national randomized study of the effect of

attending a charter school on academic progress by Mathematica, a policy research organization, found “positive impacts for more disadvantaged schools and students and negative impacts for the more advantaged” (Clark, M.A. et al., 1). A more recent study by the Center for Research on Education Outcomes at Stanford University showed that attending a charter school had positive impacts for Hispanic students who are English language learners and Black students in poverty (Raymond et al. 2013). Hispanic English-language learners gained the equivalent of 50 additional days of learning in reading and 43 additional days in math over their peers in traditional public schools. Poor, Black students gained 29 additional days in reading and 36 additional days of learning in math over their peers in traditional public schools. More affluent Hispanics experienced similar achievement to their traditional public school peers while White and Asian students lost ground.

Several researchers have tested the hypothesis of whether a higher presence of minority, low income, or learning challenged students is associated with a greater likelihood of a state passing a charter school law or of a district chartering schools.

Minority Students

Renzulli and Roscigno’s (2005) found that as the percentage of nonwhite students increased so did the number of charter schools within a state. In similar state-level adoption research, Wong, and Langevin, (2007) demonstrated that the percentage of minority students has positive impact on state adoption of charter school legislation.

At the district level, Renzulli’s 2005 study found the percentage of nonwhite and special education students to have a positive correlation with the number of charter

school application submissions. Witte, Schlomer, and Shober (2007) also hypothesized that districts with more nonwhite students would open charter schools. Their analysis demonstrated a positive correlation with the number of charter schools in districts in Wisconsin. Zhang and Yang (2008) found a greater percentage of Black students to be positively associated with more charter schools in Florida districts. Stoddard and Corcoran's 2006 research also showed districts with high or increasing percentage of Black students, a high or increasing percentage of college graduates and growing income inequality had larger charter school enrollments than did more homogeneous districts. Rincke (2007), however, found greater enrollment of Hispanic students to be negatively associated with charter adoption in California districts. Rincke acknowledged that this finding conflicted with the claim asserted by charter schools advocates that charter schools benefit disadvantaged children. He asserts that "the more favorable the social conditions under which local public school producers operate, the more likely is the establishment of additional charter schools" (538). This may have been true during the late 1990s and early 2000s from which Rincke's data are drawn. As discussed earlier, the proportion of disadvantaged students served by Colorado charter schools in the early years was lower than it is now.

Low Income Students

A number of existing studies have found that increases in low income student population exert a suppressing effect on charter school establishment (Rincke, 2007; Zhang and Yang 2008; and Renzulli, 2005). Zhang and Yang (2008) also examined the impact of the percentage of learning disabled students and found no impact. Witte, Schlomer, and Shober (2007), however, found districts with charter schools to have

higher average low income student enrollments. It is not clear why the findings are contradictory. All use data from the late 1990s and early 2000s. Witte, Schlomer, and Shober's analysis is on Wisconsin schools, Rincke's California, Renzulli's North Carolina, and Zhang and Yang's Florida. Perhaps state differences explain the variance in findings. Overall, researchers agree that the percentage of non-white students is associated with higher charter activity.

District Academic Quality

The presence of students in poverty and students of color in a district is not the only potential predictor of chartering activity. Students in low-performing districts regardless of ethnicity or poverty are likely to desire higher quality schooling options. Testing this hypothesis between district school quality and chartering activity, Renzulli (2002) found that a greater proportion of low performing schools in a district increased the mean number of charter school application submissions. Similarly, Rincke's (2007) research into charter school diffusion in California found that districts with low achievement were more likely to establish charter schools. Zhang and Yang (2008), however, found that the percentage of failing schools in a district had a negative correlation with charter school openings in Florida. Zhang and Yang had hypothesized that failing schools would lead to more charter schools but concluded that "improving educational performance may be a major concern for potential charter founders but not be the guiding principle for school boards and local politics" (583). The authors acknowledge that their findings are different from Renzulli but offer no explanation as to the reason.

In research considering state charter laws, Minstrom (1997) found that decreasing test score averages increased the likelihood of the passage of a charter law. Analysis by Stoddard and Corcoran (2006) found states with low student achievement and districts with higher dropout rates had higher charter school enrollments. Wong and Shen (2002) found that a state's adoption of a charter law was inversely related to its graduation rate, that is, states with lower rates were more likely to adopt charter laws. These studies suggest that charter schools may provide one avenue to improve student learning when test scores indicate decreases in student performance.

