VITA

Richard W. Ahlgrim

EDUCATION

2009	Indiana State University, Terre Haute, Indiana Ph.D., Educational Administration
2006	Indiana University, Bloomington, Indiana Ed.S., Administrative Leadership
2001	Indiana University, Bloomington, Indiana Certification, School Administration
1999	Indiana University, Bloomington, Indiana M.S., Counseling/Counselor Education
1995	Anderson University, Anderson, Indiana Indiana Teaching License
1987	Anderson University, Anderson, Indiana B.A., History

PROFESSIONAL EXPERIENCE

2008 -	Greenwood Community School Corporation, Greenwood, Indiana Director of Secondary Education
2005-2008	Greenwood Community School Corporation, Greenwood, Indiana Director of Student Services
2002-2005	Greenwood Community High School, Greenwood, Indiana Assistant Principal
1996-2002	Greenwood Community School Corporation, Greenwood, Indiana Social Studies Teacher

A THOROUGH AND EFFICIENT EDUCATION: SCHOOL FUNDING, STUDENT ACHIEVEMENT AND PRODUCTIVITY

A Dissertation

Presented to

The College of Graduate and Professional Studies

Department of Educational Leadership, Administration, and Foundations

Indiana State University

Terre Haute, Indiana

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

---

by

Richard W. Ahlgrim

May 2010

Keywords: School Funding, Student, Achievement, Productivity

COMMITTEE MEMBERS

Committee Chair: Robert Boyd, Ed.D.

Associate Professor of Educational Leadership, Administration, and Foundations

Indiana State University, Terre Haute, Indiana

Committee Member: Gregory Ulm, Ph.D.

Associate Professor Emeritus of Educational Leadership, Administration, and Foundations

Indiana State University, Terre Haute, Indiana

Committee Member: Candace Milhon-Baer, Ph.D.

Director of Learning, MSD Decatur Township Schools

Indianapolis, Indiana

ABSTRACT

Many school districts are facing stagnant or reduced funding (input) concurrent with demands for improved student achievement (output). In other words, there is pressure for all schools, even those schools with student populations of low socioeconomic status, to improve academic results (accountability for output) without a directly proportionate increase in resources (adequacy of input); in essence, to improve productivity. This study a) examined the productivity of Indiana school districts, b) analyzed the effect of student populations of low socioeconomic status on district productivity, and c) explored the change in district productivity since the passage of accountability legislation. In Research Question #1, archival data on the expenditures and student performance of 292 Indiana public school districts was mined and analyzed. Productivity indicators were developed, revealing in 2008 13.9 students demonstrated mastery of Indiana academic standards on ISTEP+ for every $100,000 of General Fund expenditures. However, the range of productivity indicators between districts varied greatly, even among districts of similar socioeconomic status, calling into question whether demography was as critical a productivity predictor as it was generally argued to be. In Research Question #2, regression analysis revealed a statistically significant negative relationship between the socioeconomic status of its student population and its productivity on an overall basis, however a disaggregated analysis of socioeconomic quartiles revealed the relationship between socioeconomic status and productivity at some levels to be statistically insignificant. Such a finding seemed to indicate again that the predictive value of socioeconomic status to learning

results was less reliable than generally suggested. Finally, in Research Question #3 analysis of variance of district productivity revealed that productivity declined steadily in years prior to enactment of the No Child Left Behind and began to improve the year the accountability legislation was enacted, suggesting that accountability measures may have changed educator behavior in a way that resulted in an increase of students able to demonstrate proficiency at state academic standards without a proportionate increase of expenditures.

ACKNOWLEDGMENTS

It is unlikely that this work would have seen the light of day had it not been for the friendship and encouragement of Dr. Gregory Ulm, who recommended that I consider the ELAF program at Indiana State. For that recommendation, for the introductions that followed, and for the academic guidance that he continues to offer as a member of my committee, all from his generous heart, I owe a debt of gratitude. Those current or aspiring school administrators who do not know Dr. Robert L. Boyd face the challenges of their profession at a distinct disadvantage. As the chair of my committee and as classroom instructor, Dr. Boyd's repeated (and sometimes even spoken) message to us was that this business of education, as difficult and discouraging as it can be, would not defeat the educators in whom he had confidence. For that reason, one would be foolish to knowingly do anything to disappoint this great man. Dr. Candace Milhon-Baer has opened my eyes in a remarkable way to the fact that words and ideas can be something other than the blunt instruments for which I have been known to use them. By her extensive review of this work she has introduced nuance and balance into my writing, and moved it gently, but persistently, away from recklessness.

