

ECONOMIC INDICATORS OF PUBLIC EDUCATION IN COLORADO

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John Samuel Brody

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# ECONOMIC INDICATORS OF PUBLIC EDUCATION IN COLORADO

John Samuel Brody

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## **Abstract**

The treatment of education as a production function has become a relevant way to numerically assess the state of schools and districts at a local, state, and federal level. This study examines the relationship between accreditation scores, a more holistic assessment of district quality and achievement, and the three main inputs of the education system—student, teachers, and expenditures—by using an OLS regression of Colorado Department of Education data for the 2010 – 2011 school year. Significant negative correlations between specific operating costs and pupil-teacher ratio were found with accreditation scores. These, paired with social demographic variables, were to have the largest impact on accreditation scores and thus, district quality and achievement.

KEYWORDS: (education, accreditation level, expenditures)

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## CHAPTER I

### INTRODUCTION

“The task of the modern educator is not to cut down jungles, but to irrigate deserts.”

- C.S. Lewis

The United States is at a cross roads in regards to our public education system. Having continually fallen from the tops of most education rankings, the U.S. now sits highest on a different ranking: the country with the greatest performance gap between the most- and least-proficient students (Kiersh, 2007). The United States stands to lose all competitive advantage and international power, as well as the integrity of its school system and citizens, if nothing is done. Our public education system is like a desert that has been without rainfall for years, dry and in poor condition to nurture any growth. Further investigation into this large gap, as well as lack of achievement within the country, is of the utmost importance for future generations and the wellbeing of our country.

Over the past 20 years, there has been a significant increase in the amount of statistics and data being collected by the government and institution across America due to the rise and reign of standardized testing. Though the prominence of this widespread testing has met resilience among many members in the education community, with just reasoning and statistics, it has presented an intriguing and exciting method by evaluating schools, districts, states, and the entirety of education

as a production function. While some intangibles may exist in the system, our public education system is similar to a large business, and their business is creating educated individuals who are ready to enter the workforce or postsecondary education. If the United States, and Colorado in this study specifically, can evaluate and maximize all the working parts of this “firm”, then there is real hope for the education system and the future of Colorado and the United States.

However, unlike a business, the inputs are more difficult to define numerically and some of the inputs are real people with real lives. The main three components of education to be analyzed in this study are students, teachers, and educational expenditures. Students come from different families, varying abilities, and unequal access to resources. Teachers have different educations, varying strengths, and unequal access to resources. These aspects can provide difficult hurdles in numerically classifying these historically qualitative characteristics. However, this thesis will attempt to categorize and numerate these characteristics so that they can be compared and contrasted with as little bias as possible. With the wealth of data available in modern education, this will prove less challenging than ever before.

Since the rise of standardized testing and the treatment of education as a production function, there has been controversy over the use of standardized testing results as an accurate predictor of school quality and achievement. Colorado has implemented a new, improved assessment for the success of school districts in regards to quality and achievement in accreditation scores and levels. These scores are based on four different areas of the district –academic achievement, academic longitudinal growth, academic gaps, and postsecondary and workforce readiness—

and correspond to various detailed plans that the school must enact the following year. This research will utilize these accreditation scores as a dependent variable that will offer a more comprehensive assessment of school districts. These scores, calculated with the extensive data that is available on Colorado public schools and districts, will provide an in-depth examination and evaluation of the inputs associated with public schools in Colorado.

The problem of public education will be inspected in a systematic way. The second chapter will present a literature review of current articles and books on school and district performance, measurements of quality and achievement of student and teacher characteristics, and effects of expenditures on the education system. The third chapter will discuss the theory of production functions and how this theory applies to education. The fourth chapter will provide an explanation of the data and variables, and summarize the data. The fifth chapter will explicate the methodology used to analyze the data, explain the regression model and expected outcomes, and present the results of the model. The sixth and final chapter will provide a discussion on the findings, implications, and potential future research that the results of the regression present.

## CHAPTER II

### LITERATURE REVIEW

The relationship between educational inputs and district performance is an important one that has been studied before and is the culmination of many other studies. In order to understand why the correlation between these two parts of education are important, we must set the context through the academic findings of prior researchers and show how all fields are interrelated. This literature review will evaluate the three most important aspects of education—the students, teachers, and expenditures—and break down these categories into specific facets. These three aspects of the literature and education will act as a brief guide through the details of our past and current education system and how modern society can analyze and advance the education system.

#### **Students and their Families**

Many authors view social demographics as the primary source to academic achievement, though how to measure it is still uncertain to many. Some suggest that race and ethnicity is central. Others suggest parenting style by race, and others still believe it strictly related to socioeconomic status. In this section, we examine the theories and studies in relation to socioeconomic status and education, and the implications of these studies.

## **Socioeconomic Status**

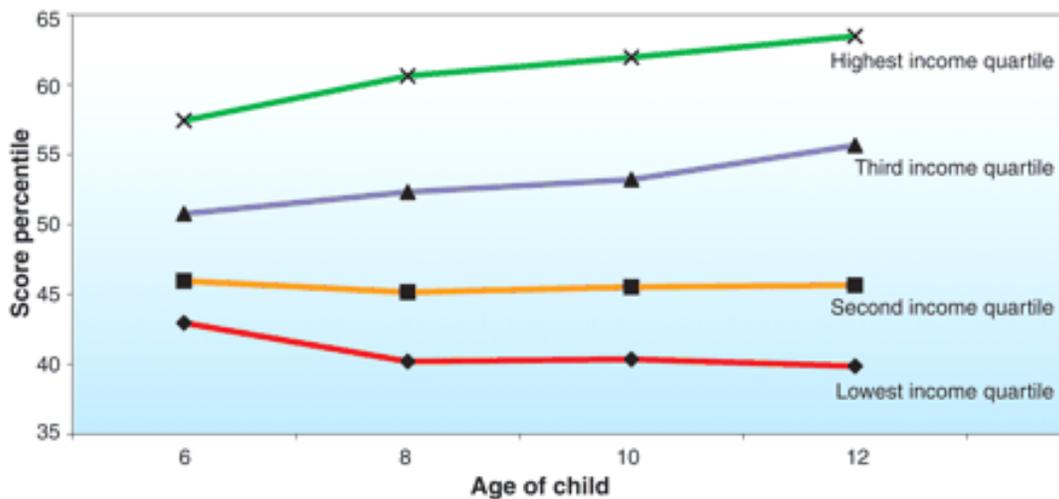
A medium to strong correlation between family socioeconomic status (SES) and school achievement has been found. Students whose family's SES is low are more likely to attend school districts that are, at best, financially inferior to wealthier districts. Financially inferior districts are most likely have less funds to spend on operating and capital costs, less educated parents and communities, and overall worse districts (Sirin, 2005). These poorer districts need even more funding than their wealthier counterparts because of the disadvantage students with low SES have already. Other studies find a correlation between SES and academic achievement also found a connection between ethnicity of students and performance on algebra tests (McCoy, 2005). This finding supports that ethnicity and race should be taken into consideration when modeling for academic achievement. Some conclude that this research of ethnicity, SES, cultural poverty, etc. is frivolous because they are inadequate as overall explanations (Wiggin, 2007). These same researchers believe ethnicity, cultural poverty, and SES are too specific to explain the grander issues of public education.