School Choice Environment

The school choice environment refers to the demand for and availability of education options in the district and adjacent districts, and the political climate. School choice, that is, the ability of parents to choose from among public or private options with the support of public funds is not a new concept in Colorado or the nation. In the colonial era and early republic, student were educated through a variety of independent schools financed by local communities, churches, and charitable organizations (Jeynes, 2003; 2007). Although tax supported public schools became the norm in the late 19th century and early 20th Century (Carpenter and Kafer 2012), the desire for alternatives resumed in the mid and late 20th century. In 1955 Minnesota adopted the first tax credit for private school tuition. Today there are 23 tuition tax credit programs exist in 15 states (Friedman Foundation for Educational Choice n.d.). In 1990, the first modern voucher program was enacted (Vermont and Maine's century and a half old rural voucher programs aside). Today there are 22 programs in 12 states and the District of Columbia.

Presence of Private Schools

One way to measure the demand for school choice is the number of private schools in a district. According to research by Schaeffer (2012), approximately 8 percent of charter elementary students and 11 percent of middle and high school students come from the private sector. In other words, they left their private school to attend a public charter school. In urban centers, private school students constitute substantial portions of charter elementary (32 percent), middle (23 percent) and high school school (15 percent) students come from private schools. Buddin's (2012) research and that of Chakrabarti and Roy (2011) also suggest that charter schools pull a significant number of students from private schools. Taken together, these results indicate that private schools may both bolster school choice legitimacy and demand and serve as an alternative source for prospective students.

A study by Renzulli and Roscigno (2005) showed that the number of private schools increased the number of charter schools operating in a state. They suggest that "the presence of competition, in the form of private schools, increases the number of charter schools that operate in the state" (358). They also point out that correlation waned in states with the highest level of private schools, indicating that there may be a saturation point for education alternatives.

Another of Renzulli's studies (2005) showed that the number of secular private schools, but not faith-based schools, had a positive impact on the number of charter school application submissions in school districts. She suggests that education alternatives increase the legitimacy of education choice. Wong, K.K. and Langevin

(2007) found the number of private schools to positively correlate with the likelihood that a state would adopt charter school legislation. Zhang and Yang's 2008 research, however, found the number of private schools to be negatively correlated with charter school creation. They suggest that "charter schools are substitutes of private to some degree" (585).

Presence of Public School Options

The presence of other public school options appears to increase the likelihood of charter openings. A study examining showed the presence of magnet schools is a positive predictor for chartering activity (Rincke's 2007). Magnet schools are district-run schools of choice which are generally established for voluntary racial integration purposes. According to Public School Review, there are 24 magnet schools in Colorado (n.d.). Renzulli and Roscigno (2005) found that the passage of a statewide open enrollment law increased the likelihood of chartering.

Even the presence of other charter schools appears to predict that more will open. Renzulli and Roscigno (2005) suggest that there is some degree of path dependence in this area, "[O]pen charter schools and the increased number of states with charter school laws may increase the legitimacy for new charter legislation and the creation of more charter schools" (348). Renzulli (2005), however, found that the number of existing charter schools in a district had a negative impact on submissions. This suggests that as the number of charter schools increases, competition for a finite number of students also increases. The number of charter schools in the state, on the other hand, had a positive impact, suggesting that existing charter schools in other districts increases the legitimacy

of charter schools without reducing the capacity within the district for more charter schools. As with private schools, the presence of nearby charter schools appears to raise interest and demand for charter schools.

Adjacency to Districts with Charter Schools

As previously mentioned, students of today are more likely to attend schools outside of their residential district than they had been in the past. Because districts lacking charter schools may see enrollments decline as students choose to attend charter schools in nearby districts, there exists an incentive to offer their own charter schools. As parents and district boards become aware of nearby district's charter schools, it seems likely that board members would experience pressure to authorize charter schools within the district.

Witte, Scholomer, and Shober's (2007) research in Wisconsin shows a positive correlation between proximity to a district with charter schools and the number of charter schools. Similar diffusion effects have also been found in in California (Rincke 2007) and Florids (Zang and Yang 2008) Further research on inter-district school choice and charter school diffusion conclude that policy makers are significantly influenced by their peers' actions in nearby districts (Rincke, 2006, 2007).

Political Climate

According to DeBray-Pelot, Lubienski, and Scott (2007), charter schools represent the "marriage of market-oriented neoliberals working from a series of state-level think tanks and progressive reformers committed to creating options with a public

system" (p. 212). Although Republicans tend to be more open to school choice; charter schools enjoy support from both sides of the aisle (Kirst 2007).