My friends at Greenwood Community School District have also helped all along the way as I have continued my studies. Thank you for your encouragement and support. A special thanks to those education warriors who continue to believe that the breath of life in this work comes from refusing to settle for the way things are. What you do inspires me.

My family may see more of me now, whether they want to or not. They have been an unbelievable source of strength. But most importantly, none of this would have been possible without the unflagging support of my wife and best friend, Rebecca Lynn Ahlgrim. She is a strong and beautiful manifestation of God's grace in my life.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

Introduction

School districts face stagnant or reduced funding concurrent with demands for improved student achievement. In other words, there is pressure for all schools, even those schools with student populations of low socioeconomic status, to improve academic results (Ladd, 1996) without a directly proportionate increase in resources (Ball & Goldman, 1997); in essence, to improve productivity. In response to this pressure for improved student learning, schools with students from low socioeconomic backgrounds began to demand compensatory education funding that they argued to be necessary to make up the educational deficit of students of poverty (Ladd, 1996). This research (a) examines the productivity of Indiana school districts, (b) analyzes the effect of student populations of low socioeconomic status on district productivity, and (c) explores the change in district productivity since the passage of accountability legislation.

Statement of the Problem

On one hand, schools face the increasingly mandated, although not historically unique, accountability environment (Tyack, 1974). Increasing standards of accountability hold Indiana public schools responsible for the improved academic success of its students (output). In essence schools are now responsible not only to deliver instruction, but to take all steps to ensure that students meet academic performance requirements (Ladd, 1996). The resultant pressure on educational leaders is considerable. For example, the federal No Child Left Behind Act and

Indiana's Public Law 221 establish that schools may face sanctions up to and including the closure of the school itself if educational leaders are unable to demonstrably raise student achievement. And, although the resulting accountability measures, such as the No Child Left Behind Act - are debated, they are still in effect.

On the other hand, faced with this challenge, schools with underperforming students eventually began to claim that, even if they were receiving the same amount of money per child as wealthier schools, the money was still insufficient (Alexander, 2004; Wise, 1983) to effectively educate all children due to the socioeconomic disadvantages children brought with them to school. Research indicated that environmental factors such as the socioeconomic status of the students may impact their academic progress (Greenwald, Hedges, & Laine, 1996; Toukoushian & Curtis, 2005). Schools with student populations of low socioeconomic status have argued, successfully in many cases, for more money per child to educate their students than that given to districts with less economically disadvantaged students. As a result, there is a current and lively debate about the amount of resources necessary to achieve the requisite student achievement. The shift from an emphasis on equity of school funding to adequacy of school funding changed the conversation from one of making sure that every student is funded by an equal dollar amount to one of determining where the juncture is of efficiency (minimum dollar amount necessary) for effectiveness (children learning) (Jesson, Mayston, & Smith, 1987; Ladd, 1996), in other words *value for money* (Vandenberghe, 1999), a concern of long-standing (Callahan, 1962; Ravitch, 2000).

The relationship between output (academic achievement) and input (resource expenditures) comprise a productivity analysis. Productivity is a widely used metric that measures units of output per unit of input. Organizations increase productivity by maximizing

the effective use of their resources. In the current debate communities, legislators, and reform groups demand that schools improve academic performance and observe budgetary controls more in line with a set of business management sensibilities (Franciosi, 2004; Ladd, 1996) while some educators argue that current funding is insufficient for the assigned task because of the socioeconomic deficiencies of the students (Alexander, 2004; Tyack, 1974; Wise, 1983).

Purpose of the Study

In one sense the current debate surrounding educational accountability and funding adequacy offers little common ground on which these two opposing positions can meet. One side argues with research that schools generate insufficient results (an argument of performance accountability) for the resources allocated (Hanushek, 1996; Ladd, 1996). The other side argues, using its own research, that schools receive insufficient resources needed for the results demanded (an argument of funding adequacy) (Alexander, 2004; Tyack, 1974; Wise, 1983). Would a metric that includes the need for a reasonable level of performance firmly tied to a reasonable level of funding facilitate the conversation and be of benefit to educators? Productivity is the combined numerical representation of student achievement and committed resources (Coelli, Rao, & Battese, 1998; Lawlor, 1985). There is little research on educational productivity that uses a straightforward productivity metric. Would a unified metric paint a sharper picture of a district's true performance and facilitate the relationship between the district's productivity and the socioeconomic status of its students? Additionally, although many agree that a child's socioeconomic status may affect a school's productivity, it may now also be possible to study what the effect of accountability measures such as the No Child Left Behind Act has had on the productivity of school districts.

