CAN MORE REALLY BE DONE WITH LESS?
THE IMPACT OF THE GREAT RECESSION ON SCHOOL DISTRICT EFFICIENCY IN GEORGIA

By

MATTHEW E. THOMPSON

(Under the Direction of Sally J. Zepeda)

ABSTRACT

This study sought to better understand the impact of the Great Recession of 2008 on school district performance in Georgia. Specifically, the relationship between school district funding, which decreased broadly for most districts in Georgia after 2008, and the ability to efficiently produce desired outcomes was scrutinized. In comparing the year just prior to the recession, 2008, with the same measures from 2013, it was found that districts in Georgia were significantly less efficient at producing student outcomes after the recession than just before it. Next, the nature of the relationship between of loss of funding and reduction in efficiency or effectiveness was directly examined. Two discriminant functions were developed, one for funding loss related variables and another related to characteristics of school districts at least partially under the control of district leadership. Efficiency and effectiveness outcomes were not significantly related to pure measures of funding reduction, but the discriminant function based on alterable variables was highly successful at classifying districts on their relative efficiency or effectiveness. These findings suggests some districts were better able to weather recession driven loss of funding and still maintain their ability to produce outcomes in their students. Implications and broader findings were discussed.

INDEX WORDS: Education Economics, Education Finance, School Efficiency, Educational Effectiveness, Quadriform Analysis

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CHAPTER 1

INTRODUCTION

In difficult economic times, it is a common mantra among educational leaders that more must be done with less. While understandable in context, there can be little doubt that statements such as this are to a great degree empty platitudes. Educating students properly requires sufficient funding to provide highly qualified teachers, contemporary technology, and support services to serve diverse student needs (Guthrie, Springer, Rolle, & Houck, 2007). The need for sufficient resources is particularly true of students who come from economically impoverished communities and unstable home lives (Coleman, 1966; Jencks, 1972). Since the economic downturn in 2008, school districts across Georgia have seen reduced tax digests and revenues and, as a consequence, systems have been subsequently forced to reduce expenditures (Georgia Department of Education, 2012). Between 2008 and 2012, 132 of Georgia's 180 school districts saw their property tax digest, the primary source of their local funding, decline. The average for districts that saw tax digest declines was 17.5% (Suggs, 2013).

The Georgia School Funding Association (2011) estimated that by the fiscal year 2012 the amount of total state allotments of funds to local systems had decreased by 25% during a 10-year timeframe. The loss of resources is undoubtedly not a positive one, but the extent of the damage to the quality of education in Georgia schools is to this point somewhat uncertain. Have districts been able to do more, or at least as much, with less? Or have declining revenues hurt schools in ways that will have repercussions for the state for decades to come?

The primary purpose of the study was to help better understand how the efficiency of student achievement in Georgia has been affected by economic austerity. Financial and achievement data for each district in Georgia were analyzed in an attempt to better understand this impact. To analyze and to model statistically how well schools were achieving prior to the recession, variables such as race and poverty needed to be controlled due of the complex interactions between educational inputs and outputs (Ruggiero, 2011). Once demographic variables were statistically controlled, financial data were cross referenced into the statistical model known as a quadriform, to help determine the degree to which lost revenue to Georgia districts and schools was a major driver of any loss or stagnation of such efficiency.

Statement of the Problem

Education cannot, nor should not, be separated from the broader culture, politics, governance, and social structures in which schools provide education and instruction resides. The effects of the economic downturn of 2008 have impacted virtually every aspect of contemporary American society (Lewis, 2011). The American education system is not exempt from that impact, and the effects of the collapse of the U.S. housing markets have had a strong disparate impact on the finances of schools across the country (Leachman & Mai, 2013). It is a widely accepted idea that for schools to operate effectively, they must have sufficient resources to provide the basics of a quality education (Baker, 2012; Guthrie et al., 2007). Accepting those two posits leads to possible interpretation that the reduction of financial resources may have a negative and potentially long-lasting impact on America's schools.

Assessing if this interpretation is correct is deeply complicated in that much controversy exists over how to best evaluate the performance of the various units of education from the teacher, school, district, state, and national levels (Bracey, 2006; Carnoy & Rothstein, 2013;

Hanushek, 1998). The literature on school effectiveness is replete with varying technical definitions of effectiveness, multiple and often inconsistent outcome measures, and disagreements over the proper methodology for analyzing school data (Klein, 2007). The addition of financial variables adds one more layer of controversy and complexity to an already clouded field of study.

The parameters of this field of study and its controversies make assessing the impact of the financial downturn of the past five years on school effectiveness difficult. Such an analysis must choose among competing definitions of terms such as effectiveness and efficiency, select a sufficient methodology to control for the myriad factors outside of resource financing that affect education, and theoretically outline a framework for how reduced financing would impact learning in the classroom. Difficult as these obstacles are, the potential benefits to educators, policy makers, and the general public of more clarity on the potential impact of reduced educational funding is potentially extremely valuable.

Purpose of the Study

The purpose of this study was to examine the relationship between the efficiency of schools in Georgia and the changing levels of funding these schools received over a five year timeframe in which education revenues were declining. Each school in Georgia's performance in multiple areas were analyzed for the year prior to the recession, 2008, to the most current year in which data were available, 2013, as a function of their financial inputs in the form of state, local, and federal revenues. Achievement data can be analyzed at the level of the school district, which is frequently the target of accountability programs at the state and national levels (Wainer, 2011).

Research Questions

The following research questions were addressed in this study:

1. To what extent had the efficiency of Georgia school districts, defined in the study as the relative portion of Georgia schools that are providing atypically high output given their demographics and unalterable characteristics, changed over the time frame of 2008 to 2013?
2. If indeed there were significant changes during that time frame to what extent can these changes be associated with variation in funding these schools received during the same time frame and the reduction in the tax digest for those districts?
3. Are most schools in Georgia performing commensurate with their financial and demographic inputs or are some substantial portion outperforming expectations?
4. From a broader perspective, how efficient were Georgia schools during the entire time period?

Theoretical Framework

This study fits neatly into what has been called the educational production function vein of research (Houck, Rolle, & He, 2010). Educational production function studies center on examining issues of how schools perform on various outcome measures when factoring their levels of funding and other characteristics as inputs. It further assumes schools are similar to private agencies in that they seek to increase performance while minimizing costs (Rolle, 2004b). This type of efficiency fits within the theoretical framework of neoclassical economic theory. Neoclassical economics is an extremely broad school of thought that is typified by a focus on market based models of economic transaction, a focus on public or consumer choice in economic decision making, and an active bent towards increasing efficiency in such markets

(Weintraub, 1993). In this way, Neoclassical Economics is distinguishable from non-market based economic theories such as Marxism and the more current Neo-Marxist economic theory.

Neoclassical economic theory can be subdivided into many schools with the two most common contemporary models being the so called “Austrian” school, which favors laissez faire regulation policies and little governmental intervention in economic markets, and the opposing Institutional or “Keynesian” school that focus on the role institutions, often governmental, play in shaping economic behavior and improving market efficiency (Weintraub, 1993). It is important to note that while both of the major contemporary schools espouse competing economic policy and social alternatives, both have a shared ideological framework of improving market efficiency and economic growth. Thus, it is not necessary for studies of this kind to take an a priori position on the best theoretical and policy framework for education. Indeed, the purpose of such studies is often to determine the degree to which pre-existing market conditions create or hinder market efficiency, with implications for policy being the key inference from such results.

Some have argued that educational entities better typify a public choice model of economic theory (Rolle, 2004b). In such a model governmental entities, with their near monopoly on services in many sectors, do not behave strictly according to cost-minimization and profit-maximization principles that typify neoclassical economics. Public choice entities, from this perspective, have a relatively steady flow of income in the form of taxes that is only loosely tied to customer satisfaction and demand. Combined with the lack of profit incentives for its employees the behavior of public choice entities frequently appear irrational from a purely market perspective (Niskanen, 1971). Employees in such public choice entities often behave in ways that are not aligned with the goals of the district or state and can thus bring inefficiency to bear in excess of normal market based inefficiency. If correct, the posit that educational units have more complex motivations and incentive structures makes the process of evaluating efficiency far more critical, at least from an economic perspective.

The shared theoretical framework of efficiency within neoclassical economic theory is more technically defined as Pareto efficiency (Sen, 1993). The most common definition, provided by the term's coiner, Vilfredo Pareto, incorporates two separate axioms. The first is that social welfare is made better if one person in an economy can be made better off without making anyone else worse off. This leads to a potential level of Pareto efficiency in which no person can be made better off without making someone worse off. At this highly theoretical and potentially unattainable point, Pareto efficiency is reached. The assumption of most classical economic theories is the improvement of Pareto efficiency levels within a market. Second, individuals themselves, as understood and measured through their revealed preferences and behaviors are always the best judges of their own welfare. Both assumptions are not without controversy, detractors, and weaknesses, but these assumptions continue to drive much of the work within classical economics (Barr, 2012).

Efficiency and Effectiveness

In its most common usage in economics, efficiency is the degree to which an agent, whether a business, government entity, or school can convert inputs into desired outputs (Hoy & Miskel, 2007). In economics efficiency is normally classified as either technical or allocative in nature (Rolle, 2004b). Technical efficiency refers to the degree in which changes in organization structure and practice increase output while leaving input static. Allocative efficiency, conversely, refers to the broader usage of all an organization's resources to achieve desired outcomes. As an example, small tweaks to the organizational practice in a hypothetical organization may increase technical efficiency, while greater inefficiencies still exist in other areas due to misallocation of resources. Both types of efficiency are typically necessary in an organization of any complexity and both are typically analyzed in production function studies (Houck, Rolle, & He, 2010).

In education, inputs can be exogenous variables such as the culture, wealth, and familial characteristics of its students or inputs can be alterable factors of which the school or district can control to a degree and include, for example, variables such as class size, personnel, instructional practices, and curricula. The link between poverty and student achievement is a well-known and documented phenomena (Coleman, 1966; Hanushek & Rivkin, 2008; Jenks, 1972). Schools and states who perform at the highest levels academically are overwhelmingly the ones who reside in wealthier cities and counties while more impoverished educational entities lag behind (Coleman, 1966; Grissmer, Flanagan, Kowata, & Williamson 2000). Given the established influence of poverty on achievement as factor almost completely out of the control of school leaders (Coleman, 1966; Lacour & Tissington, 2011) a model of educational efficiency could possibly attempt to control for the demographic characteristics of each school.

Thus, a model of efficiency needs to attempt to account for demographic profiles of schools and districts and to attempt to identify schools that are consistently outperforming expectations based on the makeup of their students. Such schools would be said, in a manner of speaking, to be functioning efficiently even if their scores may lag behind wealthier counterparts. To use a colloquialism they are “punching above their weight.” Once identified, it might be possible to ascertain whether the downturn in economic revenue has reduced the number of such schools or otherwise reduced their ability to elicit strong performances from their students.

Indeed, in an efficient market for education, the outcomes of students on achievement testing would be overwhelmingly driven by inputs that educational leaders have control over, whereas in an inefficient market, achievement is largely or solely a function of demographic inputs. While the methods of analysis were far more subtle and complex, a simple way of stating this would be that this study attempted to determine if the reduction of financial inputs made achievement more a function of demographics or if the relationship has reduced or remained stable.

A review of the research base in educational performance and funding yields a distinct impression that the terms efficiency and effectiveness are often used in subtly different and deeply technical ways and even used interchangeably at times. In framing this study, the researcher adopted the rather commonsense view outlined by Hanushek (1986) wherein effectiveness is a rather straightforward measure of how well, either in absolute or relative terms, a school or system is performing on an outcome measure while efficiency refers to the added dimension of the cost, typically in financial terms, associated with reaching various levels of effectiveness. In short, a highly efficient school or district would be one that is highly effective while also maintaining lower, in relative terms, cost structures and requirements.

It bears mentioning that the validity of such a definition of school efficiency is highly contingent on the outcome measures used being valid or well selected. Klein (2007) argued that over specification and narrowness of measured outcomes potentially casts a skeptical pallor over the entire field of educational production function studies due to the myriad possible outcomes in education, many of which are notoriously difficult to measure.

The complex relationships between effectiveness and efficiency, as thus far defined, further necessitate covariates and controls for factors such as poverty and socioeconomic status. It is a perfectly plausible view that schools tasked with educating students from impoverished backgrounds will require more resources to be effective than will other schools. Conversely, policy makers must be rigorous in ensuring that districts are being maximally efficient with the money and resources they are provided. As Jesson, Mayston, and Smith (1987) wrote:

> Schools may argue that existing resources are inadequate and that much more could be achieved if they were given more, whilst the LEA or government might need to be assured that existing resources are being deployed in the most effective manner. What is required is a form of analysis that 'does justice' to the unique characteristics of each unit (pupil, class teacher, school, LEA...) and that helps compare their performance when each has many 'inputs' and 'outputs.' (pp. 251-252)

It is this complex nature of educational funding, classroom instruction, and programmatic choice, along with the controversial nature of measuring learning as an outcome, that makes defining terms and constructing fair models of efficiency and effectiveness so crucial in these types of studies.

The Economic Downturn

While the multi-faceted causes of what is frequently called the "Great Recession" are still a matter of much debate, the general consensus is that the worldwide economic downturn was the result of the over-leveraging of major corporations, the complete failure of the bond rating agencies, and the collapse of the U.S. housing market (Lewis, 2011). This latter point is of particular importance as the vast majority of states, including Georgia, use property tax revenue as the primary source of funding for education (Guthrie et al., 2007). The reduction of property tax digests for school districts to elicit funds, combined with years of austerity from state governments, has left school districts in Georgia extremely vulnerable to reduction in revenue. Nonetheless, the downturn has not affected all school districts uniformly. Districts vary both in extent to which their housing markets declined as well as to whether they have access to alternative revenue streams such as sales taxes, corporate property tax revenue, and federal funding (Georgia School Funding Association, 2011; Rubenstein & Sjoquist, 2003; Suggs, 2013). Figure 1.1 demonstrates the change in per-pupil revenue for the average Georgia student for the past twelve years. The typical Georgia student was funded at approximately 600 dollars less in the school year 2013 than in 2008, the year just prior to the recession. For a hypothetical district of 10,000 students a drop of this magnitude would equate to a loss of around six million dollars of system level revenue.

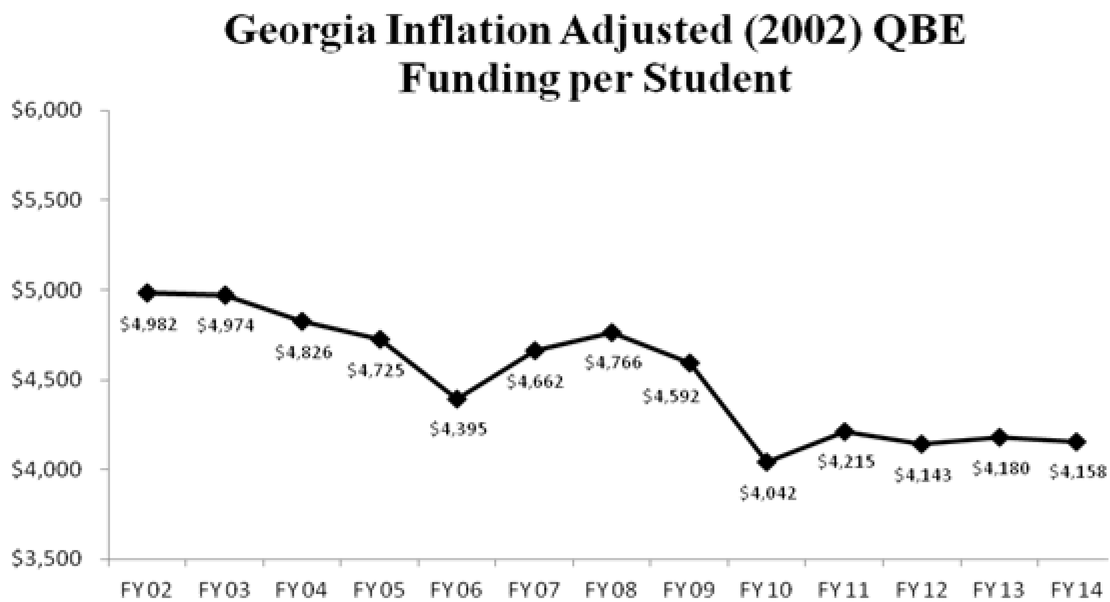

Figure 1.1. Georgia Inflation Adjusted QBE Funding per Student. Adapted with permission from "2015 Fiscal Budget Year for K-12 Education" by C. Suggs, 2014, Georgia Budget & Policy Institute, p. 2.

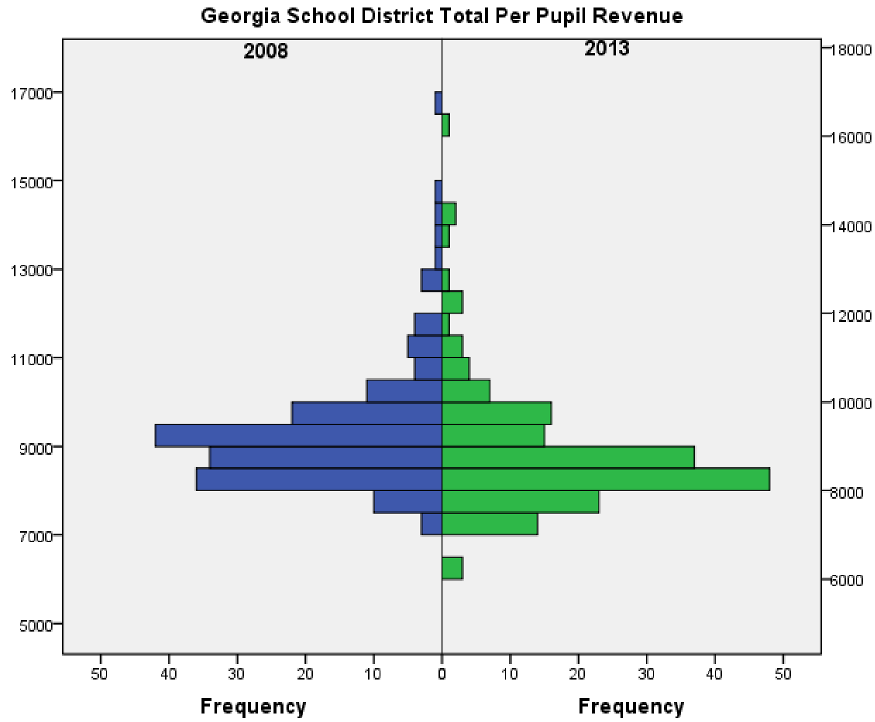

Figure 1.2. District per Pupil Revenue Distribution for 2008 and 2013.

Figure 1.2 displays the distribution of the 180 traditional school districts in Georgia based on their per-pupil revenue for the years 2008 and 2013. A clear downward shift in the distribution of funding can be observed, suggesting the loss of revenue was rather widespread across many districts, rather than limited to a few large outliers.

This scattershot distribution of funding outcomes is undoubtedly capricious and unfair to students and stakeholders, but this distribution provides fertile grounds for a natural experiment as to the relationship between financial inputs and student outcomes. Much research has been conducted that finds negligible or marginal returns on increased educational spending (Hanushek, 1986; Millimet & Collier, 2008). However, from a logical point-of-view, it is inferable that school districts require some degree of minimum level of resources to function effectively; therefore, the question arises as to how fiscally lean a district can be without seeing major reductions in its ability to educate effectively its students.

Educational Outcomes

The conflation of education and student outcomes with mere scores on an achievement test is a controversial topic within education as well as outside of it (Kohn, 2000; Phelps, 2003). There is validity to many of the criticisms and testing is at best a proxy measure of learning (Phelps, 2009). Nonetheless, the current climate of educational reform and research has largely focused on achievement outcomes and in a pragmatic sense, testing results are what stakeholders, lawmakers, and parents frequently seem to value most (Center for Education Reform, 2013; Howell, West, & Peterson, 2011). The expansion of the testing industry post No Child Left Behind creates voluminous student data that can be used to estimate student learning at every school in Georgia over an extended time frame. While proper caveats about the limitations of test data must always be respected, the sheer volume of the available data allows for statistical inferences and generalizations that researchers in previous decades could never hope to make.

Methods

Given the complexity of measuring difficult concepts such as educational efficiency and effectiveness while controlling for exogenous variables such as poverty, it is critical that the means of analysis should be chosen wisely. Education productivity studies have recently tended to use econometric models such as data envelopment analysis or stochastic frontier analysis (Houck, Rolle, & He, 2010; Rolle, 2004a) to measure the economic efficiency of educational entities. A somewhat newer approach is modified quadriform analysis (Houck, Rolle, & He, 2010; Rolle, 2004b; Stevens, 2006), which is the methodology used in this study.

The quadriform originated as a procedure for displaying relational efficiency data graphically along a two axis plane (Genge, 1991; Hickrod et al., 1990). In the most recent applications of the quadriform, in Stevens (2006) and Houck et al. (2010), the quadriform takes the form of two separate multiple regression equations that define the axes of the quadriform using standardized regression residuals to place each district along each axis. The vertical axis consists of a measure of educational output such as graduation rate, achievement scores, or college preparatory scores regressed against a set of unalterable characteristics such as district enrollment, student demographics, and community wealth. The horizontal axis uses the same unalterable characteristics to estimate per pupil expenditure. As the placement along the axis is the regression residual, a move up or down to the pole of each axis implies spending or achievement that is anomalously high or low given the district's characteristics.

Each quadrant is intended to embody a conceptual classification using the terminology of efficient/inefficient and effective/ineffective in describing the relationship between their inputs and outputs. As Houck, Rolle, & He (2010) stated, "It is worth noting that the categories of effective and ineffective both imply the same thing—namely, that districts produce outcomes commensurate with levels of inputs" (p. 339). The other two categories, efficient and inefficient, thus classify a district or school that is producing output at a level atypically higher or lower than expectations given its characteristics. Figure 1.3 displays a schematic representation of the quadriform layout.

Output	Quadrant One	Quadrant Two
↑	**Quadrant One** Efficient Low Input – High Output	**Quadrant Two** Effective High Input – High Output
	Quadrant Three Ineffective Low Input – Low Output	**Quadrant Four** Inefficient High Input – Low Output
	→ **Input**	

Figure 1.3. The quadriform diagram

The quadriform analysis was chosen as the methodology for this study because it captures the concept of identifying school districts that are achieving higher than expected results, in the form of achievement scores and other outcome measures, when factoring inputs in the form of expenditures and unalterable characteristics such as poverty. Additionally, the quadriforms taps into efficiency in a relative sense with actual performance of real schools, rather than attempting to normatively model a theoretical horizon of efficient output no actual school or district may be achieving at any given time.

Once the regression equations are completed the quadriform will either exclude or classify each school district in Georgia into one of the four defined quadrants. The quadriform analysis can be completed for a variety of outputs and will be conducted for the years 2008 and 2013, which represent the baseline pre-recession and the most recent year of available data. The change in distribution of school districts into the quadriforms for 2008 and 2013 can then be tested using a Pearson chi square test to see if any differences in the distribution of districts falling into the classification matrix between the two years is statistically significant. Second, linear discriminant analysis can be used determine if a relationship exists between classification into the inefficient and ineffective categories and reduction of the district's tax digest from the years 2008 to 2013.

Significance of the Study

The method and level of funding of schools and the ability of the educational system as a whole to efficiently deliver outcomes from students are both immensely controversial topics that frequently engender much political disagreement and controversy (Guthrie et al., 2007; Hanushek, 1986). This study used a relatively new and promising technique, the modified quadriform, to analyze the relative efficiency of Georgia school districts before and after the recession of 2008-2012. The potential benefits of such data could be substantial given the controversies over school performance and funding.

Additionally, Guthrie and Peng (2010) argued that the rapid expansion of educational spending at all levels post World War II is unlikely to continue for a variety of political, social, and structural reasons. Chief among these reasons being the looming specter of underfunded state retirement and pension funds that will be constantly strained for the foreseeable future by demographic shifts in the balance between retirees and workers. Guthrie and Peng (2010) also argued that the post-recession economic realities may become the "new normal" for school districts that must learn to reorganize and run generally leaner operations. Should the current economic reality linger it will be increasingly important for educational leaders and researchers to take the modeling of economic efficiency of outcomes seriously as a hedge against the potentially pernicious effects of declining educational revenues.

Assumptions

Any study requires assumptions, whether they are philosophical or technical, to be made and this study is no exception. The first assumption of the study was that while the specific parameters of the relationship between funding and educational effectiveness remains difficult to conceptualize (Hanushek, 1986), some minimal level of funding, personnel, and resources must be present for a school to educate its students. Put simply, schools require some minimal level of funding to operate and dropping below that point, wherever it may lie, will inevitably result in lowered effectiveness. Additionally, the researcher assumed, based on the bulk of existing evidence that the effect of poverty on educational outcomes is both significant and must be controlled to some degree to parse out the influence of funding on performance (Coleman, 1966; Hanushek & Rivkin, 2008).

Perhaps most controversially the study assumes that the results of standardized assessments such as the Georgia Criterion Referenced Competency Test (CRCT) and End of Course Tests (EOCT) represent a valid proxy of student learning. This assumption is crucial to the validity of the study and has many detractors (Kohn, 2000; Phelps, 2003). Given its importance and controversy, the usage of test scores as an outcome measure will be discussed in detail in the limitations section of this chapter.

Delimitations

The relationship under consideration in this study was between educational outcomes and reductions in funding. To model statistically that relationship it was deemed necessary to use poverty levels, measured by percentage of students at free and reduced lunch status, as a covariate in the regression model. One point of clarification must be stressed vis-á-vis poverty.

Poverty is not a reified or directly causal phenomenon when coupled with poor educational outcomes (Hunt, 2010). Poverty is, if properly understood, a collection of economic, cultural, behavioral, social, and developmental factors grouped under an umbrella term and moreover, determining that poverty causes any direct outcome is an inappropriately specified fallacy (Hunt, 2010). Some factor under that umbrella must be directly measured to draw any causal inference. Nonetheless, measures of poverty are frequently used as covariates when analyzing the efficiency of school agencies as a reflection of the strong relationships between poverty and educational outcomes (Coleman, 1966; Hanushek, 1998; Jesson, Mayston, & Smith, 1987; Klein, 2007).

Thus, no causal inferences about the role that poverty plays in educational achievement were made in this study; however, the percentage of students classified as economically disadvantaged was used as a key control and covariate in building a statistical model of efficiency in Georgia schools.

Limitations

Two broad limitations stand out as a function of this study. First, the study assumes, as do many pieces of educational research, that the results of standardized achievement scores are a valid proxy for the abstract concept of learning. The reliance on testing as a proxy measure of learning is an immensely controversial assumption that has yielded reams of criticism and the subsequent replies and rebuttals (Kohn, 2000; Phelps, 2003). It is perhaps best to simply acknowledge that such criticisms exist and ought to be taken seriously, while endorsing Hanushek's (1986) commonsense point that parents and policy makers have consistently placed a high value on achievement scores as a fair estimate of learning; and thus, research using such achievement profiles are a legitimate form of inquiry as long as the researchers do not overstep their claims in terms of generalizability to learning. Thus, achievement test scores may constitute the "least bad" option available to a researcher when exploring the impact of various factors on learning.

Second, unlike other studies in the education production function line of research, this study seeks to map out changes in the distribution of efficiency of schools over time as a function of general funding levels, rather than infer the impact of specific input based policies on outcomes. Factors such as teacher education levels, class size, teacher-student ratios, teacher experience, teacher salary, administrative inputs, and other specific factors are typically modeled against outcomes in a production function study (Hedges, Laine, & Greenwald, 1994). Conversely, this study does not attempt to measure or factor how schools spend money. Instead, the study assumes schools will have both variance and overlap in their spending patterns leading to variance in efficiency levels as a function of these choices. The key variable under examination is the restricting of these choices as a function of reduced available revenue. Thus, specific inferences about the causes of why some schools are more or less efficient cannot be inferred from the results of this study.

Definition of Terms

Allocative Efficiency – The degree to which all the various alterable inputs of a school or district are exhausted in the pursuit of a stated output (Rolle, 2004b).

Alterable Variables – Factors that school districts have some degree of control over such as the allocation of resources within a district, quality of instruction, school climate and culture, and other alterable factors.

Effectiveness – The degree to which a school or school district achieves strong performance, relative to other schools or districts, on a measure of educational output independent of the amount of inputs necessary to achieve it.

Efficiency – The degree to which a school or school district achieves strong performance, relative to other schools or districts, on a measure of educational output in relation to the amount of funding and expenditure required to actually bring about that outcome (Hickrod et al., 1990).

Normative Economics - The view within economics that certain relationships should operate within idealized or theoretically pure parameters. In other words the claim of *what should be* in economic relations (Hausman, 2013, Sen, 1970).

Positive Economics – The view within economics that economic inferences should be value free and based on actual observed data and evidence. In other words the observations of *what is* evident in economic relationships (Hausman, 2013, Sen, 1970).

Poverty – Within this study, poverty is represented as the percentage of students that are classified as receiving free/reduced lunch benefits for a particular school district.

Technical Efficiency – The degree to which a school or district is achieving maximal output given a particular set of inputs (Rolle, 2004b).

Unalterable Variables – Factors that school districts generally do not have control over such as the demographics, culture, and poverty levels of its students.

Organization of the Dissertation

Chapter 1 broadly outlines the potential problems related to the decrease of educational funding over the past five years. It also presents an overview of the theoretical considerations, technical terminology, assumptions, and controversies associated with this problem. Chapter 2 is conceptually split into three parts. The first part summarizes and comments on the existing field of research and commentary on the economics of education and the relationship between school funding and outcomes. The second section examines theoretical perspectives on education from an economic point-of-view. The final section examines the strengths and weaknesses of various methodologies of measuring school economic efficiency. The literature on each of these issues must be examined to justify the particular statistical model and perspective \ used in the present study.

Chapter 3 summarizes the methodology and statistical techniques used and the validity and reliability of the data being utilized. Chapter 4 presents the results of the analysis. Chapter 5 outlines the possible interpretations and inferences of the results and discusses limitations of the study as well as broader lessons and implications of these findings for further research, policy, and applications within school systems.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

This study sought to address what impact the reduction of school funding brought about by the Great Recession had on the economic efficiency of Georgia school districts. Four major research questions were considered.

1. To what extent had the efficiency of Georgia school districts, defined in the study as the relative portion of Georgia schools that are providing atypically high output given their demographics and alterable characteristics, changed over the time frame of 2008 to 2013?
2. If indeed there were significant changes during that time frame to what extent can these changes be associated with variation in funding these schools received during the same time frame and the reduction in the tax digest for those districts?
3. Are most schools in Georgia performing commensurate with their financial and demographic inputs or are some substantial portion outperforming expectations?
4. From a broader perspective, how efficient were Georgia schools during the entire time period?

To address these questions, a three pronged review of literature was conducted. The review of literature sought to summarize the body of research on production function research, which statistically models the impact of funding on educational outcomes, along with theoretical economic perspectives on education and critiques of various methodologies for measuring economic efficiency in education. Each area of the review undergirds some aspect of the theoretical perspective and methodological approach used in the study.

Production Function Research in Education

If everything old is eventually new again it should be unsurprising that many of the contemporary debates around the interaction of educational achievement and financial resources have clear precursors in history. Perhaps the earliest known example is William T. Harris, Superintendent of St. Louis schools, who in the late 1800's argued that all the students in his school ought to be producing equal outcomes in all ways (Guthrie et al., 2007). A somewhat chilling passage from one of Harris's works stated:

> Ninety-nine [students] out of a hundred are automata, careful to walk in prescribed paths, careful to follow the prescribed custom. This is not an accident but the result of substantial education, which, scientifically defined, is the subsumption of the individual… (Harris, 1906 as cited in Guthrie et al., 2007)

While Harris's obsessive focus on efficiency of outcome to the justification of the subsumption of the individual may seem extreme at the present, it was not terribly unusual for his time.

In his classic work, *Education and the Cult of Efficiency,* Raymond Callahan (1962) lays out in painstaking detail the history of early public schooling in America. He noted that early 20th century school leaders were, along with much of the rest of the industrial world, taken entirely with the scientific management theories of Frederick Taylor. Taylor, in his work, *The Principles of Scientific Management* (1911), laid out a systematic approach to managing workers in an organizational setting via scientific principles of time study, properly structured incentives for workers, and better organization. The end goal of Taylor's method was the rooting out of inefficiencies of process, and Taylor boasted that implementation in his factories had in many cases tripled productivity with a minimum of resource investment (Callahan, 1962)

Callahan (1962) recounts in detail the degree to which early administrators, awash in Taylor's ideas, scrutinized every aspect of the educational process for signs of inefficiency. External pressure from a society equally taken by the notion of production efficiency contributed to the movement as well. Callahan noted the public pressure from constituents, lawmakers, and the media pressured schools to organize efficiently to avoid failing students. A representative example he offers, among many others, is a 1912 editorial in *Ladies Home Journal* with the provocative title "The Case of 17 Million Children – Is Our Public-School System proving an Utter Failure?" Though the efficiency craze of the early 20th century would eventually wane, to a large degree due to the great depression and World War II, concerns about the quality and efficacy of public education in America would continue.