The research on the impact of political climate on charter diffusion is mixed. Renzulli (2002) hypothesized that a higher presence of Democrats would correlate with more chartering activity. She found that an increase in registered Democrats increased the number of submissions, but that other factors were more determinative. A follow-up study found that state level political factors had no impact on whether a state adopted a charter school law but having a Republican governor decreased the "expected number of charter school foundings" (Renzulli and Roscigno 2005, 358).

Shober, Manna, and Witte (2006) found that having large Republican representation in the state legislature was correlated with more charter schools in a state and a Republican governor even more so. Wong and Langevine (2007) found that states with a Republican governor were more likely to adopt a charter school law.

Zhang and Yang (2008) found that the percentage of Democratic voters was correlated with an increase in the number of charters to a point. When the percentage of Democrats exceeded 79.5 percent, the effect was reversed. This would suggest that charter schools enjoy bipartisan support except in heavily Democratic districts.

Union opposition to charter schools is another variable identified by researchers that impacts both charter law adoption and charter activity. Minstrom (1997) found union strength reduced the likelihood of charter law approval as did Renzulli and Roscigno (2005). However, they also found that the National Education Association's presence had

a marginally positive impact on the founding of charter schools once a law had passed. Stoddard and Corcoran (2006) had the same findings.

Research by the Thomas B. Fordham Institute ranked the strength of Colorado's teacher union 35th among the states and the District of Columbia (Winkler, Scull, and Zeehandelaar 2012). According to the report, union strength is not very strong in Colorado. Because state level union strength is weak and district level union information would be difficult to obtain, this variable will not be analyzed in the thesis.

School District Capacity

School district capacity refers to several district level factors including population density, presence of policy innovators, the superintendent, enrollment and enrollment growth, and funding.

Population Density

Renzulli's (2005) research showed that urban districts had more charter school submissions than suburban or rural districts. Total population and population density both impact the capacity of a district to open a charter school. The presence of advocacy groups will likely be stronger in urban and suburban areas. Coalitions that generally support the opening of charter schools include parents dissatisfied by local schools, business and community organizations, state charter school associations, national advocacy groups with local affiliates, real estate developers, faith-based organizations, higher education institutions, and foundations and philanthropists (Kirst 2007).

Presence of Innovators

Minstrom's (1997) research found that the presence of policy entrepreneurs significantly increases the rate at which the public approves of school choice as a policy innovation. These groups work with policy makers to effect change (Minstrom and Vergari, 1998). He notes that "[P]olicy entrepreneurs operating at the state level will most often develop their ideas for policy innovation through their conversations and interactions with members of interstate and *external policy networks*" (1997, p.130, italics in the original).

The Superintendent

In their case studies, Teske et al. (2000) found mixed support for charter school initiatives from school superintendents. Some exhibited antagonistic relationships with charter schools, while others were much more positive. Even in districts where district schools faced considerable competition from charter schools, some superintendents had positive views of charter schools. Teske et al. concluded that "[T]he attitude of the district superintendent and, through the superintendent, the attitudes of other high level administrators seem to be more a function of their individual beliefs" rather than the market share of the charter or district schools (p. 10). In all 19 case studies conducted by Witte, Scholomer and Shober (2007), there were entrepreneurial administrators, school board members, parents, and teachers who wanted to open charter schools.

Zhang and Yang's (2008) research showed that the presence of an appointed superintendent versus an elected superintendent was positively with higher rates of chartering. They suggest that this is because "appointed superintendents are less distracted by electoral politics in the community and more motivated by a desire to

enhance their reputation and labor-market value by adopting innovations. Alternatively, it may indicate that appointed superintendents treat charter schools as a dumping ground for their at-risk students so that they can boost test schools in current schools" (585). All district superintendents are appointed in Colorado.

Enrollment and Enrollment Growth

High enrollment growth could lead school districts to open charter schools as a means of increasing district capacity to absorb new students. Districts in suburban areas experiencing high growth in student enrollment become receptive to charter schools to address overcrowding (Pushpam, 2002). A study by RPI International for U.S. Department of Education examined the impact of charter schools in 49 districts in five states –Arizona, California, Colorado, Massachusetts, and Michigan (Ericson, J. et al., 2001). The researchers found, "In 35 percent of the total districts, administrators reported that charter schools had relieved overcrowding or the pressure to construct new facilities caused by an increasing student population" (p.14).