The purpose of this study was to analyze the productivity of Indiana public school districts, to determine the relationship between a district's productivity and the socioeconomic status of its students, and the effect of accountability measures, such as legislation, on productivity.

Research Questions

1. How many students demonstrate mastery of state academic standards per General Fund expenditure in each Indiana public school district? In other words, what is each Indiana school district's productivity?
2. Is there a statistically significant relationship between the productivity of Indiana school districts (the relationship of General Fund expenditures to number of students passing the state's academic assessment ISTEP+) and the socioeconomic status of their student populations as defined by the number of district students taking part in the free lunch program?
3. Has there been a statistically significant change in the productivity of Indiana school districts since the implementation of the No Child Left Behind accountability requirements?

Null Hypotheses

$H_0$1. There is no statistically significant difference in productivity between Indiana school districts.

$H_0$2. For Indiana school districts, there is no statistically significant relationship between the socioeconomic status of the student population and the productivity of the district.

$H_0$3. There has been no statistically significant change in the productivity of Indiana school districts since the implementation of the No Child Left Behind accountability requirements.

Definition of Terms

Accountability means holding schools responsible for the improving student learning results. This has been codified in the federal No Child Left Behind Act (NCLB) and the Indiana Public Law 221 which include benchmark goals for academic achievement, remedies for underserved students, interventions for failing schools, and sanctions against schools with repeated unsatisfactory results.

Academic performance is the mastery of Indiana state academic standards as measured by ISTEP+.

Adequacy is defined as the "level of school funding at which it is financially possible to deliver an adequate education to all students" (Augenblick, Myers, & Anderson, 1997, p. 63).

Certified staff refers to school teachers and administrators that are certified by state agencies after completing a course of study at a teachers college. Teachers and administrators make up the certified staff of the school district while other employees such as clerical, custodial, aides, maintenance, etc. are made up of non-certified employees. For the purposes of this study the combined unit of district teachers plus administrators will be referred to as certified staff.

Efficiency means performing so as to achieve the goals of the organization (outputs) with the least waste of resources (inputs). Waste may be seen as the expenditure of resources for non-mission-critical purposes.

Effectiveness is the demonstrated capability to reach goals.

General fund is the portion of Indiana school budgets used for the receipt and expenditure of funds for the basic operation of the school. Included in this figure are salaries and related expenses, maintenance of facilities, and other expenditures necessary for the daily operation of schools (Indiana Department of Education, 2009b).

Input is that part of the productivity formula (Output ÷ Input = Productivity) that includes the resources consumed in the production function.

ISTEP+ is Indiana Statewide Testing for Educational Progress Plus. The Indiana criterion-referenced, standardized student assessment administered annually to selected grade-levels in all accredited Indiana public schools and used as the basis for accountability determinations.

K-12 means school systems with children between grades Kindergarten and 12th grade.

Labor productivity is the productivity calculations that use only the labor portion of input resources, generally measured in man-hours.

No Child Left Behind (NCLB) is the reauthorization of the existing Elementary and Secondary Education Act that was signed into effect in 2002. It is accountability legislation that calls for improved student performance, including improved performance for children within the following subgroups: race, socioeconomic status, limited English proficiency, and special education.

Output means that part of the productivity formula (Output / Input = Productivity) that considers the result of the production process.

Productivity is the relationship between input and output in a production function. It is an indicator of how effectively and efficiently resources are used.

School district is the local education authority is generally geographically self-contained. In order to offer a K12 range of schooling for children in the community districts are usually composed of elementary schools for the youngest children, middle or junior high schools for young teen-agers, and high schools for the oldest children.

Total factor productivity is an overall productivity calculation that includes total expenditures (i.e. all factors of input) in the production calculation (Fabricant, 1969; Smith, 1995).

CHAPTER 2

Literature Review

The basic premise of this research was that conversations about school funding may lack resolution outside of the context of student achievement and, conversely, that demands for student achievement which ignore the constraints of available funding may suffer from the same lack of satisfactory resolution. From the joint consideration of the demands for student achievement (output) and the need for adequate school funding (input) emerges the study of school productivity, the relationship between results (output) and resources (input), perhaps the real – if unnamed - topic of our most current and heated public school discussions.