The Coleman Report and the Effective Schools Movement

The origins of the modern effective schools movement and its focus on efficiency of outcomes can be almost directly traced to the release of the Coleman Report, officially titled *Equality of Educational Opportunity* in 1966 (Boyd & Hartman, 1988; Guthrie et al., 1997; Rolle, 2004a). The Coleman Report was commissioned by the U.S. Department of Education and used advanced statistical techniques to analyze data from a sample of over 600,000 students. The studies primary author, sociologist James Coleman, used newly developed statistical regression techniques, now commonly referred to as production function equations, to try to tease apart the influences of schools on student achievement and outcomes while controlling the influences of family and environment. From his results, Coleman (1966) concluded that educational services were generally being provided rather equally across schools and districts (in terms of gross input categories) and that the influence of socio-economic variables, such as poverty, often dwarfed the influence of schools and instruction.

Coleman's unexpected findings created an immediate furor (Boyd & Hartman, 1988). Much of the controversy focused on the perceived impotency of schools to create outcomes in students, and the shift of the lens of efficiency from a focus on input based policies to a focus on output can largely be attributed to the Coleman Report. Of note is that Coleman's actual findings were somewhat subtler than the report's legacy. Coleman indeed did find relationships between school quality and student outcome, particularly related to quality of teachers, but these relationships were, on the whole, significantly smaller than the influence of socio-economic and demographic factors.

Coleman's datasets, and others like them, would be subject to several re-analyses over subsequent years, almost all of which reinforced his original findings (Gamoran & Long, 2006; Rolle, 2004b). The most influential of these re-analyses was conducted by Christopher Jenks (1972) in the book, *Inequality: A Reassessment of the Effect of Family and Schooling in America*. Jenks took Coleman's conclusions to an even more extreme conclusion, applying more sophisticated regression models and using the results of his analysis to argue that further attempts to improve or equalize educational services, moral justifications aside, would be unlikely to close achievement gaps or gaps in income among disadvantaged or minority students. These extremely provocative arguments had inevitable political fallout and would set much of the political tone of the debates around school input-output research in subsequent years.

Taken together, these studies drove much of the early impetus for the effective schools movement that sought to identify what characteristics were shared by schools and teachers that could overcome the influence of poverty and family and bring about stronger performance in students (Wyatt, 1996). The 1983 release of the *A Nation at Risk* report, that claimed that American public schools were "failing" students and putting the U.S. at economic risk relative to competitor nations, only exacerbated these trends (Guthrie et al., 2007). Undergirding much of this research was the production function vein of research that sought to isolate the effects of school funding on outcomes. As Rolle (2004b) argued, this line of research culminates in two dichotomous views that can be simplified in the following way: money either does not affect outcomes in education or money does affect outcomes in education.

The Evidence That Money Doesn't Matter to Student Outcomes

Given the counterintuitive nature of the findings by Coleman (1966) and Jencks (1972), a flurry of activity soon went into studying so called education production functions. Perhaps the most influential single study was a meta-analysis conducted by Hanushek (1989). Hanushek examined 187 production function equations from 30 studies that produced "startlingly consistent" results that variation in education expenditures are not systematically related to results. Hanushek tabulated his studies by multiple areas of possible input including teacher salary, teacher experience and teacher education, class size, administrative inputs, facilities, and overall expenditure per pupil. He implemented a "vote counting" methodology by which the positive or negative sign of each study analyzed was cast as a vote for or against the hypothesis that expanding financial resources to schools systematically raised student achievement.

The studies in Hanushek's meta-analysis covered myriad educational factors that could conceivably impact achievement including the effects of class size, teacher experience, teacher education, facilities, administrative inputs, and raw expenditures per pupil. Regardless of how the input variable was defined or isolated, Hanushek (1989) found the vast majority of studies, based on positive or negative signs, produced no discernible effect on student outcomes through variation in inputs. Of the studies that included measures of change in raw expenditure per pupil 80% showed either a negative or statistically insignificant relationship to student outcomes. The most studied variable, that of teacher-student ratio, showed either negative no discernible effects on student learning in 92% of studied cases. When aggregated across all variables a total of 554 significance tests can be gleaned from the 187 studies in Hanushek's sample, given that many studies tested multiple variables in their analysis. Of these 554 significant tests 82.4% were found to be insignificant in finding a relationship between financial resources and student outcomes.

Hanushek was clear, both in the 1989 study and later studies to note that the lack of systematic relationship between money and outcomes did not in fact mean that money never matters or does not matter (Hanushek, 1997). Rather, Hanushek (1989, 1997) asserted there appeared to be no systematic relationship between increasing expenditure and seeing increases in educational production. It mattered more, in his view, how money was spent rather than how much of it was spent. Hanushek termed the lack of relationship to the "failure of input based school policies" (Hanushek, 2003, p.1). Hanushek, (Hanushek, Peterson, & Woessmann, 2013) argued that educational policies, in the wake of these findings, must be focused on output based results that advocated increased spending only in areas found to produce increases in achievement. Other scholars, interpreting similar results, concluded that improvements could, in fact, be made within public education without any increase in aggregate spending (Finn, 1983; Kirst, 1983; Mann & Inman, 1984).

Some more recent findings corroborate some of Hanushek's conclusions. A large scale study conducted in South Florida by Nyhan and Alkadry (1999) found no consistent relationship between increases in any type of direct classroom spending and student achievement. Nyhan and Alkadry analyzed data using regression equations and examined the relationships between class size and per pupil spending and achievement score outcomes for 531 schools and nearly 830,000 students in south Florida. Evidence of relationships between class size and student test scores were found to be mixed with high schools showing a moderately positive relationship between class size and achievement but middle and elementary showed no real relationship between financial inputs in the form of hiring more teachers to lower class size, and student achievement scores.

Nyhan and Alkadry also found no statistically significant relationship between per-pupil spending and achievement at elementary or high schools, but did find a small relationship at the middle school level. They hypothesized this may be related to the middle school's having a lower overall level of per-pupil funding than other levels and thus money counted for more. Consistent with previous studies in the area of education production function, Nyhan and Alkadry found poverty to overwhelmingly be the most important predictor of school level achievement.

A study conducted by Walberg and Fowler (1987) examined the efficiency of nearly 600 New Jersey school districts via achievement scores and financial inputs, with socio-economic status as a control. Using standard production function regression techniques, Walberg and Fowler found inconsistent to no relationship between financial expenditure and student outcome and, consistent with previous findings, showed SES as the strongest predictor by far of achievement. Walberg and Fowler (1987) did find a small interaction effect in district enrollment size with smaller districts generally outperforming larger districts. In their conclusions Walberg and Fowler noted that "Per-student financial expenditures on education are insignificantly or inconsistently associated with achievement test scores" (p. 13).

As recently as 2012, De Pena, analyzing National Assessment of Educational Progress (NAEP) trends and state funding levels, concluded that increased levels of state funding had no discernible effect on graduation rate and ACT scores. De Pena's analysis was entirely state based and did not address variance by district within states and involved basic categorization and comparisons of state funding and outcomes with little attempt to control for demographics. Nonetheless, she concluded the lack of consistent relationship between state level spending and outcome was a clear warrant for greater investment in charter schools and public choice in education.

Critics of a systematic relationship between money and outcomes in education also point to the quadrupling of per pupil expenditures in the U.S. from the period of 1960 to the present with only modest improvements on assessments such as the National Assessment of Education Progress (NAEP) and international assessments such as Programme for International Student Assessment (PISA) to show for the investment (Rebell, Lindseth, & Hanushek, 2009; Hanushek, Peterson, & Woessman 2013; Roza, 2010). In 2005, Standard and Poor's undertook an analysis of direct spending allocations on instruction in nine states using regression models to build a "return on investment" scale, and found no relationship between the percentage of spending on direct classroom instruction and reading and math proficiency rates on the NAEP.

Hanushek, who is probably the most prolific and influential production function theorist (Baker, 2012), has in most recent years turned his interests to the estimation of educational production in international settings, arguing that failures by federal and state governments to reform the U.S. public education system have placed the U.S. at economic risk relative to better performing competitor nations (Hanushek, 1997; Hanushek, Peterson, & Woessmann, 2013; Hanushek & Woessmann, 2010). Hanushek (1997) favors a fully implemented and systematic reform package that includes greater local flexibility in spending, restructuring teacher incentives through merit pay, giving greater parental choice through charter schools, increasing accountability for schools, and using extensive value added measures to evaluate teachers for effectiveness (Rebell, Lindseth, & Hanushek, 2009).

The Evidence that Money Matters to Student Achievement Outcomes

Perhaps the strongest attack on the view that money in education does not broadly matter came from a reinterpretation of Hanushek's meta-analysis (1989) of studies showing that money did not systematically affect outcomes. Hedges, Laine, and Greenwald (1994) criticized Hanushek (1989) for the methodology in his analysis of the impact of financial resources on achievement, arguing his choice of meta-analytic methods, in this case vote counting, were questionable and ill-equipped for what he was trying to accomplish. Hedges et al (1994) asserted that vote counting, in which each study in the analysis is given a "vote" based on a positive, a negative, or an unknown sign with the tabulated results driving the conclusion, is known to be low in power and subject to Type II errors in which real and valid relationships between variables may be overlooked due to lack of sufficient statistical power and sensitivity. Hedges et al (1994) stated, "because vote counting has such low power as an inference procedure, the failure to reject a null hypothesis using this procedure is not persuasive evidence that the null hypothesis is even approximately true" (p. 6). Bracey (2004) separately questioned if around a third of the studies in Hanushek's analysis could even be argued to have examined the impact of finances on student achievement in an explicit way, rather than as merely covariates in a broader model.

Hedges et al (1994) reinterpreted Hanushek's (1989) data using a combined statistical test methodology, an inverse chi-square, which they argued was a far more sensitive and appropriate technique given the parameters of the studies and the nature of the research question. Upon completing the re-analysis of Hanushek's (1989) original data, Hedges et al. (1994) found systematic positive patterns of relations between education resource inputs and student outcomes. Hedges et al buttressed this finding with caveats that the age and nature of some of the studies made it questionable whether even their results could truly settle the issue of input-output relations in education, but they believed they had at least demonstrated the flawed nature of Hanushek's (1989) conclusions and methodology. A later analysis of some of the same data, by Wenglinsky (1997), showed that increased expenditures could be tied explicitly to reduced class size, which had been linked to greater achievement, and thus had improved efficiency.

Hanushek (1994, 1997), in turn, criticized Hedges et al. (1994) choice of methodology, arguing that since true independence of variable parameters could not be assumed between studies that a formal hypothesis test was inappropriate. Hanushek further asserted that the choice of methodology fundamentally changed the research question from the relevant "does money systematically affect outcomes in education" to the far less relevant and trivial "does money ever, under any circumstances affect outcomes in education?" Hanushek (1997) went on to criticize the statistical approaches of Wenglinsky (1997) to the class size debate, arguing that the causality could not be construed from the relationship in the manner Wenglinksy formulated. Notably, despite the heated rhetoric Hanushek (1997) and Hedges et al. (1994) agreed on several points. Namely, both Hanushek (1989; 1997) and Hedges et al. (1994) concluded that there were at least some cases in which increased funding did appear to increase performance in schools, that it was difficult to ascertain why increased funding worked in some settings but not others, and the types of spending and allocations were, overall, more important than the actual level of spending (Gamoran & Long, 2006).

The assertions of Hanushek and others that it was "how" money was spent that mattered has been examined by studying the specific allocations of funds and their impacts Cooper et al.

(1994) found a relationship between school district efficiency and the increases of funding that was specifically earmarked for instruction. Furguson (1991) took the step of looking at what higher levels of inputs (finances) actually purchased by examining the influence of levels of teacher certification and experience, measured by higher teacher salaries, and found a link to greater pupil attainment among students in classes with more experienced and educated teachers.

Kreuger (2000) reinterpreted some of the previous work of Hanushek (1986) on class size, which has clear economic factors due to the nature of personnel and salary, which had shown no relationship between class size and outcome. Kreuger argued that, when properly analyzed, a strong relationship between lower class size and achievement did indeed exist. Kreuger (2000) noted that Hanushek's meta-analyses looking at class size (Hanushek 1989, Hanushek 1997) each applied the vote counting methodology, inadvertently skewed the results by giving equal, and therefore disproportionate, weight to studies with smaller sample sizes and lower statistical power. Kreuger (2000) also recalculated the studies to show that when each individual study was weighted based on the size of the sample it contained that class size was indeed systematically related to achievement. As with his previous debates with Hedges et al. (1994), Hanushek (2000) responded to the criticisms by defending his original methodology and conclusions and accusing Kreuger of applying inconsistent and non-rigorous rules in his re-weighting of studies.

Claims about the lack of return on investment from large scale increases in education spending also have been questioned by researchers such as Bracey (2006) and Rebell (Rebell, Lindseth, & Hanushek, 2009). Bracey (2006) and Rebell (2009) similarly, but separately, asserted that critics were underestimating gains on the NAEP, and that much of the increase in spending during the past decades, had gone solely into special education; a worthy and important area of support and instruction for students, but an area unlikely to yield major increases on standardized assessments due to the inherent academic weaknesses of students identified with disabilities, along with other exogenous factors related to student disabilities.

While most of the major debates between the two sides have a strong methodological bent as researchers argued over the proper techniques to use in analyzing studies and data, other objections have emerged. Rebell (Rebell, Lindseth, & Hanushek, 2009) criticized Hanushek's and other reformers focus on an fully integrated reform packages being absolutely necessary to reverse education stagnation, arguing such a perfectly integrated packages are never politically feasible and distract from effective marginal reforms that can be made (Rebell, Lindseth, & Hanushek, 2009).

On a conceptual level, Rossmiller (1987) questioned whether it even logically followed that increase in spending, which production function studies typically argued against, would automatically be spent inefficiently. Rossmiller noted that:

> The research to date provides no definitive answer to the question, "At what level of spending do marginal returns turn down?" Adequate facilities, equipment, books and other instructional materials are necessary if a school is to be effective, but it is evident that fine facilities and abundant materials alone will not ensure school effectiveness. The research provides no basis for concluding that the level of expenditure for education should be reduced. The findings do suggest that at some level, as yet undetermined but apparently reached in developed countries, attention must increasingly turn to how resources are used in the educational process. (Rossmiller, 1987, p. 574)

Rossmiller argued it made considerably more sense argue for greater investment in education while simultaneously ensuring that increases in funding are tied to areas where links to effectiveness could be demonstrated.

Current Trends in Production function Research

While the debate over the systematic effects of increased financial resources on outcomes in education appears to have reached a stalemate; the field of educational production and efficiency studies has continued in two main directions. The first direction, sometimes called Input-Throughput-Output research, seeks to clarify and isolate the internal processes, the so-called "throughput," that allows effective schools to convert inputs to outputs. The second direction involves the attempts, often by state governments or research organizations, to use the techniques of school efficiency estimation to produce explicitly public reports on school efficiency, often for accountability or advocacy purposes.

Input-Throughput-Output Research.

Input-Throughput-Output (ITO) research uses systems perspectives to attempt to identify and understand transformational processes within organizations that allows them to effectively convert inputs, which are often financial in nature, to a wide variety of outcomes (Hoy & Miskel, 2007). Production function research is often referred to as "black box" research in that it does not generally attempt to understand the mechanism of how schools convert input into output, but rather is interested in the general levels and combination of inputs that result in greater output (Gamoran & Long, 2006). Consequently, ITO research is a much broader field than production function research in that its scope can extend beyond the mere financial-achievement dichotomy that typifies typical educational productivity studies and examine the dynamics of production between them. However, efficiency measures that attempt to quantify the relationship between financial inputs and output, or in some cases use financial variables as a co-factor, are still ubiquitous within the ITO field.

Many of the studies Hanushek (1989) used in his influential meta-analysis can be argued to be part of the ITO research field. One of the primary reasons for the recent growth in the ITO field is the wider availability of better data and accounting mechanisms of school based instructional practices than had existed in the past (Cooper et al., 1994). With better data, it became possible to examine and isolate the throughput variables driving the interaction between input and output in ways that would not have been possible previously. In most cases of ITO where financial input is used for calculating school or school district efficiency is the mechanism by which throughput processes are evaluated, rather than the primary focus of the study itself. In this way, the field is distinct from the more explicit production function research program.

Efficiency as Advocacy and Accountability.

A more recent trend in the production function field has been the increase of efficiency techniques being moved from the pages of economic and educational journals and into more public settings. Several states including Kansas (Standard & Poor's, 2007), Iowa (Pennington, 2009), Wisconsin (Wittkopf, Turville-Heitz, & Janczy, 2012), and Texas (Financial Allocation Study for Texas, 2014) have either commissioned independent efficiency studies through educational or finance think tanks and research organizations or been subject to study by them. These reports provide efficiency scores on each district in the state in public and explicit ways. The primary motivating factor, as is often stated (Financial Allocation Study for Texas, 2014; Standard & Poor's, 2007), are as attempts to better understand the specific performance of educational units to foster greater accountability and stewardship of public resources. These studies do not necessarily attempt to examine or understand the underlying systematic relationships between resources and outcomes, but instead, try to identify particularly efficient or inefficient school districts within a larger economy of schools districts.

These types of analyses can even be extended beyond the state level. In 2011, the Center for American Progress released a major research report, entitled *Return on Educational Investment: A District-by-District Evaluation of U.S. Educational Productivity* (Boser, 2014), which used standard production function techniques to classify every school district in the country on the basis of its achievement performance given its demographic and financial inputs. The report included an interactive website that allows users to drill down to data for each district. A report released by GEMS Education Solutions (Dalton, Marcenaro-Gutierrez, Still, 2014) purported to take the concept of education efficiency international by analyzing results on the PISA assessment with per pupil expenditures to determine which nations best maximized educational investment. That these reports, which use extremely complex methodology unlikely to be understood by much of the public, have major political and public relations implications for educators seems apparent. \

How Economists Misunderstand Education

Economics, like all complex disciplines, cannot be distilled down to one theory or area of study. Competing theories and frameworks animate debate and scholarship all the way to the present. The dominant paradigm in modern western economics is what is often called neoclassical economics (Lawson, 2013). Neoclassical economics is an extremely broad school that is typified by a focus on market based models of economic transaction, the role of public or consumer choice in economic decision making, and an active bent towards increasing efficiency in such markets (Weintraub, 1993). Neoclassical economics is not a unified school but has competing frameworks and theoretical perspectives within it. The two most common contemporary models are the so called “Austrian” school, which favors laissez faire regulation policies and little governmental intervention in economic markets, and the opposing Institutional or “Keynesian” school, which focuses on the role institutions, often governmental, play in shaping economic behavior and improving market efficiency (Weintraub, 1993).

One of the shared theoretical frameworks of efficiency within neoclassical economic theory is more technically defined as Pareto efficiency. The most common definition, provided by the term's coiner, Vilfredo Pareto, incorporates two separate axioms. The first axiom is that social welfare is made better if one person in an economy can be made better off without making anyone else worse off. This assertion logically allows a potential level of Pareto efficiency in which no person can be made better off without making someone worse off. At this highly theoretical and potentially unattainable point Pareto efficiency is reached. The goal of most classical economic theories is the improvement of Pareto efficiency levels within a market. Second, individuals themselves, as understood and measured through their revealed preferences and behaviors are always the best judges of their own welfare. Both assumptions are not without controversy, detractors, and weaknesses, but these assumptions continue to drive much of the work within classical economics (Barr, 2012).

Importantly, these considerations lead to two key assumptions frequently made by economists working within the neoclassical school; namely the assumption that firms and organizations are by their nature profit maximizing and that economic actors, including individuals and firms, are rational (Betts & Loveless, 2005). The goal of any firm, on this account, is to maximize gross output, usually measured by sales, while minimizing input usually measured by cost, overhead, and investment (Romer, 2006). As the difference between output and input roughly equates to profit the goal of Pareto optimization of the balance between the two is key to understanding firm behavior. An organization may be able to increase sales by a certain percentage by adding significant costs, but if the ratio of input to output between the two does not equate to net gains in profit the firm will likely choose not to do so.

The second assumption is rationality on the part of economic agents. Neoclassical economic theory has long held the idea of rationality as a primary assumption of models of behavior in economic markets. Put simply individuals and groups are assumed to act rationally in ways to maximize their self-interest (Thaler & Sunstein, 2009). It is important to clarify that rational here is used in descriptive terms. Irrational behavior is allowed under the theory. Rational here means in the sense of behaviors that enable an actor to reach their goals and desires in a direct manner. The model allows that such goals and desires themselves may be irrational, counterproductive, or even evil; but posits that individuals will be rational in pursuit of them (Kahneman, 2011). The twin assumptions of rationality of choice and the goal of profit maximization on the part of individuals and firms drives much of contemporary economic thinking.

Public Choice Theory

Since the mid-20th century, many economists have challenged the notion that publically held firms, typically administered by state, local, and federal governments, operate under the assumption of rationality and profit maximization. A new theoretical perspective, dubbed public choice theory, arose to question if such organizations lie outside of normal economic theory and if so whether their influence was pernicious or beneficent. The earliest work in this area originated with the economists Duncan Black and Kenneth Arrow, who working independently sketched out the parameters of the theory (Buchanan, 2003). Other theorists, most notably Niskanen (1971) and Tullock (1965), have added and expanded the theory greatly. The choice of the name "public choice" is intended as a counterpoint to the theory of rational choice that undergirds much modern economic thinking, but a more evocative and descriptive term that was once used, and may be helpful in grasping the theory, is non-market decision making (Buchanan, 2003).

Rolle (2004b, p. 42) summarized two of the key features of public choice theory as follows.

1. Publically managed organizations lack profit motives that can influence successful performance of the organization
2. Public organizations receive recurring tax-supplied budgets whose supply is independent of satisfying customers

Michaelsen (1981) adds a third consideration in that the interaction of supply and demand in a public agency, in which there is no natural inverse relationship between the two, typically leads to economic inefficiency in which costs of production are frequently too high relative to output. Through the lens of public choice theory this relationship is further strained by an incentive structure for decision makers that frequently manifests itself as decision makers placing personal goals over official organizational goals because the costs of inefficient behaviors are relatively low (Boyd & Hartman, 1988). Rolle (2004a) explained the mechanism by which this occurs as follows:

> For instance, public schools do not generate profits; therefore, as rational, self-interested people seeking to maximize their own welfare, administrators and teachers may be inclined to maximize their non-pecuniary benefits. In other words, in place of salary bonuses and profit sharing, public education personnel seek to maximize such things as the size of their budgets, the scopes of their activities, the ease of their work, and their power and prestige. (Rolle, 2004a, p. 280)

This dynamic of self-interest driving inefficiencies in public organizations need not be viewed as selfish or unethical. Motivations for such behavior can vary widely and Are a ubiquitous aspect of economic decision making in all settings according to Neo-Classical economic theory (Weintraub, 1993).

When applied to public institutions, such as public schools, the public choice approach can be sketched out in much the following way. There are few economic incentives on the parts of educational decision makers to reduce costs (input) relative to output as the revenue to cover costs are being provided in a predictable and consistent way by the mechanisms of governance and taxation regardless of the quality of actual performance. An increase in budgetary allocation, assuming the resources are available, can be justified in many ways by bureaucrats that are either self-interested or serving needs not easily measured or a part of the organizations underlying mission (Michaelsen, 1981). Further, schools receive taxes from citizens enrolled in their district regardless of whether their children actually attend the local schools; and while widespread displeasure in school district services can certainly be problematic for leaders, it rarely leads to economic sanctions on the part of state and local governance. In short, the mechanism of action due to loss of profit motivation and the locked in nature of customer base leads public school districts to be budget maximization agencies, rather than the profit maximization agencies. Indeed the notion of profit is not really relevant at all to a public entity that can, by law, only hold excess funds in reserve.

This dynamic leads to a phenomenon in which budgetary requests and maximization increase irrespective of actual need. When examining the phenomenon of rising higher education costs, Howard Bowen (1980) coined the "revenue theory of costs" in which he argued the primary driver of increased size of budget in colleges and universities was the ever expanding revenue stream made available to institutions as a result of, at the time, increased public funding and more widely available student loan financing (Archibald & Feldman, 2008). In this line of thinking, public institutions, regardless if they are colleges or public K-12 schools spend all of the funds they are provided or that they can raise and as such revenue is the only possible constraint on cost.

Where & Why Inefficiency May Manifest

Researchers not explicitly working within the public choice paradigm have uncovered phenomena in allocation and resource funding that can be interpreted as the result of public choice dynamics in action. Roza (2009, 2010) has conducted systematic analyses of spending priorities in multiple urban districts and found deep asymmetry between stated system objectives and actual spending patterns. A typical example provided, among many others, includes a district whose strategic plan called for major focus on remedial education while, on a per pupil basis, the system was spending between 25 to 80 percent more on honors and AP classes. Roza's (2009; 2010) research has, in general, shown that districts often have spending patterns that do not match stated objectives. While some of the issues are the result of poorly designed salary schedules and funding formulas at the state level, others seem to fit lack of focus and accountability, in which district managers allot money in inefficient and sometimes capricious ways. This inefficiency can emerge through multiple related factors.

The loose coupling of bureaucratic structures in schools to the technical core of teaching has oft been cited as a possible reason for misalignment of priorities and practice in education (Meyer & Rowan, 1978). In this view of organizational structure, the actual operation and day to day function of schools and district are only loosely coupled to the actual day to day classroom instruction and teaching practices. The frequent asymmetry between school spending patterns and school goals as described by Roza (2010) may be seen as evidence of this loose coupling.

Additionally, education spending nationwide is estimated to be around 80% personnel and salary costs (Guthrie & Peng, 2010). Districts, particularly in union states, face major challenges in managing both the contracts and management of staff size and cost given the often labyrinthine politics and dynamics behind contract and salary negation coupled with employee rights (Roza, 2010). This heavy investment of personnel creates further strain on districts financially as rapidly increasing pension and health care costs are frequently absorbed by districts into general budgeting (Kaiser Family Foundation, 2012). With such a large portion of district financial resources tied into a dynamic where costs will inherently be difficult to control undoubtedly adds to potential district inefficiency in that poor decisions in personnel size and structure are difficult to walk back or re-organize without major effort and potential hardship on the part of district leaders. A district that hires too many administrators or support staff in areas unrelated to system mission and goals may be stuck with a financial albatross it finds difficult to shed.

Public Choice Theory as a Lens for Education

Public choice theorists have, by and large, been critics of public institutions and utilized their theories concerning the inefficiency of public institutions as justification for increasing market forces into public spaces, eliminating government agencies, and generally lessening governmental influence (Rolle, 2004b). Indeed, William Niskanen, one of the more influential public choice theorists, was for many years chairman of the libertarian Cato Institute which has among its advocacy the stated goal of to "shift the terms of public debate in favor of the fundamental right of parents and toward a future where government-run schools give way to a dynamic, independent system of schools competing to meet the needs of American children" (Cato Institute, 2014).

The critique of ideological slantedness in public choice theory is often raised as a flaw in the theory, but is rarely successful in disarming critics who often are fully willing to own their advocacy as tied to their research programs (Luyten, Visscher, & Witziers, 2005; Michaelson, 1981; Rolle, 2004b). Further, the political implications of the theory have, whatever its empirical value, actually strengthened and furthered the efficacy of the theory as its arguments have been explicitly cited in multiple judicial and legislative circumstances (Brown, 1996).

However, it should be noted within the context of this study that it is perfectly possible to agree with the particulars of public choice theory while rejecting the oppositional nature of its advocates towards public education. Public choice theory says that schools do not operate like businesses or traditional economic firms. This is a sentiment almost universally shared by educators of all stripes. The salient questions are whether economic considerations ought to be the only foundation on which a public good like education rests and how public agencies can manage and control the real threats to efficiency and unwarranted cost increases that result from the budget maximization tendencies in publically held organizations.

Public education as an institution has multiple charters, purposes, and values (Larabee, 2010). At various times and to varying degrees public schools have been argued as means for imparting basic skills on students, a creator of cultural cohesiveness and uniformity, a means of preparing workers for modern economies, a bastion of classical reason and values, a means of protecting national interest, and a transmitter of character and values (Corcoran & Goertz, 1995). While the multi-faceted and often conflicting purposes of public education create much controversy and disagreement over how schools should teach and be structured, it is a robust criterion that is far wider than mere economic reductionism. Welch (1998) captured these ideas:

> While recognizing the need for efficient and effective decision making, public accountability and some kind of responsiveness to state and market, however, it is still possible to resist the domination of education by increasingly narrow and technicist versions of the 'dismal science' and to insist upon a wider and fairer form of efficiency, that does some justice to notions of equality and difference, by comprehending both wider and more liberal conceptions of curriculum and the educative process and which equally embraces the interests of the 'have-nots' as well as the 'have': working-class students, recent migrants, indigenous minorities and others. (Welch, 1998, pp. 172-173)

Through the broader perspective that the entirety of what education seeks to accomplish cannot be entirely measured by the efficiency a district or school in producing achievement scores, public choice dynamics become a critical consideration that must be understood and dealt with to control costs and root out inefficiency in educational funding; while at the same time the maintaining of a vital and effective public schooling system can be justified on moral, cultural, and pragmatic grounds.

This combination of perspectives is certainly not inevitable or perfectly complementary, but neither is it mutually inconsistent. Perhaps more importantly for this study, combining public choice theory and educational efficiency as a lens of analysis necessitates a particular type of statistical methodology in evaluating school district efficiency than has been studied in the past. Such a statistical efficiency measurement ought not to be tailored specifically for market based rational choice institutions. Rather what is needed is an approach that allows efficiency to be measured in a relative sense within the public education system.

Considerations in the Measurement of Economic Efficiency in Education

The modern production function strain of research can likely be traced to the influential Coleman Report (1966) that first spurned interest and debate in the interaction of money and outcomes in education (Guthrie et al., 2007). Coleman's finding that the influence of school characteristics and practices on achievement was dwarfed by the influence of poverty and student demographic variables was both unexpected and provocative and opened up a vibrant field of research. The field, overwhelmingly referred to as production function research, attempted to systematically analyze the relationship between inputs in education, be they student characteristics or school funding and practice, and its influence on learning. Production function researchers adopted many of the econometric models and techniques of the business and financial spheres (Guthrie et al., 2007).

In a typical production function research study a species of regression was used, frequently ordinary least squares (OLS) regression, and a series of inputs that reflected both institutional characteristics such as class size, teacher experience, teacher pay, administrator pay, demographic characteristics such as levels of poverty, student ethnicity, special education status, and English learner status, and both sets of inputs regressed against a measure of student achievement or outcome, most frequently state and national test scores and graduation rates. The particular model used and variables chosen varies widely depending on what the researcher was investigating and what data were available.

The production function strain of research has, in general, failed to full clarify the systematic relationship between educational inputs and outputs and significant controversy still exists as to how to interpret the body of results (Rolle, 2004b). Nonetheless, production function studies have turned up some important findings and have been extremely influential in decision making at the judicial and legislative arenas (Brown, 1996, Levin, 1976). However, a growing argument has been made in recent years that the econometric regression models used in production function studies are inappropriate and ill-suited to fully understand the complex dynamics of public schools (Houck et al., 2010; Klein, 2007; Luyten et al., 2004; Wenger, 2000). The criticisms can be organized into four broad categories.

The Assumption of Linearity

Standard OLS regression models typically assume a linear relationship between variables (Soyer & Hogarth, 2012). There are, however, good reasons to question whether the relationship between variables in the relationships between school funding and outcomes are linear. Indeed in educational finance some have argued that most relationships are interactive and curvilinear to some degree (Hickrod et al., 1989; Stevens, 2006). Further, OLS regression's focus on average effects may occlude the existence of outliers, which in the case of production function studies would be districts or schools where inputs were having disproportionately large influence on output. Figlio (1998) argued that the traditional production function model may be systematically underestimating the impact of finance in education due to their models lack of sensitivity to non-linear and curvilinear relationships between inputs and outputs.

The Problem of Multiple Outputs

Overwhelmingly, production function studies utilize test scores as their outcome measure for their statistical models (Klein, 2007). While test scores can be argued to represent a reasonable proxy for learning and achievement (Phelps, 2003) and are certainly valued by much of the public (Zeehandelaar & Winkler, 2013), it is unquestionable that schools seek to maximize many outputs that are not readily reflected in production function studies. Schools do not operate, in a systematic sense, to maximize one single goal at a time (Wenger, 2000). At a basic level, a school district might choose to spend significant money and resources on programs and areas that it views as worthwhile and part of its mission that are either unrelated or second order to achievement scores. A short, but non exhaustive, list might include fine arts, athletics, facilities, student health and social supports, special education supports for low incidence populations, and vocational training. While some of these undoubtedly support achievement scores, they are in many cases ends in and of themselves and ends that constituents and taxpayers often value highly (Zeehandelaar & Winkler, 2013).

Indeed, even when the output measures seem highly related, such as achievement scores and graduation rates at high school, there can be explicit tradeoffs between outcomes. Wenger

(2000) analyzed 40 years of high school achievement and graduation rate data and determined that schools often faced tradeoffs on investment when choosing to improve test scores or graduation rate. Many districts appeared, based on their demographic profiles, to have more of a tradeoff than others, but in total the relationship between the two, while not zero sum, was inverse to a substantial degree.