The research on enrollment growth and charter activity is lean. Zhang and Yang, however, found no association between enrollment growth and chartering (2008). Higher enrollment, in general though, has been shown to correlate with higher chartering activity. Witte, Schlomer, and Shober (2007) found that districts with higher enrollments were more likely to charter schools. They suggest that larger districts have larger administrative infrastructure to support the chartering process.

Renzulli (2005) found that the larger the size of the district and the higher the number of district administrators the higher the charter school submissions. She

hypothesizes that high levels of bureaucracy increase inefficiencies and red tape and will therefore increase the number of submissions.

Funding

Witte, Schlomer and Shober (2007) found that districts with more federal revenues were more likely to start chartering schools and attributed it to the fact that these districts have more low income students. In their analysis of factors related to charter law adoption, Wong and Langevin (2007) found lower classroom spending associated with charter law adoption. Renzulli (2002) also found that districts with lower state and local funding had higher charter school submissions.

CHAPTER III

METHODOLOGY

This study will test for relationships between the size of the charter school sector and ten variables associated with student demographics and district factors. Although the number charter schools open in the 2013–2014 is available, academic data are available only for the 2012–2013 school year. Therefore all data used in the study come from the 2012–2013 school year.

Hypotheses

Level of Need

One of the primary reasons for founding charter schools according to advocates is that they can serve disadvantaged children who are not well served in the traditional system. The Colorado Charter School Acts of 1993 states:

(2) The general assembly further finds and declares that this part 1 is enacted for the following purposes:

> a) To improve pupil learning by creating schools with high, rigorous standards for pupil performance; (b) To increase learning opportunities for all pupils, with special emphasis on expanded learning experiences for pupils who are identified as academically low achieving; (Colorado Charter Schools Act (1993).

For the purposes of this study, level of need is defined as the percentage of disadvantaged students (minority and low income students) and student achievement as measured by district accreditation status.

H_1: School districts with a higher percentage of nonwhite students will have a greater quantity of charter schools.[1]

H_2: School districts with a higher percentage of low income students will have a greater quantity of charter schools.[2]

H_3: School districts with a lower accreditation plan will have a greater quantity of charter schools.[3]

School Choice Environment

School choice environment refers to the level of school choice within the district. All districts are impacted by Colorado's open enrollment law. Some districts have private schools. As the researchers noted, private schools act as competition for public schools and as a pool of potential student recruits. Parents who enroll their children in private

[1] These data are found at the CDE website at www.cde.state.co.us/cdereval/pupilcurrentdistrict.htm Data set for minority students from CDE that included all nonwhite students. Percentages have been transformed into decimals for data processing.

[2] These data are found at the CDE website at www.cde.state.co.us/cdereval/pupilcurrentdistrict.htm This CDE data includes students who are eligible for the Federal Free and Reduced Lunch Program. In 2012, free lunch eligibility was set was 130 percent of the federal poverty level (approximately $29,965 for a family of four) and at 185 percent of the federal poverty level (approximately $42,643 for a family of four) for a reduced price lunch. Percentages have been transformed into decimals for data processing.

[3] The state of Colorado assigns districts an accreditation category based on the overall District Performance Framework score that includes academic achievement, academic growth, academic growth gaps, and postsecondary and workforce readiness. Accreditation categories are as follows: Accredited with Distinction, Accredited, Accredited with Improvement Plan, Accredited with Priority Improvement Plan, and Accredited with Turnaround Plan. To simplify, districts with accreditation status of Accredited with Distinction, Accredited, Accredited with Improvement Plan were coded as "0" and those with Priority Improvement Plan, and Accredited with Turnaround Plan were coded as a "1."

schools are accustomed to choosing schools. Some of the research shows that high number of private schools is associated with a greater number of charter schools.

District adjacency to other districts with charter schools is also included. If a sufficient number of parents leave the district to attend a charter school in another district, district boards will feel pressure to charter schools of their own.

Political climate is also included in this category as a null hypothesis. Colorado history shows bipartisan support for charter schools so it is expected to have no impact on charter diffusion. The weakness in using countywide voter registration statistics is that they do not capture political diversity within each county. For example, political registration in the Manitou Springs school district and the Colorado Springs 11 school district located near Peterson Air Force Base are likely different. Both districts are assigned 22 percent Democratic registration because that is the county level. Similarly, there is considerable diversity in Jefferson and Arapahoe Counties, as well, that is not reflected in the countywide percentages. Finally, the rising number of unaffiliated voters, dilutes the usefulness of this variable. Independents, which make up about a third of voters in Jefferson and Arapahoe Counties vote for Democrats, Republicans, and other parties. Other researchers may consider using more complicated variable to better capture political culture but none has yet embarked down that road.