The literature review begins with a look back at the emerging concept of adequacy of school funding beginning in the early 1970s with the appearance of a societal mandate to provide equitable resources for the purpose of helping all students prepare for their role in society. School districts face stagnant or reduced funding concurrent with demands for improved student achievement. Districts with low socioeconomic student populations have successfully argued that they need more money per child to educate their students than do districts with less disadvantaged students (Alexander, 2004; Tyack, 1974; Wise, 1983).

The second section of the literature review deals with the argument that the promised relationship between increasing resources and increasing student learning remains a difficult relationship to confirm. Prior to the introduction of the concept of adequacy, discussions about

school performance revolved around expenditures. School districts were judged by how much money they spent and how much they spent in comparison with other schools, not necessarily the academic achievement of their students (Alexander, 2004). Student achievement became the focus of accountability legislation and critics maintained that academic progress has been disappointing in some districts in light of the resources given to the schools. Although the resulting accountability measures, such as the No Child Left Behind Act, are debated, they remain in effect.

The final section of the literature review ties together the ideas of adequate funding and improved student achievement through the widely used mechanism of productivity analysis. Due to the litigation between those arguing for more funding and those maintaining the need for improved student learning results, courts have moved to compel educators to specify a dollar amount which they would find sufficient to educate a child. In other words, the judges are forcing agreements between society on one hand and its educators on the other to establish a more exact dollar figure at which schools can reasonably guarantee an acceptable education at a price that society is willing and able to sustain.

Adequacy - Societal Mandate for Adequate School Funding

A new accountability movement, invigorated perhaps by President Johnson's 1965 Elementary and Secondary Education Act (ESEA), seemed to increase the social value of schooling to the state which increasingly carried more weight in decisions of curriculum than the consideration given to the value that the individual student might receive from being educated (Carnoy, 1983). Whether or not education was of appropriate quality was becoming a topic of debate and social consensus. To a point, the choice of how much schooling a student must have

has gradually been removed from the parent and the student and given more completely to the state (Carnoy, 1983).

This shift in power to the state changed the relationship between the state and the students in which, while the state may have received added authority and resources to establish the conditions of an improved education system, the student accrued new rights to an adequate education. More than ever before, an education sufficient to prepare a child for the challenges of the workplace and citizenship was considered a right (Augenblick et al., 1997; Carnoy, 1983; Wise, 1983). In addition, although for generations it was assumed that the student and parents had responsibility for the student's successful academic career (Franciosi, 2004; Ravitch, 2000), now the onus fell on the schools (Carnoy, 1983). Although the state's interest in public education had been a point of disagreement for as long as there had been public funding of schools (Tyack, 1974), the expectation had been that students who put in the 12 years required of them would receive a diploma (Ravitch, 2000). Over time property rights were even accorded the diploma and schools were hesitant not to grant one to any student who outlasted the senior year.

Against that background, society, through its legislators and through those who have sought educational alternatives for their children, expressed concern with the failure rate of students in schools whose funding they saw as fully sufficient to have purchased a sufficient quality of education for children (Hanushek, 1998; Ladd, 1996; Wise, 1983). In response, districts with low student achievement argued that they could not improve student performance without more money. This was not money equal to that of wealthy school districts that they were seeking. It was compensatory money they saw as necessary to overcome disadvantages that their students brought with them to the educational production process (Alexander, 2004;

Tyack, 1974; West & Peterson, 2007; Wise). One of the often cited limitations of an educational production function that measures student achievement as an output is that the pre-instruction abilities of students are so variable that it is unreliable to judge efficiency of process by a set output benchmark when their starting points might have been so far apart. The occupation and education level of the parents has also proven to be something of a predictor of student academic achievement (Caldas & Bankston, 1997). Klingele and Warrick (1990) studied student achievement by focusing on fourth grade reading scores and compared them to student background characteristics. There was a strong negative correlation between the number of minority students in a school and that school's fourth grade reading achievement and between the percent of students on free and reduced lunches and fourth grade reading achievement. In a study on student achievement in Louisiana, Caldas (1993) found that socioeconomic status and minority status accounted for differences in student achievement between schools. Strong negative relationships between socioeconomic status graduation rates, and race and graduation and dropout rates have also been documented (Sutton & Soderstrom, 1999).