Nonetheless, this paper plans to use socioeconomic status of students to examine and help control for academic achievement. Socioeconomic status appears in most present literature and has convincing evidence in support. They will be added to proxy for nonschool attributes. The importance of gauging individuals' backgrounds, what sort of different behavior they may have, and most importantly, the amount or lack of resources they have had access to, is crucial in assessing how well districts teach and how much academic achievement students truly gain.

## Early Childhood Educational Programs

The body of literature on socioeconomic status does imply that early childhood educational programs heavily influence the success of school districts and their students. Scholars have looked to early childhood educational programs like Head Start and the Perry Program as potential equalizers for disadvantaged students to close the achievement gap between students and school districts. This section will highlight the findings of key studies.

The Coleman report was a massive report, with a sample size of over 150,000 students, conducted by James Samuel Coleman and a few other scholars. The investigation examined school expenditures and its effects on the outcome of students. More importantly, the report highlighted the importance of student socioeconomic status and student backgrounds as greater determinants of student performance.

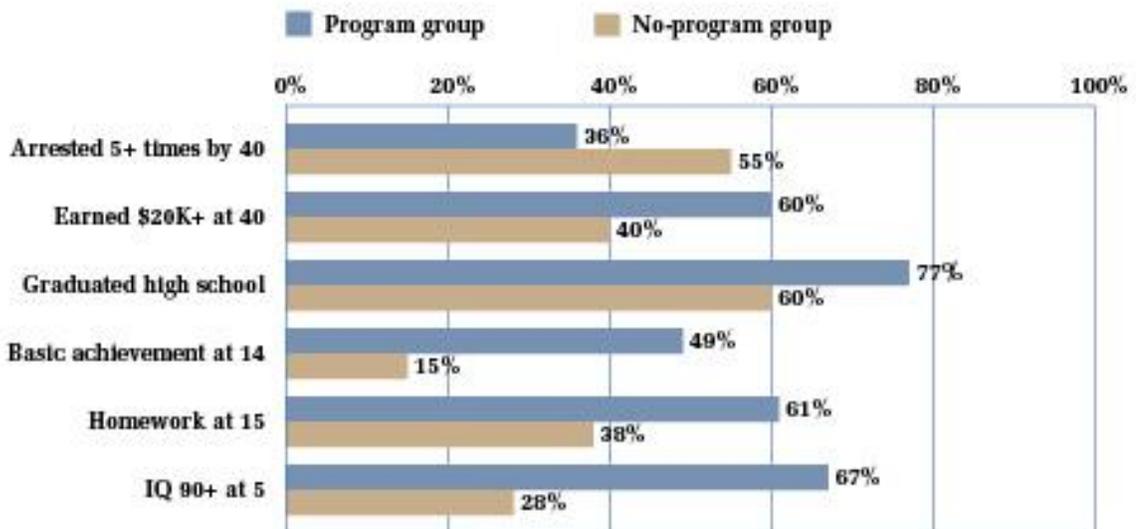


Source: Heckman, 2006.

This graph shows the achievement gaps and stabilization of said gaps from students age 6 onward.

The Perry Program is one of the most successful early childhood education programs for disadvantaged students with long-term achievement. The program placed 120 at-risk African American children, ages 3 and 4, into two groups: a test group that received a high quality preschool experience and a control group that received no preschool program at all. Follow-ups with these individuals were kept over time, and the results were very positive. Student from the Perry Program received higher achievement test scores during their schooling career. Even more astounding were the follow-ups conducted at age 40; those who were in the test group had “higher rates of high school graduation, higher salaries, higher percentages of home ownership, lower rates of receipt of welfare assistance as adults, fewer out-of-wedlock births, and fewer arrests than the control group” (Schweinhart, 2005).

**Figure 1**  
Major Findings: High/Scope Perry Preschool Study at 40



Source: Schweinhart, 2005

The Perry Program enhanced the overall lives of disadvantaged students, and did so at an effective price. The economic benefits in relation to costs of the program are eight to one (Schweinhart, 2005).

## **Teachers**

One educational input that is continually questioned and examined is the role that teachers play in students' performance output. Various aspects of teachers and their role, from the quality of the teacher to their performance to the compensation teachers receive, have been researched. The focus of studies has been in two main areas: the effect of teacher quality on student performance and how to efficiently incentivize teachers.

### **Teacher Pay**

One option that has been suggested to boost student performance and teacher quality is by enacting teacher merit pay, or that teachers are paid based on how well their students do on tests or in class. The results of inquiries on merit-based pay in relation to student performance are inconclusive in the current body of literature. Figlio and Kenny provide the first attempt to examine the correlation between merit-based pay and student performance (Figlio, 2007). While they find a positive correlation between student performance and individual teacher performance incentives, they conclude that due to their data set, it is difficult to tell if this correlation is due to better schools adopting merit-based pay or if merit-based pay leads to ingenuity on the teachers' behalf within the school. Springer et al. examined the POINT program and its resulting data, a program that offered up to \$15,000 bonuses to middle school mathematics teachers in Tennessee if they participated in

the program for 3 years. Springer et al. found that the POINT program had no significant correlation between student achievement and merit-based pay. 80% of teachers said they did not change their curriculum because “because I was already working as effectively as I could before the implementation of POINT.” Proponents of performance pay believe this study did not have the correct goal in mind that the goal should be to improve the overall workforce overtime and encourage hard work and new, interested candidates into teaching. Darling-Hammond highlights the importance of teacher quality over almost every other input to student performance (Darling-Hammond, 2000). Using three different national student assessments, she finds that teachers with the most experience, accreditation, and preparation are the greatest correlates of student performance in mathematics and reading. Darling-Hammond cites that while programs, like STAR in Tennessee, seem to elevate student achievement, they have not been inspected under the lens of teacher quality.

### **Value of Teacher-Pupil Ratio**

Pupil-teacher ratio is another key aspect of a teacher’s ability to succeed in the classroom. The Student-Teacher Achievement Ratio program (STAR), an experiment of sorts in some Tennessee elementary schools is a good example of this notion. The following statistics come from Krueger and Whitmore’s 2001 study on the STAR program. The STAR program placed nearly 12,000 children in their first four years of school in one of three class room settings: a small classroom with 13-17 students, a regular-sized classroom with 22-25 students, or a regular-sized classroom with a teacher aide. In 2001, Krueger and Whitmore found a few interesting facts about the relation of class size of students who participated in the STAR program and their

educational success. They found that 43.7% of students who were assigned to a small class in the STAR program took the ACT or SAT test, in relation to 40.0% of students in a regular-sized class, a finding statistically significant at the 0.05 level. Also, 40.2% of black students in small classes within the STAR program took the ACT or SAT, in comparison to the 31.7% in regular-sized classes with or without an aide. The effect of small classes, within the STAR program, was a reduction of the black-white gap in college-entrance-test-taking by 54%. The STAR program suggests that the long term affects of smaller classrooms leads to increased likelihood of a student going to college, especially for minorities and disadvantaged students.

Teachers act as the primary source of educational knowledge and interaction for students in the educational system. The quality and accessibility of a teacher could be the most important factor in a child's education, no matter what resources, capital, or socio-economic advantages exist. Teacher quality is an essential aspect of an examination into the efficiency of education and will be included in this paper inquiry of the educational system.