H_4: School districts with a higher number of private (independent and faith-based) schools will have a greater quantity of charter schools.[4]

[4] Data for independent and faith-based schools are found at the CDE website at www.cde.state.co.us/cdereval/pupilcurrentnonpublic.htm. The data set includes the total number of private schools. Because research variable on the whether the number of total private schools, number of secular

H_5: School districts adjacent to districts with charter schools are more likely to have charter schools.[5]

H_6: The Percentage of Democratic registered voters will have no impact on the quantity of charter schools in school districts.[6]

District Capacity

District capacity refers to the capacity to open additional schools. Districts with higher student enrollments can authorize more schools. Such district will have both the demand and the capacity to operate additional schools. Districts experiencing enrollment increases over the past few years will have additional capacity. Districts in urban and suburban areas should have more capacity to open additional schools than rural schools. Finally, districts with lower per-pupil funding should be more likely to charter schools as the research findings predict.

H_7: School districts with higher levels of enrollment growth will have a greater quantity of charter schools.[7]

H_8: School districts with higher levels of enrollment will have a greater quantity of charter schools.[8]

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private schools, or number of secular private correlated to chartering activity the study also tests this hypothesis for secular and faith-based schools.

[5] These data are found at the CDE website at http://www.cde.state.co.us/cdeedserv/coloradoschooldistrictsmap. I identified charter districts on the map and noted which non-charter districts were next to charter districts. Districts adjacent to charter districts are coded as a 1 and districts that do not touch another district with charter schools are coded as 0.

[6] These data are found at Colorado Secretary of State's office at www.sos.state.co.us/pubs/elections/VoterRegNumbers/2013/June/VotersByPartyStatus.pdf. Each school district fits within the boundaries of a county. Most counties have more than one district usually between two and six. The average is 2.7. Outliers El Paso County and Weld County have 15 and 12 twelve school districts respectively. Denver, Douglas, and Jefferson, three of largest school districts, are county-wide.

[7] These data are found at Membership Trends District Totals 2006–2013 at CDE website at http://www.cde.state.co.us/cdereval/pupilcurrentdistrict.

H_9: School districts with a Denver Metro, Urban/Suburban, and Outlying City designation will have a greater quantity of charter schools than Outlying Town, and Rural school districts.[9]

$H_{10:}$ School districts with lower levels of total per pupil funding will have a higher quantity of charter schools.[10]

Dependent Variables

The study measures the quantity of charter schools in districts using two dependent variables to be analyzed separately. The use of the two variables is useful for validation of the results.

The first dependent variable is the number of charter schools in a district. This is the most common dependent variable used in the literature.

The reason for using a second variable, that of student population, is that some districts may appear to be enthusiastic chartering authorities by the absolute number of charter schools, but may in fact, serve a proportionally small number of kids. Researchers Teske, Schneider and Cassese noted in their 2005 study of school district authorizers that many school boards view charter schools as competitors for their own schools and attempt to limit charter school creation and growth. School boards have held a monopoly

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[8] These data are found at Membership Trends District Totals 2006–2013 at CDE website at http://www.cde.state.co.us/cdereval/pupilcurrentdistrict

[9] These data are at CDE website at http://www.cde.state.co.us/sites/default/files/documents/cdereval/download/pdf/districtslistedbysetting.pdf CDE designates each school district as one of the following: Denver Metro; Urban/Suburban; Outlying City; Outlying Town; and Rural. To simplify, Denver Metro, Urban/Suburban, and Outlying City districts were coded with "1" and Outlying Town; and Rural districts coded as a "0." This includes state and local funding.

[10] Data represent Total Formula Funding and are found at CDE website at http://www.cde.state.co.us/cdefinance/dbydfy13. This includes state and local funding.

for a long time and do not wish to give it up. Boards, however, experience pressure to respond to local political forces to open schools. The researchers hypothesize that school boards are more likely to favor niche schools that serve special populations and do not compete with the school district's general education schools. A district may charter a high number of charter schools but because they are primarily niche schools, the district actually serves a relatively low percentage of district students.