The quarrel between states who were demanding improved student learning and the schools who felt inadequately funded to deal with the academic deficiencies of disadvantaged student populations wound its way to the courts. Beginning in the early 1970s state supreme courts began to find many state school funding systems inadequate in providing an appropriate education to all children and therefore declared those funding programs to be in violation of their state constitutions (Augenblick et al., 1997; Fischel, 1989). By 2007 over 39 states had been to court facing the accusation that they were guilty of failing to fund public schools at adequate levels (West & Peterson, 2007). The New Jersey Supreme Court in *Robinson v. Cahill* described adequacy as a "thorough and efficient education sufficient to prepare a child to take his place in

the world as a citizen and a worker" (Wise, 1983, p. 301). The case of *San Antonio v. Rodriguez* asked whether Texas was providing the kind of education that future citizens would require (Wise, 1983). These declarations by the courts were indicators of the changing environment in which no longer was equal opportunity to learn or even equal expenditure for all students considered adequate (Wise, 1983). Definitions of adequacy began to emerge. "Adequacy is the provision of that minimum educational opportunity necessary to (minimally) prepare students for adult roles" (p. 309). Therefore, funding adequacy is based on the value added to the student's academic capabilities for having been under the tutelage of the school (Alexander, 2004; Carnoy, 1983, Odden, 2000). The courts often found in favor of the plaintiff school districts, in an accomplishment described as turning "classroom failure into courtroom success" (West & Peterson, 2007, p. 8).

Although society may determine that students have a right to a sufficient level of educational quality from their schools and although courts may determine that schools have a right to adequate funding from the state to meet the educational needs of the students in their communities (and thereby the state's constitutional obligations), it is another thing entirely to be able to declare to the satisfaction of all parties how much money is adequate in order to fund a sufficient education. Nearly four decades into the courts' involvement in the debate over adequate school funding, there is still little agreement about what is adequate funding or even how to go about calculating what can be agreed upon as adequate (Augenblick et al., 1997; West & Peterson, 2007). The attempt to determine what dollar amount would constitute adequate school funding often involved two litigants (the state as defendant and either schools or parent groups as plaintiffs) each lining up their finance experts to justify their estimation of appropriate school spending.

Over time several methods of calculating these estimates emerged (Augenblick et al., 1997; Odden, 2000; West & Peterson, 2007). States often find it easiest to use a *Historical Spending Approach* which considers history to be prophecy in that the best estimate of how much money a school district needs to spend will likely be in the vicinity of what it has spent in the past, making minor adjustments for changing conditions. This method helps with the predictability of budgeting but does not necessarily directly address the actual academic needs of the students. The *Expert Design Approach* assigns educational experts to make a shopping list of those things they judge to be necessary for a model school. Putting prices to the items is said to result in an adequate financing figure for the school. Although this methodology results in great detail, it has generally proven to call for spending much higher than expected or politically expedient. The *Econometric Approach* uses extensive statistical analysis to discover the relationship between the inputs to education and the outputs (Alexander, 2004), seeking to find the optimum point at which the inputs (generally resources) yield the desired outputs (perhaps student learning). Although it would undoubtedly be satisfying to know which inputs result in which outputs, it has been difficult to establish a strong relationship between a certain level of input and a certain level or output (Alexander, 2004; Brimley & Garfield, 2002; Grosskopf, Hayes, Taylor, & Weber, 1997; Hanushek, 1998; Hartman & Boyd, 1998; Jesson et al., 1987; Ladd, 1996; Odden, 2000; Toutkoushian & Curtis, 2005; Wenglinsky, 1998; West & Peterson, 2007), perhaps due to the process and the seemingly limitless number of process variables that come between inputs and the eventual output. The *Successful Schools Approach* offers the understandable premise that spending money on the same things that schools successful in whatever their mission happens to be would be a good place to start in creating another school successful in the same way.

However, in spite of the effort to connect inputs to outputs into a mechanism of some predictive value, the disparate approaches to answering the adequacy of funding question indicate that "… little is known about the adequacy of school funding" (Augenblick et al., 1997, p. 74). Fischel (1989) argued that the primary effect of lawsuit-driven school tax redistributionism has been to aggravate overspending rather than to improve student achievement.