The Assumption of Budget Minimizing Behavior

A production function model assumes that if a systematic relationship exists between spending and achievement that an increase or decrease in funding should reliably produce a subsequent gain or loss in outcome measure, usually achievement scores. This assumption holds reasonably well if it can be assumed that a school district would have no incentive to raise costs or increase budget unless it could be reliably shown to increase achievement. Public choice theory posits that in actuality public entities, such as public schools, have many incentives to maximize budget irrespective of whether the budget increase results in a gain in outcome measure at all (Michaelsen, 1981; Rolle, 2002; Rolle, 2004a). Coupled with the problem of multiple outcome measures, many of which are difficult to quantify (Klein, 2007; Wenger, 2000), the assumption that a decline or increase in funding ought to logically result in a change in outcome seems suspect and illusory.

The Problem of Underspecified and Insufficient Variables

On a deeper level, it is also unclear whether or not the relationships between inputs and outputs in a production function model can even be assumed to be related in a direct or causal way. Hanushek (1986) argues that positive correlations between teacher experience and test scores may, in some states and school districts, reflect seniority systems that allow veteran teachers freer latitude to choose higher ability students and class assignments, rather than an actual causal relationship. Additionally, many production function studies do not differentiate within types of funding in their models, which can be distorted by the nature of higher poverty schools receiving significantly higher funds due to federal subsidies gained via eligibility under Title 1 or other specialized incentive programs.

In a study of production function outcomes in New York City schools, Schwartz and Zabel (2005) found a potentially endogenous relationship in their dataset due to low performing schools receiving more money automatically as a function of their underperformance in previous years. In this way, it was difficult if not impossible to assume a cause/effect relationship between funding levels and outcomes when a plausible mechanism exists for how outcomes can to some degree drive funding. Thus, without direct theoretical evidence that funding can indeed be isolated from, or shown to be causal to, measured outcomes production function studies are at best correlational in nature.

The choice of variables can also be limiting if careful consideration is not given to their selection and nature. The use of standardized achievement measures, particularly state level assessments, to the consistent exclusion of so many others, can be seen as a limitation. Research conducted by the Fordham Foundation (2007) has cast light into the deeply inconsistent quality and rigor of state assessments under No Child Left Behind (Carey, 2007; Cronin, Dahlin, Xiang, & McCahon, 2009). One method of addressing this by eschewing pass rates, which are themselves a function of heavily inconsistent cut score setting, for z-score conversions of scale scores; but the differences in assessment force them to typically isolate a single state as their focus of analysis.

Free and reduced lunch, to the exclusion of other variables for measuring impoverishment, can also be scrutinized. Coleman (1966) in the seminal production function study noted that financial capital was not the only measure of “family background” and that social capital in families and communities was also a key consideration and potential determinant of later success in education. More recently, Lubienski and Crane (2010) analyzed free and reduced lunch data and determined that, while useful, such data was subject to distortions based on age (socio-economic status is heavily correlated with age) and birthrates (free and reduced lunch status is based on both income and number of children in the household). As such it may, if not considered carefully, occlude many important cultural trends that affect success in education and beyond (Kurki, Boyle, & Aladgjem, 2005).

Normative and Positive Economic Approaches to Education

These criticisms together constitute a challenge to the measurement of education efficiency. One possible solution is a movement towards relative efficiency models. The production function research project falls largely into what is called the normative approach to economics. Normative economics is an approach to understanding economic relations in which economists attempt to argue for how economic relationships should occur and operate given certain parameters (Hausman, 2013, Sen, 1970). It is contrasted with positive economics in which economists attempt to interpret economic behavior and relationships and to understand such relationships through a value free, fact based approach to how economies actually work. The distinction can be crudely drawn as the dichotomy between what *is* versus what *should be*. The line between normative and positive economics is often blurry and both approaches are likely necessary to truly understand economic realities and to navigate the complex interplay between the political realities of governance and the abstract scientific understanding of economic systems (Caplan & Shotter, 2008).

In the case of production function researchers the value judgment applied is that greater financial investment into public education *should* result in greater performance on measures of learning such as test scores. Evidence that such return on investment is not occurring is then argued to be evidence that public education systems are inefficient, incompetent, in need of reform, or perhaps even irreparably broken (Hanushek, Peterson, & Woessman, 2013). A positive economic approach to the issue of educational efficiency and production would conversely focus on why greater financial investment was not resulting in proportional increases in achievement. The problems discussed previously in this chapter provide multiple reasons why a simplistic view of the relationship between education funding and test scores is unlikely to truly encompass the complex realities of how money and outcomes interact in public settings.

The normative question of why greater investment in education is, apparently, not leading to greater return on achievement is an important one. However the limitations of production function approaches to public schools render such a question unanswerable at present and the broad conclusions drawn by many such researchers rests on a largely unexamined edifice of assumptions that begs a more thorough and subtle approach to better evaluating the efficiency how schools spend money and what that money can then achieve for them.

Relative Approaches to Measuring Educational Efficiency

Given these limitations some researchers have suggested alternative approaches to measuring educational efficiency (Guthrie et al., 2007). Houck, Rolle, & He (2010) argued that relative approaches to measuring the efficiency offered a potential escape from some, though not all, of the limitations of production function research. Houck, Rolle, & He centered their arguments within the public choice paradigm and argued that by looking at efficiency in a relative, rather than normative sense within a group of organizations, it was possible to explore non-linear relationships between input and output and better contextualize the political and social environments that schools operate within.

The relative models bring a practical edge to the evaluation of efficiency as they assess efficiency based on the best results by an actual school or district in the sample, which can be studied and scrutinized, rather than the average results as per OLS regression and other normative techniques. Further, relative models have more flexibility in assessing multiple outcome variables simultaneously (Rubenstein, 2005). As each unit within a relative efficiency measure is operating under very similar, if not identical funding and incentive structures, the issue of budget maximization is lessened in relative approaches.

In essence, these methods seek to define a relative degree of efficiency in which particular districts or schools can be identified as being efficient along a particular spectrum, with the most efficient schools or districts serving as a production frontier or horizon of comparison for the others. Factors that increase efficiency can then be isolated using methods such as discriminate analysis (Guthrie et al., 2007). Three primary methods of relative efficiency measurements have been utilized in educational efficiency research and include Data Envelopment Analysis, Stochastic-Frontier Analysis, and Modified Quadriform Analysis.

Data Envelopment Analysis

Data Envelopment Analysis (DEA) was originally pioneered by Charnes, Cooper, and Rhodes (1978) as a method of evaluating the performance of the efficiency of public entities (Sherman & Zhu, 2006). The primary statistical technique is to identify the most efficient single organization or group of organizations within a whole which are then used to define a production frontier on which all other units are compared (Stevens, 2006). Each unit below the production frontier is considered inefficient to some degree and a ratio of inefficiency is calculated for each unit. The DEA model can then be used to estimate, in an economic sense, the savings or gains in output if each individual unit was moved to the frontier of the most efficient units.

Stochastic Frontier Analysis

Similar to DEA, Stochastic Frontier Analysis attempts to define a production frontier on the basis of the most efficient units of a group. Its primary difference lies in more technical sophistication in defining the frontier, which is typically displayed as a curve (Stevens, 2006). Units lying below the curve, referred to as a "cost curve," are classified as inefficient and a ratio of inefficiency can be calculated for each unit (Barrow, 1991). Just as in DEA, a total cost savings of moving inefficient units onto the curve can be calculated once the analysis is complete.

Modified Quadriform Analysis

First proposed by Hickrod et al. (1989), the modified quadriforms began as an abstract method of displaying two-dimensional relationships graphically. Hickrod explained the rationale behind the quadriforms as follows:

> The crucial research question is "What could be a solid operational definition of economic efficiency for a public school district?" Suppose the answer is that a district is economically efficient if, and only if, it obtains higher than expected test scores at lower than expected costs. Then a shortened production function can be used to predict test scores that would be expected in a school district given certain characteristics over which the district has little control. The shortened cost equation can also be used to predict expenditures from variables over which, again, the school board has little control. Not there are two sets of residuals: one from the productivity equation and one from the cost equation. (Hickrod et al., 1989, pp. 5-6)

The logic behind the quadriform thus shifts the conceptual measure of efficiency from economic terms, in which outcome levels of an input-output relationship are measured against only the levels of cost required to achieve them, to a relative view that compares the relationship between input-output for a particular unit, in this case a school district, to other school districts like it (Anderson, 1996; Hickrod et al, 1989; Stevens, 2006).

In the modified quadriforms, separate regression equations are constructed using standard input-output methodology, typically attempting to predict a particular educational output from a combination of alterable and non-alterable inputs such as demographics, funding, and school characteristics. The first equation predicts the output variable, which may be achievement scores, graduation rates, or some other desirable output. The second predicts funding levels. These equations are then used to calculate standardized residual values for each district or school in the group under examination (Rolle, 2004b; Stevens, 2006).

Both residuals are then used to plot the school or district along a two dimensional plane bisected into four dimensions along each axis at the zero residual point, or the point at which a district or school's performance is perfectly in line with the regression equation. The four zones are then used to classify the district or school as efficient, inefficient, effective, or ineffective based on which of the four zones it falls into. As the classifications along each axis are binary, a zone of exclusion is setup around the zero residual point of each axis in which a particular range, typically based on the variance of the measure, are used to exclude any school or district from the analysis.

The zone of exclusion helps minimizes the risk of misclassification by eliminating school districts that are too close to their own zero residual to be effectively classified. The modified quadriform is somewhat limited in that the nature of the regressions will mean that there will always be districts classified into each of the zones, but as a tool for representing relative relationships the quadriforms provided excellent insight into the interplay of funding and achievement in a relative sense (Houck et al., 2010).

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

The purpose of this study was to examine the impact of the recession of 2008 on the productive efficiency of school districts in the state of Georgia. The study was conducted in the tradition of educational production function research, which seeks to examine the relationship between school district spending and student achievement outcomes. This chapter includes a restatement of the research questions under investigation, expands on the chosen analytic technique of the modified quadriform, and discusses the population, variables, procedures, and instrumentation used in the analysis.

Research Questions

The financial recession of 2008 had profound impact on the global and national economy, and its effects cascaded down to every level of governance, including local boards of education. Since the economic downturn in 2008, school districts across Georgia have seen reduced tax digests and revenues and, as a consequence, systems have been subsequently forced to reduce expenditures (Georgia Department of Education, 2012). Between 2008 and 2012, 132 of Georgia's 180 school districts saw their property tax digest, the primary source of their local funding, decline. The average for districts that saw tax digest declines was 17.5% (Suggs, 2013). While the relationship between educational spending and achievement is controversial and a source of heated debate (Hanushek, 1989; Hedges et al., 1994), it seems plausible to assume that the sharp decline in financial resources and expenditures for school districts in Georgia may have had some type of impact on how well districts can facilitate achievement outcomes from their particular student populations.

This study sought to examine four research questions related to the impact of the financial recession on school district efficiency in Georgia. They were as follows:

1. To what extent had the efficiency of Georgia school districts, defined in the study as the relative portion of Georgia schools that are providing atypically high output given their demographics and alterable characteristics, changed over the time frame of 2008 to 2013?
2. If indeed there were significant changes during that time frame to what extent can these changes be associated with variation in funding these schools received during the same time frame and the reduction in the tax digest for those districts?
3. Are most schools in Georgia performing commensurate with their financial and demographic inputs or are some substantial portion outperforming expectations?
4. From a broader perspective, how efficient were Georgia schools during the entire time period?

Methodology

To effectively understand the relationship between school district spending and outcomes, it is necessary for the method of analysis to be sensitive to the very strong influence of poverty and student demographics on achievement (Coleman, 1966; Grissmer, Flanagan, Kowata, & Williamson 2000). Thus, most production function research projects use some species of regression that attempt to control statistically for demographic variables when examining outcome measures for students (Wenglinsky, 1997). Further, the specific methodology or regression technique should logically encompass the operational definition of efficiency the researcher is employing in the study.

In framing this study, the researcher adopted the rather commonsense view outlined by Hanushek (1986) wherein effectiveness is a rather straightforward measure of how well, either in absolute or relative terms, a school or system is performing on an outcome measure while efficiency refers to the added dimension of the cost, typically in financial terms, associated with reaching various levels of effectiveness. In short, a highly efficient school or district would be one that is highly effective while also maintaining lower, in relative terms, cost structures and expenditures. The diagram in Figure 3.1 demonstrates the theoretical relationship between input and output in a production function study.

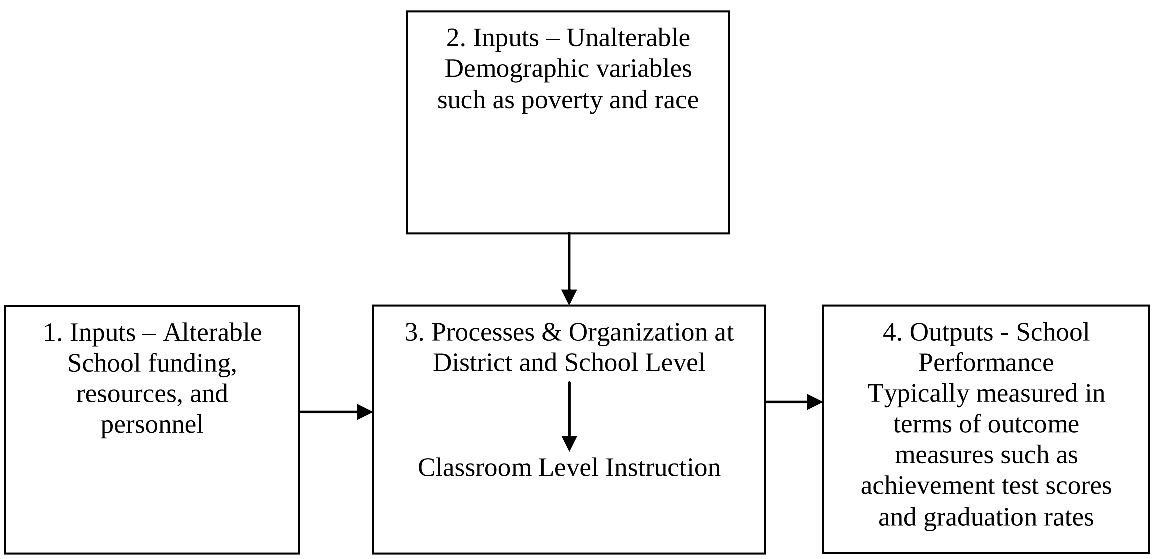

Figure 3.1. Theoretical relationship of a school system production function

In contemporary production function studies, a distinction can be drawn between studies that attempt to view the efficiency in normative fashion, in which the systematic relationship of funding to outcomes of all units under study is reduced and examined globally, and include relative approaches, which attempt to examine the relationship of units within the sample to one another and draw out relative degrees of efficiency within the sample (Guthrie et al., 2007; Rolle, 2004b). The present study was influenced by public choice economic theory, discussed in detail in Chapter 2, which argues that traditional normative econometric measures are inappropriate for the study of public entities, and thus a relative efficiency framework was chosen. Building off the previously stated definition of efficiency, coupled with the need to view efficiency relatively, the modified quadriform was chosen as the methodology for examining data on school district expenditure and student achievement in Georgia.

Modified Quadriform Analysis

First proposed by Hickrod et al. (1989), the modified quadriform began as an abstract method of displaying two-dimensional relationships graphically. Hickrod et al. (1989) explained the rationale behind the quadriforms as follows:

> The crucial research question is “What could be a solid operational definition of economic efficiency for a public school district?” Suppose the answer is that a district is economically efficient if, and only if, it obtains higher than expected test scores at lower than expected costs. Then a shortened production function can be used to predict test scores that would be expected in a school district given certain characteristics over which the district has little control. The shortened cost equation can also be used to predict expenditures from variables over which, again, the school board has little control. Not there are two sets of residuals: one from the productivity equation and one from the cost equation. (p. 5)

The logic behind the quadriform thus shifts the conceptual measure of efficiency from economic terms, in which outcome levels of an input-output relationship are measured against only the levels of cost required to achieve them, to a relative view that compares the relationship between input-output for a particular unit, in this case a school district, to other school districts like it (Anderson, 1996; Hickrod, 1989; Stevens, 2006).

In the modified quadriform separate regression equations are constructed using standard input-output methodology, typically attempting to predict a particular educational output from a selection of non-alterable inputs such as demographics, poverty, and enrollment. The first equation predicts the output variable, which may be achievement scores, graduation rates, or some other desirable outputs. The second equation predicts funding levels on a per pupil basis. These equations are then used to calculate standardized residual values for each district or school in the group under examination (Rolle, 2004; Stevens, 2006).

Both standard residuals are then used to plot the school or district along a two dimensional plane bisected into four dimensions along each axis at the zero residual point, or the point at which a district or school's performance is perfectly in line with the regression equation. The four zones are then used to classify the district or school as efficient, inefficient, effective, or ineffective based on which of the four zones it falls into. Figure 3.2 is a diagram of a typical framework for a modified quadriform.

Output	**Quadrant One** Efficient Low Input – High Output	**Quadrant Two** Effective High Input – High Output
	Quadrant Three Ineffective Low Input – Low Output	**Quadrant Four** Inefficient High Input – Low Output
	Input	

Figure 3.2. The Quadriform Diagram

The classification scheme would break out into one of four categories defined as follows.

1. *Efficient* school districts have higher than expected outcomes with lower than expected expenditures.
2. *Inefficient* school districts have lower than expected outcomes at higher than expected expenditures.
3. *Effective* school districts have higher than expected outcomes at higher than expected expenditures.
4. *Ineffective* school districts have lower than expected outcomes at lower than expected expenditures.

Anderson (1996) proposed calling effective schools in the quadriform “lighthouse” schools and ineffective schools “frugal” schools. Despite the evocative terminology, the present study retained the more symmetrical terminology scheme outlined above.

As the classifications along each axis are binary, a zone of exclusion is setup around each axis in which a particular range, typically based on the standard error of the measure, are used to exclude any school or district from the analysis. The zone minimizes the risks of misclassification of each particular school district. The specific convention for how large a zone of exclusion ought to be used is at this point not definitively established in the limited literature on the quadriform. The relative size of the exclusion zone, due to its impact of removing districts from the sample, can be seen as a tradeoff between misclassification and statistical power.

Hickrod (1989), one of the earliest users of the quadriform, recommended a zone of exclusion of 0.5 of a standard deviation while others chose the lower bound of 0.1 standard deviation units (Anderson, 1996; Houck et al., 2010). Still other researchers chose to eschew the zone of exclusion altogether (Rolle 2004a; Stevens 2006). For this study, the narrower range of

0.1 standard deviation units was chosen as a middle ground between the two extremes due to relative paucity of research studies that have utilized a quadriform technique at the time of this study.

Variables and Structure

The quadriform requires a strict separation of variables in the analysis made on the basis of their alterable and non-alterable nature (Houck et al., 2010; Stevens, 2006). Non-alterable variables, typically called unalterable variables in quadriform literature, are variables that the school district would not be expected to have control over, such as their total enrollment size, student demographics, and poverty, and the unalterable variables are used to build the two equations that classify the district in the quadriform. Alterable variables are variables the district would be expected to have at least some control over, such as teacher pay, student-teacher ratios, administrator pay, and percentage of funding allocated to instruction vs. administration, and these alterable variables are used in the discriminate analysis portion of the modified quadriform that attempts to outline correlations and relationships between alterable variables and efficiency.

Unalterable Variables

The first phase of the modified quadriform involves building separate regression equations predicting first achievement and then per-pupil expenditures from the same set of unalterable variables for each school district in the sample. The equations derived from these regressions are then applied to each district in the sample and the residuals then used to place each district on the quadriform classification matrix. The equations for each took the following form.

$$Z_i = b_0 + b_1D_{1i} + b_2D_{2i}$$

In this case, Z equals the predicted value, either per pupil expenditure or a measure of achievement or outcome, for each school district in the sample. Variables represented with a D are the unalterable demographic measures for each school district. The residuals used in placement on the quadriform are the standardized difference between the regressions predicted value and the actual value for each district then standardized. Variables used in the regressions as unalterable characteristics included total district enrollment, median household income of the county or zone served by the district, percentage of students served as free/reduced lunch, percentage of students served special education, and percentage of students served as English learners.

Alterable Variables

The second phase of the quadriform involves discriminate analysis of the classifications derived in phase one using alterable characteristics of the school district. These are variables the district would be expected to have some degree of control over, although likely not complete control. Some examples of alterable variables would include, but not be limited to, percentage of total expenditures allocated towards instruction vs. administration or operations, teacher compensation and experience levels, class size, and total instructional days reduced during the recession.

The pattern of relationships between alterable variables and the quadriform efficiency classification can then be used as fruitful areas of further research and discussion into educational production function. These relationships cannot, however, be inferred as strictly causal. Variables used in the second phase of the analysis include average teacher salary, average administrator salary, average teacher experience, student-teacher ratio, percentage of total expenditure allocated to instruction, percentage of total expenditure allocated to district and school administration, and percentage spending on special education.

An additional step was taken in this study by the key inclusion of tax digest reduction and other funding loss measures in the period following the recession of 2008. These variables adds a third step to the quadriform in that as the primary variables being examined they cannot be included as part of the first quadriform phase used to classify districts, but neither can they be strictly construed to be an alterable characteristic under the control of the district. Indeed it is the district's inability to largely control the reduction of their tax digest that is the key issue being examined in the study. Thus, a linear discriminant analysis will be separately conducted to attempt to predict classification into the quadriform from each district's unalterable funding loss characteristics from 2008 to 2013.

Outcome Variables

A limitation of the quadriform, relative to other production function techniques, is that each outcome variable must be modeled separately. Separate regression equations and quadriforms were calculated for each outcome variable examined, although the equation and residuals for predicted expenditures remained constant for all iterations of the quadriform. Following the work of Houck, Rolle, & He (2010), the separate quadriforms were then aggregated into average performance and variation across each quadriform to create a meta-efficiency rating. It was that rating that was then examined using discriminant analysis models using alterable or unalterable characteristics of districts.

Outcome variables examined were traditional state assessment and accountability measures in Georgia which included the Criterion Reference Competency Tests, given at elementary and middle school, and the End of Course Tests, administered at high school in both language arts and mathematics. To simplify and condense the myriad tests given at each grade level and subject, a total pass rate for each subject area consisting of the combined pass rate of each grade level for each district was calculated.. Quadriforms were also constructed for each district's graduation rate, mean SAT score, and mean ACT score, dropout rate, attendance rate, student retention rate, and disciplinary actions per 1000 students. Conducting separate quadriforms for multiple outcomes was intended to offset the problem of multiple outcomes discussed in detailed chapter two. Table 3.1 summarizes the alterable, unalterable, and outcome variables used in each stage of the traditional quadriform.

Table 3.1

Variables used in the two stage modified quadriform analysis

Unalterable Characteristics	Alterable Characteristics	Outcome variables
Total district enrollment	Average teacher salary	CRCT Language Arts pass rate
Percentage of student receiving free/reduced lunch	Average administrator salary	CRCT Math pass rate
Percentage of students eligible for special education services	Average teacher experience	EOCT Language Arts pass rate
Percentage of students identified as English learners	Student-Teacher ratio	EOCT Math pass rate
Percentage of students that are minority (non-white)	Percentage of total expenditure allocated to instruction	Graduation Rate
Median household income	Percentage of total expenditure allocated to administration	Mean ACT score
	Percentage spending on special education	Mean SAT score
		Disciplinary actions reported per 1000 students

Percentage of students with greater than 15 absences
Percentage of students retained
Dropout Rate

Population

The population examined was all 180 traditional school districts in the state of Georgia. Not included were non-traditional charter schools or school districts independent of local boards of education. The decision to exclude non-traditional charters derived from the small numbers of pupils enrolled at many of these districts and schools and the inconsistent availability of stable demographic and financial data for them. Additionally, the theoretical framework of public choice theory is of uncertain application to charter schools, whose method of recruiting and access to students varies considerably across Georgia and the nation.

Sources of Data

The data used in the study were derived from several sources, all of which were publically available. Data on student achievement came from datasets released annually by the Georgia Department of Education's Office of Assessment and Accountability. Financial data related to expenditures and revenues came from public datasets released annually by the Georgia Department of Education's Office of Finance and Business Operations. Data concerning tax digests and some specific demographic variables came from the annual Georgia County Guide, which is collaboratively published by the University of Georgia's Carl Vinson Institute of Government and the Center for Agribusiness and Economic Development. Data for the reduction of tax digest from 2008 to 2012 came from a dataset released by the Georgia Budget and Policy Institute. All datasets and their sources are summarized in Table 3.2.

Table 3.2

Listing of data sets

Dataset Title	Variables	Source
School System Financial Reports	Per FTE revenue Per FTE expenditure Percentage spending by category	Georgia Department of Education
Schoolhouse Squeeze	Tax digest reduction (% of total) 2008-2012	Georgia Budget & Policy Institute
Georgia County Guide	Total system enrollment System demographics Average teacher experience Average teacher salary Average administrator salary Student-teacher ratio	University of Georgia's Carl Vinson Institute of Government and the Center for Agribusiness and Economic Development.
State Test Scores	CRCT Scores by system EOCT scores by system ACT scores by system SAT scores by system	Georgia Department of Education
State Graduation Rates	Graduation Rate by system	Georgia Department of Education

All data used were selected to be salient to the 2007-2008 and 2012-2013 school years, which were the pre and post-recession years under examination. All data were combined, organized, and structured into coherent unified datasets by the researcher. Microsoft ACCESS was the database software used in conjunction with Microsoft EXCEL to build datasets. All statistical analysis was conducted with IBM SPSS Statistics Version 22.

CHAPTER 4

RESEARCH FINDINGS

The purpose of this study was to evaluate the degree to which the efficiency of Georgia school districts was affected by the loss of tax revenue brought about by the economic recession of 2008. Efficiency here is defined as a schools ability to produce outcomes when factoring in unalterable characteristics such as the relative poverty of students and other demographics variables possessed by the community of students served. The study was segmented into four research questions:

1. To what extent had the efficiency of Georgia school districts, defined in the study as the relative portion of Georgia schools that are providing atypically high output given their demographics and volitional characteristics, changed over the time frame of 2008 to 2013?
2. If indeed there were significant changes during that time frame to what extent can these changes be associated with variation in funding these schools received during the same time frame and the reduction in the tax digest for those districts?
3. Are most schools in Georgia performing commensurate with their financial and demographic inputs or are some substantial portion outperforming expectations?
4. From a broader perspective, how efficient were Georgia schools during the entire time period?

A variety of statistical approaches were employed to address each question. This chapter outlines the results of these analyses. Descriptive statistics for all measures used in this study are available in Appendix B.

Findings for Research Question 1

The first question addressed was the degree of change in efficiency between the 2007-2008 school year, the last school year budgeted and funded prior to the 2008 recession, and 2012-2013, the most recent school year in which comprehensive district level data on funding and outcomes were available. A quadriform analysis was conducted on a variety of outcome measures for both years. For the 11 discrete outcome variables, a quadriform was constructed for both 2008 and 2013. The quadriform places each school district into one of five categories, which were efficient, effective, inefficient, ineffective, or unclassified. After unclassified districts were removed from the analysis, a four category quadriform remained for each of the 11 outcome measures. To assess overall efficiency, a meta-quadriform was aggregated from each of the 11 quadriforms for both years.

The meta-quadriform plots the average of the standardized residuals for each outcome variable to the standardized residual for funding, which remains constant across all the quadriforms calculated in a particular year. To ensure arithmetic averaging was a valid approach to collapsing the 11 dimensions, the residual distributions were each tested for normality using Q-Q plots and Kolgorov-Smirnov statistics and found to be overwhelmingly normal in shape or, at least, symmetrical. As such, averaging was determined to be a valid approach to condensing the 11 dimensions into a single measure.

Comparisons were made between the quadriforms for both years on the same outcome variables with an eye to changes in the frequency of school districts classified as efficient or effective. The nature of quadriform analysis requires each district that is classified to fall into one of two binary categories, that being efficient/ineffective or effective/inefficient. As effectiveness still implies performance stronger than demographic expectancy, albeit at higher cost, the distribution of effective and efficient schools was considered relevant to the analysis at much the same level as the distribution of purely efficient districts. Table 4.1 summarizes the distribution of quadriforms and change between the two years.

Table 4.1

Distribution of Efficient and Efficient/Effective Schools for 2008 and 2013

Outcome Variable	2008 Efficient	2013 Efficient	2008 Efficient or Effective	2013 Efficient or Effective
Meta-Quadriform	42 (33.1%)	23 (17.0%)	59 (46.5%)	71 (52.6%)
ES/MS English/Language Arts	58 (40.0%)	31 (21.7%)	76 (52.4%)	68 (47.6%)
ES/MS Math	55 (38.7%)	31 (21.4%)	70 (49.3%)	75 (52.4%)
HS Literature	49 (33.8%)	30 (21.3%)	69 (47.6%)	73 (51.8%)
HS Math	55 (36.4%)	28 (19.4%)	73 (48.3%)	75 (52.1%)
Graduation Rate	43 (29.7%)	29 (19.5%)	70 (48.3%)	72 (48.3%)
ACT	43 (39.1%)	32 (23.4%)	58 (52.7%)	72 (52.6%)
SAT	56 (38.9%)	35 (24.1%)	72 (50.0%)	76 (52.4%)
Dropout Rate	44 (30.1%)	30 (20.5%)	67 (45.9%)	80 (54.8%)
Retention Rate	45 (32.4%)	41 (28.9%)	72 (51.7 %)	83 (58.5%)
Attendance Rate	53 (35.8%)	32 (21.9%)	76 (51.4%)	72 (49.3%)
Discipline per 1000 students	50 (34.7%)	30 (21.3%)	76 (52.8%)	76 (53.9%)

Percentages of school districts being labeled as efficient decreased from 2008 to 2013 on every quadriform of all 11 outcome measures. The largest absolute decreases were observed in elementary and middle school math and language arts and on the overall meta-quadriform. Both the absolute change in efficiency and effectiveness between the two years as well as the significance level and effect size of the chi square statistic between the quadriform distributions are presented in Table 4.2.

Table 4.2

Absolute Change and Significance of Quadriform Comparisons between 2008 and 2013

Outcome Variable	Chi Square Significance	Phi	Absolute Change in % Districts Efficient	Absolute Change in % Districts Efficient/Effective
Meta-Quadriform	.000*	.294	-16.1%	+6.1%
CRCT Language Arts	.000*	.264	-18.3%	-4.8%
CRCT Math	.000*	.288	-17.3%	+3.1%
EOCT Literature	.000*	.271	-12.5%	+4.2%
EOCT Math	.000*	.296	-17.0%	+3.8%
Graduation Rate	.001*	.242	-10.2%	0.0%
ACT	.001*	.250	-15.7%	-0.01%
SAT	.000*	.265	-14.8%	+2.4%
Dropout Rate	.001*	.238	-9.6%	+8.9%
Retention Rate	.001*	.240	-3.5%	+6.8%
Attendance Rate	.000*	.263	-13.9%	-2.1%
Discipline Actions per 1000 students	.003*	.221	-13.4%	+1.1%

*$p < .05$

Uniformly across all outcome quadriforms calculated a significant distributional difference was observed between 2008 and 2013 results with considerable decreases in the portion of school districts classified as efficient. Effect sizes, as measured by phi coefficients, suggest moderate to large differences between the quadriform distributions for the two years. Phi represents strength of association statistic, similar in some respects to a correlation coefficient, between categorical distributions. As such, the relatively moderate degree of association demonstrated in the phi coefficients suggests the distribution of quadriforms across a variety of outcome measures changed markedly over the course of the five year period under investigation. The comprehensive meta-quadriform distribution is summarized in Table 4.3. Note that for both years under consideration approximately 25 to 30 percent of districts were excluded from classification due to residuals on one or both axes within 0.1 standard deviations of the zero residual line.

Table 4.3---Meta-Quadriform for 2008 and 2013

Meta-Quadriform 2008		Meta-Quadriform 2013	
Efficient	Effective	Efficient	Effective
33.1%	13.4%	17.0%	35.6%
36.2%	17.3%	25.9%	21.5%
Ineffective	Inefficient	Ineffective	Inefficient
52 Districts Unclassified		44 Districts Unclassified	

Findings for Research Question 2

Research question two addressed the degree to which loss of financial revenue by school districts in the period after the 2008 recession is associated with changes in the distribution of efficiency in Georgia schools. Answering this question requires a two stage process. In the first stage, linear discriminant analysis was used to ascertain the degree to which districts could be classified within the meta-quadriform on the basis of variables related to loss of tax revenue during the recessionary period. In the second stage, linear discriminant analysis was utilized to identify which alterable characteristics, related to attributes of spending and personnel deployment, were associated with classification on the quadriform. For both stages, the classification being predicted was a binary between efficient/effective and inefficient/ineffective on the 2013 meta-quadriform.

Meta-Quadriform Classification based on Revenue Loss

Linear discriminant analysis was used to determine the degree to which classification on the meta-quadriform could be predicted as a function of loss of revenue related measures. The four variables included in the discriminate function on the 2013 meta-quadriform categories were percentage decline in total tax digest from 2009-2013, percentage change in revenue per student from 2008-2013, change in the proportion of total revenue coming from local sources from 2008 to 2013, and total tax digest per student in 2013. Table 4.4 summarizes the outcome of the data analysis.