The study analyzes open charter schools instead of charter schools application submissions. Researchers examining charter school diffusion use both. Of the five studies examining charter school diffusion, two studies tracked charter school application submissions (cite these two here) and three used charter school openings as dependent variables (cite these three here) (Renzulli, 2005, Renzulli and Roscigno, 2005, Renzulli, 2002, Teske, Schneider and Cassese, 2005, Witte, Scholomer, and Shober, 2007). Renzulli (2005) used application submissions because examination of charter school openings would exclude the number of rejected applications "and underestimate the initiation patterns for charter schools and ignore important information about how organizational environments foster or subdue efforts at innovation" (Renzulli 2005, p. 4). She found that between the years 1991 and 1998, 1,147 applications were submitted and 418 schools received a contract and opened. Indeed, using openings alone could underestimate the interest in establishing charter schools.

In Colorado, however, one may not need to gather submission data to capture the breadth of the charter school initiation efforts, given the ease with which a rejected applicant may appeal to the State Board of Education. Over the past seven years (2006–2012), there have been 32 appeals to the State Board. In 12 cases, the State Board upheld

the school board's decision. In 10 cases, the school board was ordered to reconsider. In four cases on second appeal, the State Board ordered the school board to allow the school to be opened. Parties settled the issue and dropped the appeal in four cases, and in two cases, the appeal was rejected because of failure by the applicant to follow the appeals process. In all, 83 charter schools opened during those years (Colorado Department of Education 2013).

Moreover, Colorado school districts may not be openly hostile to charter schools, otherwise they risk losing their Exclusive Chartering Authority granted by the State Board. In the 10 school districts without exclusive authority, the state's alternative authorizer, the CSI, may open schools without district approval.

Given the rate of charter school openings and successful appeals, this study will use the number of existing schools, rather than submissions as its dependent variable.

Quantitative Methods

First, a multivariate regression model is used for the second dependent variable, percentage of students educated in district charter schools. A second analysis uses negative binomial regression model using a simplified dependent variable namely the number of charter schools. This modeling approach is suitable because of the distribution of this dependent variable indicating the raw number of charter schools. This approach has similarly been employed by other scholars Zhang and Yang (2008) and Renzulli (2002 and 2005).

Model 1: Multivariate Analysis was used with dependent variable 2 (percentage of students in districts' charter schools) and 10 independent variables. Statistics for private

schools, secular private schools, and faith-based private schools were analyzed separately because of high covariance levels.

Model 2: Negative Binomial Regression was used with the first dependent variable (number of charter schools) and 10 independent variables. Minority and low income students were analyzed together and separately.

CHAPTER IV

RESULTS AND DISCUSSION

Descriptive Statistics

Table 5 provides descriptive statistics for the dependent and independent variables used in this analysis.

Table 5: Descriptive Statistics Dependent Variables

	Mean	Std. Dev.	Min.	Max.
Number of Charter Schools in District	0.87	3.28	0	37
% of Charter School Students in District	0.02	0.05	0	0.25
% Minority Students	0.33	0.22	0	0.95
% Poor Students	0.47	0.18	0.07	0.90
High District Accreditation Status	0.88	0.33	0	1
Low District Accreditation Status	0.12	0.33	0	1
Secular Private Schools	0.61	2.20	0	15
Faith-based Private Schools	0.94	3.05	0	28
All Private Schools	1.56	4.95	0	41
Adjacency to Districts with Charter Schools	0.58	0.50	0	1
Percentage of Democrats	0.28	0.12	0.1	0.72
Change in Enrollment	-0.03	0.16	-0.79	0.45
Enrollment	4780.14	12539.58	10	85508
More Urban/Suburban	0.24	0.43	0	1
More Rural	0.76	0.43	0	1
Funding	9732.59	2545.6	7207.46	16539.42

Correlations

As Table 6 shows, several of the independent variables are highly correlated within the sample used for this study. Specifically, the demographic factors of economic affluence and racial minority population are somewhat correlated with a correlation coefficient of 0.63. Variables indicating the number of private, faith-based, and secular private schools are highly correlated. Enrollment and the number of private schools are also highly correlated. This is not surprising since large, populous districts are more likely to have more private schools than smaller, less populous areas.