### **Educational Expenditures**

When it comes to educational spending on the public school systems, certain questions always arise: Is there any benefit? Who should get it? Is it worth it? Over the past 50 years authors have argued over these questions with great fervor and come to very few conclusions and many contradictions. Nonetheless, when discussing education, spending on schools is a focal point in school achievement evaluation.

## **Specified Spending**

With the advent of standardized testing and its widespread acceptance, schools have been examined similarly to production function; money, resources, people as inputs and academic achievement as output. However, some believe that increased expenditures independently do not lead to educational output (Hanushek, 1989). Thus, for these researches there is little correlation between overall expenditures and achievement, and policies that increase total expenditures are wasteful and should not be enacted. Hedges et al. seriously question this methodology and data though; citing revisions and performing new analyses on prior data that lead to new, significant findings with regards to input resources relating to output achievements (Hedges, 1994). Simply “throwing” funds at administrations will not lead to higher achievement in public schools. However, there is a great need for more funding and resources, properly allocated, in order to witness true achievement and improvement in our nation’s public education systems. All signs point to specific, intentional spending within the umbrella of school expenditures.

## **The Public, Private, or Charter Question**

Another area of interest in regards to educational funding and spending is the debate over public, private, or charter school question. Interesting research has been done on these three types of schools, along with their advantages and disadvantages and how well their students perform. One of these studies is by Christopher and Sarah Lubienski, who examined the data of the National Assessment of Educational Progress (NAEP) and found that the difference from charter, public, and private

schools does not lie among the schools, but really the students. The study shows that initial high scores of private schools are more than described by the demographic differences between the student populations of private and public schools. This exemplifies that the high test scores of private schools does not come from superior teaching, schooling, or administration, but rather from the caliber of students within the school. While the Lubienski's provide an encouraging study, most of their data and models have been based off assumptions and numbers that favor their own argument, making it difficult to use or support their claim. Thus, the question on the effectiveness of educational expenditures will remain focused on public schools.

### **Conclusion**

This is the direction in which the literature and research on students, teachers, and educational expenditures is heading; narrowing down factors are most important and least costly. The models in this study will account for many of these factors by accumulating data from the Colorado Department of Education. These variables will be chosen from each of the three divisions of education: the students and their families, the teachers and administration, and the educational expenditures.

## CHAPTER III

### THEORY

#### **Theory of Production Function**

In Pindyck and Rubinfeld's textbook *Microeconomics*, it states that a production function is "the relationship between the inputs into the production process and the resulting output" (pg 197). The following section and references to theory are based this textbook by Pindyck and Rubinfeld's. Under the most basic understanding of production functions, firms use two quantities of input: capital and labor. A third type of input is technology, which can increase overall production by providing the best knowledge of how to produce goods and services. Capital, labor, and technology compose what are called the factors of production. An example in regards to education, capital would be the buildings and tax revenues for schools, labor would be the teachers and administrators, and technology would be smart boards or computer access for students. Different levels and combinations of the factors of production lead to varied output, though firms (or school districts in our education analogy) usually strive to maximize their profits in the most efficient combination possible.

Time also becomes an aspect of production by differentiating between the short run and long run. It takes time for firms to construct new buildings or to get new machinery, thus two different time periods are made distinct. The first is the short

run, which Pindyck and Rubinfeld refer to a period of time which quantities of one or more production factors cannot be changed. The long run, on the other hand, is the amount of time needed to make all production inputs variable. The types of choices firms make in the short run versus the long run are very different; the short run focuses more on what the firm already has and the intensity of those factors. In the long run, firms can change their plant, the technological process, and all other factors. In the short run, for example, school districts could vary how much funding they allocate to certain programs in a matter of a school year or two. However, if the district desired a new elementary school or to switch to a year-round curriculum, it may need a 10 or 15 year plan to actually execute one of the ideas. Short and long run have no specific time associated with them; only the ability to vary the firm's inputs decides whether it is short or long run.

When taking into account short and long run choices of production by a firm, an important aspect to examine is the marginal product. Marginal product is the additional output produced as an input is increased by one unit. For each increased unit, the firm gets  $X$  amount of production in return. In regards to education, a school would want to know how many more students would graduate or attend college with the addition of one teacher with a bachelor's degree. This law will be crucial in our understanding of educational expenditures in relation to the production function of education. The law of diminishing marginal returns almost always challenges firms. The law states that as the use of an input increases with other inputs fixed, the resulting additions to output will eventually decrease. The law typically pertains to the short run; however, it can apply to the long run if the firm decides to control a

variable intentionally over a long period of time to see what the diminishing returns are for multiple aspects of the firm. Finally, all of the above holds true under the assumption that everything else remains unchanged, meaning no change in quality of labor or break down of machinery.

There are certain ways in which a firm can be more productive. One of these ways is to increase the firm's human capital per worker. Human capital is the knowledge and skill set that workers have or acquire via education, experience, and training. These abilities can be gained in a variety of settings, from all levels of education to training at job or on-site. To continue the education example, increasing human capital could be paying for current teachers and administrators to obtain their masters or PHD. Human capital helps increase productivity because it improves a firm's workforce and thus, productivity; it is just not as concrete as physical capital or the addition of natural resources.

Lastly in this theory section is a review of returns to scale, which is the rate at which output increases as inputs are increased proportionally. There are three types of returns to scale: increasing, constant, and decreasing. Increasing returns to scale is when, if the inputs of production are doubled, the output more than doubles. This is important in education because if a large school could give the same or better education to more students opposed to a smaller school, while being less costly, it would be economically efficient to have larger schools. Constant returns to scale are when a firm's output doubles when all inputs are doubled. When this occurs, a firm's size does not really matter and provides the same output no matter how large or small. Decreasing returns to scale is when a firm doubles input and the output is less than

double. This can occur when a firm has gotten too large and is having difficulties managing a firm of its own size.

### **Applied Theory of Production Function**

In this section, the theory of production functions will be related to the current United States educational system, the research variables used in this paper and the Colorado educational system. The ways that the United States' schools are treated, on a state and federal level, like production functions should become apparent in this section. The importance of this section is that it will provide a bridge between theory and the educational system in order to assess the successes, failures, and values of education numerically.

In regards to the two major inputs of a production function, capital and labor, our educational system has many different types of those two inputs. Education's capital comes in the form of both state and federal funding, schools buildings, paper materials, computers, copy machines, and various types of facilities in a school or district to name a few. Specifically in this study's model, operating expenditures at the elementary, middle, and high school levels reported by the Colorado Department of Education (CDE) will be utilized. The labor variable in the United States educational production function is the administration and teachers. In the paper's model, three variables will gauge labor: the first will be the teacher-pupil ratio, the second will be the average total experience of the teacher, and third will be the average salary a teacher receives in a district. Schools use this administration and teacher labor input, along with the capital of the schools they work at and the facilities of said school, in order to produce educated students. These students, the

output, are supposed to be the primary focus of the school and, as stated by the Colorado Department of Education in their vision statement, all students should “...become educated and productive citizens capable of succeeding in a globally competitive workforce” (CDE Vision Statement). If a school strives for this goal, then its optimal output would be to produce as many “educated” and post-secondary ready students as possible.