Table 4.4

Summary for Meta-Quadriform by Funding Reduction Characteristics

Eigenvalue	Canonical Correlation	Wilkes Lamda	Chi Square	df	Sig.
.056	0.230	0.947	7.118	4	.130

Variable	Structure Matrix Weight
Change in % of revenue from local sources 2008-2013	. 680
Total tax digest per student	-.552
% Change in local tax digest 2008-2013	.438
% Change in funding per student 2008 to 2013	.436

Functions at Group Centroids

Group	Function
Inefficient/Ineffective	.247
Efficient/Effective	-.233

In general, the discriminant model constructed around funding change and level variables was not a particularly good discriminator between efficient/effective and inefficient/ineffective school districts. The model did not reach statistical significance, X^2 (1, N=135) =7.118, p=0.13, and could only account for approximately 5.3% of the variance between the two outcome classifications. The funding reduction discriminant function was only able to correctly classify 55.6% of districts into their correct quadriform classification.

Meta-Quadriform Classification based on Alterable Characteristics

Linear discriminant analysis was used to determine the degree to which classification on the 2013 meta-quadriform could be predicted as a function of multiple alterable variables related to expenditure and personnel deployment and structure. Each of these variables can be conceptualized as at least somewhat alterable and under the control of local district leaders, as opposed to the variables in the unalterable funding decrease discriminant function. Results from the analysis are summarized in Table 4.5.

Table 4.5

Summary for Meta-Quadriform by Alterable Characteristics

Canonical Correlation	Wilkes's Lamda	Chi Square	df	Sig.
.522	.727	35.056	14	.001

Variable	Structure Matrix Weight
Student-Teacher Ratio	-.428
Administrator Salary	.388
% Teachers with Advanced Degrees	.366
Average Teacher Salary	.364
Support Personnel per Student	-.347
Percentage of Revenue from Federal Sources	-.234
Average Teacher Experience Levels	.230
Total Reduction in Teacher Days 2009-2013	.225
Average Administrator Experience	.204
Percentage of Expenditure to Instruction	.194
Total Reduction in Student Days 2009-2013	.159
Total Staff Reduction 2009-2013	-.141
Administrators per Student	-.133
Percentage of Expenditure to Administration	-.073

Functions at Group Centroids

Group	Function
Inefficient/Ineffective	-.484
Efficient/Effective	.437

The discriminant model using alterable financial and personnel characteristics was far better able to classify districts along the efficient/effective and inefficient/ineffective binary than was the funding decrease model. The model overall was significant ($p<.001$) and accounted for roughly 27.2% of variance in classification on the two quadriform dimensions. The alterable characteristics function was able to correctly classify 72.3% of districts into their actual quadriform category. The alterable discriminant function was slightly more successful in classifying efficient/effective districts (76.6%) than inefficient/ineffective (67.3%).

Structure matrix coefficients are generally interpreted along the plus or minus 0.3 levels for criterion as being labeled a “contributing predictor” (Burns & Burns, 2008). Using that standard convention, the strongest variables contributing to the ability to discriminate correctly along the quadriform axis were student-teacher ratio, administrator salary, portion of teachers with advanced degrees, average teacher salary, and support personnel per student. To make the size and direction of the group differences of the function variables more clear, Table 4.6 summarizes the means of each variable in the discriminant function along with the Wilks's Lambda and p value of the tests of equality of group means.

Table 4.6

Means of Alterable Discriminator Variables by Category

Variable	Mean of Efficient/Effective	Mean of Inefficient/ Ineffective	Wilks's Lambda	Sig.
Student-Teacher Ratio	14.1	14.7	.936	.005*
Administrator Salary	84,970	81,290	.946	.011*
% Teachers with Advanced Degrees	67.4%	64.3%	.952	.017*
Average Teacher Salary	52,687	51,457	.953	.017*
Support Personnel per Student	9.0%	10.1%	.957	.023*
Percentage of Revenue from Federal Sources	10.1%	10.1%	.980	.123
Average Teacher Experience Levels	14.5	14.5	.980	.130
Total Reduction in Teacher Days 2009-2013	6.7	9.7	.981	.139
Average Administrator Experience	22.5	21.8	.985	.179
Percentage of Expenditure to Instruction	66.3%	65.1%	.986	.202
Total Reduction in Student Days 2009-2013	12.0	15.9	.991	.295
Total Staff Reduction 2009-2013	77.8	47.2	.993	.351
Administrators per Student	1:151.6	1:159.4	.993	.379
Percentage of Expenditure to Administration	4.9%	5.1%	.998	.627

* Significant at .05 level

Thus, we can infer that districts classified as efficient/effective tended to be discriminated from inefficient/ineffective schools on the basis of having lower student-teacher ratios, higher administrator pay, higher portions of teachers with advanced degrees, higher teacher salaries, and fewer support personnel per student.

The nature of the variables in question makes inferring true causality of how alterable and unalterable variables affect classification tenuous. Additionally, the effect sizes for both unalterable and alterable predictors of quadriform classification were not terribly strong. Nonetheless, evidence suggests that characteristics of expenditure and staffing that were, to some degree, alterable by school district leaders were better predictors of whether a school district was efficient/effective rather than inefficient/ineffective than were variables related to recession driven funding and tax base change. Such alterable characteristics can be, and likely were, affected by recession era pressures and decision making, but the relationship between efficiency and loss of funding was not systematically related to efficiency classifications in the quadriform. Taken together, the safest thing to say is that the impact of the recession was less a direct function of what happened to district's financial funding, and more a function of how districts were financially and systemically organized pre-recession and the decisions made by leaders during the recession itself.

Findings for Research Question 3

Previous research on Georgia school districts conducted by Houck, Rolle, and He (2010) using data from the 2005-2006 academic year, found that approximately 30% of Georgia school districts were, across four outcome measures, producing results efficiently and around 77% were producing results at above or expected results given their input levels. This latter measure was defined as all classified districts minus inefficient districts, as ineffective districts are not producing outcome results but plausibly lack resources to produce desired outcomes and thus can be considered on par with their input levels.

The results of the Houck, Rolle, & He (2010) study are not directly comparable to this study's results as far more outcome measures were used to define efficiency in this analysis, along with some methodological differences in how exclusion bands were utilized. Nonetheless, using that logical framework of efficient and on-par districts, this study found 82.7% of districts in 2008 were producing results commensurate with their input while only 78.5% were producing on par results in 2013. In 2008, 33.1% of districts were producing results efficiently while only 17.0% were producing efficient results in 2013. The graphs found in Figures 4.1 and 4.2 summarize the percentage of on-par and efficient districts across all outcome measures for 2008 and 2013.

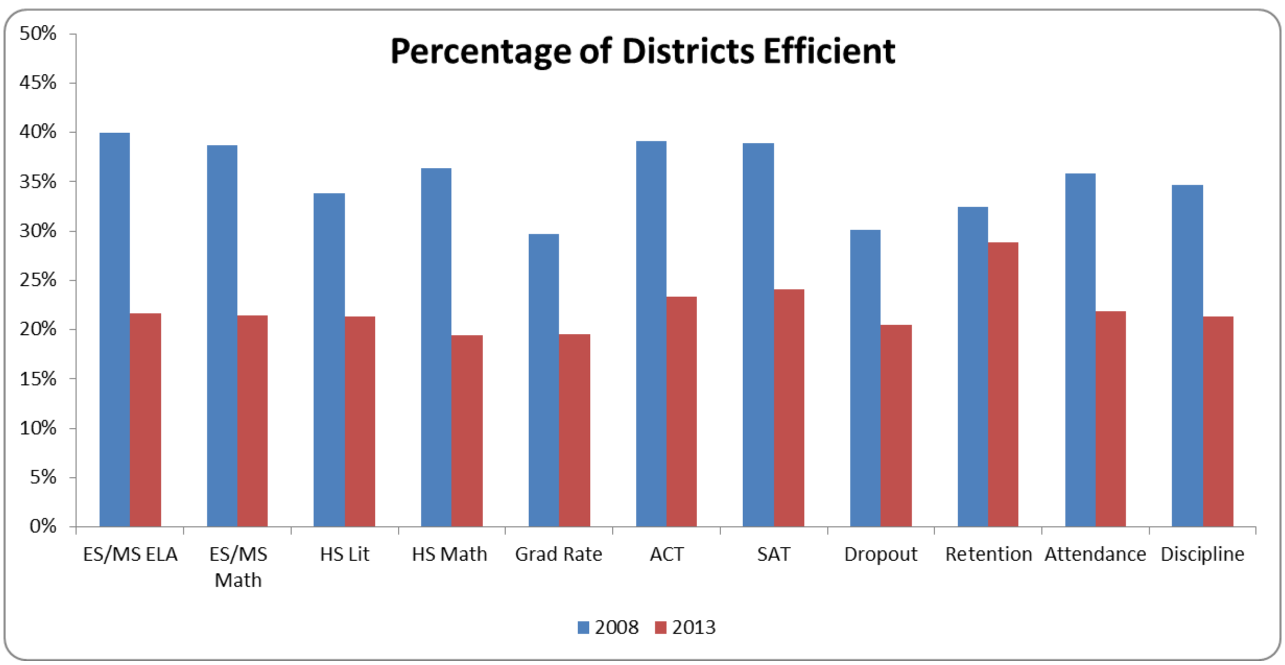

Figure 4.1

Percentage of Districts Efficient by Year

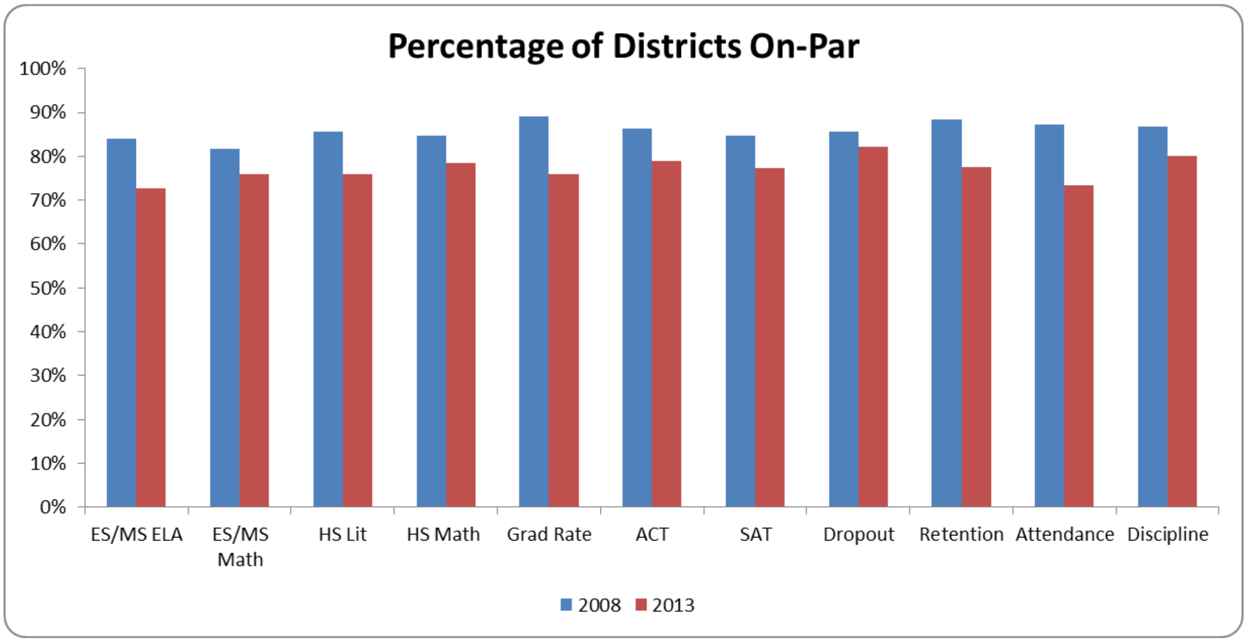

Figure 4.2

Percentage of Districts On-Par by Year

Figures 4.1 and 4.2 make clear that across every outcome measure fewer districts were either efficient or on par in 2013 than in 2008. The raw distribution of districts placed on the meta-quadriform is displayed in Figure 4.3 and Figure 4.4. These distributions demonstrate the degree of variance within each category and suggest that interpretation cannot merely be limited to categorical analysis.

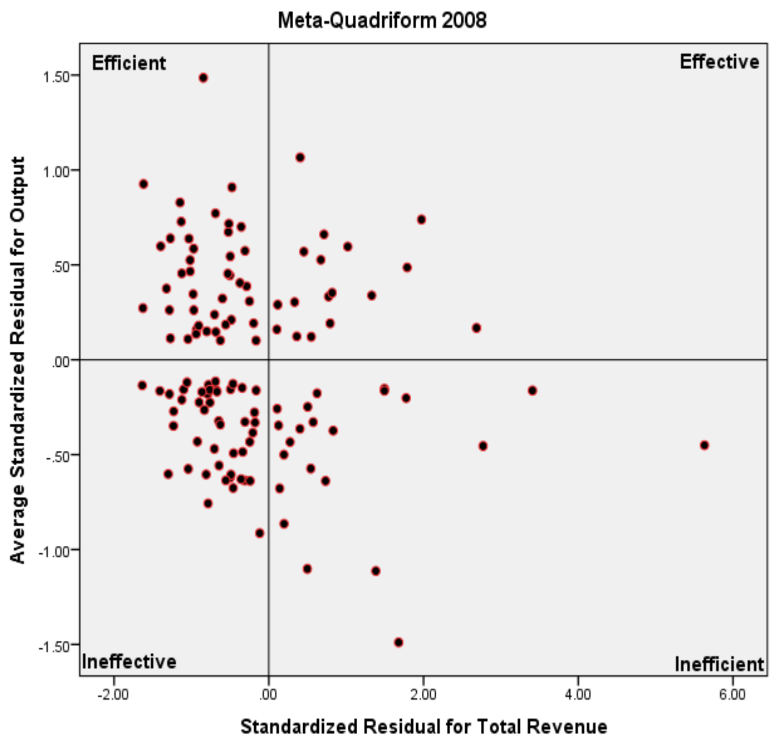

Figure 4.3

Meta-Quadriform Distribution 2008

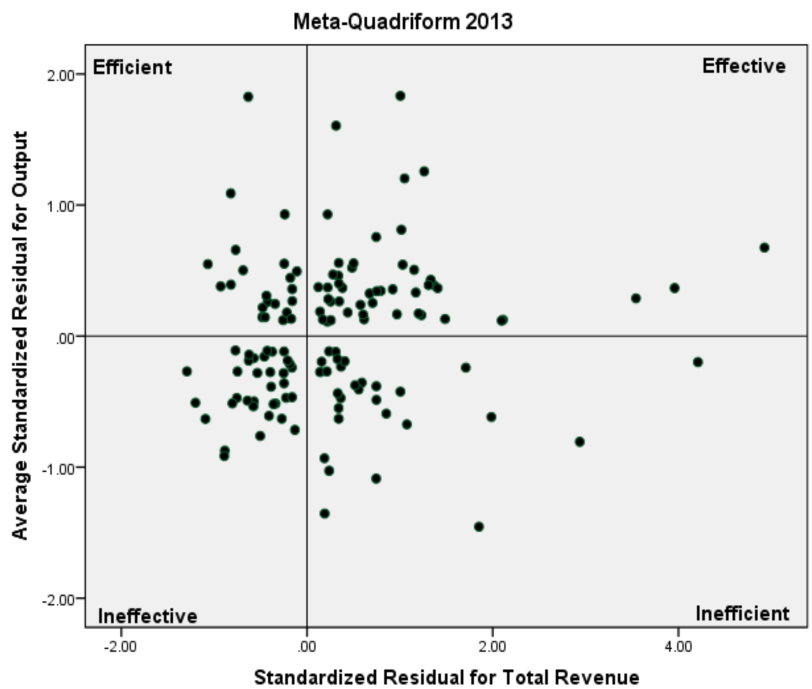

Figure 4.4

Meta-Quadriform Distribution 2013

Findings for Research Question 4

Research question four addresses the degree to which outcomes for Georgia districts are a function of demographic characteristics and if a substantial portion of districts are, based on their composition of students and community, outperforming expectations. The meta-quadriform collects the average of the standardized residuals for 11 outcome variables, each of which represents the degree to which a school district's performance on the outcome measure deviated from predictions based solely on its unalterable demographic characteristics. The histogram in Figure 4.3 plots the distribution of average standardized residuals against a normal probability plot. The distribution of outcomes does closely follow a normal distribution, but we can identify from the plot a cluster of 6 districts whose average performance across the 11 outcome measures exceeds expectations by a standard deviation or more. These districts can, in a descriptive sense, be thought of as significantly outperforming expectations in multiple areas at a level worthy of further investigation in future research. These overperforming districts are indicated by a green circle in Figure 4.5

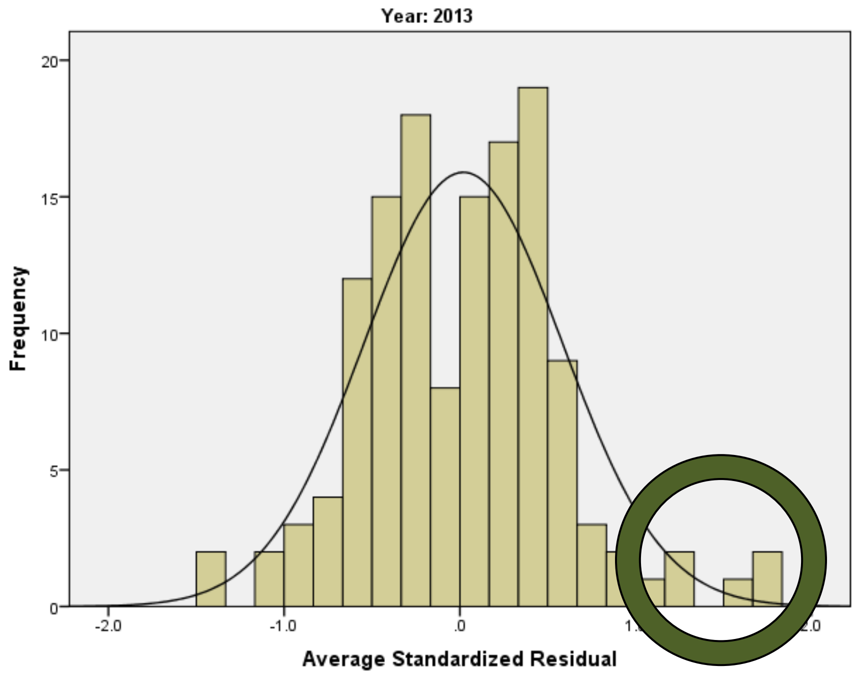

Figure 4.5

Histogram of Average Standardized Residuals 2013

A second, more comprehensive approach to answering the question involves inspection of the regression models that were used to classify districts into quadriforms. Using the r square statistic from each model, it is possible to glean what portion of the variance in outcomes is related to unalterable characteristics of the districts being examined. Table 4.7 summarizes the r square from each regression equation for 2008 and 2013 used in building school quadriforms.

Table 4.7

R Square Statistics for Quadriform Regressions in 2008 and 2013

Quadriform	2008	2013
CRCT English/Language Arts	.306	.542
CRCT Math	.397	.540
EOCT Literature	.674	.451
EOCT Math	.474	.495
Graduation Rate	.256	.360
ACT	.511	.663
SAT	.571	.663
Dropout Rate	.207	.161
Retention Rate	.369	.319
Attendance Rate	.073	.121
Discipline Actions per 1000 students	.332	.386
Funding per Student	.147	.356

Note that in 9 of the 12 regressions calculated to construct the quadriforms that the r square statistic was higher in 2013 than in 2008. In many cases, the r square was considerably higher in 2013 than pre-recession. As the predictor variables for outcome measures in the quadriform are all unalterable, demographic characteristics of the school district and its students; it can be inferred that in 2013 it was easier to predict performance on myriad outcome measures based solely on characteristics of the district and its students than it was before funding levels in Georgia decreased due to the recession. This may not be efficiency per se or as technically defined earlier in the study, but it is suggestive that the ability of districts to transcend the raw characteristics of its students and community has lessened in the past five years.

CHAPTER 5

PRINCIPLE FINDINGS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to evaluate the degree to which broad decreases in funding to public school districts in Georgia, driven largely by the Great Recession of 2008, may have impacted the ability of districts to produce outcomes in their students. As this question considers the impact of varying levels of funding on produced school district outcomes it can be broadly classified as an attempt to assess the educational efficiency of Georgia districts. More specifically, the study attempted to answer the following four research questions related to educational efficiency in Georgia:

1. To what extent had the efficiency of Georgia school districts, defined in the study as the relative portion of Georgia schools that are providing atypically high output given their demographics and volitional characteristics, changed over the time frame of 2008 to 2013?
2. If indeed there were significant changes during that time frame to what extent can these changes be associated with variation in funding these schools received during the same time frame and the reduction in the tax digest for those districts?
3. Are most schools in Georgia performing commensurate with their financial and demographic inputs or are some substantial portion outperforming expectations?
4. From a broader perspective, how efficient were Georgia schools during the entire time period?

The principle findings are summarized related to the research questions followed by discussion and analysis. Theoretical implications of the findings, as well as more practical implications, are discussed pertaining to public policy makers, education researchers, and educational leaders.

Principle Findings

In framing the principle findings, it is worth separating the four research questions under examination in this study into two classes. The first two questions posit explicit hypotheses that are directly tested. Namely, that the recession may have impacted the efficiency of Georgia school districts and that loss of funding revenue is directly tied to loss of efficiency. The latter two research questions pose more general and exploratory questions. Specifically, the degree to which performance on myriad outcomes is associated directly with non-alterable demographic characteristics of school districts and if particularly efficient or effective school districts that are overwhelmingly “beating the odds” can be identified. The following were the principle findings of the study.

1. Across every outcome measure examined, including an aggregate “meta” measure, the percentage of Georgia school districts found to be efficient on a quadriform metric in 2013 was significantly lower than the percentage found effective on the same metric in 2008. On the meta-quadriform measure 33.1% of districts were found to be efficient in 2008, compared to only 17.0% in 2013.
2. It was not possible to identify a statistically significant relationship between direct measures of funding loss during the recessionary period and classification as efficient or effective on the quadriform for 2013. Conversely, a discriminant function was found that significantly predicted classification on the 2013 quadriform using characteristics and

structures of districts that were at least somewhat under the control of the districts themselves.

3. Six districts were identified, out of a total of 179 used in the analysis, that were producing an average performance across multiple student outcome measures more than a standard deviation above their predicted performance based on the demographic characteristics of their students and communities.
4. Predictive regression models, used as part of the quadriform calculations, showed a range of variance attributable to unalterable demographics from as high as 67.4% of total variance to as low as 7.3%. More notably, in nine of twelve variables examined the r square value was higher in 2013 than in 2008, often significantly so. This suggests it was easier to predict performance on student outcome measures post-recession than prior.

Discussion of Findings

Finding 1

The finding that significantly fewer Georgia school districts could be classified as efficient in 2013 when compared to the same number in 2008 is, at first blush, rather straightforward. Namely, the prima facie conclusion is that far fewer districts in 2013 were producing above average results with below average funding than prior to the Great Recession. Three important caveats need to be made about this finding. The first is that such a finding, though stark and powerful, is not necessarily causal. A loss in school district efficiency occurring simultaneous to recession driven funding losses is certainly provocative, but more work needs to be done to make the causal mechanism behind such a loss apparent. Research question two attempted to make the relationship between funding loss and efficiency more explicit by examining the relationship directly.

The second caveat is that the quadriform itself is distributional in nature. It is not necessarily the case that a loss in overall efficiency involves the same districts. A district can, depending on the position of its outcome performances and funding level in the overall state distribution, be classified in any category in the quadriform in any given year. A degree, perhaps significant, of overall consistency is to be expected based on the nature of the underlying variables, but it is not a logical necessity. Figure 5.1 below shows how the 42 districts labeled efficient in 2008 performed on the quadriform in 2013.

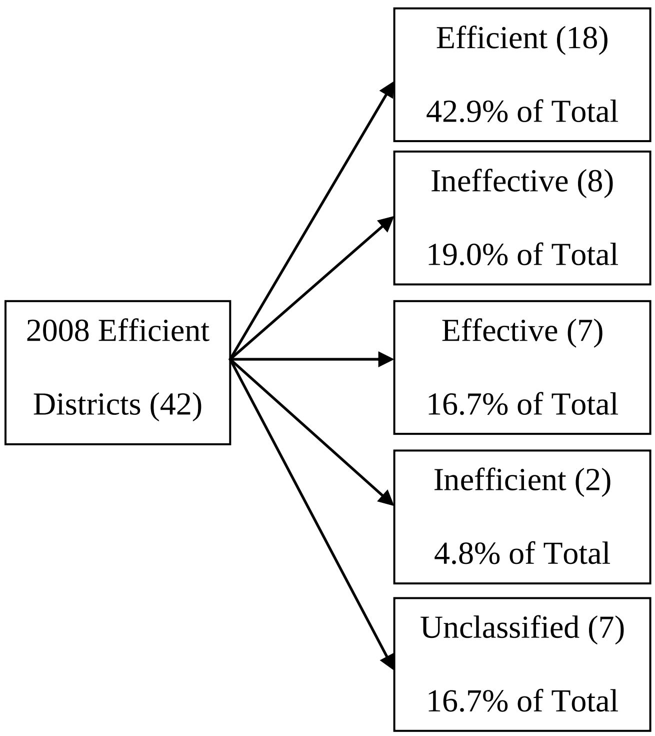

Figure 5.1

The Quadriform Classification of 2008 Efficient Districts in 2013

Nearly half of 2008 efficient districts remained efficient in 2013. This finding is suggestive of some consistency in classification across years. Eight districts, 19% of the original 42, moved to the ineffective classification, which means their funding levels stayed below average but their outcome performance moved from above to below average. Additionally, of the seven "unclassified" districts six were unclassified due to having expected levels of outcome performance while still retaining below average funding levels.

Taken together, this implies that 14 districts, 33.4% of the original 42 efficient districts, remained below average in funding but produced weaker results in 2013 than in 2008. This finding could be considered the "classic" example of efficiency loss, in which a district that was initially producing strong results despite relatively meager resources is no longer able to maintain these performances and thus slips in classification. The remaining 10 districts, those not remaining efficient or part of the 14 classic efficiency loss cases, were classified differently based on the nature of their funding changing. These would appear to be districts whose funding was below average in 2008 but, perhaps due to being better able to protect resources and whether the recession, actually had expected or above average funding in 2013 and were thus unable to be classified as efficient or ineffective at all.

The final caveat worth noting is that quadriform analysis is a relatively young and still underused econometric system for classifying district or school level efficiency. Although the quadriform analysis holds great promise and has advantages relative to other methods of efficiency classification, it is still somewhat unknown how stable scores and classification systems are across time series. The bulk of usage of quadriform analysis, at least that which has been reviewed by this researcher, has thus far utilized snapshot views of efficiency across single year performance. This is an area in need of more research and empirical data to ascertain how best to interpret change over time with quadriform analysis. Within this study, the sample of 42 efficient districts from 2008 around three quarters, 76.1% to be precise, maintained a below average funding level across both years, suggesting at least some degree of consistency across classification.

Finding 2

The second research question builds off the first by attempting to provide a measure of causality to changes in efficiency during the pre-and post-recessionary period. As a general reduction in the proportion of efficient districts between 2008 and 2013 was found, to what degree can this be attributed to loss of funding itself? To answer this research question, two separate differential equations were constructed. Both equations attempted to predict classification along the 2013 meta-quadriform along an efficient/effective or inefficient/ineffective binary. The first differential model used variables that assessed the loss of funding and revenue over the recessionary period. This model can be construed as the "unalterable" model that assesses funding characteristics that happen to districts and are almost entirely out of the hands of educational leaders. Conversely, the second attempted to predict classification using characteristics and structures of districts that are at least somewhat under the control, even if not always directly, of the district leadership. We will call this model the "alterable" model.

Results indicated that the alterable model was able to predict classification with a significant degree of accuracy. The alterable model was able to correctly classify 72.3% of districts into their quadriform categories. Conversely, the unalterable model, which was constructed to assess the direct impact of recessionary funding loss, was not able to classify significantly better than chance, only correctly classifying 55.6% of districts. Taken together, the data and analysis on this research question does not support a direct relationship between funding loss and school district performance during the period of the Great Recession in Georgia. This does not, importantly, imply that the recession had no impact. Indeed, given the massive structural and personnel changes brought about by the recession nationwide it would be extremely surprising if there were no effects. These results do suggest it may be more important what districts did in their staffing, structure, and organization both prior to and during the recession, than how much funding they lost due to the downturn. In other words, a plausible interpretation of these results is that districts that made wise choices before and often difficult choices during, the recession were better able to weather the storm and preserve the efficacy of their impact on students.

There is, to be fair, an alternative interpretation of the findings in this area of the study. Namely, if one begins from the point-of-view that school districts are bloated and inefficient bureaucracies then the hard choices made by districts during the recession could be construed as necessary cost cutting mechanisms that could only be brought about due to external forces of a recession and its corresponding revenue losses. This viewpoint would say the belt tightening brought onto districts during the recession was a healthy development that should allow these districts to operate leaner and more efficiently in the future. While such a view merits consideration and respect, there are reasons to question if it can be sustained from the data presented here. For while it is true that loss of funding was not directly shown to result in loss of efficiency, it was also found that the portion of efficient districts in Georgia actually decreased significantly from 2008 to 2013. If Georgia districts were overwhelmingly bloated and inefficient, then the cutbacks made during the period ought to have resulted in more efficient districts, rather than less.

Interpreting the specific alterable factors within the model that correctly classified districts as efficient or effective is somewhat trickier. Variables chosen for inclusion in the alterable model were chosen both for their availability as well as their snapshot view of how the districts are organized and composed. However, in many cases variables may be measuring second order correlations or serving as proxies for other factors. Thus, it is not causally justified, without more extensive research and randomized experimentation, to infer direct causal inference. However as a jumping off point for future research, it may be instructive to hypothesize why specific variables might be serving as a strong differentiator between districts performing well relative to expectations versus poorly. Table 5.1 offers hypotheses as to why these variables may matter. Headings indicate directionality for efficient/effective (e.g. districts with lower student-teacher ratio are more likely to be efficient/effective).

Table 5.1

Hypotheses for Why Alterable Characteristics Differentiate Districts on the Quadriform

Differentiating Factor	Possible Hypothesis
Lower student-teacher ratio	Districts that are better able to protect instructional personnel in recession years better protect student learning outcomes
Higher administrative pay	Districts that are broadly successful both recognize and develop leadership, which necessitates strong and effective leadership. These districts realize leadership is critical and that, in general, you get what you pay for.
Higher % of teachers with advanced degrees	Efficient/Effective districts invest in stronger teaching staffs, to the detriment of ancillary areas, as this is the most critical component of effectiveness.
Higher teacher salaries	Efficient/Effective districts invest in stronger teaching staffs, to the detriment of ancillary areas, as this is the most critical component of effectiveness.
Fewer support personnel per student	Some districts are better able to support their students efficiently and remove bloat from their support staff at district and schools. Alternatively, such districts may in fact be ignoring the non-academic needs of their students to some degree and the deleterious effects are hidden by the lack of measures assessing those dimensions.

The preceding list was of course speculative and not intended to be exhaustive of possible hypotheses or possibilities. Nonetheless, understanding why particular factors seem to differentiate efficient/effective districts from inefficient/ineffective districts is important to better understand the dynamics in play, and all research needs a theoretical starting point.

Finding 3

One of the felicitous benefits of applying efficiency analysis like the quadriform is the ability to identify particular districts that are producing student outcomes at unusually high levels. This granular level of identification can be a boon to researchers or leaders wishing to further examine the means, frequently not measurable in or reducible to quantitative terms, such districts use to achieve significantly higher than expected results. The locus of this study has been efficiency performance, which centers on assessing how well districts achieve results at a particular level of cost. However, removing cost from the equation leaves a sound and reasonably sophisticated measure, across a broad spectrum of student outcomes, of how well Georgia school districts perform relative to their unalterable demographic characteristics irrespective of funding levels. Using the data thusly can allow leaders and researchers to identify districts that are significantly “punching above their weight” or “beating the odds” to use two oft used applied colloquialisms.

The identification of over performing districts can be realized through examination of the average standardized residuals from the quadriform calculations. Standardized residuals indicate the degree to which, as measured in standardized units, a particular district performs on outcome measured relative to where it would be predicted to be based on unalterable, demographic characteristics of its students and community. The meta-quadriform assesses the average performance across multiple outcome measures including achievement tests, college preparatory examinations, discipline, attendance, graduation, and dropout measures. For 2013, six districts were found to have meta-residual averages more than a standard deviation above expectation. The full results for every district in Georgia are summarized in Appendix 1, but the specifics for these districts are summarized in Table 5.2 and Table 5.3.