Table 6: Correlation Matrix of Independent Variables

	Mn Std	**Pr Std**	**High Acc**	**Low Acc**	**Sec Schl**	**FB Schl**	**Pri Schl**	**Adj**	**Dem**	**Enr Chg**	**Enr**	**Urb Sub**	**Rur**	**Fund**
Min Std	1.00													
Pr Std	.63	1.00												
High Acc	-.45	-.31	1.00											
Low Acc	.45	.31	-1.00	1.00										
Sec Schl	.10	-.15	-.05	.05	1.00									
FB Schl	.21	-.01	-.18	.18	.78	1.00								
Pri Schl	.17	-.07	-.13	.13	.92	.96	1.00							
Adj	-.04	-.28	-.01	.00	.23	.24	.25	1.00						
Dem	.47	.30	-.23	.22	.17	.14	.16	-.01	1.00					
Enr Chg	.15	-.15	.10	-.10	.18	.18	.19	.24	.02	1.00				
Enr	0.20	-.13	-.13	.13	.77	.89	.89	.29	.13	.02	1.00			
Urb Sub	.32	-.03	-.19	.18	.45	.50	.50	.30	.10	.13	.57	1.00		
Rur	-.32	0.03	.19	-.19	-.45	-.50	-.50	-.30	-.10	.10	-.57	-1.00	1.00	
Fund	-.30	0.13	.13	-.13	-.23	-.25	-.25	-.37	-.09	-.10	-.30	-.47	.46	1.00

Model 1: Percentage of District Charter Students and 10 Independent Variables

The first analysis presented in this section is a multivariate regression of Dependent Variable 2 (students educated in district charter schools as a percentage of all district students) and 10 independent variables. Private schools, faith-based private schools and secular private schools were analyzed separately as are poor and minority students. In Model 1, district enrollment, urbanicity, and district adjacency to at least one other district with charter schools were correlated with a higher percentage of district charter school students. When all private schools and secular private schools are analyzed in this model, there is a negative correlation between the number of schools and percentage of district charter school students. When just secular private schools are analyzed, the percentage of poor students in the district is found to be negatively associated with the size of the charter school sector in the district. Similarly, when the percentage of poor and minority students are analyzed separately, the percentage of poor students is negatively correlated at a statistically significant level of .10.

Table 6: Regression Results for Model 1, Dependent Variable 2 (percentage of students in district charter schools) for all Colorado school districts in 2012-13

Independent Variable			
Minority Students	.00 (.02)	.00 (.02)	.00 (.02)
% of Poor Students	-.03 (.02)	-.04** (.03)	-.03 (.03)
Low Accreditation	.00 (.01)	-.00 (.01)	.00 (.01)
# of Private Schools	-.00* (.00)	-------	-------
# of Secular Private Schools	------	-.01* (.00)	.------
# of Faith-based Private Schools	-------	-------	-.02 (.03)
Adjacent to Charter Districts	.01* (.01)	01* (.01)	.01* (.01)
% of Democratic Registration	-.01 (.03)	-.00 (.03)	-.02 (.03)
Enrollment Change 2008-2013	.02 (.02)	.02 (.02)	.02 (.02)
District Total Enrollment	2.12* (5.55)	1.73* (4.16)	1.76* (5.66)
Greater Urbanicity	.03* (.01)	.03* (.01)	.03* (.01)
District Funding	-1.42 (1.48)	-1.36 (1.48)	-1.44 (1.50)
Constant	.03 (.02)	.03 (.02)	.04 (.02)
* Statistically significant at .05.	** Statistically significant at .10.		

Model 2: Number of Charter Schools and 10 Independent Variables

In Model 2, Negative Binomial Regression was used with the first dependent variable (number of charter schools) and 10 independent variables. As Table 7 shows, only the results for total number of private schools are shown. Analysis of secular private schools did not produce different findings and data that included faith-based private schools did not converge in Stata. In this model, the number of private schools and the degree of enrollment change are correlated with greater numbers of charter schools at a .10 statistically significant level. Adjacency to charter school districts, total enrollment, and greater urbanicity are positively correlated and funding is negatively correlated. No correlation was found when poverty and minority rates were analyzed separately.

Table 7: Negative Binomial Regression

Independent Variable	
Minority Students	1.16 (1.29)
% of Poor Students	-.22 (1.26)
Low Accreditation	.07 (.44)
# of Private Schools	.04** (.02)
Adjacent to Charter Districts	2.00* (.74)
% of Dem Registration	-.79 (1.48)
Enrollment Change	1.75** (.99)
District Total Enrollment	.00* (8.42)
Greater Urbanicity	.91* (.36)
District Funding	-.00* (.00)
Constant	2.30 (2.32)
* Statistically significant at .05.	** Statistically significant at .10.

Discussion

As Table 7 shows, several of the hypotheses were confirmed.