The school and system must take into account short and long-term goals of the school or district to perform optimally. Short-term goals for schools may be to increase a reading or writing test score of its students, to have students perform better on AP tests, or have more students go to college. These goals could be reached in a variety of ways, like by increasing the length of English classes, devoting more funds to AP preparation courses, or by hiring a college counselor to work with the students. Long-term goals for a school or district might be along the lines of placing in the top five in the state for SAT testing. This would involve a multitude of different actions, potentially from building new facilities or passing a levy for more school funding or having a course dedicated to SAT preparation worked into the curriculum. The results from the model will help shed some light on the most beneficial short and long-term goals for schools and school districts by highlighting more advantageous variables.

A school district must pay close attention to its marginal productivity if it desires to produce educated and post-secondary ready students from a school. This is a tricky aspect of the United States educational system because on the one hand, it is important to this system to educate all students to a certain standard. On the other hand, there are not enough funds or equality in the entirety of the system for this to

happen. However, school districts could examine marginal productivity of each school to better estimate how those funds could be reallocated within the district. In the educational system, the marginal productivity of a school or district would be the number of educated and post-secondary ready students for each dollar (or \$1000, or \$10,000) spent. While this study will not be able to specifically calculate the marginal productivity of a district, it will shed light on the productivity of specific variables to a school districts accreditation scores, which in turn is related to educated and post-secondary ready students.

Human capital is an integral part of the education system in both Colorado and the United States. One way to look at human capital in regards to the system is that the schools and teachers are increasing the human capital of the students as they progress towards graduating. The other way to view human capital in this educational production function is that labor, the teachers and administration, can be improved and increase their productivity by increasing their human capital. This second way will be the focus of this paper in regards to human capital. The model will account for teacher experience as a measure of human capital.

Finally, the advantage of a school or district discerning their returns to scale would be beneficial for optimizing productivity. If a school was very similar in all statistics of another, and yet, the first one was double the size of the second, and the first produced more than double the educated and post-secondary ready students than the second, it could be said that the returns to scale for this school could potentially be increasing. If the second, smaller school observed this, they could theoretically double the size of the school and all its components, and graduate more students. The

flipside would be just as important, if a big school was underperforming, they might want to look into downsizing so they could be more effective. It would be useful for all districts to understand how they could perform more optimally in regards to their returns to scale.

## CHAPTER IV

### DATA AND METHODOLOGY

In an attempt to understand economic indicators of education, an OLS regression is used to discover the relationship between accreditation scores and spending per student in Colorado public school districts. OLS regression is used because it parallels the production function theory associated with modern education. The inputs of education, in this case being the students, teachers, and expenditures of a district and the output of accreditation scores in Colorado, a more advanced measure to examine the short and long term output of public school districts. This chapter begins with an explanation of the data that will be used, a general summary of the raw data, then an overview of the regression model, and a table and description of the variables included in the model.

#### **Data**

The majority of the data is from the Colorado Department of Education (CDE). Each year, after the creation of the Educational Accountability Act of 2009, Colorado grades each of its 178 school districts based on four aspects of its public schools: academic achievement, academic longitudinal growth, academic gaps, and postsecondary and workforce readiness. These categories are to fairly evaluate the quality and improvement of the school, and add up to give the district a score on the scale of 0 to 100, with 100 being the best possible score. This will be the dependent

variable in this model because it is a fair and more holistic way of grading school quality than by simple, average standardized test scores of a district. These “accreditation level” scores can be found on the Colorado Department of Education’s website. This study will use a cross-sectional approach to examine the primary and secondary public schools in Colorado’s 178 school districts in the 2010-2011 school year. Data for the independent variables come from the same accreditation level report, other CDE reports, and the United States 2010 Census. The other Colorado Department of Education data comes from two reports, the first information from the Revenues and Expenditures report of 2010-2011 and the second from the Colorado Preschool Program Slot Allocations database.

### **Student, Teacher, and Expenditure Variables**

Three of the most important categories in education, as indicated in the literature review, are the student, teacher, and expenditure characteristics. The variables listed above have been carefully chosen in order to explain those three categories, and this section will describe why those variables have been chosen to represent student, teacher, and expenditure characteristics.

The students and their families are being represented by four variables: ‘frl’, ‘malehs’, ‘femhs’, and ‘cppallocper’. ‘frl’ is short for the percent of a district that receives free and reduced lunch, and is an indicator of socioeconomic status for both the students and their families. Those eligible for free and reduced lunch are Coloradans that make just about above the poverty line. From the literature review, it’s apparent that students from poor families historically have less access to educational resources and perform lower on average in school. ‘frl’ has been chosen

as the best indicator of student socioeconomic status because it focuses solely on student's status and not other community members that an average household income statistic may give. 'malehs' and 'femhs' are variables that denote male and female adults in the district, age 25 years and older, that have graduated from high school. A well-educated community, and specifically parents, lead to more educated children. These variables will either show that having more high school only educated is good for students and the community, or show that more high school only educated individuals means less adults with Bachelor's degrees and higher. Either way, this will be an important factor in this study. Finally, 'cppallocper' is the number of openings in the Colorado Preschool Program in relation to the number of students enrolled in the district. This variable will exemplify how present early childhood educational programs are in a given district. Early childhood education has been shown to be extremely important to overall educational success, from the Perry School Program to Head Start program, and the CPP is similar in goals. These four variables together will cover the core issues at the heart of district success in relation to students and their ability to achieve and succeed.

The teachers are being represented by three variables: 'teachavsal', 'totyears', and 'pupteachrat'. 'teachavsal' is the average teacher salary made in a district in 2011 and denotes the value of a teacher in a given district. This variable will help differentiate between quality and appreciation for teachers in a district; the more a teacher makes, it is assumed the higher the quality of teacher and is debatable that the teacher is more incentivized to teach, based off previous literature. 'totyears' is the average total of in- and out-of-state years of experience teachers have in a district.

This variable will also gauge teacher quality, as well as desire to stay within a school district. 'pupteacher' is the pupil-teacher ratio of a district. Pupil-teacher ratio is extremely important, as seen in prior literature, to a student's success in class and teachers effect on students. This variable will highlight the availability of teachers and the importance of close interactions between pupil and teacher. These three variables will exemplify the importance of teachers and their quality, devotion, and availability to students.

The district expenditures are being represented by six variables: 'elemoper', 'midoper', 'highoper', 'pupfund', 'instfund', and 'admintotalfund'. 'elemoper', 'midoper', and 'highoper' are the operational expenditures of districts at the elementary, middle (junior high), and high school levels in a district. These expenditures will help explain how much the district is spending on instruction between staff and students and highlight the overall wealth of the district in comparison to other districts. The three operational expenditure variables were selected over capital costs because this study is more focused on the funding for students and staff, not buildings and machinery, which seems more indicative of student and district success, at least in the short term. 'pupfund', 'instfund', and 'admintotalfund' are the percent of all district funds spent on pupils, instructional staff, and administration, respectively. These variables will help exemplify how districts allocate their funds and what is the most beneficial, proportionally, to being an accredited district. The six expenditure variables will examine the ways in which districts spend their money and what seems most proven to creating a high quality school district that receives accreditation.