School Funding Data

Although how much should be spent on schools is the subject of continued debate, the amount that has been spent is more easily obtained. According to the U.S. Census Bureau, in 1998 state and federal governments spent more on public schooling ($318 billion) than any other single item other than Social Security ($379 billion). Lesser expenditures included national defense ($270 billion), Medicare ($193 billion), highways ($87 billion), police protection ($50 billion), parks and recreation ($22 billion), fire protection ($20 billion), and foreign aid ($13 billion) (U.S. Census Bureau, as cited in Franciosi, 2004). From 1960 until the mid-1980s spending on public schooling averaged approximately 4% of the Gross National Product (GNP) (Hanushek, 1986).

From 1890 to 1990 K12 school expenditures outran inflation by about 3.5% per year (Hanushek, 1998). This equates to a real expenditure (this figure, keyed to 1990 dollars factors out the effect of inflation) increase from $2 billion in 1890 to $190 billion in 1990 (Hanushek, 1998). Real per student costs during the same period of time grew from $164 in 1890 to $4,622 in 1990, also a real growth rate (over inflation) of 3 to 3.5% per year (Hanushek, 1998). From 1967 to 1991 real per-pupil spending (after factoring for inflation) increased by anywhere from 60% to 100% depending on the formulas used to consider inflation (National Center for

Education Statistics, 2005b; Rothstein & Mishel, 1996). In Indiana 1981-82 expenditures per student were $2,319. Twenty years later in 2001-2002 expenditures per student were $8,268, a 250% increase. Controlling for inflation, the 2001-2002 figure is $4,365, a near doubling of money spent per student in real (1981) dollars. These figures reflect the general increase in education spending nationwide (Hoxby, 2004).

Labor costs make up the largest portion of school expenditures and are responsible for notable parts of the increase in school expenditures. From 1890 until the 1960s most of the growth in expenses came from the increase in teacher salaries followed by the increase in students. However between 1970 and 1990 the cost of education grew dramatically because of the reduction of class-size, i.e. teaching load (Franciosi, 2004; National Center for Education Statistic, 2005b). Americans have increased per-pupil spending at a rate faster than that of inflation in order to reduce class size and pay teachers more money (Franciosi, 2004). Hanushek (1998) maintains that the rising cost of U.S. public schooling has resulted from the rising cost of teachers, the reduction in class size, and the rising cost of non-instructional staff, all payroll items.

As a percentage of overall spending, special education expenditures have also increased. For example, from 2001 to 2005 in Indiana, per-pupil spending on the state's special education students increased from $7,401 to $7,909 in an inflation-controlled calculation, an increase of nearly 7%. An increase in federal funds provided the largest portion of the increase in per-student expenditures for these students during that period of time. Such figures reflect an increase in the percentage of the total Average Daily Membership (ADM) reimbursement dedicated to special education programs from 17.96% of targeted revenue in 2001 to 19.65% in 2005 (Plucker et.al, 2007).

Student-teacher ratios have decreased dramatically from one teacher for every 37.6 students in 1870 to one teacher for every 16.5 students in 1998 (Hanushek, 1996; Monk, 1990; National Center for Education Statistics, 2000). In addition to the reduction of the student to teacher ratio, the percentage of teachers with master's degrees increased from 23.1% in 1960 to 52.6% in 1990, and median years of teacher's experience from 11 in 1960 to 15 in 1990, these latter two indicators impacting payroll due to contract agreements (Hanushek, 1996). Therefore, although the inflation-adjusted salary of teachers has increased somewhat, the number of teachers (and supporting certified staff) added to school payroll is likely more responsible for the lag in school productivity than are salary increases (Hanushek, 1998).

Additionally, expenditures for schools fluctuate, not based on the size of the student population but on the income of its community. In other words, school spending seems more directly linked to the amount of money available than it does to the cost of the actual programs effective in meeting the schools' mission (Jefferson, 2005; Roza, Goldhaber, & Hill, 2009). For example the *Buffalo News* from May of 2005 allows us to explore the case of two New York districts in which we can compare the Lancaster district which spent $6,524 per student in 2005 to the Barker district which consumes $10,587 per student (as cited in Pasciak, 2005). Although the student demographics are similar, the standardized test scores are the same in spite of the difference in expenditure. This story found that Barker spent more per student primarily because it could. It could be due to a $900 million energy plant built about 25 years ago which paid off very well to the school district. This windfall led to higher spending but not necessarily improved student achievement, and not to student achievement as high as similar New York districts managed with much less money to spend. Now that the value of the energy plant has

begun to decline, Barker is moving toward lowering spending while maintaining the quality of their district (as cited in Pasciak, 2005).