Table 5.2

Districts Performing One Standard Deviation above Expectation

Category	Buford City	Calhoun City	Mitchell County	Rome City	Stewart County	Union County
Region of State	Metro Atlanta	Metro Atlanta	Southwest Georgia	Northwest Georgia	Southwest Georgia	North Georgia
Setting	Suburban	Suburban	Rural	Suburban	Rural	Rural
Enrollment	3,783	3,692	2,502	5,865	563	2,611
2013 CCRPI	87.3	82.8	73.4	74.0	75.1	90.1

Table 5.3

Average Standardized Residuals for 2008 and 2013 for Over-Performing Districts

District	Average Standardized Residual 2008	Average Standardized Residual 2013
Buford City	1.07	1.26
Calhoun City	0.27	1.83
Mitchell County	-0.10	1.61
Rome City	0.73	1.09
Stewart County	-0.15	1.83
Union County	-0.16	1.20

The six identified districts performing more than a standard deviation average above expectation across multiple outcomes were strikingly diverse. They include three city districts and three county districts and span both rural and suburban settings. These odds-beating districts also disperse geographically across the state with districts spanning the virtual gamut of the state from north to south Georgia. Their scores on the College and Career Performance Index, Georgia's current school accountability system, are also quite mixed, ranging from a low of 73.4 to a high of 90.1 on the 100 point scale. The latter point is particularly instructive in suggesting that the state's accountability measure is not entirely in tune with statistical models that attempt to control for poverty and other demographics. Also of note is that, for many of these districts, the over performance is a more recent trend. Two of the districts also displayed well above average performance in 2008, while the other four districts were either right at expectation or slightly below expectation. Perhaps most notably, two of the identified districts, Calhoun City and Rome City, actually received less than average funding. These two districts displayed a marked degree of efficiency of educational production.

The reasons why these districts performed so far in excess of demographic expectation is a question that cannot be answered by a study of this type. Factors such as leadership, strategic planning, instructional practice and professional learning, hiring and staff retention practices, community and parent engagement, and dozens of other factors play into the development of successful schools and school districts. None of these factors is directly under consideration in this study. It is enough to say that these districts appear to be performing far in excess of what we might purely expect from the normal relationship between student and community demographics and performance. Answering why they, and others, seem to be beating the odds is a worthy research program for educational researchers and leaders.

Finding 4

Since the advent of production function research in education, at least as far back as the Coleman Report (1966), educational researchers have been interested in the degree to which schools could influence students and overcome social and structural impediments to learning, development, and later economic and social mobility. The development of sophisticated statistical regression techniques in particular have allowed educational researchers to partition variance of student achievement and outcomes to estimate the degree to which non-educational factors influence performance. Linear regression models using non-alterable external variables assessing poverty, race, and community wealth were utilized in the calculation of the quadriforms and can help shed light on the last research question posed, which centers on the degree to which student outcomes in Georgia appear associated with non-school factors. Figures 5.2 and 5.3 summarize the r square statistic, a measure of variance from the response variable associated with the predictor factors, for each regression equation in the quadriforms.

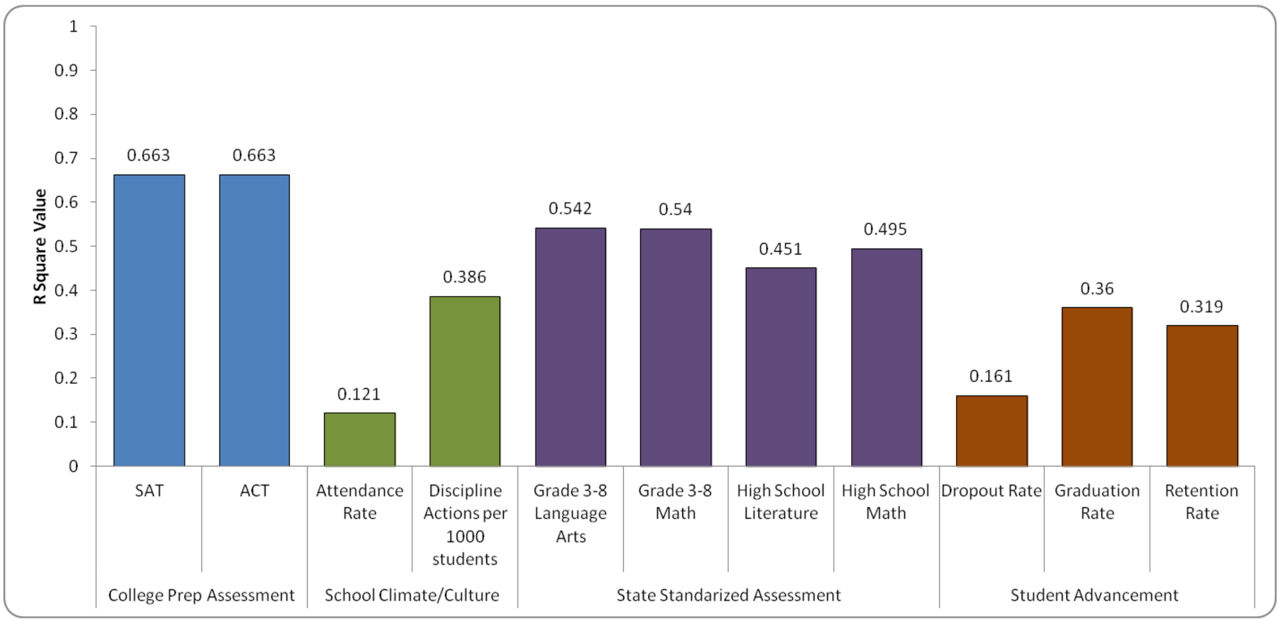

Figure 5.2

R Square values for regression models used in 2013 Quadriform Calculations

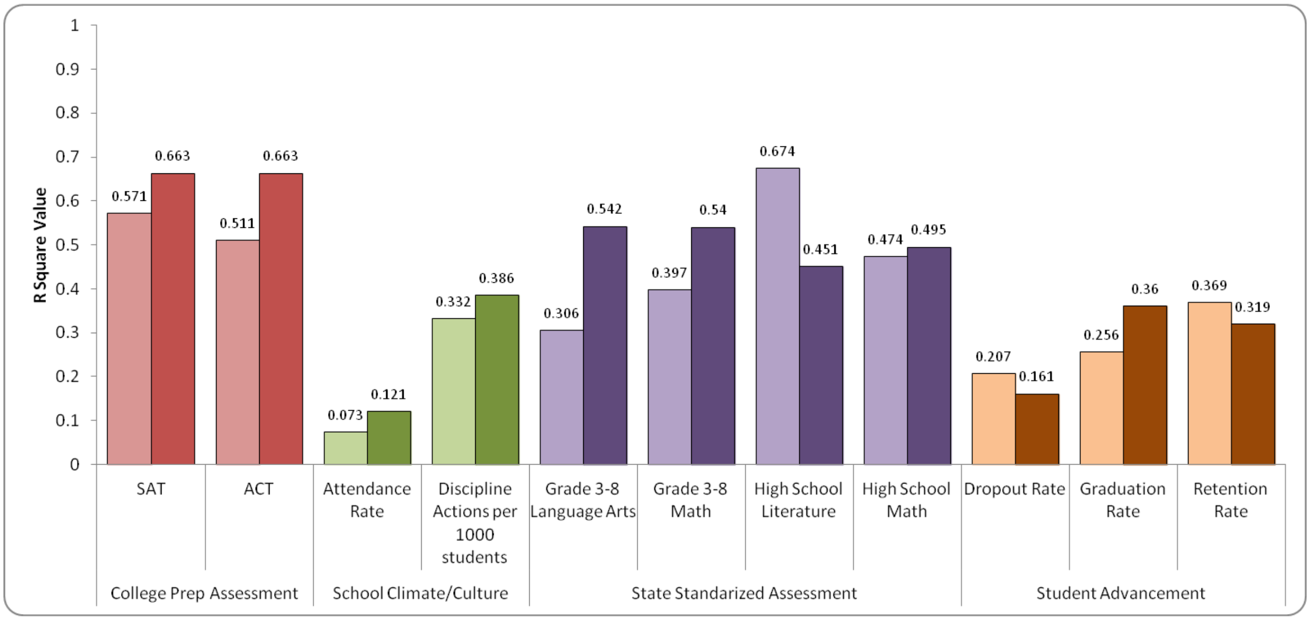

Figure 5.3

R Square values for regression models for Quadriform Calculations in 2008 and 2013

The 11 variables assessed can be conceptually split into 4 categories based on what they are attempting to measure. These categories are college preparatory assessments, state standardized assessments, school climate measures, and student advancement metrics.

Across both years, college preparatory assessments showed the highest degree of variance associated with demographic factors, with well over half to two thirds of the variance in outcome associated with non-alterable characteristics of school districts. State standardized assessments also showed strong effects of community and student demographics as between 30.6% and 67.4% of performance is explicable on the basis of non-alterable variables, depending on year and academic measure. It is perhaps unsurprising these outcome factors showed the strongest influence of poverty, race, and wealth as the link between these variables and achievement is well established in the literature (Coleman, 1966; Hanushek & Rivkin, 2008) and the measures themselves are standardized, which reduces subjectivity and variability of reporting and measurement practices. Non-achievement measures tended to be more inconsistent in relationship with demographics, and across all measures attendance rate had the least association with non-alterable variables.

One of the more striking findings is that in 9 of 11 outcome measures a notably higher r square loading was found in 2013 than in 2008. Indeed, the average r square for 2013 was .427, compared to .379 in 2008. While it is not within the scope or means of this research project to compare or test the differences between regression models of each year, which would require more sophisticated multi-level statistical models, it is at least provocative that notably more variance in 2013 is associated with unalterable factors than in 2008, given the marked loss of financial resources many districts experienced between the years. A tentative statement we might make from the data is that it is easier to predict performance on myriad outcomes for a district, based solely on factors it has no control, post-recession than in the year just prior. Such a state of affairs does not fit neatly within the definition of efficiency used in this research, but it is certainly a distressing finding.

Overcoming the influence of poverty, societal prejudice, and differential communal wealth is certainly one of the many charters that public education is tasked. A potential reduction in the ability to overcome demographic destiny for students, particularly if related to loss of financial resources for schools, is something policy makers ought to take very seriously. The data here are not dispositive to answer whether than an unwelcome situation is in fact occurring; however, the initial findings are certainly uncomfortable in their potential implications.

Theoretical Implications

This study was conducted in what is broadly referred to as the production function strain of research (Houck, Rolle, & He, 2010). Educational production function studies center on examining issues of how schools perform on various outcome measures when factoring their levels of funding and other characteristics as inputs. The field of production function research has featured a longstanding empirical debate between two views related to the relationship between educational inputs (funding levels to schools) and outputs (various measures of student achievement and performance). The first, which is probably most associated with Hanushek (1989, 1998), takes the view that money does not systematically influence school performance and that increasing spending on education does not necessarily translate to better outcomes for students (Rolle, 2004b). A countering body of research contends that, properly understood, increased funding to education does produce better outcomes (Hedges, Laine, & Greenwald, 1994; Wenglinsky, 1997). While a definitive answer to that debate has yet to materialize, a third view has arisen that the proper focus should be on the specific mechanisms by which resources and money translate to production of student outcomes in schools. This synthesis, sometimes referred to as Input-Throughput-Output (ITO) research (Hoy & Miskell, 2007) generally attempts to understand the mechanism of how schools convert input into output and how specific programs and structures influence learning (Gamoran & Long, 2006).

The findings of this study straddled the line between the traditional debate of the general influence of money and the specific mechanisms of educational production. The Great Recession offered an interesting natural experiment in that, for the first time in many decades, Georgia school districts had to deal with a major decrease in resources and funding at their disposal. It could be argued that a loss of efficiency in Georgia school districts directly corresponding to loss of input resources might be supportive of the view that money systematically influences outcomes. Conversely, were districts able to continue to produce outcomes at their pre-existing levels with leaner budgets and resources then credence to the views that districts are broadly inefficient and wasteful, espoused by researchers such as Hanushek, would have been be supported.

Interestingly, findings of this study appeared to be more in line with the assumptions of ITO researchers. Namely, efficiency did decrease in Georgia schools during the recessionary period, but not in a systematic fashion related to pure loss of funding. Instead, the ability to maintain efficiency and effectiveness was more related to structural and organizational characteristics of the districts themselves. Thus, the evidence does not support a systematic relationship between financial inputs and educational outcomes in either direction. Instead it appears the specific usages of resources and finances, which this study explored but did not systematically examine, is more important to the process of creating outcomes. The fact that overall efficiency did decrease during the period is suggestive that districts varied in how well they used resources. This study thus is supportive of the view that the casting of the production function literature as a binary debate of money either mattering or not mattering to outcomes is overly simplistic, and that continued research into what types of resource allocation are most effective and efficient at producing outcomes is needed within the context of school districts.

Further Implications

Further implications from these findings are summarized according to audience. Three prospective audiences for this research were conceived, and implications were separated as not all findings and implications will be relevant to all groups. The three groups are policy makers, educational researchers, and educational leaders. The group labeled policy makers refer to legislators at the federal, state, and local levels, but also technical bureaucrats working within the infrastructure of governance. This group includes individuals who have the ability to influence and shape broad governmental policies at state, local, and federal levels. Educational researchers refer to academics and policy analysts conducting research in the areas of educational finance and funding and the implications of resources to performance in education. The group labeled educational leaders refers to superintendents, principals, and central office support staff working in public school districts.

Implications for Policy Makers

The finding that efficiency in Georgia school districts was significantly lower post-recession compared to the years just prior might be interpreted in a somewhat tautological and simplistic way. Namely, major economic recessions always have consequences. That inference being placed as an implication for policy makers is a bit unfair in that they surely do not wish recessions to take place and actively work against them; but perhaps more importantly, the relationship between the recession and the lessening of efficiency is far from clear. First, it was found that, rather than a waning tide lowering all ships, some districts were better able to weather the loss of funding than were others. A district's ability to do so might be related to a combination of structural and organizational factors under the control of local district leadership. This finding does have major implications for policy makers in a slightly removed fashion.

The Georgia Budget Policy Institute estimates that, since fiscal year 2003, the State of Georgia has shortchanged public school districts at least 10 billion dollars in funding (Suggs, 2013). This dollar estimate refers to funding earned under Georgia's Quality Basic Education formula, which is nearly 30 years old and non-inflation adjusted, but monies withheld from Georgia districts on the basis of "austerity" cuts in which the legislature simply does not fully fund the amount of money earned. Austerity cuts are not always malicious in intent, and herein likely reflect the hard fiscal realities of the economy in Georgia. Nonetheless, austerity cuts make long-term planning on the part of Georgia public school leaders extremely difficult as it is often impossible to estimate in advance how much funding a district will actually receive out of what was earned through QBE formulae. Given the importance of how well and effectively districts budget any impediment to that process, as uncertain austerity cuts undoubtedly are, make it more difficult for districts to budget effectively and to be efficient in their production of outcomes. State-level austerity cuts also shift more of the burden of filling in budgetary gaps to local sources, of which great variation exists across communities, and thus raises the specter of greater inequality of resources across districts.

Fully funding education would be one way out of this problem. Districts would undoubtedly have been more insulated from the recession with their fully earned funding at their disposal. In the event that is not fiscally or politically feasible, which appears likely at the present, at least revising the Quality Basic Education formula to reflect the current economic reality would give districts more consistency and stability in their budgets and allow greater year- to-year planning. The concern about the shift to more local burden of educational funding would remain a problem, and one that policy makers must think long and hard about. Not every district has room on their millage rate or healthy tax digests to simply absorb budgetary cuts. Shifting the burden to local communities likely creates a double effect of overall lesser resources for school districts and greater inquality of resources across the state. These are troubling possibilities policy makers should engage with soberly and sincerely.

Implications for Educational Researchers

The implications of this study for those who research the link between educational resources and school performance are likely methodological in nature. To some degree, this is because these findings represent merely one more data point in the long, complex, and contentious body of research that is educational productivity research, and one that is unlikely to reformulate or answer any of the broad questions and problems that plague the field. On a more important level, this study does emphasize the importance of methodology and technique to analyzing school district efficiency and effectiveness. Here some relevant implications for researchers can be found.

First, this study is one more example of the relative approach to educational efficiency research that researchers such as Rolle (2004a; 2004b) and Houck, Rolle, and He (2010) have been suggesting for the past decade. Moving beyond normative economic models, whose assumptions better fit the profit maximizing world of market based firms, to more relative models is critical for continued progress in increasing the efficiency and controlling costs of public education. Econometric techniques such as the quadriform, data envelopment analysis, and others allow for the identification and study of efficient schools and districts whose underpinnings and approaches to budgeting and instruction can be scrutinized and, possibly, replicated to less efficient districts. If conducted properly, these techniques are far more persuasive and powerful in making a case to educational leaders that spending efficiently and effectively is indeed possible and desirable. Normative models that make critical misassumptions about how public education functions are more likely to declare all or most schools as inefficient due to schools lack of profit maximization incentives. Relative models are, on pragmatic grounds, far more likely to persuade the very people spending the money of the need to control or regulate costs and budgets. Normative models are easier to dismiss as simply being "out of touch" with how education works. Relative econometric techniques, in the view of this researcher, offer far greater promise to actually making public school districts more efficient than normative models, and it is hoped the findings of the present study makes the need for more rigorous relative models in understanding school district funding and production clear.

Second, researchers have to take the problem of multiple outcomes seriously. School districts do not simply seek to "create" test score increases. If a singular charter for public school districts exists, it is to facilitate learning among its students. To the degree standardized test scores serve as a proxy for that learning they certainly can, interpreted properly, tell a great deal about how well districts are facilitating learning in their students. However, restricting econometric research of school outcomes solely to standardized test scores, as much modern research does, misses key components of what schools and their constituent stakeholders are actually trying to achieve with students. Researchers should strive to find and assess outcomes across a greater range of outcomes than merely test scores. This study attempted to evaluate, with some success, a range of outcomes broader than mere test scores. Nonetheless, this study too was restricted to information that was easily attainable and is thus open to critique as being too narrow in scope. Finding ways to measure a more diverse range of outcomes that are tied to the goals and charters of public school districts will allow for much fairer, realistic, and powerful findings as to how well individual districts are meeting the needs and goals of their students and the public as a whole.

Implications for Educational Leaders

One likely response to this research project on the part of educational leaders, who often take a healthy disinterest in the economics of education, is a nonplussed shrug. They may ask how, beyond the obvious implication that their schools need money, and likely much more of it, do these findings truly affect their jobs of educating children? Here a quote from the great philosopher and economist John Maynard Keynes (1936) may be of use:

> The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist. (pp. 383-384)

Put another way, budgeting and the implications of state and local financial policies are not merely a necessary evil or impediment because policies will invariably embody the values and decisions of the organizations that create them. Economics in education is, in a matter of speaking, too important to leave to the economists.

District leaders must strive to create budgeting processes in their districts that are equitable, fair, and rational. Perhaps more importantly, processes that are sufficient to determine effectiveness and efficiency of resources must be developed. Simply spending money because we can, or because it anecdotally seems like a good usage of funds, is not a successful path forward for districts in the modern economic and political climate. District leaders must be thorough, rigorous, and perhaps a touch ruthless in their evaluation of how dollars are spent. Rigorous budgeting processes are critical not just as good stewards of public finances, but also for two other important reasons.

First, educators should learn to appreciate what economists call opportunity costs. Money spent poorly, or ineffectively, in one area is money that cannot be spent effectively in another. By failing to clean up inefficiencies in spending, leaders lose the opportunity to spend money in ways that might do more good or allow them to better meet their goals. Rooting out inefficiency also empowers leaders to control their circumstances to a greater degree. Former Arlington, Massachusetts School District superintendent Nathan Levenson, in writing a first person account of his attempts to financially reform his district, noted that his leaders and support staff viewed budgeting as something that happened to them, rather than something they had agency to change (Levenson, 2011). By empowering leaders to find inefficient or ineffective programs and re-allocate scarce resources, leaders can regain real power and control in budgeting processes that often leave leaders feeling powerless.

Second, educational leaders must embrace efficiency in budgeting because social and economic trends suggest current educational spending growth may be unsustainable. For the period of 1980 to 2006 per pupil educational expenditure in the US, adjusted for inflation, rose over 67% (National Center for Educational Statistics, 2008). However, a combination of factors related to demographic changes in the US, in which longer life spans and a smaller portion of the populace in the labor force to support retirees, will place increasing pressure on state, local, and federal governance finances (Novy-Max, & Rauh, 2009). The increasing costs of providing health insurance and pensions to active and retired employees have already strained budgets and will seemingly do so for the foreseeable future. Embracing a culture of efficiency, strategic planning, and effectiveness-based budgeting will allow educational leaders to better weather future storms and recessions to come.

Conclusions

This research was grounded in the field of the economics of education, which can accurately be described as a niche field within the broader disciplines of education and economics proper. The cross-disciplinary status of the field may itself represent something of a problem, as those who come into it will invariably bring the dominant paradigms of one of those fields with them and fail to understand, or even worse misunderstand, the other. As this research was conducted from the perspective of an educator, it may be useful to say something about the particular economic approach employed here so that those from outside of education may have a better understanding of the approach and a broader perspective for critique.

Many different definitions have been provided over the years for what economics, as a field, is actually studying and organized around (Mankiw, 2011). One particular definition, and the one favored by this researcher, is that education is the study of value (George, 1992). Value, in this definition, refers to desired goals which are brought about through money to be sure, but also to time, effort, and directed behavior, all of which are marshaled to achieve the desired end (Becker, 1962; Blundell, 2005). Economists often like to use this lens to scrutinize individual’s stated preferences, those that the subject avers that they wish to achieve, versus revealed preferences, those that the subject actually appears to be attempting to achieve through their actual behaviors and resource usage (Kahneman, 2011). A common perceived preference for an individual on New Year’s Day might be losing 20 pounds of weight, but if that perceived preference is not followed by changes in diet, exercise, and money for gym memberships, it is reasonable to question the degree to which the individual actually values that goal relative to others.

Using that perspective it is fair, and necessary, to scrutinize the degree to which policy makers, education researchers, and educational leaders actually value education. To be sure, each group would plausibly state that their value of education is paramount, but an economic perspective would move beyond such platitudes to the actual behaviors that underlie these statements. For legislators and policy makers to value education would mean working to provide funding for public education that is adequate to realize the educational goals they, the policy makers themselves and their constituents, seek to enact. To be sure, fully funding education does not simply mean blank checks and lack of accountability for resources, but to consistently shortchange districts and schools based on their own, outdated, funding formulae belies a stated value for education.

For those who research the finance and funding of education to realize the value of education means accepting schools and school districts as they are, with the culture, incentive structure, and history they actually have, rather than idealized economic models designed for private firms with very different cultures and incentives. Education finance researchers must strive to find perspectives and tools that work to make school districts more efficient and effective, but on terms that are fair and well chosen to the relative, and complex, circumstances public schools operate. To fail to do so would not only belie their stated value of education, but will also likely result in findings that are simplified at best and incorrect at worst.

For educational leaders to question their stated value of education might seem both offensive and counterintuitive. However, returning to the research of Roza (2009, 2010) and others it is necessary to reflect on the frequency with which budget expenditure at district and schools frequently fails to match the very strategic improvement plans those schools and districts produce and work within. To truly value education means leaders cannot simply view budget as a necessary evil largely outsourced to the accountants in their business offices. The creation and evaluation of budgets must be conducted rigorously and deliberately and be an active and important part of the roles and duties of educational leaders. Leaders must strive to ensure that money spent is well directed and used in ways that are effective. To fail to take creation of effective and well designed school and district budgets seriously is to belie the stated value of education on the part of the very leaders tasked to oversee our public school system.

In summation, this research study attempted to provide some clarity to the question that began appearing throughout educational circles near the beginning of the Great Recession of "can we do more with less." The answer is complicated and, to the degree it can be answered, not entirely straightforward. It does, however, appear that school districts in Georgia were less efficient post-recession in 2013 than they were in the year just prior to the beginning of the recession. Districts sorted themselves by performance within multiple student outcome measures far more on the basis of poverty and demographics than they did before funding began to decrease. Nonetheless, some districts were better able to protect their production of student outcomes than were others and no systematic link between decreases in funding and reduction of performance was found. The answer might be thought of as a glib and unhelpful “maybe.” A better way to think of the answer for educational leaders might be to take the active tense of “it depends on what we do with the less that we have been given.” Whether school districts should even have to pose such a question is for our leaders and democratic society to decide. May they wisely choose what they truly value.

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APPENDIX A

META-QUADRIFORM CLASSIFICATIONS BY

SCHOOL DISTRICT FOR 2008 AND 2013

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2008	APPLING	601	0.03	-0.57	Expected	Below	On-Par
2013	APPLING	601	-0.02	-0.08	Expected	Expected	On-Par
2008	ATKINSON	602	0.15	-0.68	Above	Below	Efficient
2013	ATKINSON	602	0.26	-0.43	Above	Below	Efficient
2008	BACON	603	-0.23	-0.76	Below	Below	Ineffective
2013	BACON	603	-0.12	0.24	Below	Above	Inefficient
2008	BAKER	604	-0.45	2.77	Below	Above	Inefficient
2013	BAKER	604	-1.45	1.85	Below	Above	Inefficient
2008	BALDWIN	605	-0.35	-1.23	Below	Below	Ineffective
2013	BALDWIN	605	-0.12	-0.38	Below	Below	Ineffective
2008	BANKS	606	0.44	-0.50	Above	Below	Efficient
2013	BANKS	606	0.55	-0.25	Above	Below	Efficient
2008	BARROW	607	-0.18	-0.79	Below	Below	Ineffective
2013	BARROW	607	-0.14	-0.07	Below	Expected	On-Par
2008	BARTOW	608	-0.33	-0.31	Below	Below	Ineffective
2013	BARTOW	608	-0.27	0.14	Below	Above	Inefficient
2008	BEN HILL	609	-0.26	-0.83	Below	Below	Ineffective
2013	BEN HILL	609	-0.02	-0.50	Expected	Below	On-Par
2008	BERRIEN	610	0.39	-0.29	Above	Below	Efficient
2013	BERRIEN	610	-0.36	-0.25	Below	Below	Ineffective
2008	BIBB	611	-0.62	-0.50	Below	Below	Ineffective
2013	BIBB	611	-0.87	-0.89	Below	Below	Ineffective
2008	BLECKLEY	612	0.91	-0.48	Above	Below	Efficient
2013	BLECKLEY	612	0.50	-0.69	Above	Below	Efficient
2008	BRANTLEY	613	-0.36	0.40	Below	Above	Inefficient
2013	BRANTLEY	613	-0.62	0.09	Below	Expected	On-Par
2008	BROOKS	614	-0.77	-0.08	Below	Expected	On-Par
2013	BROOKS	614	-0.02	-0.37	Expected	Below	On-Par
2008	BRYAN	615	0.04	-0.86	Expected	Below	On-Par
2013	BRYAN	615	-0.24	-0.16	Below	Below	Ineffective
2008	BULLOCH	616	-0.02	-0.90	Expected	Below	On-Par
2013	BULLOCH	616	-0.31	0.09	Below	Expected	On-Par
2008	BURKE	617	0.49	1.79	Above	Above	Effective
2013	BURKE	617	0.46	0.34	Above	Above	Effective
2008	BUTTS	618	-0.68	0.14	Below	Above	Inefficient
2013	BUTTS	618	-0.47	-0.23	Below	Below	Ineffective
2008	CALHOUN	619	-0.20	1.77	Below	Above	Inefficient
2013	CALHOUN	619	-0.01	0.98	Expected	Above	On-Par
2008	CAMDEN	620	-0.32	-0.65	Below	Below	Ineffective
2013	CAMDEN	620	0.32	0.67	Above	Above	Effective

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2008	CANDLER	621	-0.45	5.63	Below	Above	Inefficient
2013	CANDLER	621	0.27	-0.16	Above	Below	Efficient
2008	CARROLL	622	-0.49	-0.46	Below	Below	Ineffective
2013	CARROLL	622	0.11	0.22	Above	Above	Effective
2008	CATOOSA	623	0.02	-0.13	Expected	Below	On-Par
2013	CATOOSA	623	0.13	0.61	Above	Above	Effective
2008	CHARLTON	624	-0.35	0.13	Below	Above	Inefficient
2013	CHARLTON	624	-0.20	0.16	Below	Above	Inefficient
2008	CHATHAM	625	-0.91	-0.12	Below	Below	Ineffective
2013	CHATHAM	625	-0.50	0.08	Below	Expected	On-Par
2008	CHATTAHOOCHEE	626	0.57	0.45	Above	Above	Effective
2013	CHATTAHOOCHEE	626	-1.03	0.24	Below	Above	Inefficient
2008	CHATTOOGA	627	-0.13	-0.78	Below	Below	Ineffective
2013	CHATTOOGA	627	-0.61	0.05	Below	Expected	On-Par
2008	CHEROKEE	628	-0.28	-0.19	Below	Below	Ineffective
2013	CHEROKEE	628	-0.23	0.37	Below	Above	Inefficient
2008	CLARKE	629	-0.18	0.62	Below	Above	Inefficient
2013	CLARKE	629	-0.03	1.10	Expected	Above	On-Par
2008	CLAYTON	631	0.06	-1.90	Expected	Below	On-Par
2013	CLAYTON	631	-0.02	-0.96	Expected	Below	On-Par
2008	CLINCH	632	0.67	-0.52	Above	Below	Efficient
2013	CLINCH	632	0.37	0.38	Above	Above	Effective
2008	COBB	633	0.06	-0.29	Expected	Below	On-Par
2013	COBB	633	0.24	0.58	Above	Above	Effective
2008	COFFEE	634	0.00	-0.66	Expected	Below	On-Par
2013	COFFEE	634	-0.17	-0.57	Below	Below	Ineffective
2008	COLQUITT	635	0.11	-1.27	Above	Below	Efficient
2013	COLQUITT	635	-0.09	-0.07	Expected	Expected	On-Par
2008	COLUMBIA	636	0.09	-0.66	Expected	Below	On-Par
2013	COLUMBIA	636	0.02	0.06	Expected	Expected	On-Par
2008	COOK	637	-0.16	-1.41	Below	Below	Ineffective
2013	COOK	637	-0.02	-0.78	Expected	Below	On-Par
2008	COWETA	638	-0.16	-0.68	Below	Below	Ineffective
2013	COWETA	638	-0.21	-0.19	Below	Below	Ineffective
2008	CRAWFORD	639	-0.43	-0.92	Below	Below	Ineffective
2013	CRAWFORD	639	-0.01	-0.55	Expected	Below	On-Par
2008	CRISP	640	0.15	-0.80	Above	Below	Efficient
2013	CRISP	640	0.14	-0.19	Above	Below	Efficient
2008	DADE	641	-0.04	0.12	Expected	Above	On-Par

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2013	DADE	641	-0.27	0.21	Below	Above	Inefficient
2008	DAWSON	642	-0.64	0.73	Below	Above	Inefficient
2013	DAWSON	642	-0.24	1.71	Below	Above	Inefficient
2008	DECATUR	643	0.64	-1.03	Above	Below	Efficient
2013	DECATUR	643	0.04	-0.48	Expected	Below	On-Par
2008	DEKALB	644	0.10	-0.16	Above	Below	Efficient
2013	DEKALB	644	-0.67	1.07	Below	Above	Inefficient
2008	DODGE	645	0.59	-0.97	Above	Below	Efficient
2013	DODGE	645	0.07	-0.65	Expected	Below	On-Par
2008	DOOLY	646	-0.49	-0.34	Below	Below	Ineffective
2013	DOOLY	646	-0.63	0.34	Below	Above	Inefficient
2008	DOUGHERTY	647	0.08	-1.04	Expected	Below	On-Par
2013	DOUGHERTY	647	0.14	-0.48	Above	Below	Efficient
2008	DOUGLAS	648	-0.16	-1.10	Below	Below	Ineffective
2013	DOUGLAS	648	0.05	-0.43	Expected	Below	On-Par
2008	EARLY	649	0.41	-0.37	Above	Below	Efficient
2013	EARLY	649	0.56	0.34	Above	Above	Effective
2008	ECHOLS	650	0.66	0.71	Above	Above	Effective
2013	ECHOLS	650	0.26	0.35	Above	Above	Effective
2008	EFFINGHAM	651	-0.11	-0.69	Below	Below	Ineffective
2013	EFFINGHAM	651	-0.09	0.06	Expected	Expected	On-Par
2008	ELBERT	652	-0.25	0.50	Below	Above	Inefficient
2013	ELBERT	652	-0.38	0.75	Below	Above	Inefficient
2008	EMANUEL	653	-0.12	-1.06	Below	Below	Ineffective
2013	EMANUEL	653	-0.27	-1.29	Below	Below	Ineffective
2008	EVANS	654	0.47	-1.02	Above	Below	Efficient
2013	EVANS	654	-0.01	-0.65	Expected	Below	On-Par
2008	FANNIN	655	0.34	1.33	Above	Above	Effective
2013	FANNIN	655	0.39	1.36	Above	Above	Effective
2008	FAYETTE	656	0.44	0.03	Above	Expected	On-Par
2013	FAYETTE	656	0.25	0.71	Above	Above	Effective
2008	FLOYD	657	0.06	0.61	Expected	Above	On-Par
2013	FLOYD	657	0.34	0.79	Above	Above	Effective
2008	FORSYTH	658	0.02	-0.83	Expected	Below	On-Par
2013	FORSYTH	658	0.15	0.10	Above	Expected	On-Par
2008	FRANKLIN	659	-0.22	-0.90	Below	Below	Ineffective
2013	FRANKLIN	659	-0.06	-0.06	Expected	Expected	On-Par
2008	FULTON	660	0.19	0.79	Above	Above	Effective
2013	FULTON	660	0.33	1.17	Above	Above	Effective
2008	GILMER	661	0.28	0.04	Above	Expected	On-Par