TABLE 3.1

## CONSOLIDATED DESCRIPTION OF VARIABLES

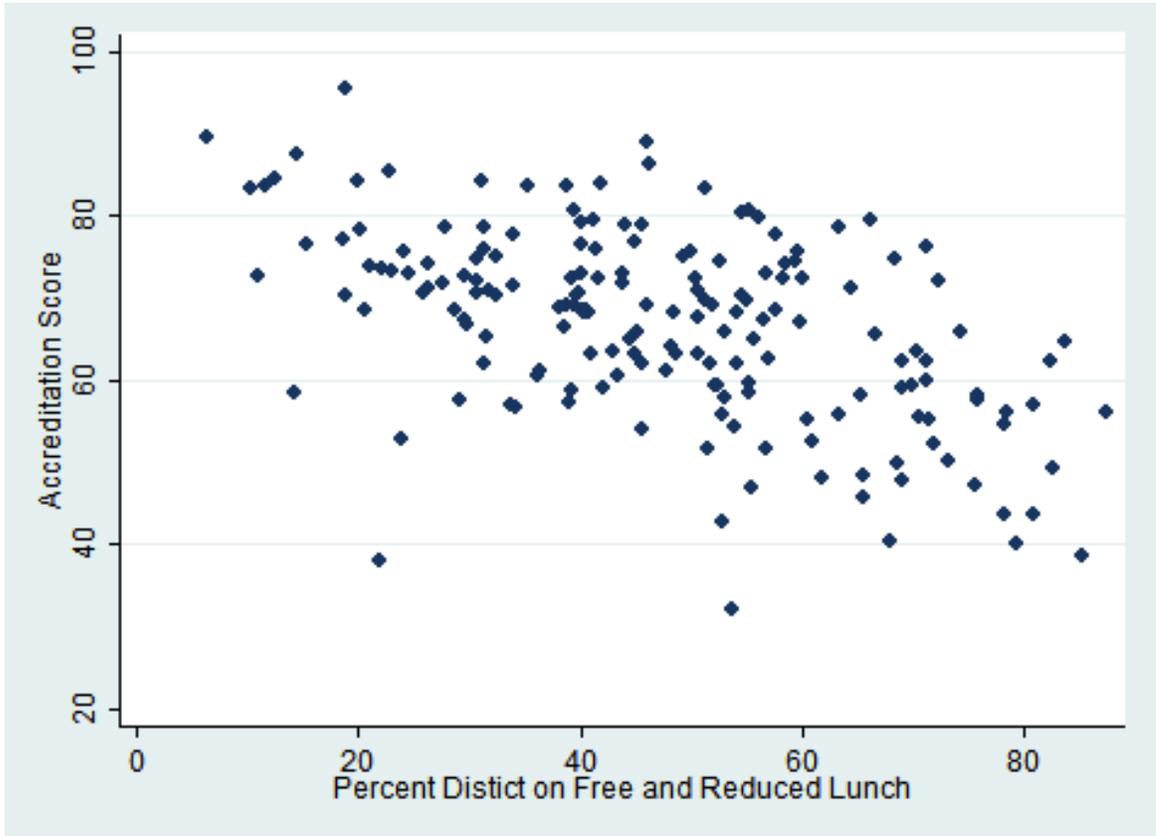
Variable Name	Variable Type	Definition	Reason for inclusion
accredlvl	Dependent	Score given to district based on its academic achievement, long-term growth, academic gaps, and postsecondary readiness for students	Metric for district performance
cppallocper	Independent	Percent of openings in the Colorado Preschool Program in relation to all students in each district	Proxy of early childhood education
teachavsal	Independent	Average salary a teacher made in the given district in 2011	Proxy of teacher value
frl	Independent	Percent of students on free and reduced lunches in the school district	Proxy of student socioeconomic status
totyears	Independent	Total experience, in years, that a teacher in a district has taught	Proxy of teacher quality
pupteachrat	Independent	Pupil teacher ratio of a school district	Proxy of teacher availability
elemoper	Independent	Operational expenditures incurred at schools in elementary instruction.	Proxy of school wealth in elementary
midoper	Independent	Operational expenditures incurred at schools in middle, or junior high, instruction.	Proxy of school wealth in junior high
highoper	Independent	Operational expenditures incurred at schools in high school instruction.	Proxy of school wealth in high school
pupfund	Independent	Spending per pupil in a district as a percent of all funds spent by a district	Proxy of pupil priority
instfund	Independent	Amount allocated for activities associated with assisting instructional staff as a percent of all funds spent by a district	Proxy of instructional staff priority
admintotalfund	Independent	Amounts paid for activities associated with administering school district operating policies as a percent of all funds spent by a district	Proxy of administration priority
malehs	Independent	Percent of adult males 25 years of age and older that have graduated high school in the district	Proxy of adult male education
femhs	Independent	Percent of adult females 25 years of age and older that have graduated high school in the district	Proxy of adult female education

TABLE 3.2

## STATISTICAL DESCRIPTION OF VARIABLES

Variable	Obs	Mean	Std. Dev.	Min	Max
accredlvl	179	66.70559	11.4479	32.2	95.4
cppallocper	179	3.884809	2.237775	0	10.76923
frl	179	47.41173	18.21344	6.2	87.5
teachavsal	179	40347.02	6159.353	26598	62086
pupteachrat	179	14.08603	4.017123	5.3	33.4
elemoper	179	9186662	2.43E+07	0	1.71E+08
midoper	179	3386478	8463821	-4042	5.70E+07
highoper	179	5531247	1.44E+07	0	1.13E+08
pupfund	179	2.881006	1.852292	0	13
instfund	179	3.07933	2.102611	0	11.2
admintotaldfund	179	8.983799	3.281839	2	18.5
malehs	179	9.465978	2.690047	2.93	20.92
femhs	179	9.439888	2.269783	2.88	14.73
totyears	179	12.08531	2.851737	3.79	25.67

FIGURE 3.1  
SCATTER OF ACCREDITATION SCORES AND PERCENT OF A  
DISTRICT RECEIVING FREE AND REDUCED LUNCH



The scatter above reflects the relation between accreditation scores and the percent of a school district that receives free and reduced lunch, and it is evident that a best-fit line would go from the upper left quartile to the lower right one. The most apparent explanation of this scatter plot would be that poorer scoring schools have poorer students and thus have more students eligible for free and reduced lunch. These poorer schools do not usually score well in regards to accreditation in Colorado, thus there is some correlation between students and district wealth.

FIGURE 3.2

SCATTER OF ACCREDITATION SCORES AND INSTRUCTIONAL STAFF  
EXPENDITURES AS A PERCENT OF ALL EXPENDITURES



In the graph above, it is apparent that there is a downward trending line from left to right, indicating that as instructional staff spending increases, accreditation scores decrease. There are two possible reasons for this, the first being that schools that need to spend more on instructional staff development have poorer quality of teachers. The content and process of providing learning experiences for those teachers are most likely already present and do not need additional spending. The second possibility is that wealthier, better scoring districts need to spend a lesser percentage of their total funds on instructional staff. This would happen if there were a threshold

of marginal return for expenditures on a district's instructional staff and the wealthier districts could meet said threshold with less percentage of their total funds.

The data used in this study was specifically chosen to best determine not only accreditation scores of school districts in Colorado but also the quality and underlying factors of education. In theory, a school and its district are similar to a production function, with each of the inputs affecting the final output. When a school district is examined under the same lens, three general factors are seen with many smaller aspects within them. The big three factors are students, teachers, and expenditures. From the work above, it becomes apparent not just one variable can represent each of these factors, but that many are needed. Thus, three or four variables were selected, at least, to control for the larger groupings. The data above has been summarized and explained, but has not been calculated in regards to each other. In order to understand the importance of each variable, they must be regressed together. In this next section, Methodology, it will be explained how the data is controlled in relation to the other variables and what these outcomes means.