Table 7: Hypotheses and Results

Hypotheses	**Model 1**	**Model 2**
H_1: School districts with a higher percentage of nonwhite students will have a greater quantity of charter schools.	No correlation	No correlation
H_2: School districts with a higher percentage of low income students will have a greater quantity of charter schools.	No correlation (in most cases)	No correlation
H_3: School districts with a lower accreditation plan will have a greater quantity of charter schools.	No correlation	No correlation
H_4: School districts with a higher number of private schools will have a greater quantity of charter schools.	Negative correlation in most cases	Positive correlation
H_5: School districts adjacent to districts with charter schools are more likely to have charter schools.	Positive correlation	Positive correlation
H_6: The Percentage of Democratic registered voters will have no impact on the quantity of charter schools in school districts.	No correlation found	No correlation found
H_7: School districts with higher levels of enrollment growth will have a greater quantity of charter schools.	No correlation found	Positive correlation
H_8: School districts with higher levels of enrollment will have a greater quantity of charter schools.	Positive correlation	Positive correlation
H_9: School districts with a Denver Metro, Urban/Suburban, and Outlying City designation will have a greater quantity of charter schools than Outlying Town, and Rural school districts.	Positive correlation	Positive correlation
$H_{10:}$ School districts with lower levels of total per pupil funding will have a higher quantity of charter schools.	Negative correlation	Negative correlation

Level of Need

Hypotheses in this group predicted that the percentage of minority and low income students and lower academic achievement would positively correlate with chartering activity. The majority research showed a link between minority students and lower academic achievement with chartering and the research is mixed on the impact of low income students. In this study, the two models showed no statistically significant findings on level of need except in one case when only data for secular private schools was included. In this case, a negative correlation was found. It is possible that the racial and economic demographics in Colorado differ than in states studied by other researchers. Many of the Colorado's poorest districts are not urban districts but rural districts in the state's San Luis Valley and other rural areas. These districts do not have charter schools. It is also possible that district accreditation status, a holistic measure of school quality and outcomes, produces different results than subject proficiency rates.

School Choice Environment

The hypotheses regarding school choice environment predicted that the number of private schools would be associated with more charter schools. The models, however, produced contradictory results. Model 1 found a negative association and Model 2, a positive association. The existing research is also mixed for this variable. As was expected, the percentage of Democratic registration is not associated with charter activity. Charter schools have significant bipartisan support in Colorado which may explain why some states produce different findings on the impact of partisanship on charter school growth. A positive association between adjacency to districts with charter

schools concurs with existing research. Most Front Range districts, where charter activity is the greatest, abut one another, so this finding is not surprising.

District Capacity

The hypotheses in this group concern enrollment, enrollment growth, funding, and urbanicity. Both models showed a positive association between enrollment and urbanicity and greater charter activity. This finding concurs with existing research. Only Model 2 found an association between enrollment growth and more charter schools. Both models found an association between lower funding and great charter activity which aligns with existing research. Colorado's highest funded districts are its rural districts, so the finding is not surprising.

There is also a possibility of reverse causation in this analysis as it pertains to enrollment and dependent variable 1 (Model 1), the number of charter schools. Since charter schools are schools of choice, they draw students from outside of the district. High performing charter schools attract students from outside of the district and thus increase district enrollment and enrollment growth. Thus the dependent variable may cause increases in the variables regarding enrollment and enrollment growth.

Conclusion

Using two statistical models and a variety of data, this thesis shows enrollment, urbanicity and adjacency to a chartering district are correlated with greater chartering activity. Per pupil funding is negatively correlated and there does not appear to be a correlation between the number of charter schools and district academic achievement or political affiliation of district voters. The presence of private schools may have a negative

or positive impact on chartering activity. A more sophisticated statistical model may be able to solve the differing results in this study.

The findings in this study provide some insight into why some districts have more charter schools than others. Though urban, adjacent to charter districts, and similarly funded to other Denver Metro areas, the Englewood and Sheridan districts have no charter schools. A potential reason could be that their student populations are small; they are more similar to rural districts in terms of size. The paucity of charter schools in isolated, rural, low population areas accurately predicts fewer charter schools on the eastern plains and mountain regions.

The results, however, do not illuminate reasons for why Cherry Creek has so few charter schools compared to other districts of its size and funding level. Boulder Valley has a similar funding level and far fewer students but far more charter schools. In the same way, Denver has a similar student population size and higher per-pupil funding than Jefferson County, yet has twice as many charter schools.

As with many studies, the results prompt new questions. Are there additional quantifiable variables that can account for such differences or do the differences lie in characteristics not measurable by numbers? The answer may lie in the qualities of superintendents and boards, the presence or absence of policy innovators, parent demand, or the strength of charter advocates and opponents. This thesis paves the way for other researchers to ask new questions.

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