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2013	GILMER	661	0.17	0.97	Above	Above	Effective
2008	GLASCOCK	662	-0.50	0.19	Below	Above	Inefficient
2013	GLASCOCK	662	-0.59	0.85	Below	Above	Inefficient
2008	GLYNN	663	-0.33	-0.18	Below	Below	Ineffective
2013	GLYNN	663	0.16	1.23	Above	Above	Effective
2008	GORDON	664	-0.58	-0.01	Below	Expected	On-Par
2013	GORDON	664	0.19	0.14	Above	Above	Effective
2008	GRADY	665	0.11	-1.05	Above	Below	Efficient
2013	GRADY	665	-0.11	-0.77	Below	Below	Ineffective
2008	GREENE	666	-0.16	3.41	Below	Above	Inefficient
2013	GREENE	666	-0.42	1.01	Below	Above	Inefficient
2008	GWINNETT	667	0.31	-0.25	Above	Below	Efficient
2013	GWINNETT	667	0.52	0.48	Above	Above	Effective
2008	HABERSHAM	668	0.03	-0.54	Expected	Below	On-Par
2013	HABERSHAM	668	-0.05	0.35	Expected	Above	On-Par
2008	HALL	669	-0.21	-1.12	Below	Below	Ineffective
2013	HALL	669	-0.50	-0.57	Below	Below	Ineffective
2008	HANCOCK	670	0.33	0.77	Above	Above	Effective
2013	HANCOCK	670	-0.36	0.59	Below	Above	Inefficient
2008	HARALSON	671	-1.10	0.50	Below	Above	Inefficient
2013	HARALSON	671	-1.35	0.19	Below	Above	Inefficient
2008	HARRIS	672	-0.11	-0.09	Below	Expected	On-Par
2013	HARRIS	672	-0.47	0.36	Below	Above	Inefficient
2008	HART	673	-0.07	-0.15	Expected	Below	On-Par
2013	HART	673	-0.12	0.31	Below	Above	Inefficient
2008	HEARD	674	0.15	0.09	Above	Expected	On-Par
2013	HEARD	674	0.76	0.74	Above	Above	Effective
2008	HENRY	675	-0.27	-1.23	Below	Below	Ineffective
2013	HENRY	675	0.14	-0.45	Above	Below	Efficient
2008	HOUSTON	676	0.57	-0.31	Above	Below	Efficient
2013	HOUSTON	676	0.37	0.22	Above	Above	Effective
2008	IRWIN	677	0.10	-0.16	Expected	Below	On-Par
2013	IRWIN	677	-0.19	0.41	Below	Above	Inefficient
2008	JACKSON	678	0.05	-0.12	Expected	Below	On-Par
2013	JACKSON	678	0.17	1.20	Above	Above	Effective
2008	JASPER	679	-0.34	-0.63	Below	Below	Ineffective
2013	JASPER	679	-0.28	-0.53	Below	Below	Ineffective
2008	JEFF DAVIS	680	0.03	-2.46	Expected	Below	On-Par
2013	JEFF DAVIS	680	-0.51	-0.34	Below	Below	Ineffective

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2008	JEFFERSON	681	1.49	-0.85	Above	Below	Efficient
2013	JEFFERSON	681	0.38	-0.93	Above	Below	Efficient
2008	JENKINS	682	0.77	-0.69	Above	Below	Efficient
2013	JENKINS	682	0.12	-0.26	Above	Below	Efficient
2008	JOHNSON	683	-0.16	-0.49	Below	Below	Ineffective
2013	JOHNSON	683	-0.63	-0.27	Below	Below	Ineffective
2008	JONES	684	-0.43	-0.25	Below	Below	Ineffective
2013	JONES	684	-0.61	-0.41	Below	Below	Ineffective
2008	LAMAR	685	-0.16	-0.77	Below	Below	Ineffective
2013	LAMAR	685	-0.06	-0.18	Expected	Below	On-Par
2008	LANIER	686	-0.04	-0.10	Expected	Expected	On-Par
2013	LANIER	686	-0.17	0.33	Below	Above	Inefficient
2008	LAURENS	687	0.16	-0.94	Above	Below	Efficient
2013	LAURENS	687	-0.02	-0.74	Expected	Below	On-Par
2008	LEE	688	0.00	-0.88	Expected	Below	On-Par
2013	LEE	688	-0.07	-0.39	Expected	Below	On-Par
2008	LIBERTY	689	0.05	-0.40	Expected	Below	On-Par
2013	LIBERTY	689	-0.10	-0.08	Below	Expected	On-Par
2008	LINCOLN	690	0.60	1.02	Above	Above	Effective
2013	LINCOLN	690	0.51	1.15	Above	Above	Effective
2008	LONG	691	-0.60	-1.30	Below	Below	Ineffective
2013	LONG	691	-0.92	-0.89	Below	Below	Ineffective
2008	LOWNDES	692	0.14	-0.94	Above	Below	Efficient
2013	LOWNDES	692	0.18	-0.22	Above	Below	Efficient
2008	LUMPKIN	693	0.41	-0.10	Above	Expected	On-Par
2013	LUMPKIN	693	0.12	0.26	Above	Above	Effective
2008	MACON	694	-0.64	-0.31	Below	Below	Ineffective
2013	MACON	694	-0.81	0.04	Below	Expected	On-Par
2008	MADISON	695	-0.57	0.54	Below	Above	Inefficient
2013	MADISON	695	0.16	0.60	Above	Above	Effective
2008	MARION	696	0.29	0.12	Above	Above	Effective
2013	MARION	696	0.26	0.25	Above	Above	Effective
2008	MCDUFFIE	697	0.26	-1.28	Above	Below	Efficient
2013	MCDUFFIE	697	0.22	-0.48	Above	Below	Efficient
2008	MCINTOSH	698	-0.26	0.11	Below	Above	Inefficient
2013	MCINTOSH	698	-0.12	-0.25	Below	Below	Ineffective
2008	MERIWETHER	699	-0.38	-0.21	Below	Below	Ineffective
2013	MERIWETHER	699	-1.06	-0.05	Below	Expected	On-Par
2008	MILLER	700	0.07	-0.23	Expected	Below	On-Par
2013	MILLER	700	-0.55	0.34	Below	Above	Inefficient

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2008	MITCHELL	701	-0.10	-0.03	Below	Expected	On-Par
2013	MITCHELL	701	1.61	0.31	Above	Above	Effective
2008	MONROE	702	-0.04	0.39	Expected	Above	On-Par
2013	MONROE	702	0.23	-0.06	Above	Expected	On-Par
2008	MONTGOMERY	703	0.19	-0.20	Above	Below	Efficient
2013	MONTGOMERY	703	0.12	2.11	Above	Above	Effective
2008	MORGAN	704	0.12	0.00	Above	Expected	On-Par
2013	MORGAN	704	0.18	0.44	Above	Above	Effective
2008	MURRAY	705	0.35	-0.98	Above	Below	Efficient
2013	MURRAY	705	0.31	-0.44	Above	Below	Efficient
2008	MUSCOGEE	706	0.02	0.01	Expected	Expected	On-Par
2013	MUSCOGEE	706	0.03	0.53	Expected	Above	On-Par
2008	NEWTON	707	-0.01	-1.29	Expected	Below	On-Par
2013	NEWTON	707	-0.16	-0.46	Below	Below	Ineffective
2008	OCONEE	708	0.53	-0.08	Above	Expected	On-Par
2013	OCONEE	708	0.36	0.92	Above	Above	Effective
2008	OGLETHORPE	709	-0.09	-0.08	Expected	Expected	On-Par
2013	OGLETHORPE	709	-0.49	0.75	Below	Above	Inefficient
2008	PAULDING	710	-0.76	-0.79	Below	Below	Ineffective
2013	PAULDING	710	-0.93	0.19	Below	Above	Inefficient
2008	PEACH	711	-0.06	-0.59	Expected	Below	On-Par
2013	PEACH	711	-0.63	-1.09	Below	Below	Ineffective
2008	PICKENS	712	0.10	1.19	Expected	Above	On-Par
2013	PICKENS	712	0.43	1.33	Above	Above	Effective
2008	PIERCE	713	0.32	-0.60	Above	Below	Efficient
2013	PIERCE	713	0.49	-0.11	Above	Below	Efficient
2008	PIKE	714	-0.56	-0.64	Below	Below	Ineffective
2013	PIKE	714	-0.19	-0.63	Below	Below	Ineffective
2008	POLK	715	-0.60	-0.81	Below	Below	Ineffective
2013	POLK	715	-0.76	-0.50	Below	Below	Ineffective
2008	PULASKI	716	-0.56	0.00	Below	Expected	On-Par
2013	PULASKI	716	0.05	0.29	Expected	Above	On-Par
2008	PUTNAM	717	0.12	0.36	Above	Above	Effective
2013	PUTNAM	717	0.93	0.22	Above	Above	Effective
2008	QUITMAN	718	0.12	0.55	Above	Above	Effective
2013	QUITMAN	718	0.68	4.93	Above	Above	Effective
2008	RABUN	719	0.74	1.97	Above	Above	Effective
2013	RABUN	719	0.29	3.54	Above	Above	Effective
2008	RANDOLPH	720	-0.43	0.27	Below	Above	Inefficient
2013	RANDOLPH	720	-1.09	0.74	Below	Above	Inefficient

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2008	RICHMOND	721	-0.47	-0.70	Below	Below	Ineffective
2013	RICHMOND	721	-0.11	-0.43	Below	Below	Ineffective
2008	ROCKDALE	722	0.45	-0.53	Above	Below	Efficient
2013	ROCKDALE	722	0.36	-0.16	Above	Below	Efficient
2008	SCHLEY	723	0.72	-0.52	Above	Below	Efficient
2013	SCHLEY	723	0.40	0.01	Above	Expected	On-Par
2008	SCREVEN	724	0.64	-1.27	Above	Below	Efficient
2013	SCREVEN	724	0.55	-1.07	Above	Below	Efficient
2008	SEMINOLE	725	-0.04	-0.46	Expected	Below	On-Par
2013	SEMINOLE	725	-0.05	-0.50	Expected	Below	On-Par
2008	SPALDING	726	-0.68	-0.46	Below	Below	Ineffective
2013	SPALDING	726	-0.27	-0.75	Below	Below	Ineffective
2008	STEPHENS	727	0.33	-0.04	Above	Expected	On-Par
2013	STEPHENS	727	0.54	1.03	Above	Above	Effective
2008	STEWART	728	-0.15	1.49	Below	Above	Inefficient
2013	STEWART	728	1.83	1.01	Above	Above	Effective
2008	SUMTER	729	-0.58	-1.04	Below	Below	Ineffective
2013	SUMTER	729	-0.08	-0.23	Expected	Below	On-Par
2008	TALBOT	730	-1.49	1.68	Below	Above	Inefficient
2013	TALBOT	730	-0.81	2.94	Below	Above	Inefficient
2008	TALIAFERRO	731	0.09	2.96	Expected	Above	On-Par
2013	TALIAFERRO	731	0.12	2.10	Above	Above	Effective
2008	TATTNALL	732	0.18	-0.91	Above	Below	Efficient
2013	TATTNALL	732	-0.49	-0.64	Below	Below	Ineffective
2008	TAYLOR	733	0.21	-0.48	Above	Below	Efficient
2013	TAYLOR	733	0.28	0.23	Above	Above	Effective
2008	TELFAIR	734	-0.13	-0.46	Below	Below	Ineffective
2013	TELFAIR	734	0.36	-0.06	Above	Expected	On-Par
2008	TERRELL	735	-0.63	-0.36	Below	Below	Ineffective
2013	TERRELL	735	0.93	-0.24	Above	Below	Efficient
2008	THOMAS	736	0.26	-0.97	Above	Below	Efficient
2013	THOMAS	736	-0.54	-0.58	Below	Below	Ineffective
2008	TIFT	737	-0.18	-1.28	Below	Below	Ineffective
2013	TIFT	737	-0.05	-0.91	Expected	Below	On-Par
2008	TOOMBS	738	0.60	-1.40	Above	Below	Efficient
2013	TOOMBS	738	-0.19	-0.21	Below	Below	Ineffective
2008	TOWNS	739	-1.11	1.38	Below	Above	Inefficient
2013	TOWNS	739	0.13	1.49	Above	Above	Effective
2008	TREUTLEN	740	0.53	-1.02	Above	Below	Efficient
2013	TREUTLEN	740	0.13	-0.17	Above	Below	Efficient

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2008	TROUP	741	0.70	-0.36	Above	Below	Efficient
2013	TROUP	741	0.08	0.23	Expected	Above	On-Par
2008	TURNER	742	0.10	-0.63	Above	Below	Efficient
2013	TURNER	742	-0.41	0.56	Below	Above	Inefficient
2008	TWIGGS	743	-0.33	0.57	Below	Above	Inefficient
2013	TWIGGS	743	-0.62	1.99	Below	Above	Inefficient
2008	UNION	744	-0.16	1.49	Below	Above	Inefficient
2013	UNION	744	1.20	1.05	Above	Above	Effective
2008	UPSON	745	0.18	-0.56	Above	Below	Efficient
2013	UPSON	745	-0.47	-0.76	Below	Below	Ineffective
2008	WALKER	746	0.04	0.09	Expected	Expected	On-Par
2013	WALKER	746	0.47	0.28	Above	Above	Effective
2008	WALTON	747	-0.60	-0.49	Below	Below	Ineffective
2013	WALTON	747	-0.44	0.33	Below	Above	Inefficient
2008	WARE	748	-0.15	-0.34	Below	Below	Ineffective
2013	WARE	748	0.40	0.34	Above	Above	Effective
2008	WARREN	749	0.02	-0.31	Expected	Below	On-Par
2013	WARREN	749	0.00	0.88	Expected	Above	On-Par
2008	WASHINGTON	750	0.24	-0.70	Above	Below	Efficient
2013	WASHINGTON	750	-0.52	-0.36	Below	Below	Ineffective
2008	WAYNE	751	-0.64	-0.56	Below	Below	Ineffective
2013	WAYNE	751	-0.72	-0.13	Below	Below	Ineffective
2008	WEBSTER	752	-0.86	0.20	Below	Above	Inefficient
2013	WEBSTER	752	0.39	1.31	Above	Above	Effective
2008	WHEELER	753	-0.16	-0.16	Below	Below	Ineffective
2013	WHEELER	753	0.37	1.41	Above	Above	Effective
2008	WHITE	754	0.53	0.67	Above	Above	Effective
2013	WHITE	754	0.81	1.02	Above	Above	Effective
2008	WHITFIELD	755	0.03	-0.74	Expected	Below	On-Par
2013	WHITFIELD	755	-0.51	-1.20	Below	Below	Ineffective
2008	WILCOX	756	-0.37	0.83	Below	Above	Inefficient
2013	WILCOX	756	-0.47	-0.16	Below	Below	Ineffective
2008	WILKES	757	0.16	0.10	Above	Above	Effective
2013	WILKES	757	0.04	0.23	Expected	Above	On-Par
2008	WILKINSON	758	0.35	0.82	Above	Above	Effective
2013	WILKINSON	758	0.55	0.50	Above	Above	Effective
2008	WORTH	759	-0.64	-0.24	Below	Below	Ineffective
2013	WORTH	759	-0.39	-0.39	Below	Below	Ineffective
2008	ATLANTA CITY	761	0.07	2.74	Expected	Above	On-Par
2013	ATLANTA CITY	761	-0.20	4.21	Below	Above	Inefficient

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2008	BREMEN	763	0.29	-0.06	Above	Expected	On-Par
2013	BREMEN	763	-0.14	-0.62	Below	Below	Ineffective
2008	BUFORD	764	1.07	0.40	Above	Above	Effective
2013	BUFORD	764	1.26	1.26	Above	Above	Effective
2008	CALHOUN CITY	765	0.27	-1.63	Above	Below	Efficient
2013	CALHOUN CITY	765	1.83	-0.63	Above	Below	Efficient
2008	CARROLLTON CITY	766	0.10	-0.71	Expected	Below	On-Par
2013	CARROLLTON CITY	766	0.25	-0.34	Above	Below	Efficient
2008	CARTERSVILLE	767	0.37	-0.04	Above	Expected	On-Par
2013	CARTERSVILLE	767	0.13	0.17	Above	Above	Effective
2008	CHICKAMAUGA CITY	769	-0.17	-0.86	Below	Below	Ineffective
2013	CHICKAMAUGA CITY	769	-0.28	-0.25	Below	Below	Ineffective
2008	COMMERCE CITY	771	0.54	-0.50	Above	Below	Efficient
2013	COMMERCE CITY	771	0.37	0.12	Above	Above	Effective
2008	DALTON CITY	772	0.83	-1.15	Above	Below	Efficient
2013	DALTON CITY	772	0.44	-0.18	Above	Below	Efficient
2008	DECATUR CITY	773	0.17	2.68	Above	Above	Effective
2013	DECATUR CITY	773	0.37	3.96	Above	Above	Effective
2008	DUBLIN	774	0.46	-1.13	Above	Below	Efficient
2013	DUBLIN	774	0.66	-0.77	Above	Below	Efficient
2008	GAINESVILLE CITY	776	0.93	-1.62	Above	Below	Efficient
2013	GAINESVILLE CITY	776	-0.51	-0.80	Below	Below	Ineffective
2008	JEFFERSON CITY	779	-0.06	-1.46	Expected	Below	On-Par
2013	JEFFERSON CITY	779	0.58	0.08	Above	Expected	On-Par
2008	MARIETTA CITY	781	0.59	-0.06	Above	Expected	On-Par
2013	MARIETTA CITY	781	0.34	0.75	Above	Above	Effective
2008	PELHAM	784	-0.07	-0.78	Expected	Below	On-Par
2013	PELHAM	784	-0.06	-0.26	Expected	Below	On-Par
2008	ROME CITY	785	0.73	-1.13	Above	Below	Efficient
2013	ROME CITY	785	1.09	-0.82	Above	Below	Efficient
2008	SOCIAL CIRCLE CITY	786	-0.03	0.18	Expected	Above	On-Par
2013	SOCIAL CIRCLE CITY	786	-0.37	0.52	Below	Above	Inefficient
2008	THOMASVILLE CITY	789	-0.17	-0.67	Below	Below	Ineffective

Year	School District	System Number	Meta-Residual for Outcome	Residual for Revenue	Output Classification	Input Classification	Meta-Quadriform Category
2013	THOMASVILLE CITY	789	-0.27	-0.40	Below	Below	Ineffective
2008	TRION	791	0.30	0.33	Above	Above	Effective
2013	TRION	791	0.52	-0.08	Above	Expected	On-Par
2008	VALDOSTA CITY	792	-0.14	-1.64	Below	Below	Ineffective
2013	VALDOSTA CITY	792	0.07	-0.77	Expected	Below	On-Par
2008	VIDALIA CITY	793	0.38	-1.32	Above	Below	Efficient
2013	VIDALIA CITY	793	0.39	-0.82	Above	Below	Efficient

APPENDIX B

STANDARDIZED RESIDUALS FOR ALL QUADIFORM OUTPUT VARIABLES BY DISTRICT

Header Key

Heading	Variables
ELA	Grades 3-8 Standardized ELA Assessment
MT1	Grades 3-8 Standardized Math Assessment
LIT	High School Standardized Literature Assessments
MT2	High School Standardized Math Assessments
GR	Graduation Rate
ACT	Mean ACT Scores
SAT	Mean SAT Scores
ATT	Attendance Rate
DRP	Dropout Rate
RTN	Retention Rate
DSP	Discipline Rate

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	APPLING	0.82	0.71	-1.15	-0.20	-0.29	-0.75	-0.16	-0.08	0.19	1.18	0.11
2013	APPLING	0.08	0.33	0.28	0.09	0.96	-1.77	-0.18	-0.97	-0.85	1.48	0.37
2008	ATKINSON	0.34	-1.01	-0.19	-0.15	-0.19	-0.46	1.42	1.09	-0.14	-0.53	1.44
2013	ATKINSON	0.96	0.36	0.99	-1.26	0.55	-1.57	-0.77	1.06	0.90	0.86	0.80
2008	BACON	0.60	0.10	-0.76	-0.37	0.15	N/A	-0.91	0.05	-0.88	0.68	-0.92
2013	BACON	1.25	1.04	-1.50	0.20	0.68	-1.32	-0.95	-0.78	0.44	-0.50	0.16
2008	BAKER	-2.54	-2.75	-1.55	-0.10	3.51	N/A	N/A	0.70	0.00	0.24	-1.61
2013	BAKER	-1.80	-1.48	-0.84	-1.75	-3.38	N/A	N/A	-1.47	-1.50	1.62	-2.47
2008	BALDWIN	-0.16	-0.63	0.20	1.13	-0.26	0.01	-0.36	-0.20	-2.01	-0.91	-0.64
2013	BALDWIN	0.60	0.30	-0.29	0.68	-0.84	0.35	0.09	0.09	-0.75	-0.53	-1.01
2008	BANKS	-0.02	0.71	0.64	0.07	-1.04	2.24	1.35	-0.25	-0.05	0.92	0.33
2013	BANKS	0.53	0.83	0.43	-0.53	1.52	-0.03	0.42	1.19	0.13	0.74	0.85
2008	BARROW	-0.25	-0.83	-0.13	0.76	-0.35	-0.40	0.21	-0.54	0.23	-0.56	-0.13
2013	BARROW	-0.39	0.01	0.00	-0.45	-0.31	-0.55	0.14	-0.26	0.78	-0.60	0.06
2008	BARTOW	-0.36	-0.12	-1.28	-0.39	-0.46	0.37	0.23	-0.46	-1.15	0.00	0.00
2013	BARTOW	-0.29	-0.43	-0.06	-0.92	-1.24	-0.01	0.32	-0.28	-0.86	0.58	0.16
2008	BEN HILL	-0.11	-0.44	-0.47	-0.30	-0.26	0.00	1.08	-0.42	-1.26	-0.79	0.08
2013	BEN HILL	0.47	0.67	1.28	0.31	1.54	0.86	-0.61	0.26	-2.07	-2.79	-0.17
2008	BERRIEN	0.08	0.61	-0.13	1.13	0.53	N/A	0.65	1.34	0.05	-0.37	-0.02

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2013	BERRIEN	1.25	1.20	-0.03	-0.87	-1.03	-1.38	-0.60	-0.18	-1.64	-0.06	-0.62
2008	BIBB	-0.82	-1.11	-0.05	-0.69	-1.02	0.28	0.36	-0.58	-0.72	-1.07	-1.41
2013	BIBB	-0.82	-1.06	-1.83	-1.37	-0.78	-0.25	-0.33	-0.74	-2.05	-0.72	0.35
2008	BLECKLEY	2.00	0.94	1.01	1.87	0.14	N/A	2.00	0.18	0.55	0.02	0.38
2013	BLECKLEY	1.37	1.44	1.18	0.83	-0.09	-1.11	2.71	-0.08	-0.64	-0.08	-0.02
2008	BRANTLEY	0.53	-0.12	-0.07	-1.72	-1.24	N/A	-1.00	0.65	-0.66	0.33	-0.35
2013	BRANTLEY	0.30	0.16	0.12	-0.33	-1.05	-1.48	-0.64	-2.54	-1.20	-0.11	-0.08
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	BROOKS	0.46	-0.50	-0.21	-1.04	-0.76	-1.31	-1.81	-0.61	-0.83	-0.96	-0.86
2013	BROOKS	0.93	0.71	0.49	0.47	-0.35	-0.62	0.26	-1.43	-0.07	-1.01	0.39
2008	BRYAN	0.18	0.13	-0.63	0.53	-0.36	0.86	0.63	0.12	0.00	-0.78	-0.28
2013	BRYAN	-0.25	-0.09	-0.18	-0.04	-0.83	-0.41	0.08	-0.90	-0.36	-0.08	0.42
2008	BULLOCH	0.31	0.02	0.10	-0.74	0.46	-0.07	0.32	-0.79	0.28	-0.04	-0.06
2013	BULLOCH	0.52	0.42	0.48	0.41	-0.93	-1.32	-0.02	-0.98	-1.26	-0.97	0.21
2008	BURKE	-0.04	0.59	1.13	2.64	-0.41	0.75	1.03	1.35	-0.29	0.46	-1.85
2013	BURKE	1.23	1.70	-0.60	0.14	1.33	0.97	0.06	0.71	0.80	-0.65	-0.61
2008	BUTTS	-0.05	-0.14	0.21	-2.16	-0.66	0.18	-0.76	-0.63	-1.22	-1.77	-0.45
2013	BUTTS	-0.23	-0.67	-0.20	-0.14	-0.13	-2.24	-0.77	0.19	-0.95	0.44	-0.47
2008	CALHOUN	1.49	2.31	-2.55	-0.34	0.81	N/A	N/A	-0.01	1.10	-0.34	-4.29
2013	CALHOUN	-0.84	-1.75	-0.59	-1.83	0.66	1.30	-0.27	0.06	0.78	1.69	0.67
2008	CAMDEN	0.28	0.25	0.08	-0.59	-0.44	0.12	-0.44	-1.78	-0.83	0.02	-0.22
2013	CAMDEN	0.11	0.32	0.32	1.85	0.46	0.15	0.81	-1.30	0.33	0.17	0.36
2008	CANDLER	-0.54	0.20	-0.99	-0.43	-0.48	-0.80	-1.76	-0.56	-0.35	1.14	-0.39
2013	CANDLER	1.52	1.69	0.59	0.73	-0.31	0.39	-0.32	1.07	0.75	-0.45	-2.72
2008	CARROLL	-0.70	-0.76	-1.79	-1.49	-0.36	-0.88	0.24	0.56	-0.62	0.55	-0.18
2013	CARROLL	0.24	0.15	-1.34	0.26	0.18	0.15	0.34	0.66	-0.73	1.20	0.09
2008	CATOOSA	0.17	0.10	-0.37	-0.31	-0.62	0.45	-0.05	0.69	-0.64	0.44	0.42
2013	CATOOSA	-0.54	-0.64	0.04	0.15	-0.48	0.43	0.31	0.90	0.37	0.51	0.37
2008	CHARLTON	-0.81	0.01	-0.53	0.28	-0.58	-1.75	-1.34	-0.77	0.77	0.12	0.80
2013	CHARLTON	-0.15	-0.67	0.15	0.95	1.24	-0.60	-0.76	-1.39	-0.09	-1.09	0.26

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	CHATHAM	-1.22	-1.30	-0.63	-1.12	-0.94	-0.79	0.00	-0.47	-1.18	-2.03	-0.38
2013	CHATHAM	-0.15	-0.79	0.40	-0.55	-0.44	-0.87	-0.77	-0.58	-0.51	-1.93	0.67
2008	CHATTAHOOCHEE	-1.10	-1.70	1.43	0.90	1.78	N/A	N/A	-0.38	1.29	0.95	1.95
2013	CHATTAHOOCHEE	-0.33	-1.76	-0.65	-1.38	-0.46	-0.60	-1.16	-3.17	0.01	-1.01	-0.79
2008	CHATTOOGA	-1.60	-0.93	0.27	-1.35	0.08	-0.46	0.26	-0.34	1.91	-0.51	1.22
2013	CHATTOOGA	-1.85	-2.00	-1.57	-1.51	-1.19	0.51	-0.74	0.61	-0.92	0.35	1.65
2008	CHEROKEE	0.13	0.18	0.42	1.16	-0.51	-0.61	-0.10	0.38	-1.16	-2.37	-0.57
2013	CHEROKEE	-0.44	-0.51	0.17	0.10	-0.78	0.16	0.28	0.85	-0.81	-1.15	-0.43
2008	CLARKE	-1.59	-1.00	-0.11	0.83	-0.47	1.43	1.23	-0.68	-1.24	-0.67	0.30
2013	CLARKE	-0.70	0.10	-0.70	0.09	-0.12	0.61	0.74	-0.36	-0.32	0.11	0.20
2008	CLAYTON	-0.85	-0.37	-0.50	-1.01	0.78	-0.85	-0.49	-0.80	2.52	1.30	0.94
2013	CLAYTON	0.17	-0.03	0.21	0.01	-0.87	-0.40	-0.60	-0.11	-0.43	1.37	0.44
2008	CLINCH	0.71	1.13	3.06	2.03	0.64	N/A	-1.85	1.51	1.39	-0.98	-0.91
2013	CLINCH	-0.27	0.16	0.24	3.81	0.23	N/A	-0.07	-0.50	1.26	-0.20	-0.98
2008	COBB	0.05	0.04	0.08	0.25	0.35	0.12	-0.33	0.19	0.00	0.39	-0.52
2013	COBB	0.14	0.30	0.45	0.13	0.55	0.52	0.05	0.46	0.60	0.06	-0.62
2008	COFFEE	0.84	0.54	0.11	-0.59	-0.76	1.25	0.59	0.45	-0.88	-0.61	-0.92
2013	COFFEE	1.36	1.11	-0.14	0.98	-0.05	-0.84	-0.16	-0.47	-1.91	-1.03	-0.70
2008	COLQUITT	-0.25	-0.09	-0.19	0.74	0.05	1.38	0.28	-0.45	-0.98	0.00	0.77
2013	COLQUITT	-0.93	-0.73	-0.37	1.39	0.51	-0.07	-0.21	-1.43	1.16	0.10	-0.44
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	COLUMBIA	0.40	0.35	0.49	0.80	-0.29	-0.40	-0.13	0.44	-0.28	0.03	-0.37
2013	COLUMBIA	-0.19	-0.10	0.47	1.18	-0.90	1.08	0.32	-0.02	-0.88	-0.74	0.04
2008	COOK	0.11	-0.40	0.38	0.43	-0.39	-0.44	-0.27	0.63	-1.29	-0.55	-0.02
2013	COOK	-0.29	-0.69	0.12	0.64	0.46	-0.93	-0.21	0.62	-0.10	0.34	-0.13
2008	COWETA	-0.19	-0.39	-0.71	0.73	0.10	-1.09	-0.10	-0.30	0.01	-0.09	0.26
2013	COWETA	-0.44	-0.31	-0.10	-0.25	-0.93	-0.04	0.37	0.04	0.11	-1.33	0.52
2008	CRAWFORD	0.59	0.41	-0.81	-2.00	-1.27	0.20	-0.68	1.24	-0.94	0.02	-1.50
2013	CRAWFORD	-0.09	0.46	-0.52	0.91	-0.77	0.66	0.49	0.37	-0.42	-0.92	-0.26
2008	CRISP	1.47	1.75	1.14	1.52	0.00	N/A	-0.63	-0.35	-1.59	-1.26	-0.55

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2013	CRISP	1.47	1.20	0.19	0.81	-1.11	1.19	1.36	-0.58	-1.57	-1.10	-0.35
2008	DADE	-1.29	-0.54	-0.65	-1.78	0.61	1.85	0.52	-0.07	-0.19	1.34	-0.20
2013	DADE	-2.36	-2.03	-0.29	-0.47	-0.05	0.79	0.54	0.22	0.66	0.02	-0.01
2008	DAWSON	-0.98	-1.04	-0.76	-0.21	-0.27	-1.03	-1.05	-1.20	-0.51	-0.67	0.71
2013	DAWSON	-0.30	-1.11	-0.23	-0.10	0.15	0.29	-0.57	-0.74	-0.01	-0.43	0.40
2008	DECATUR	1.89	2.01	1.37	0.11	0.57	0.66	0.46	-0.22	-0.34	0.26	0.25
2013	DECATUR	1.08	0.11	-0.47	-1.07	-0.14	0.32	-0.09	-1.27	0.70	0.89	0.36
2008	DEKALB	-0.60	-0.71	-0.50	0.13	0.37	-0.49	-0.55	-0.15	1.69	1.31	0.62
2013	DEKALB	-1.48	-1.39	-0.79	-0.35	-0.42	-1.05	-0.87	-0.79	-0.05	-0.36	0.12
2008	DODGE	1.27	0.27	0.20	1.32	0.87	0.82	0.45	1.03	1.62	-0.83	-0.57
2013	DODGE	-0.39	-0.20	0.21	-0.33	-0.26	0.25	1.06	0.63	0.40	-0.89	0.24
2008	DOOLY	-0.96	-1.77	0.21	-0.72	-0.17	N/A	-0.08	-0.01	-0.73	-1.31	0.69
2013	DOOLY	-0.87	-0.35	-0.05	-0.94	0.83	-0.95	-2.17	-1.08	-0.14	-0.39	-0.83
2008	DOUGHERTY	0.07	0.14	0.63	-0.64	-0.44	0.85	0.77	0.68	0.34	-2.17	0.64
2013	DOUGHERTY	0.34	0.88	-0.88	-0.11	-0.89	0.31	0.71	0.05	0.13	0.33	0.72
2008	DOUGLAS	-0.33	-0.20	-1.04	-0.10	-0.26	-0.71	-0.36	-0.35	0.10	1.56	-0.01
2013	DOUGLAS	0.46	0.24	0.03	-0.72	-0.41	-0.21	-0.44	-0.01	0.51	1.39	-0.27
2008	EARLY	0.25	1.35	0.86	-0.21	0.60	0.46	0.19	0.27	1.01	-0.60	0.29
2013	EARLY	0.77	1.58	0.06	1.02	0.32	0.86	0.40	-0.55	-0.24	0.97	0.96
2008	ECHOLS	0.86	-0.29	0.79	1.11	-0.09	N/A	N/A	2.15	2.26	-2.10	1.24
2013	ECHOLS	-1.31	-0.03	1.08	1.42	-0.31	1.37	0.41	0.76	-0.73	0.00	0.27
2008	EFFINGHAM	0.26	0.44	-0.07	1.05	-0.47	-0.22	-0.23	0.14	-0.86	-1.12	-0.18
2013	EFFINGHAM	0.44	0.68	0.36	-0.33	-0.34	-0.36	-0.55	-0.21	0.17	-0.36	-0.51
2008	ELBERT	0.28	-0.39	-1.90	1.63	-1.06	0.17	0.39	0.15	-1.03	-0.74	-0.22
2013	ELBERT	0.03	0.09	-0.12	-1.39	-0.64	-0.47	-0.21	0.02	-1.17	-0.46	0.11
2008	EMANUEL	-0.49	-0.71	-0.06	0.69	-0.44	-0.61	-0.36	-0.31	0.27	0.23	0.48
2013	EMANUEL	-0.37	-0.02	-1.23	0.09	0.49	-0.42	-0.20	-1.84	0.17	-0.40	0.77
2008	EVANS	0.91	1.84	1.27	0.58	0.53	-2.06	0.45	0.13	0.44	0.67	0.37
2013	EVANS	0.53	0.95	0.74	-1.18	0.12	N/A	-2.07	0.11	0.02	-0.37	1.03
2008	FANNIN	0.07	-0.48	0.12	1.15	0.71	0.74	0.37	-1.02	0.32	1.05	0.70