### **Methodology**

An OLS regression is used to understand and analyze the determination of school performance. An OLS regression is used because it will control the variables in regards to each other and acts similarly to production function that is the base theory of this study. Below is the general process of the regression, the variables that have been discussed above inserted into a regression model, and the results of the model.

## Process

The process of narrowing down to the final regression model left a lot of original variables out in the dust. The first model had 40 different independent variables and extreme cases of multicollinearity. In order to reduce the collinearity, blocks of variables (variables that measured different levels of the same thing, i.e. teacher education) were removed because they were being measured in another regard. These included teacher education levels, capital expenditures of districts at each level of schooling, education of parents at each level, and average income of families in a district. All of these variables were being measured in some other capacity and were removed because of it. Other variables were added or divided into other variables in order to create newer, better variables; this happened with pupil count and instate/out-of-state experience to give percent variables of a district and ‘totyears’, respectively. The result was the removal of 26 variables, to create a final regression model of 14 variables as show in equation 3.1.

$$\begin{aligned} \text{Accreditation score} = & \beta_0 + \beta_1 \text{cppallocper} + \beta_2 \text{frl} + \beta_3 \text{malehs} + \beta_4 \text{femalehs} + \\ & \beta_5 \text{teachavsal} + \beta_6 \text{totyears} + \beta_7 \text{pupteachrat} + \beta_8 \text{elemoper} + \beta_{19} \text{midoper} + \\ & \beta_{10} \text{highoper} + \beta_{11} \text{pupspdist} + \beta_{13} \text{pupfund} + \\ & \beta_{13} \text{instfund} + \beta_{14} \text{admintotalfund} \end{aligned} \quad (3.1)$$

The model above is used in this study, with  $\beta_0$  being the constant, and all other  $\beta$ 's are coefficients for the variables, with definitions provided earlier in the chapter.

## **Expected Outcomes**

Before the model is estimated it is important that the expected outcomes are established to be able to compare and contrast the expected and actual outcomes, so the theory behind the choices can be upheld or rethought. The expected outcomes of the variables will be explained in the three general sections: students, teachers, and expenditures.

Student variables are expected to have various effects on accreditation scores in school districts. Out of the four student variables –‘frl’, ‘malehs’, ‘femhs’, and ‘cppallocper’—‘frl’ is the only one definitely expected to have a negative coefficient because as the percent of student receiving free and reduced lunch increase, we expect the district to have less resources and the students to be, on average, at a disadvantage. ‘cppallocper’ is expected to have a positive correlation, although because it does not control for students who went through Colorado Preschool Program, only the current number, it is unclear if this variable will be significant or not. ‘malehs’ and ‘femhs’ could be either positively or negatively correlated; the effect is unclear because it may be better or worse to have a higher percentage of adults that have graduated high school only as parents and in a district.

Two of the teacher variables, ‘teachavsal’ and ‘totyears’, are expected to have significant and positive coefficients in regards to accreditation scores. It would seem apparent that the more a teacher makes and the longer they’ve taught, the higher quality and more dedicated to teaching. ‘pupteachrat’ is expected to have a negative and significant relation to accreditation scores; a district with a greater number of

pupils per teacher is most likely less personalized and less wealthy than a district of its size should be.

It is expected that the expenditure variables will be significant because as wealthier districts tend to have higher test scores, better learning, more readiness for postsecondary schooling and/or the workforce. The six expenditure variables are 'elemoper', 'midoper', 'highoper', 'pupfund', 'instfund', and 'admintotalfund' and they are all expected to have positive coefficients.

These expected outcomes should provide an opportunity to analyze if predictions prior to regression of the model were correct or not. They will be at the basis of the final discussion and underlying reasons as to why or why not the variables are important to school districts, their accreditation scores, and education in Colorado. The next chapter will provide the choice of regression and the results of that regression to compare to the expected outcomes, which will lead to conclusions being drawn between those two and their similarities and differences.

## CHAPTER V

### RESULTS

In this section, the findings of the aforementioned OLS regression on the data set will be displayed. The interpretation of these findings will help to better understand what this research is asking, which is what factors have the most significant effect on the accreditation score of a school district. The regression was performed using the computer program STATA '12, the most up-to-date version of the analysis software. Below will be a table of the results, an explanation of tests done to the data set to ensure that model errors are uncorrelated, and an explanation of the previous hypotheses in regards to the results.

TABLE 4.1  
OLS RESULTS

accredlvl	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cppallocalper	0.2052	0.3479	0.5900	0.5560	-0.4818	0.8922
frl	-0.3023	0.0447	-6.7600	0.0000	-0.3906	-0.2140
teachavsal	0.0000	0.0002	-0.1700	0.8650	-0.0003	0.0003
pupteachrat	-0.9742	0.2085	-4.6700	0.0000	-1.3858	-0.5627
elemoper	0.0000	0.0000	-1.2000	0.2330	0.0000	0.0000
midoper	0.0000	0.0000	-0.1500	0.8830	0.0000	0.0000
highoper	0.0000	0.0000	1.6300	0.1060	0.0000	0.0000
pupfund	0.0349	0.3827	0.0900	0.9270	-0.7208	0.7906
instfund	-1.3739	0.3336	-4.1200	0.0000	-2.0326	-0.7152
admintotalfund	-0.2504	0.2480	-1.0100	0.3140	-0.7402	0.2393
malehs	-0.3582	0.2637	-1.3600	0.1760	-0.8789	0.1625
femhs	-0.7888	0.3094	-2.5500	0.0120	-1.3996	-0.1779
totyears	0.5114	0.2325	2.2000	0.0290	0.0524	0.9705
constant	106.0692	8.3677	12.7000	0.0000	89.5476	122.5908

The most notable observations presented in this chapter are: 1) percent of district receiving free and reduced lunch has a statistically significant impact on accreditation scores; 2) teacher average salary does not have a statistically significant effect on accreditation scores; 3) the number of females 25 years and older with only a high school degree negatively impacts a district; 4) the percent of total students enrolled in CPP does not have a statistically significant effect on accreditation scores; 5) the amount of total funds spent on instructional staff is statistically significant and negatively correlated in regards to accreditation scores.

### **Econometric Problems**

In this section, econometric tests and the corresponding problems will be addressed. There were no major econometric problems, although some minor ones did arise during the examination of the data's variance. Once the data was regressed, four different tests were performed to test for: heteroscedasticity, non-normality of errors, multicollinearity, and omitted variables.

The first test, for heteroscedasticity, failed to reject the null hypothesis. This means that we can assume homoscedasticity and that the model errors are uncorrelated. The second test was for non-normality of errors, which was found in the data. The way to correct for non-normality of errors is to add more data to the dataset; however, there is no more data to be used from the Colorado Department of Education, or anywhere, because the number of school districts is finite and limited to 178 districts. Thus, this economic problem must be noted and taken into account as analysis of the results continues. There was no need to test for auto-correlation because this data comes from a cross-sectional of Colorado public schools from the

2010 - 2011 school year, and only the properties of a time-series data set can lead to auto-correlation. The third test run was a RESET test, which is to check for functional form errors and identify if multicollinearity is present. The test found an F-stat of .43 and can then be categorized as linear. The fourth and final test looked for omitted variables; while the test concluded that there were no omitted variables, there were some manually omitted before the regression and tests were run. A small number of variables were omitted because sufficient data could not be found. Overall, with the exception of the non-normality of errors, the tests were successful.

### **Observations of Independent Variables**

A comprehensive analysis of the variables and their implications is a necessary aspect of this research to indicate the importance of district expenditures in the Colorado public schools. It is crucial to contextualize the findings of this regression in general and in regards to each other. It is essential for this study to answer questions such as whether the effect of increasing spending on administrative staff or on instructional staff leads to higher accreditation scores in a school district. This section will highlight some of the main comparisons and important figures found in the results.

An important aspect to note is variables that were not significant and did not correlate with accreditation scores. These include ‘cppallocper’, ‘teachavsal’, ‘midoper’, and ‘pupfund’. ‘cppallocper’ was expected to be significant and positive, but it appears that current allocation of CPP slots is not a good indicator of accreditation scores. ‘teachavsal’ was expected to be significant and have a positive coefficient, and it is a surprise that is uncorrelated to district scores. Finally,

‘midoper’ and ‘pupfund’ were expected to have positive correlation to accreditation scores, though neither were even though similar measurements of district expenditures were correlated.

In order to compare and contrast the magnitude of the independent variables and effect on district accreditation scores in Colorado, it is necessary to create standardized coefficients for the variables. To generate these new coefficients, the standard deviation of each variable was multiplied by the original coefficients from the OLS regression. The new coefficient represents the effect of a one-unit change in standard deviation and will be referred to as one standard unit change. The table below indicates the aforementioned data and the standardized coefficients.

TABLE 4.2  
VARIABLES STANDARDIZED COEFFICIENTS

Variable	Std. Dev.	Coef.	Standardized Coef
cppallocper	2.24	0.21	0.00
frl	18.21	-0.30	-5.51
teachavsal	6159.35	0.00	0.00
pupteachrat	4.02	-0.97	-3.91
elemoper	24300000.00	0.00	-6.54
midoper	8463821.00	0.00	0.00
highoper	14400000.00	0.00	6.87
pupfund	1.85	0.03	0.00
instfund	2.10	-1.37	-2.89
admintotaldfund	3.28	-0.25	-0.82
malehs	2.69	-0.36	-0.96
femhs	2.27	-0.79	-1.79
totyears	2.85	0.51	1.46

The percent of total funds spent on instructional staff in a school district, or ‘instfund’, had a significantly greater effect on school district accreditation scores than any of the other variables. ‘instfund’ had a standardized coefficient of -2.89, thus for an increase of one standard unit in instructional staff spending, a decrease of

almost 3 accreditation points is expected. The correlation with accreditation scores and ‘instfund’ was a negative one, so that as spending on instructional staff increased, the accreditation scores of a school district decreased. While ‘instfund’ did meet expectations of being significant, it was not expected to have a negative correlation to accreditation scores.

The percent of a school district receiving free and reduced lunch in a district, or ‘frl’, had a standardized coefficient of -5.51. The magnitude of this coefficient is quite large, because an increase of one standard unit of students receiving free and reduced lunch, a decrease of 5.51 accreditation points is expected. ‘frl’ met the expectations that were estimated before the model was regressed in being significant and negatively correlated to accreditation scores.

The pupil-to-teacher ratio in a district, or “pupteachrat”, was negatively correlated to accreditation scores. This variable was added as a proxy for teacher availability and personal attention a student receives. The standardized coefficient of ‘pupteachrat’ was -3.91, so for an increase of one standard unit in pupil-teacher ratio, a decrease of almost 4 accreditation points is expected. ‘pupteachrat’ met the expectations that were estimated before the model was regressed in being significant and negatively correlated to accreditation scores.

‘totyears’, or the average total years of experience teachers have in a district, had a standardized coefficient of 1.46, so an increase of one standard unit in the average total years of experience teachers have in a district, an increase of only 1.46 accreditation points is expected. ‘totyears’ met the expectations that were estimated

before the model was regressed in being significant and positively correlated to accreditation scores.

These observations of select independent variables give an overview of actual effects of the variables and lead to comparison of the reasons why these variables met or did not meet the expected outcomes estimated prior to regression of the model. In the final section, an analysis of the findings and implications of the regression will be examined and conclusions will be drawn as to why these variables did or did not meet expectations

## CHAPTER VI

### DISCUSSION

The primary purpose of this study was to examine and evaluate the economic indicators of education, specifically in Colorado. Like most firms, the educational system has been treated like a production function and because of this, it is possible to analyze the inputs and output of the system numerically. Ever since the creation of standardized testing, everyone from school districts to politicians has used these scores as the primary numeric output of schools. However, a shift in the educational environment has led Colorado to begin assigning “accreditation scores and levels” to its districts to provide a more comprehensive analysis of its districts. With this as the measured output, this study then focused on data provided by the Colorado Department of Education and other government resources to exemplify the three most important components of education as inputs: the students, teachers, and expenditures. These three encompass much of the measureable aspects of education and anywhere from three to six major variables were selected to proxy for these components. This section will discuss the findings, implications, and possibility for future research of the regression model that encompassed all variables representing students, teachers, and expenditures in regards to accreditation scores in school districts in Colorado.

## Findings

This section will offer an overview of what was found from the model and whether that confirms or denies what the expected outcomes had been hypothesized.

The first findings discussed will be those related to students, specifically the variables 'frl', 'malehs', 'femhs', and 'cppallocper'. 'frl', or the percent of students in a district receiving free or reduced lunch, was found to be significant and negatively correlated, as expected. As Sirin mentioned, school districts with higher percents of socioeconomically disadvantaged families tend to have worse school districts, less educated parents, and less to spend on operating and capital costs (Sirin 2005). This will be an important factor to examine in policy implications because 'frl' had one of the highest standardized coefficients out of 13 variables.

'malehs', or adult males in the district with only a high school degree, was correlated to accreditation scores, though much less so than most of the other variables and only had a standardized coefficient of -0.96. On the other hand, 'femhs' or adult females in the district with only a high school degree, was strongly correlated with accreditation scores and had a standardized coefficient of -1.74. From the literature as well as inference, it would seem that the more high school only female graduates in a school district brings down accreditation scores because this means there are less female college graduates and thus, less college educated mothers who have been shown to raise children with higher educational achievement.

'cppallocper', or the ratio of Colorado Preschool Program (CPP) slots allocated to a district based on its size, was not correlated to accreditation scores. This was surprising because much of the literature highlighted how well students do when

they are enrolled in a preschool program. There are a few reasons why ‘cppalloper’ was not significant in this model. The first reason is that the variable was calculated by dividing current CPP slot allocations by the pupil count for each district. The increase or variation from year to year, or growth in school districts, could affect how many current students actually participated in CPP when they were younger. The second reason is that the program itself may not be of the same quality as Head Start or the Perry School Program, so similar results cannot be expected. The third reason could be that early childhood education programs and their presence do not actually have a positive effect on educational attainment or success. Due to the way ‘cppalloper’ was calculated, it seems as though the first reason is the most likely as to why there was no correlation.