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2013	FANNIN	0.13	-0.42	0.75	0.21	0.54	1.03	0.09	0.30	0.04	1.28	0.35
2008	FAYETTE	0.57	1.03	0.65	0.89	0.34	0.27	-0.14	-0.01	0.65	0.60	-0.05
2013	FAYETTE	0.00	0.10	0.25	0.86	0.17	0.79	0.51	-1.10	0.78	0.12	0.29
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	FLOYD	0.35	0.47	0.20	-0.60	0.28	0.11	-0.30	0.14	0.37	-0.62	0.26
2013	FLOYD	0.33	0.42	0.51	-0.90	-0.22	0.60	1.40	0.81	0.02	0.38	0.44
2008	FORSYTH	0.74	1.18	0.21	0.27	-0.22	0.08	-1.03	-0.31	-0.45	0.09	-0.39
2013	FORSYTH	-0.33	-0.18	0.04	0.66	0.37	0.49	-0.30	0.25	0.48	0.38	-0.22
2008	FRANKLIN	-0.64	-0.31	-1.17	-0.10	-0.69	0.93	-0.44	-0.24	-0.63	-0.18	1.01
2013	FRANKLIN	0.23	0.36	-0.76	-0.61	-0.34	-0.45	-1.03	1.02	0.59	-0.51	0.87
2008	FULTON	0.19	-0.07	0.28	-0.63	0.31	0.74	0.81	-0.12	0.17	0.53	-0.10
2013	FULTON	0.19	0.11	0.41	0.31	0.18	1.13	1.08	0.17	-0.55	0.28	0.35
2008	GILMER	-1.10	-0.89	-0.04	0.94	1.05	0.63	0.26	0.04	1.20	0.58	0.42
2013	GILMER	-1.24	-0.64	-0.57	1.49	0.89	0.54	0.36	-0.16	0.85	0.31	0.00
2008	GLASCOCK	-0.53	-0.62	N/A	N/A	1.05	N/A	-1.90	-1.12	-0.30	-1.32	0.74
2013	GLASCOCK	-1.01	-0.25	-0.66	0.09	-1.25	N/A	-1.50	-1.40	0.57	0.53	-1.05
2008	GLYNN	-0.74	0.04	-0.72	-0.63	-0.94	0.59	0.74	0.25	-1.51	-0.49	-0.23
2013	GLYNN	0.00	0.53	0.81	0.71	0.43	0.28	0.60	-0.02	0.87	-2.25	-0.20
2008	GORDON	-0.91	-0.75	-0.58	-0.47	-0.08	-0.48	-0.82	-0.13	-0.46	-1.27	-0.41
2013	GORDON	-0.19	0.15	-0.55	0.75	1.18	-0.71	-0.72	0.37	0.61	0.95	0.22
2008	GRADY	0.22	-0.02	0.14	1.16	-0.18	-0.13	0.46	-0.12	0.32	-0.26	-0.39
2013	GRADY	-0.12	0.20	-0.26	-1.44	0.21	0.36	0.52	-0.17	0.12	-0.07	-0.55
2008	GREENE	-0.93	-1.04	-0.44	-1.14	0.96	0.38	N/A	-0.40	0.44	0.20	0.34
2013	GREENE	-0.36	0.05	-0.92	-0.27	-1.31	-1.02	-1.00	-0.89	-0.24	-0.40	1.69
2008	GWINNETT	0.68	0.79	0.94	0.74	0.08	0.22	-0.27	0.94	0.00	-0.19	-0.54
2013	GWINNETT	1.17	1.35	0.56	0.59	1.28	-0.10	-0.17	0.53	1.23	-0.07	-0.63
2008	HABERSHAM	-0.56	-0.07	-0.82	-0.12	-0.25	1.12	0.41	0.18	-0.40	0.08	0.70
2013	HABERSHAM	-0.09	0.12	-0.19	0.12	-0.37	-0.12	-0.35	-0.16	0.53	0.15	-0.14
2008	HALL	-0.81	-0.32	0.40	0.50	-0.23	0.44	-0.15	-0.44	-1.17	-0.79	0.26
2013	HALL	-0.98	-0.87	-1.01	-1.98	0.10	0.44	-0.53	-0.28	0.38	-0.06	-0.70

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	HANCOCK	0.54	0.40	0.37	-1.03	1.37	-1.25	-3.16	1.45	1.27	1.48	2.21
2013	HANCOCK	-4.82	-4.21	-0.14	-1.65	2.57	-0.63	-1.97	0.28	1.18	2.43	3.05
2008	HARALSON	-2.21	-1.24	-0.93	-2.28	-0.74	-1.47	-1.06	-0.88	-0.83	0.29	-0.78
2013	HARALSON	-1.41	-1.82	-2.01	-1.65	-2.33	-0.45	-0.52	-0.04	-2.21	-2.79	0.32
2008	HARRIS	0.26	-0.45	-0.91	-0.51	-0.06	-0.92	0.35	1.03	0.18	0.36	-0.59
2013	HARRIS	-0.54	-0.37	-0.72	-0.90	0.38	-1.77	-0.91	-1.21	0.23	0.50	0.09
2008	HART	-0.60	-0.08	-0.79	-0.66	0.30	0.09	0.25	0.13	0.47	0.04	0.09
2013	HART	0.53	0.81	-4.67	0.20	0.39	-0.67	-0.54	0.69	0.59	0.84	0.51
2008	HEARD	0.41	0.91	0.14	0.11	0.83	-0.59	0.54	-0.50	0.35	-0.45	-0.13
2013	HEARD	0.13	0.60	1.30	2.55	1.42	1.12	0.62	-0.58	0.83	0.14	0.18
2008	HENRY	0.23	-0.01	-0.01	-0.38	-0.32	-0.39	-0.62	-0.31	-0.83	0.18	-0.53
2013	HENRY	0.94	0.49	0.61	-0.30	0.24	-0.24	-0.85	0.53	-0.16	0.22	0.08
2008	HOUSTON	0.59	1.15	0.60	0.48	0.52	0.33	0.62	0.77	0.12	-0.18	1.31
2013	HOUSTON	0.25	0.63	-0.06	0.15	0.21	-0.03	1.03	0.88	0.65	0.59	-0.21
2008	IRWIN	0.81	0.57	-2.62	-0.08	0.53	0.49	-0.66	-0.01	0.97	1.27	-0.19
2013	IRWIN	1.18	0.09	0.79	0.34	-1.08	-0.02	-0.83	-0.62	-1.78	-0.81	0.62
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	JACKSON	0.83	1.06	-0.56	1.28	-0.86	-0.20	0.42	0.28	-1.18	-0.48	-0.07
2013	JACKSON	0.15	0.24	0.38	-0.08	-0.05	-0.61	-0.28	1.05	-0.04	1.09	0.07
2008	JASPER	-0.87	-0.23	-0.10	-1.09	-0.19	0.02	-0.22	-0.54	0.48	-0.41	-0.61
2013	JASPER	-0.34	-0.71	-0.94	-0.92	-0.28	0.90	0.51	-0.21	-0.57	-0.31	-0.23
2008	JEFF DAVIS	0.07	0.64	-0.92	0.37	-0.28	N/A	0.50	-0.12	-0.78	0.82	-0.01
2013	JEFF DAVIS	-0.31	-0.27	-0.79	0.68	-0.54	-1.14	-0.46	-1.82	-0.91	0.62	-0.73
2008	JEFFERSON	3.34	3.89	-0.25	1.04	1.45	N/A	1.22	0.60	1.35	0.79	1.43
2013	JEFFERSON	-0.05	1.04	-0.89	0.60	0.19	N/A	0.36	0.40	-0.47	1.06	1.55
2008	JENKINS	1.58	1.55	0.65	0.71	0.58	0.68	1.68	-1.17	1.42	0.55	0.25
2013	JENKINS	0.11	-1.17	0.60	0.85	0.35	-0.21	0.42	-1.12	0.46	0.35	0.70
2008	JOHNSON	-0.33	0.12	-0.83	0.78	-0.57	N/A	0.17	0.13	-0.14	0.92	-1.81
2013	JOHNSON	-1.52	-0.49	-1.86	-0.67	-2.12	0.71	-0.81	-0.39	0.62	0.56	-0.96
2008	JONES	0.35	-0.34	0.39	-1.08	-0.41	-1.41	-0.62	-0.51	-0.83	-0.57	0.28

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2013	JONES	-0.37	-0.09	0.05	-0.97	-0.72	-1.68	-1.06	-1.17	-1.39	0.30	0.40
2008	LAMAR	-0.34	-0.53	-0.29	-0.60	-0.22	-0.87	-0.18	-0.16	1.31	0.34	-0.21
2013	LAMAR	0.73	-0.11	-0.60	0.43	0.66	-1.53	-0.80	0.41	-0.01	0.27	-0.13
2008	LANIER	0.02	0.14	-1.14	0.02	-0.12	-1.10	2.61	-0.56	0.70	-0.49	-0.53
2013	LANIER	-0.90	-0.29	-0.56	0.91	-0.25	N/A	0.02	-0.23	0.04	0.42	-0.93
2008	LAURENS	0.43	0.54	-0.65	0.95	-0.15	0.96	-0.67	0.19	-0.12	0.72	-0.46
2013	LAURENS	0.09	-0.04	0.05	0.38	0.02	0.23	-0.23	0.29	-0.30	-0.59	-0.16
2008	LEE	0.34	-0.13	0.32	-0.30	-0.20	0.25	0.38	1.18	0.02	-0.59	-1.24
2013	LEE	-0.13	-0.29	0.00	0.32	0.11	1.07	0.10	0.29	-1.55	-0.19	-0.52
2008	LIBERTY	0.69	0.35	0.50	0.21	-0.04	-0.13	0.10	-0.20	0.19	-0.89	-0.27
2013	LIBERTY	0.64	0.17	0.80	-0.33	-0.34	0.39	0.62	-1.34	-1.49	-0.08	-0.17
2008	LINCOLN	1.39	0.78	1.27	1.71	0.25	N/A	-1.22	0.35	1.67	-1.13	0.91
2013	LINCOLN	0.03	0.14	1.20	0.37	0.05	1.41	0.83	0.98	0.87	-1.27	0.96
2008	LONG	-0.19	-0.10	-0.64	0.81	0.28	N/A	-0.78	-0.36	-1.62	-0.69	-2.73
2013	LONG	-0.83	-0.28	-0.02	-0.22	-1.66	-3.35	-1.46	0.66	-0.79	0.11	-2.22
2008	LOWNDES	0.66	0.30	0.60	-0.08	0.06	-0.85	-0.13	0.79	0.12	-0.18	0.20
2013	LOWNDES	0.89	1.08	0.26	0.25	-1.14	0.30	-0.22	1.14	-0.41	-0.50	0.33
2008	LUMPKIN	-0.50	0.08	-0.10	0.01	1.06	2.23	0.98	-0.26	1.97	-0.37	-0.62
2013	LUMPKIN	0.38	0.53	0.56	0.58	0.02	0.43	0.39	-0.44	0.15	-1.10	-0.16
2008	MACON	-2.44	-0.96	-0.61	-0.17	-0.08	-0.47	-0.75	-0.29	0.49	-1.89	0.17
2013	MACON	-1.70	-0.29	-2.32	0.19	-1.10	-0.03	-0.81	-0.96	2.00	-3.87	-0.06
2008	MADISON	-0.34	-0.65	-0.92	0.18	-1.15	-0.12	-0.23	-0.90	-1.72	-0.26	-0.21
2013	MADISON	0.33	0.62	0.50	0.03	-0.13	0.04	-0.83	0.15	0.46	0.84	-0.19
2008	MARION	-0.22	0.24	1.38	0.36	0.44	N/A	0.11	0.42	-1.13	-0.40	1.69
2013	MARION	0.96	0.83	1.51	-0.05	-0.45	-0.18	0.77	-0.05	0.88	-1.42	0.10
2008	MCDUFFIE	0.28	0.96	0.93	0.54	-0.03	-0.54	0.53	-0.16	0.37	-0.47	0.46
2013	MCDUFFIE	-0.07	0.38	0.30	-0.41	0.64	-0.25	0.66	-0.40	1.93	0.18	-0.56
2008	MCINTOSH	-1.09	-0.56	1.41	-0.84	0.11	N/A	-1.30	0.22	0.68	-0.54	-0.65
2013	MCINTOSH	-0.48	-0.65	-0.31	1.53	-0.11	-0.08	-1.12	-2.04	1.78	0.69	-0.51
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	MERIWETHER	-0.65	-0.89	-0.22	-1.58	0.15	-0.96	-2.13	1.21	-0.36	0.73	0.47
2013	MERIWETHER	-2.00	-2.98	-2.34	-2.50	-0.57	-1.51	-2.84	1.62	1.14	-0.18	0.52
2008	MILLER	0.32	1.11	1.71	-1.46	0.50	N/A	-0.81	0.72	0.43	-1.88	0.07
2013	MILLER	-0.24	-0.40	-0.65	-0.76	-0.50	-1.80	-1.70	1.17	-0.65	-0.59	0.08
2008	MITCHELL	1.01	-0.18	1.72	-0.73	0.25	-0.78	-2.27	-0.09	-0.92	-0.73	1.58
2013	MITCHELL	1.53	1.85	2.33	1.37	2.07	2.19	0.93	1.27	1.94	-0.07	2.25
2008	MONROE	1.73	1.17	0.34	0.49	0.23	-1.12	-1.06	-0.28	-0.40	-0.80	-0.69
2013	MONROE	0.61	0.84	0.40	-0.25	1.04	-0.78	-0.79	0.96	0.35	0.24	-0.16
2008	MONTGOMERY	-0.41	-0.81	1.15	0.14	-0.09	N/A	-0.54	0.48	1.48	0.09	0.43
2013	MONTGOMERY	-0.35	-0.64	0.64	-0.18	0.37	0.63	1.43	-0.27	0.31	-0.20	-0.37
2008	MORGAN	1.13	0.95	-1.73	-1.76	0.37	0.57	-0.18	-0.06	1.32	0.54	0.12
2013	MORGAN	0.89	0.62	0.10	0.13	0.41	-0.42	0.79	-0.83	0.32	0.16	-0.19
2008	MURRAY	0.80	0.36	0.65	-0.10	-0.83	1.08	0.62	0.55	-0.46	0.50	0.66
2013	MURRAY	0.16	-0.04	-0.52	-0.74	0.55	0.46	0.59	0.61	0.92	0.98	0.42
2008	MUSCOGEE	0.00	-0.42	0.20	0.22	0.37	-0.60	0.53	-0.28	0.20	-0.19	0.19
2013	MUSCOGEE	-0.81	-1.19	0.30	0.73	-0.21	0.19	0.89	-0.56	0.37	0.51	0.11
2008	NEWTON	-0.72	-0.60	-0.48	-0.36	0.54	0.04	0.71	-0.66	1.06	0.20	0.14
2013	NEWTON	0.37	-0.10	-0.30	-1.45	-0.24	-0.53	-0.47	-0.08	0.11	0.34	0.64
2008	OCONEE	0.82	0.70	0.32	1.04	0.34	0.65	-0.17	0.55	0.84	0.68	0.09
2013	OCONEE	-0.52	-0.46	-0.06	0.66	0.33	1.51	0.56	0.75	0.60	0.45	0.14
2008	OGLETHORPE	-0.63	0.89	-1.35	0.66	-0.64	0.04	1.32	0.22	-0.20	-0.29	-1.04
2013	OGLETHORPE	-0.14	0.39	-0.85	0.10	-0.64	-1.31	-0.17	-0.33	0.06	-1.39	-1.07
2008	PAULDING	-0.67	-0.99	-0.47	-1.58	-0.73	-1.25	-1.24	-0.55	-0.78	0.04	-0.09
2013	PAULDING	-0.83	-0.46	-0.71	-1.79	-0.26	-1.80	-1.99	-1.06	-0.12	-0.79	-0.44
2008	PEACH	-0.04	-0.10	-0.73	-1.81	0.49	0.06	0.48	-1.58	-0.12	2.02	0.67
2013	PEACH	-1.95	-1.83	-0.83	-0.57	-1.15	-1.61	-0.81	1.30	-0.23	0.33	0.39
2008	PICKENS	0.07	0.03	-1.09	0.57	-0.01	0.47	0.16	0.47	-0.17	-0.32	0.90
2013	PICKENS	-0.37	-0.40	0.00	-0.63	0.84	2.20	0.32	1.22	1.18	0.02	0.33
2008	PIERCE	1.05	1.70	0.71	0.37	-0.24	N/A	0.00	0.89	-1.32	0.25	-0.18
2013	PIERCE	0.27	0.62	0.25	1.24	1.35	-0.63	0.89	0.94	-0.36	0.94	-0.09

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	PIKE	0.18	-1.05	-1.17	-1.31	-0.48	-0.80	-1.33	-0.09	-0.05	0.02	-0.06
2013	PIKE	-1.19	-0.69	-0.27	-0.69	0.69	0.47	-0.44	-0.36	-0.02	0.64	-0.19
2008	POLK	-0.90	-1.09	-1.26	-1.16	-0.23	-1.19	-0.62	0.42	-0.65	-0.02	0.04
2013	POLK	-0.34	0.09	0.08	-1.29	-1.70	-1.32	-1.01	0.54	-1.23	-1.73	-0.48
2008	PULASKI	-1.21	-1.02	-0.06	-1.67	0.46	-1.74	-0.64	-0.71	0.72	1.48	-1.72
2013	PULASKI	1.07	0.76	0.37	-0.30	-0.18	-1.01	1.20	-0.12	0.78	-0.04	-1.95
2008	PUTNAM	1.13	1.04	-0.25	0.07	0.06	0.27	-0.23	-0.14	-0.15	-0.09	-0.36
2013	PUTNAM	2.49	1.61	1.16	0.76	0.28	1.97	2.21	-0.43	-0.11	0.18	0.09
2008	QUITMAN	0.25	0.25	N/A	N/A	-5.90	N/A	N/A	-0.09	0.00	3.76	2.58
2013	QUITMAN	-0.68	-0.32	2.09	0.12	-1.07	N/A	-1.48	3.43	2.29	0.00	2.37
2008	RABUN	0.71	1.03	1.30	0.43	0.76	0.60	0.65	0.66	1.07	0.20	0.72
2013	RABUN	0.54	0.72	-0.14	0.59	-0.62	0.93	0.06	-0.32	0.35	1.20	-0.14
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	RANDOLPH	-1.15	-0.54	-0.75	-0.44	0.95	-1.33	-1.67	0.39	1.45	1.29	-2.97
2013	RANDOLPH	-1.82	-1.40	-0.88	0.20	-1.66	0.37	0.17	-0.29	-1.58	-1.17	-3.89
2008	RICHMOND	-0.87	-1.14	-0.94	-1.56	-0.60	-0.05	1.20	-0.54	-0.07	-0.87	0.28
2013	RICHMOND	-1.29	-1.54	-0.41	0.59	-1.15	-0.17	0.26	-0.45	1.14	1.11	0.68
2008	ROCKDALE	0.95	0.83	0.34	-0.31	0.09	1.81	1.20	0.20	0.27	-0.67	0.27
2013	ROCKDALE	1.27	1.10	0.51	-0.36	0.70	0.57	0.23	0.34	-0.23	-1.39	1.19
2008	SCHLEY	0.61	0.50	2.41	1.09	0.54	N/A	-0.53	1.56	1.32	-0.15	-0.20
2013	SCHLEY	0.96	0.94	1.17	0.08	-0.40	N/A	-0.12	1.65	0.43	-0.69	-0.02
2008	SCREVEN	0.93	0.61	0.83	0.86	1.17	1.47	0.78	0.36	0.76	1.03	-1.75
2013	SCREVEN	-0.55	-0.71	1.63	2.56	1.58	1.71	0.67	-0.53	0.41	1.77	-2.49
2008	SEMINOLE	-0.18	-0.35	1.62	0.19	1.16	-0.08	1.09	0.25	-0.81	-2.02	-1.35
2013	SEMINOLE	-0.03	0.35	0.22	0.58	0.69	N/A	0.49	-0.06	0.54	-1.13	-2.12
2008	SPALDING	-0.30	-1.02	0.28	-0.96	-0.63	0.02	-0.29	-0.49	-1.73	-1.39	-0.93
2013	SPALDING	-0.32	-0.42	-0.31	-0.53	-0.60	-0.23	0.18	-0.21	-1.04	0.25	0.25
2008	STEPHENS	1.44	1.38	0.99	-0.61	-0.27	0.53	0.07	0.63	-0.65	-0.49	0.63
2013	STEPHENS	1.21	1.38	0.57	0.36	1.27	0.22	0.10	0.28	0.51	-0.18	0.27
2008	STEWART	-0.24	-0.27	0.26	-0.44	-0.53	N/A	-1.86	-0.49	-1.66	0.59	3.11

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2013	STEWART	3.06	2.90	1.42	0.28	2.29	1.49	N/A	0.28	2.76	0.92	2.92
2008	SUMTER	0.24	-0.48	-0.54	-0.16	-1.09	0.11	-0.18	-0.12	-1.30	-0.37	-2.44
2013	SUMTER	-1.05	-1.52	-0.62	0.00	-0.12	1.29	1.09	0.55	-0.38	1.65	-1.76
2008	TALBOT	-3.23	-2.71	-1.01	-1.09	-0.51	N/A	-2.23	-3.29	-0.12	0.02	-0.72
2013	TALBOT	-1.34	-1.25	-2.64	-1.15	-1.44	-1.61	-2.90	2.90	-1.70	1.39	0.86
2008	TALIAFERRO	-1.58	-0.86	-2.38	2.03	0.77	N/A	N/A	-1.12	1.52	1.83	0.63
2013	TALIAFERRO	-0.42	-1.02	2.40	2.68	N/A	N/A	N/A	-0.79	1.99	-0.58	-3.33
2008	TATTNALL	-0.30	-0.31	-0.05	0.68	0.45	N/A	1.05	0.03	0.76	-0.08	-0.43
2013	TATTNALL	-0.02	-0.50	-1.30	-0.08	-0.76	0.58	-1.10	-0.36	-1.39	-0.22	-0.25
2008	TAYLOR	-0.17	0.43	-0.51	-0.17	0.28	0.56	1.01	0.56	-0.92	0.30	0.93
2013	TAYLOR	0.06	-0.64	0.32	-0.47	-0.21	0.56	0.68	0.31	1.07	0.22	1.21
2008	TELFAIR	-0.89	-0.73	2.43	1.25	0.52	N/A	-0.09	-1.59	-0.63	-1.68	0.14
2013	TELFAIR	-0.69	-0.59	1.61	-0.17	0.43	N/A	1.65	-1.07	1.03	0.14	1.21
2008	TERRELL	0.02	-0.40	-0.72	-1.93	-1.24	-1.29	-1.96	-0.34	-0.87	1.03	0.79
2013	TERRELL	0.67	0.08	-0.19	-0.18	2.89	-0.51	0.41	2.36	1.83	1.98	0.89
2008	THOMAS	0.52	-0.26	-0.46	0.78	0.70	0.07	0.24	-0.56	1.07	0.60	0.17
2013	THOMAS	-0.17	-0.42	0.39	-0.93	-0.31	-0.23	-0.60	-1.55	-1.51	-0.61	0.04
2008	TIFT	-1.16	-1.13	0.51	0.90	-0.51	1.50	0.28	-0.14	-1.56	-0.58	-0.10
2013	TIFT	0.22	-0.15	0.11	0.36	0.27	0.38	-0.08	-0.47	-0.49	0.48	-1.22
2008	TOOMBS	0.23	0.77	1.30	1.60	0.04	N/A	1.23	0.97	0.00	0.38	-0.56
2013	TOOMBS	-0.73	-0.43	0.20	-1.09	-0.81	-2.26	1.06	1.23	0.46	1.37	-1.04
2008	TOWNS	-0.55	-0.85	-0.81	-0.53	0.22	N/A	-0.41	-8.19	-2.86	1.82	1.06
2013	TOWNS	0.17	-0.36	1.00	-0.84	1.01	0.76	-0.53	-1.27	0.60	0.77	0.13
2008	TREUTLEN	1.87	1.43	0.96	-0.29	-0.28	N/A	-1.71	0.64	1.65	0.42	0.57
2013	TREUTLEN	-0.20	-0.70	0.11	-0.34	-0.45	-0.34	0.59	-0.47	1.53	1.06	0.65
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	TROUP	2.70	2.76	-0.27	0.77	-0.48	0.56	1.17	0.35	-0.01	0.38	-0.23
2013	TROUP	0.08	0.30	-0.58	-0.21	-0.30	0.47	1.33	-0.37	0.18	0.28	-0.33
2008	TURNER	0.27	0.87	0.90	-0.15	-0.56	N/A	-1.17	0.79	0.45	0.89	-1.27
2013	TURNER	-0.36	-0.64	-1.69	0.12	-0.12	N/A	-0.41	0.85	-1.25	-0.10	-0.47

Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	TWIGGS	0.93	0.22	-0.31	-2.08	-0.87	-1.92	0.21	0.74	1.04	-1.35	-0.23
2013	TWIGGS	-1.06	-0.91	-3.02	-1.24	1.27	-0.64	-1.11	-0.28	0.63	-0.28	-0.15
2008	UNION	-3.20	-3.79	1.54	0.21	1.40	-1.48	-0.45	0.43	2.31	0.09	1.16
2013	UNION	1.67	1.65	1.38	1.42	1.81	1.97	0.22	1.18	0.98	0.39	0.56
2008	UPSON	1.83	1.95	0.12	-0.53	0.25	-0.04	-0.18	-0.31	-0.57	0.27	-0.74
2013	UPSON	0.75	0.68	-0.45	-1.02	-1.31	-0.37	-0.79	-0.56	-2.21	0.47	-0.37
2008	WALKER	-0.02	0.18	0.44	0.00	-1.24	1.04	0.91	0.14	-1.24	-0.53	0.72
2013	WALKER	0.20	0.10	0.69	0.86	0.01	1.17	2.19	0.32	-0.69	0.04	0.27
2008	WALTON	-0.29	-0.11	-1.82	-0.23	-0.15	-0.95	-1.23	-0.67	-0.39	-0.17	-0.65
2013	WALTON	-0.16	0.13	-1.19	-0.61	0.16	-0.47	-1.00	-0.24	-1.21	-0.23	0.03
2008	WARE	0.71	0.60	0.49	-0.31	-0.82	0.24	-0.47	-0.71	-0.87	-0.46	-0.02
2013	WARE	1.71	1.34	1.28	0.91	0.84	1.23	-0.18	0.49	-1.51	-1.62	-0.08
2008	WARREN	-0.64	-0.09	-0.68	-0.36	0.76	-0.94	-0.18	2.05	-0.69	0.70	0.25
2013	WARREN	1.06	1.71	2.27	-0.29	1.96	0.39	0.01	-1.42	-1.33	-3.16	-1.17
2008	WASHINGTON	-0.15	0.28	-0.03	0.74	0.30	-0.24	2.02	-0.06	0.36	1.60	-2.21
2013	WASHINGTON	0.04	-0.80	-0.47	-1.54	0.39	-0.33	0.29	-0.45	0.17	1.11	-4.14
2008	WAYNE	-1.30	-0.84	-1.98	-1.28	-0.18	-0.19	-0.21	-0.84	-0.10	0.25	-0.32
2013	WAYNE	-1.95	-0.68	-1.41	-0.05	-0.91	0.36	-0.67	-2.15	-1.02	0.66	-0.04
2008	WEBSTER	-1.41	0.10	N/A	N/A	-6.93	N/A	N/A	2.01	-0.13	0.71	-0.40
2013	WEBSTER	2.11	1.03	0.99	0.47	-2.21	N/A	-1.62	2.41	1.52	-2.41	1.60
2008	WHEELER	0.54	0.14	-1.05	-0.82	0.29	N/A	-1.98	-0.29	0.60	0.58	0.37
2013	WHEELER	-0.54	-0.10	-0.40	-0.75	1.01	N/A	0.22	0.97	1.95	0.00	1.31
2008	WHITE	0.26	0.16	1.49	0.70	0.70	-0.32	0.41	0.38	0.90	0.14	0.97
2013	WHITE	0.05	0.24	1.17	0.84	1.75	1.19	0.23	0.94	0.86	0.95	0.72
2008	WHITFIELD	0.27	0.34	-0.48	-0.99	0.40	0.66	-0.06	-0.30	0.47	0.54	-0.48
2013	WHITFIELD	-0.57	-1.43	0.00	-1.04	-0.66	-0.06	-0.40	0.42	-1.36	-0.18	-0.32
2008	WILCOX	0.66	-1.22	-0.68	-0.88	1.30	-2.00	-0.20	-1.91	0.62	0.58	-0.37
2013	WILCOX	-0.85	-1.79	0.36	-1.40	-0.87	-0.94	2.39	-1.30	-0.36	0.66	-1.04
2008	WILKES	0.37	0.65	0.97	0.81	2.38	-2.15	0.47	0.33	-0.83	-1.34	0.11
2013	WILKES	0.63	2.03	0.71	-0.58	-1.97	-0.28	1.51	0.85	-1.80	-1.79	1.14