The second findings discussed will be those related to teachers, specifically the variables ‘pupteacherat’, ‘teachavsal’, and ‘totyears’. ‘pupteacherat’ is the average pupil-teacher ratio for a school district, and was found to be significant and negatively correlated with accreditation scores, which was expected. As the number of students per teacher increase in a district, there is less personalized attention and usually less resources in a school district. The luxury of having a smaller pupil-teacher ratio is partially an indicator of a school district that can afford more teachers, but more importantly one that provides a more personalized and hands-on education.

‘teachavsal’, or the average salary for teachers in a school district, was not found to be significant in this regression model, which was not necessarily expected. While Figlio and Kenny, as well as Springer, found that teachers could not be incentivized by merit-based pay, common sense would assume that better school

districts could and would afford to pay their teachers more than poorer districts and have higher quality teachers. Either way, this model shows that average teacher salary of the district does not affect accreditation score.

‘totyears’, or the average total years of experience for teachers in a district, was found to be significant and positively correlated with accreditation scores, as expected. Teachers with more experience tend to produce better students, or are teaching in a wealthier district that has families and students who are likely to have more resources and higher educated parents.

The third and final findings discussed will be those related to district expenditures, specifically the variables ‘elemoper’, ‘midoper’, ‘highoper’, ‘pupfund’, ‘instfund’, and ‘admintotalfund’. Both ‘elemoper’ and ‘highoper’, or elementary and high school operating expenditures in a district, were significant and had the two largest standardized coefficients out of all the variables at approximately seven. However, ‘elemoper’ was negatively correlated and ‘highoper’ was positively correlated. These findings are intriguing because originally it was expected that both variables would be significant and positively correlated. If either were to be positively correlated out of the two, it would seem that elementary operating expenditures would be the one, given the extensive literature on the benefits of early childhood education. One possible reason why high school operating expenditures are more effective than elementary expenditures is because one of the four main components of accreditation scores are postsecondary and workforce readiness of students, which could give more significance to ‘highoper’. ‘midoper’ was not significant, this could be due to the less funding that middle schools receive due to being smaller than the

other two or because schools make a conscious decision to fund middle schools less. ‘instfund’, or the percent of total funds allocated to instructional staff spending, was significant but negatively correlated with accreditation scores. This could occur for a couple reasons, first being that schools have a certain threshold for instructional staff spending so wealthier schools with better accreditation scores need to spend less percent of their total funds on instructional staff. The second is it could be because districts that spend a higher percent of funds on their instructional staff neglect other, more important areas. ‘admintotatlfund’ was borderline significant and is negatively correlated to accreditation scores, which means that districts who spend proportionally more of their total funds on administration have worse accreditation scores. This could be due to spending too much on administration and not enough in other areas. ‘pupfund’, or percent of funds spent directly on the pupils, was insignificant and means that while expenditures should not be cut from these funds, they do not need to be augmented either.

From these variables, we can see that a few variables stand out in regards to accreditation scores, mainly ‘frl’, ‘femhs’, ‘pupteachrat’, ‘highoper’, ‘instfund’, and ‘totyears’. In the next section, these variables will be analyzed in order to uncover the true implications of the findings in this model regression.

### **Implications and Further Research**

In this section, the implications of the results and findings will be discussed to promote general policy implementations for school districts and state legislators. While this data may not be thorough enough for direct policy creation, it is a good beginning for policy formation and for further research to be conducted. The section

will be broken into the three main components of education: students, teachers, and expenditures.

The two variables among students with the highest correlation and standardized coefficients were 'femhs' and 'frl'. 'femhs', or adults 25 years of age and older in a district that have only graduated high school, was negatively correlated with accreditation scores. The more female adults that have only graduated high school mean higher proportions of less educated mothers, and thus, poorer performing districts. This is a self-perpetuating cycle because less educated mothers mean less educated students, who become mothers, and the cycle repeats. This variable does not give us a direct implication to policy, other than possibly focusing more on female education as opposed to males (which would be preposterous in public schools); however, it is more of an indicator that a good education perpetuates good education. The second variable, 'frl', is also difficult to propose education-related policy because it is a proxy of socio-economic status of a district. 'frl' was one of the largest and most consistent negatively correlated variables in all models and tables. This variable speaks to the difficulties that poor, disadvantaged school districts and their students face. Perhaps one of the best ways to enhance education in Colorado, and possibly America, is to transform social inequality; it seems time and time again that the widening gap between the rich and poor continues the vicious cycle of oppressing the lower classes. These two variables help explain how the poor and uneducated cannot escape from this cycle; further research would look into how the issues between social inequality and education can be solved because the issues of both enable the failure of the other. Nonetheless, it is important to see how

intertwined social inequality and education are and should always be considered in future research regarding education.

The two variables among teachers with the highest correlation and standardized coefficients were 'pupteacher' and 'totyears'. 'pupteacher' is a variable that proxies for pupil-teacher ratio and was found to be very significant and negatively correlated. Essentially, it is important to have smaller classes and a more personalized classroom setting for students. A policy implication could be from state legislators to introduce a mandatory pupil-teacher ratio in school districts, given the optimal cost-benefit of pupil-teacher ratio for districts. This could be a major area of future research for Colorado and the Colorado Department of Education that could enhance educational expenditures and increase accreditation scores throughout the state. The second teacher variable of significance was 'totyears', or average total years of experience of teachers in a district, also has some policy implications. While you cannot 'make' teachers with more experience, policy could be implemented that requires districts give priority to teachers with a given amount of experience when hiring, especially districts with accreditation scores below a certain level. Further research would be necessary to find optimal levels of experience the cost-benefit for the increase in experienced teachers and accreditation scores.

The three variables among students with the highest correlation and standardized coefficients were 'elemoper', 'highoper' and 'instfund'. 'highoper' and 'elemoper' had the two largest standardized coefficients and thus, the greater influence on accreditation scores for every one standard unit change. 'elemoper' had a negative correlation to accreditation scores, meaning that a standard unit increase of

one results in 6.54 decrease in accreditation score. On the contrary, 'highoper' had a positive correlation to accreditation scores. This implies that districts should decrease spending on operational expenditures in elementary schools and increase spending in high schools. The only way this could make sense in regards to policy implications interpretively is that districts should counteract overspending on elementary operating expenditures by increasing operating costs in high schools. Before policy is implemented in relation to these findings, further examination into correlation among accreditation score calculations and new regression of more in-depth operating expenditures should be done so that a clearer distinction between spending at different levels can be concluded. 'instfund' was also significant and negatively correlated to accreditation scores; however, this seems to be a result of poorer districts having to spend more on instructional staff as a percent of their total funds, as opposed to higher instructional staff funds being detrimental to accreditation scores. In poorer districts, there are fewer funds to be expended, and instructional staff funds are a necessary part of a functioning district. So these districts spend a disproportionate amount on this part and make cuts to other funding. Further research would require collecting complete reports on the division of district funding and examining where districts first make cuts from and how severely. Time-series data could be very interesting and helpful in this study, so as to track how districts tend to cut over time, and to examine how to better allocate funds given the amount of resources a district possesses.

The main theme that has emerged from these findings and implications is that poor districts are at an extreme disadvantage in comparison to their wealthy

counterparts. While these findings can help direct funding and attention towards some specific variables, more research will need to be done on the narrowed list to maximize each dollar spent. Social inequality or the quality of a state's educational system cannot be changed overnight; however, realizing that these inputs can be altered with the proper allocation of funds is a crucial step in a district and states attempt to improve education.

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