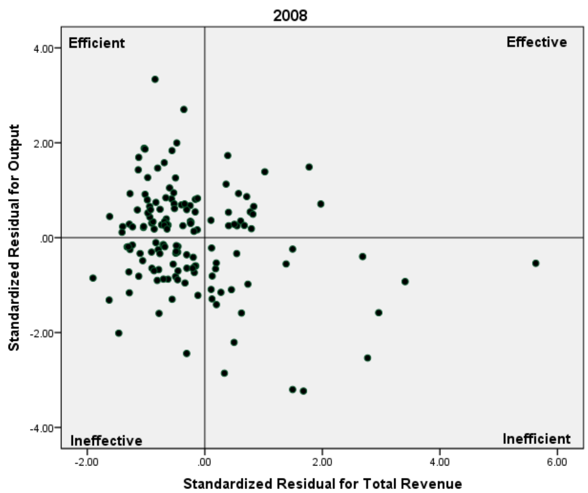
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	WILKINSON	0.49	-0.15	0.02	-0.89	1.33	0.24	-1.21	1.50	0.36	1.85	0.34
2013	WILKINSON	0.44	1.10	0.15	-0.49	1.65	-0.09	1.03	0.30	0.22	0.64	1.17
2008	WORTH	0.30	0.78	-0.69	0.42	-0.80	-0.16	-0.15	-1.06	-0.94	-1.86	-2.85
2013	WORTH	-0.70	-1.11	0.12	-0.08	0.28	0.54	-0.12	-0.04	-1.29	0.23	-2.08
2008	ATLANTA CITY	N/A	N/A	-0.36	-0.09	0.34	-0.71	-0.45	0.04	-0.51	0.72	1.64
2013	ATLANTA CITY	-0.35	-0.49	-0.66	-0.15	-0.55	-0.66	0.32	-0.18	-1.45	0.60	1.39
2008	BREMEN	0.50	0.95	0.62	0.44	0.44	-1.56	-0.46	0.25	0.93	0.88	0.22
2013	BREMEN	-0.54	0.12	0.10	0.54	0.04	-0.12	-1.53	-0.85	0.46	-0.09	0.32
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2008	BUFORD	0.25	0.61	2.14	1.05	1.42	0.79	0.46	1.04	1.61	0.79	1.56
2013	BUFORD	1.13	1.07	1.91	2.93	0.96	1.87	1.85	1.11	0.14	0.28	0.56
2008	CALHOUN CITY	-1.32	-2.83	-0.80	-0.19	0.68	1.55	0.92	0.84	1.48	1.70	0.97
2013	CALHOUN CITY	3.55	3.37	2.76	2.47	3.46	N/A	-0.95	2.41	0.84	-0.22	0.57
2008	CARROLLTON CITY	-0.15	0.01	-1.17	-1.30	0.42	0.35	0.07	0.24	0.88	1.25	0.45
2013	CARROLLTON CITY	0.31	0.28	-0.96	-0.94	0.46	2.01	0.50	-0.13	0.32	0.33	0.53
2008	CARTERSVILLE	0.41	0.33	0.73	0.78	0.16	0.94	0.25	0.46	0.10	0.24	-0.30
2013	CARTERSVILLE	0.61	0.42	0.01	0.95	-0.28	-0.63	0.11	0.06	0.15	0.27	-0.26
2008	CHICKAMAUGA CITY	-0.70	-0.59	-1.38	-1.32	0.33	0.51	-1.30	1.19	0.36	0.95	0.10
2013	CHICKAMAUGA CITY	-0.43	-0.70	-0.41	-0.31	0.39	-0.66	-1.88	1.17	0.38	-0.75	0.08
2008	COMMERCE CITY	1.26	0.59	0.83	1.02	0.95	-0.19	0.48	0.27	0.38	0.02	0.39
2013	COMMERCE CITY	1.53	1.14	1.46	-0.72	0.87	-0.03	-0.97	0.91	0.24	-0.76	0.45
2008	DALTON CITY	0.59	1.46	1.49	1.20	0.92	2.36	2.42	0.06	-0.23	-3.13	1.99
2013	DALTON CITY	0.54	0.36	0.09	-0.19	0.62	0.69	0.59	0.78	1.63	-1.26	1.05
2008	DECATUR CITY	-0.40	-0.60	0.62	-0.59	-0.18	0.12	0.37	0.14	0.82	1.15	0.40
2013	DECATUR CITY	0.06	-0.09	0.21	1.73	0.70	-0.42	0.06	0.65	0.44	0.72	-0.02
2008	DUBLIN	1.69	0.58	-0.13	0.23	0.02	1.24	0.64	0.93	-0.27	-0.26	0.33

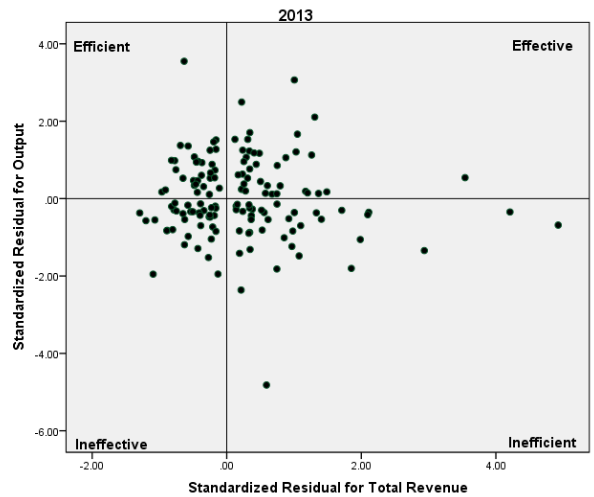
Year	District	ELA	MT1	LIT	MT2	GR	ACT	SAT	ATT	DRP	RTN	DSP
2013	DUBLIN	0.05	0.52	1.07	0.26	-0.40	2.04	1.06	0.81	-0.29	2.19	-0.09
2008	GAINESVILLE CITY	0.45	0.54	2.01	1.65	0.84	3.02	1.45	-0.49	-1.16	-0.40	2.27
2013	GAINESVILLE CITY	-0.80	-1.13	-0.25	0.56	-0.40	-0.81	-1.14	-0.63	-0.90	-0.02	-0.12
2008	JEFFERSON CITY	-2.01	-1.09	0.94	1.24	0.32	-2.13	-0.50	0.50	0.77	1.15	0.18
2013	JEFFERSON CITY	0.38	0.63	0.61	0.64	0.22	-0.06	1.96	1.11	0.53	0.20	0.19
2008	MARIETTA CITY	-0.70	-0.15	1.59	2.08	0.70	0.87	1.53	-0.66	0.71	-0.06	0.63
2013	MARIETTA CITY	0.85	0.94	0.65	0.35	-1.15	2.26	1.80	-0.57	-0.95	-0.48	0.06
2008	PELHAM	0.09	-0.30	0.87	2.02	-0.62	N/A	1.10	-1.09	-1.94	0.03	-0.83
2013	PELHAM	-0.47	-0.83	-0.06	0.59	0.27	0.69	1.84	-1.32	-0.93	-0.30	-0.08
2008	ROME CITY	1.43	0.94	1.51	0.57	-0.28	2.24	2.40	1.33	-1.50	-2.15	1.52
2013	ROME CITY	0.99	0.98	0.81	1.31	1.68	0.31	2.93	0.47	0.85	0.89	0.77
2008	SOCIAL CIRCLE CITY	-0.66	-1.37	-0.33	-1.07	0.57	-0.80	1.52	0.47	1.63	0.21	-0.55
2013	SOCIAL CIRCLE CITY	-0.30	-0.99	-1.01	-1.78	-0.30	-0.95	-0.36	0.27	0.87	0.23	0.19
2008	THOMASVILLE CITY	0.01	-0.49	-1.06	-0.94	-0.93	0.57	1.15	-1.04	-0.32	1.25	-0.06
2013	THOMASVILLE CITY	-0.43	-0.23	-1.02	0.09	-0.50	0.44	0.52	-1.81	-1.56	1.75	-0.28
2008	TRION	-2.86	-2.18	1.53	-1.06	1.07	N/A	1.63	1.74	1.64	1.16	0.35
2013	TRION	0.86	0.62	0.59	-1.84	1.30	-0.49	1.05	1.66	1.15	0.69	0.20
2008	VALDOSTA CITY	0.08	-0.60	-0.90	0.49	-0.84	0.90	1.75	-0.63	-1.02	-0.95	0.24
2013	VALDOSTA CITY	0.98	0.71	0.30	-0.28	-0.53	0.33	0.42	0.90	-0.66	-1.04	-0.35
2008	VIDALIA CITY	-0.19	0.13	-0.59	1.26	0.11	0.30	0.22	0.81	0.57	2.21	-0.69
2013	VIDALIA CITY	-0.20	-0.50	0.55	0.04	-0.39	0.99	1.74	1.08	-0.47	1.19	0.29

APPENDIX C

FULL QUADRIFORM RESULTS FOR EACH OUTCOME VARIABLE ANALYZED

Elementary/Middle School English/Language Arts





ELA 2008

Efficient	Effective
40.0%	12.4%
31.7%	15.9 %
Ineffective	Inefficient

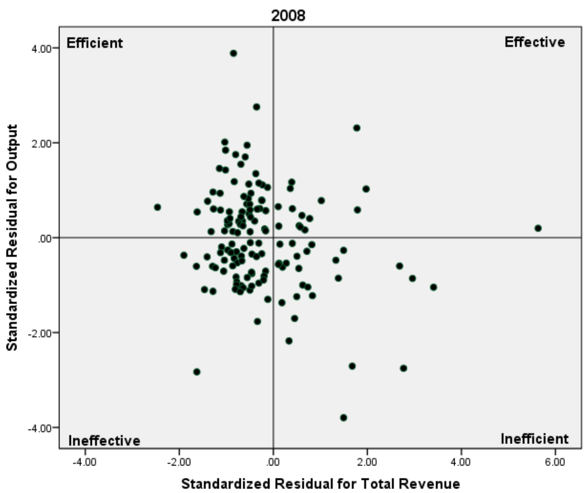
34 Districts Unclassified

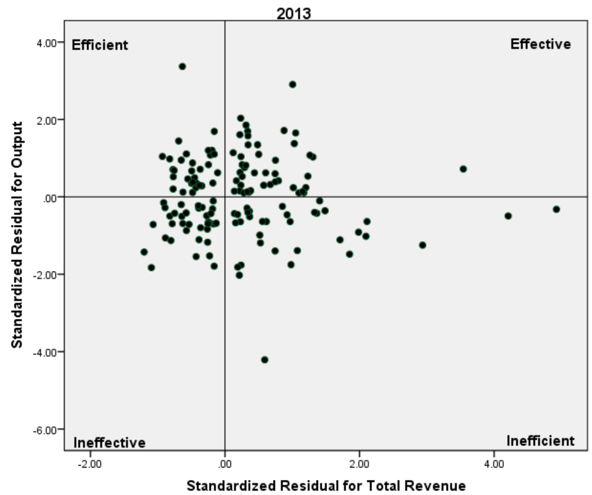
ELA 2013

Efficient	Effective
21.7%	25.9%
25.2%	27.3%
Ineffective	Inefficient

36 Districts Unclassified

Elementary/Middle Math





Math 2008

Efficient	Effective
38.7%	10.6%
32.4%	18.3%
Ineffective	Inefficient

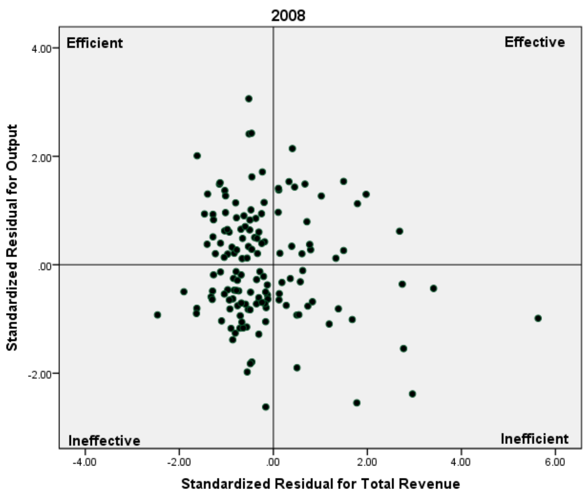
37 Districts Unclassified

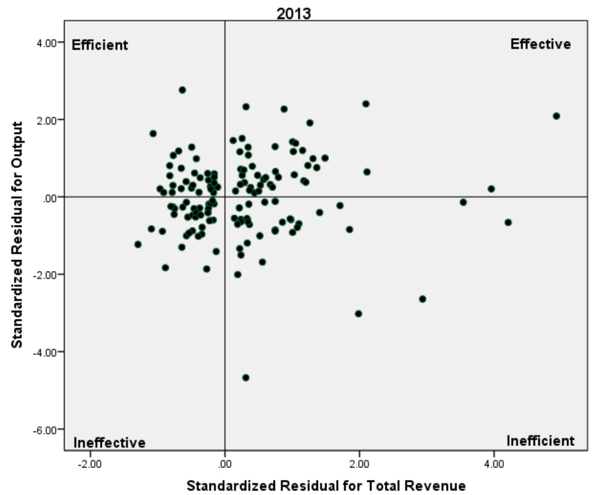
Math 2013

Efficient	Effective
21.4%	30.3%
24.1%	24.1%
Ineffective	Inefficient

34 Districts Unclassified

High School Literature





HS Lit 2008

Efficient	Effective
33.8%	13.8%
37.9%	14.4%
Ineffective	Inefficient

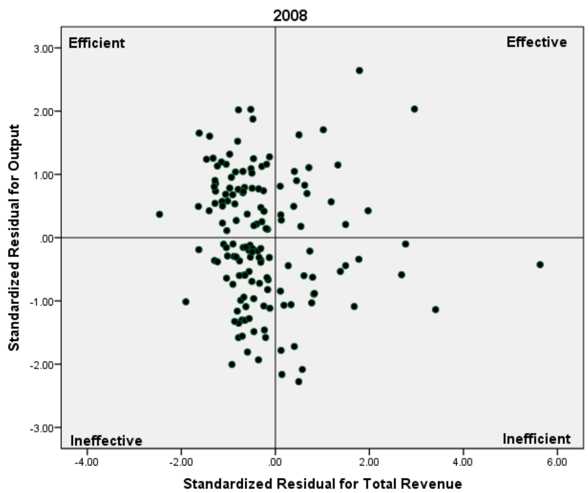
34 Districts Unclassified

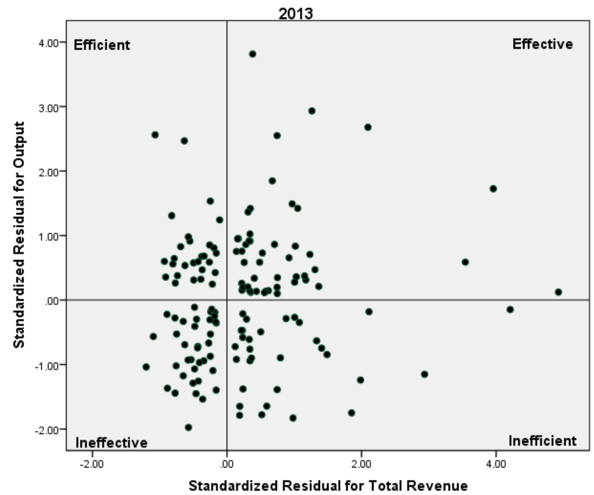
HS Lit 2013

Efficient	Effective
21.3%	30.5%
24.1%	24.1%
Ineffective	Inefficient

38 Districts Unclassified

High School Math





HS Math 2008

Efficient	Effective
36.4%	11.9%
36.4%	15.2%
Ineffective	Inefficient

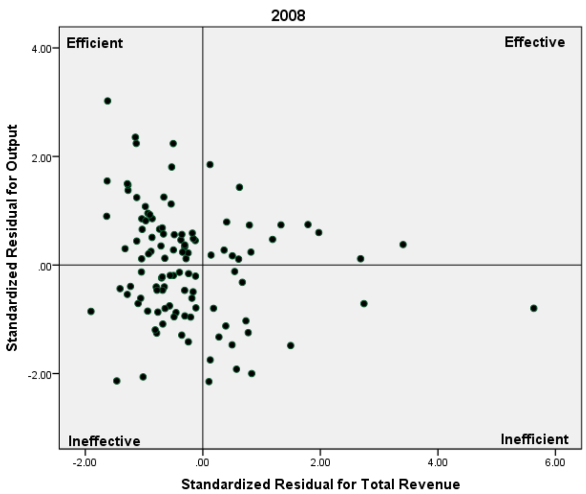
28 Districts Unclassified

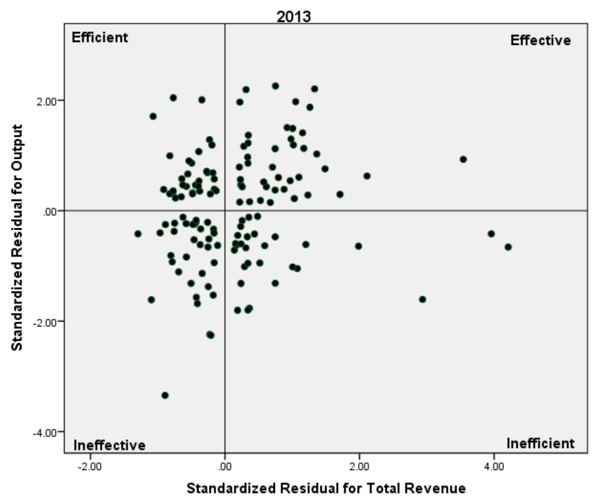
HS Math 2013

Efficient	Effective
19.4%	32.6%
26.4%	21.5%
Ineffective	Inefficient

35 Districts Unclassified

ACT





ACT 2008

Efficient	Effective
39.1%	13.6%
33.6%	13.6%
Ineffective	Inefficient

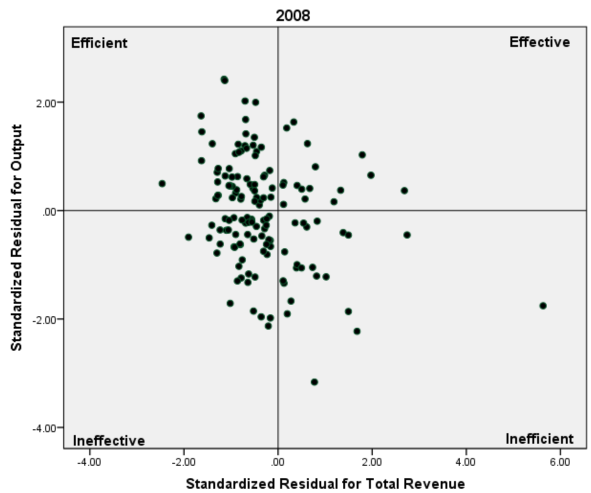
69 Districts Unclassified

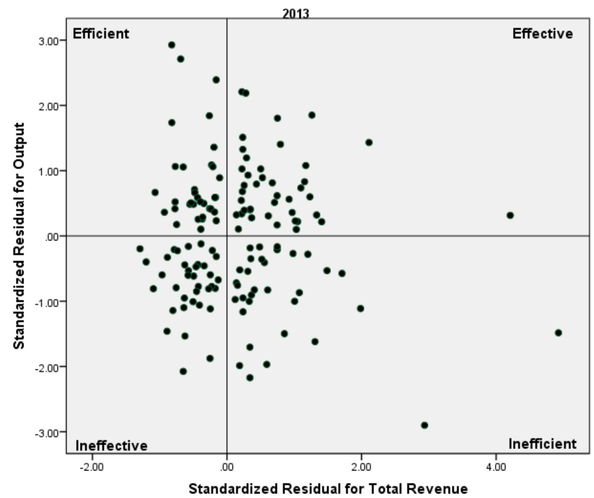
ACT 2013

Efficient	Effective
23.4%	29.9%
25.5%	21.2%
Ineffective	Inefficient

42 Districts Unclassified

SAT





SAT 2008

Efficient	Effective
38.9%	11.1%
34.7%	15.3%
Ineffective	Inefficient

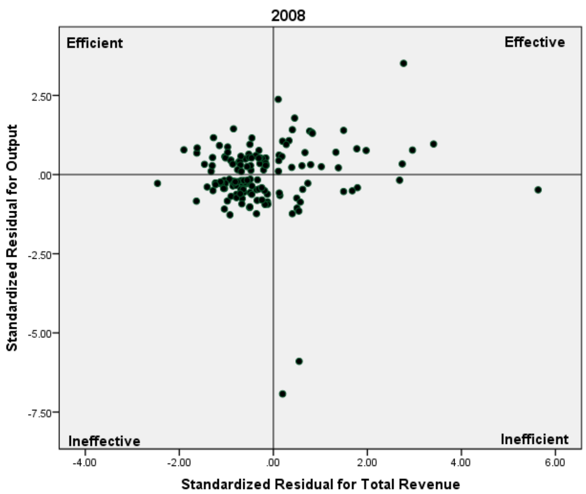
35 Districts Unclassified

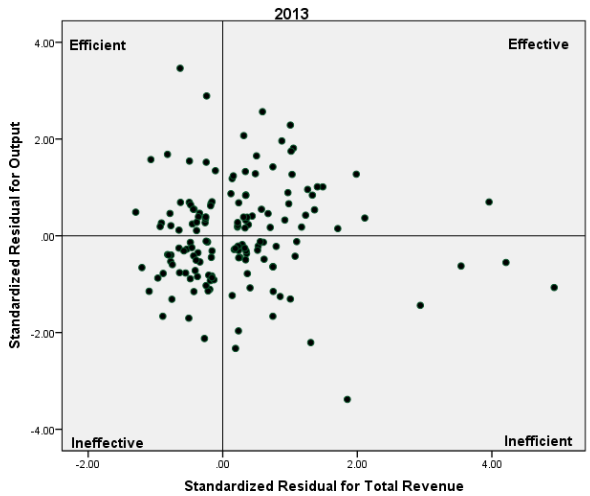
SAT 2013

Efficient	Effective
24.1%	28.3%
24.8%	22.8%
Ineffective	Inefficient

34 Districts Unclassified

Graduation Rate





Grad Rate 2008

Efficient	Effective
29.7%	18.6%
40.7%	11.0%
Ineffective	Inefficient

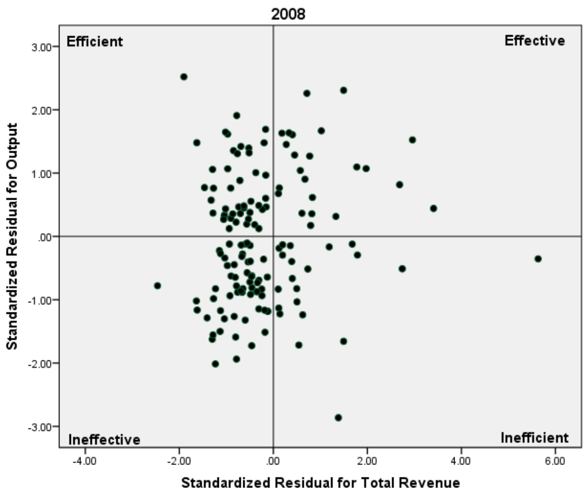
34 Districts Unclassified

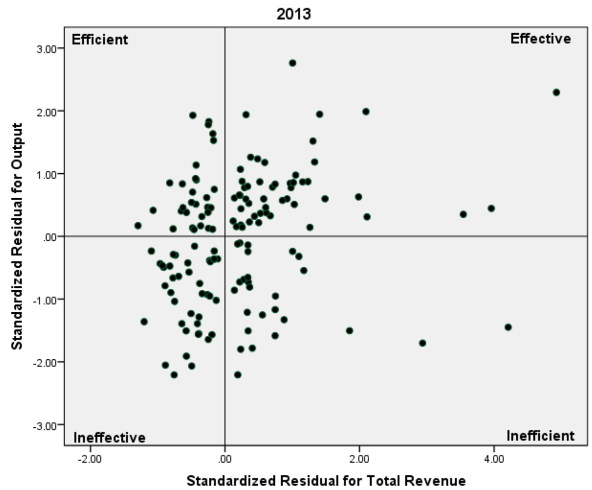
Grad Rate 2013

Efficient	Effective
19.5%	28.9%
27.5%	24.2%
Ineffective	Inefficient

30 Districts Unclassified

Dropout Rate





Dropout Rate 2008

Efficient	Effective
30.1%	15.8%
39.7%	14.4%
Ineffective	Inefficient

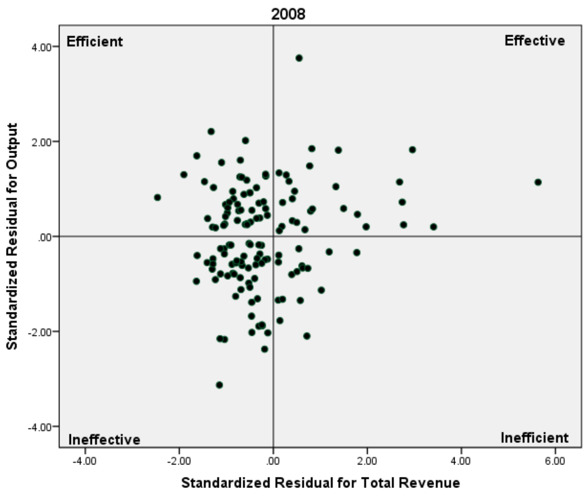
33 Districts Unclassified

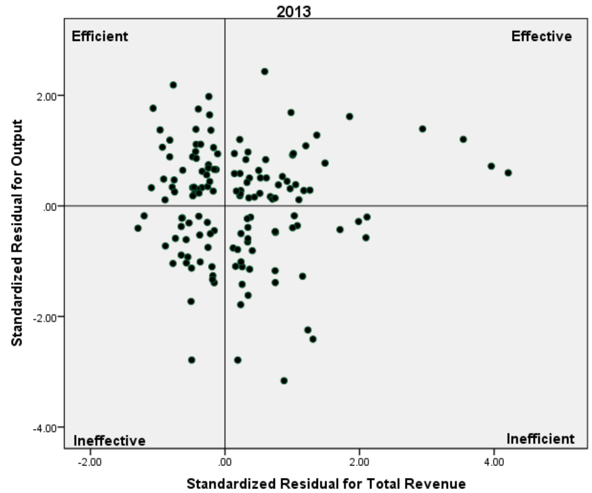
Dropout Rate 2013

Efficient	Effective
20.5%	34.2%
27.4%	17.8%
Ineffective	Inefficient

33 Districts Unclassified

Retention Rate





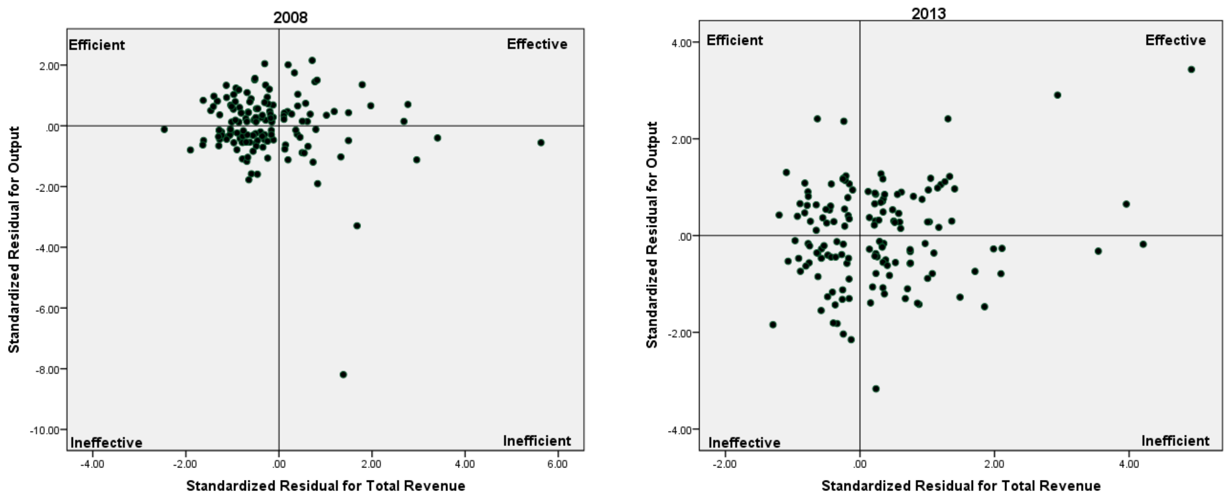
Retention Rate 2008

Efficient	Effective
32.4%	19.4%
36.7%	11.5%
Ineffective	Inefficient
40 Districts Unclassified	

Retention Rate 2013

Efficient	Effective
28.9%	29.6%
19.0%	22.5%
Ineffective	Inefficient
37 Districts Unclassified	

Attendance Rate



Attendance Rate 2008

Efficient	Effective
35.8%	15.5%
35.8%	12.8%
Ineffective	Inefficient

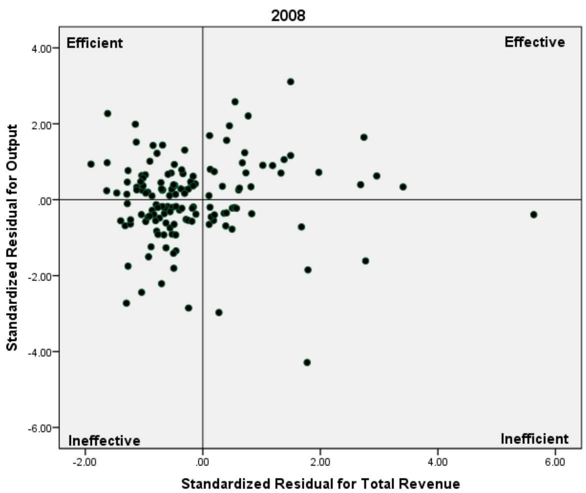
31 Districts Unclassified

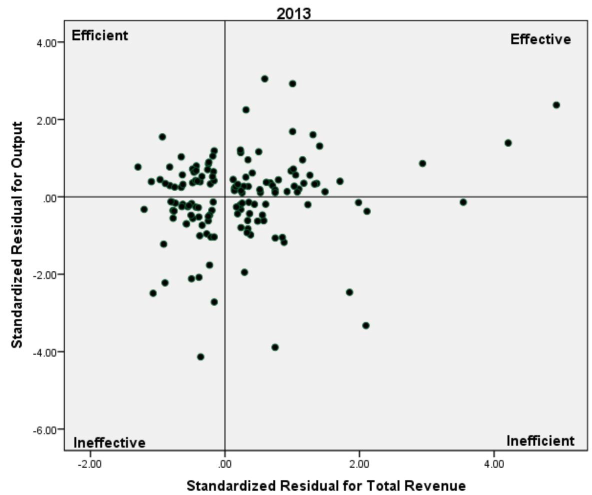
Attendance Rate 2013

Efficient	Effective
21.9%	27.4%
24.0%	26.7%
Ineffective	Inefficient

33 Districts Unclassified

Discipline Rate





Discipline Rate 2008

Efficient	Effective
34.7%	18.1%
34.0%	13.2%
Ineffective	Inefficient

35 Districts Unclassified

Discipline Rate 2013

Efficient	Effective
21.3%	32.9%
26.2%	19.9%
Ineffective	Inefficient

38 Districts Unclassified

APPENDIX D

DESCRIPTIVE STATISTICS FOR ANALYZED VARIABLES

Variables in 2013 Alterable Discriminant Model

Variable	Mean	Median	Standard Deviation
Change in % of revenue from local sources 2008-2013	2.12%	0.4%	1.81%
Total tax digest per student	$187,164.15	$156,489.00	$106,870.37
% Change in local tax digest 2008-2013	- 13.88%	- 13.00%	12.66%
% Change in funding per student 2008 to 2013	- 4.87%	- 4.54%	7.80%

Variables in 2013 Unalterable Discriminant Model

Variable	Mean	Median	Standard Deviation
Students per Teacher	14.26	14.41	1.26
Average Administrator Salary	$82,873.68	$83,269.42	$7,737.03
% Teachers with Advanced Degrees	65.48%	65.39%	7.04%
Average Teacher Salary	$51,840.48	$51,847.77	$2,687.44
Support Personnel per Student	137.11	130.83	42.79
Percentage of Revenue from Federal Sources	9.84%	9.37%	3.73%
Average Teacher Experience Levels	14.26	14.25	1.56
Total Reduction in Teacher Days 2009-2013	7.97	8.00	9.97
Average Administrator Experience	22.16	22.10	2.70
Percentage of Expenditure to Instruction	65.64%	66.45%	4.50%
Total Reduction in Student Days 2009-2013	13.58	9.0	19.3
Total Staff Reduction 2009-2013	56.47	18.00	160.3
Administrators per Student	157.34	153.85	52.50
Percentage of Expenditure to Administration	4.87%	4.34%	2.31%

Quadriform Outcome Variables 2008

Variable	Mean	Median	Standard Deviation
ES/MS ELA	87.26%	87.33%	4.42%
ES/MS Math	67.81%	68.68%	9.45%
HS Literature	73.76%	73.81%	8.54%
HS Math	58.96%	60.50%	16.60%
Graduation Rate	72.54%	73.50%	11.52%
Dropout Rate	5.15%	5.16%	2.03%
Retention Rate	4.36%	4.20%	1.68%
Attendance Rate	9.75%	9.77%	4.17%
Disciplinary Events per/1000 Students	805.14	738.62	483.70
ACT	19.13	19.20	1.65
SAT	944.16	950.00	65.64
Total Funding per Student	$9,147.69	$8,867.59	$1,307.49

Quadriform Outcome Variables 2013

Variable	Mean	Median	Standard Deviation
ES/MS ELA	91.41%	91.95%	4.20%
ES/MS Math	83.84%	85.23%	7.51%
HS Literature	86.15%	86.81%	6.36%
HS Math	46.31%	47.73%	12.66%
Graduation Rate	75.06%	75.50%	9.78%
Dropout Rate	3.28%	3.04%	1.64%
Retention Rate	3.62%	3.44%	1.67%
Attendance Rate	9.42%	9.50%	3.09%
Disciplinary Events per/1000 Students	558.78	488.34	388.28
ACT	19.01	18.90	1.72
SAT	920.59	918.50	67.37
Total Funding per Student	$8,675.69	$8,451.01	$1,212.34

Quadriform Input Variables 2008

Variable	Mean	Median	Standard Deviation
Median Household Income for Community	$34,953.64	$32,010.00	$9,545.90
% Students Non-White	44.54%	43.37%	24.71%
% Students Free/Reduced Lunch	58.88%	60.23%	16.87%
% Students English Learners	5.81%	1.49%	14.21%
% Students with Disabilities	12.51%	12.57%	3.73%
Total Enrollment	8,708	3,416	17,508

Quadriform Input Variables 2013

Variable	Mean	Median	Standard Deviation
Median Household Income for Community	$39,412.08	$36,486.00	$10,635.65
% Students Non-White	46.70%	45.72%	24.04%
% Students Free/Reduced Lunch	64.75%	66.97%	15.29%
% Students English Learners	2.94%	1.83%	3.66%
% Students with Disabilities	12.13%	12.01%	2.34%
Total Enrollment	9,172	3,392	18,974