Critics imply that schools spend whatever money is available whether or not it is spent efficiently (Fowler & Monk, 2001). Between 1971 and 1984 total school population dropped from 51 million students to 45 million students while spending held steady yielding a per-student increase (Franciosi, 2004). In Indiana, where over one-third of the state budget goes to public education, districts with declining enrollment have continued to receive increasing amounts of public funding. From 1993 to 2003 Indiana public school funding increased 69.3% while student enrollment increased 4.2% and inflation increased by only 27.3%. As an example, the Indianapolis Public Schools, whose enrollment has declined 20% since 1990, has received a 60% increase in state funding over the same period of time (*Indianapolis Star*, 2005). In 2005 Buffalo, New York taxpayers were faced with a district whose enrollment increased by 66 students but whose school district expenditures increased by $51 million and levied $34 million more in property taxes (Cervantes, 2005).

Since the early 1970s courts have defined adequate school funding as that level of money at which society could have a reasonable expectation that schools could successfully teach students to master assigned curriculum. In support of that, courts have often required states to increase, sometimes dramatically, the amount of money they give to public schools. Because of this environment and the call for reduced class sizes, spending on education has increased faster than the rate of inflation by 3 to 3.5 percentage points per year. In Indiana in the 20 years from 1981 to 2001 the per-student expenditure by schools after controlling for inflation doubled.

Accountability – Demands for Improved Student Achievement

However, as school funding was dramatically increased in search of adequacy, discontent could be heard from those who claimed that schools were unaccountable for returning demonstrably improved student learning results in exchange for the added money. In other words, critics charge that schools operate inefficiently in that resources are not effectively targeted at improved student learning (Grosskopf et al., 1997). Butressing this claim was the fact that throughout the 1960s and 1970s social issues seemed to have taken the minds of educators off of academics to the point that academic rigor in American schools had suffered and student achievement along with it (Ravitch, 2000). The move to a discussion of adequacy gradually began to add results to the equation, moving from the mere offering the opportunity for the child to learn to the need for schools to have provided for an actual mastery of the curriculum (Odden, 2000; Wise, 1983). In 1975 the Public School Education Act stated that schooling needed to produce a definable and "reasonable" level of English and Math skills (Wise, 1983). By the end of the 1970s, a sufficient number of educators and legislators began to see the inadequate teaching under which many disadvantaged students were held as a denial of a basic right. This eventually resulted in the passage of the No Child Left Behind Act, a culminating event on the journey leading through President Johnson's 1965 Elementary and Secondary Education Act (ESEA), the publication of *A Nation at Risk* in 1983, President Clinton's Goals 2000 of 1994, and then, finally, the meeting of Senator Kennedy and President Bush to sign NCLB in 2002 (Kennedy, 2005). The sensed urgency that resulted in bipartisan agreement on the need for these stronger accountability enforcement mechanisms may have been compelled in part by the resonating claim in *A Nation at Risk* that the dismal level of academic proficiency of American students would have to be considered an act of war had another country been responsible for it

rather than the proprietors of American schools themselves (United States Department of Education, 1983).

To those disgruntled with the state of American education (especially for those most concerned about the disadvantaged child), the problem with an emphasis on inputs is that schools may receive more money with no corresponding burden to document improved student learning (Ladd, 1996). Indeed, the relationship between increasing or decreasing inputs and consequent student learning results has been difficult to establish (Alexander, 2004; Brimley & Garfield, 2002; Grosskopf et al., 1997; Hanushek, 1998; Hartman & Boyd, 1998; Jesson et al., 1987; Ladd; Odden, 2000; Toutkoushian & Curtis, 2005; Wenglinsky, 1998; West & Peterson, 2007). The understanding of the relationship between inputs and outputs proving problematic due to intervening factors, such as the socioeconomic status of the children and the quality of the instruction met the skeptic claim that more money would reliably yield desired improved student learning results (Augenblick et al., 1997). Through the late 1980s courts began to declare that the constitutional requirements mandate that schools not only provide educational opportunity but that they provide a quality of education that satisfies the courts themselves (Augenblick et al., 1997). As a result, states began to take the initial tentative steps to demand accountability; forcing schools to act as though "rational management principles require evidence that goals are being met, and [that] they necessitate adjustments in the system (or sanctions) when goals are not met" (Wise, 1983, p. 306). Accountability systems were in the process of forcing the conversation to shift from a concern with inputs to consideration of the output, the student learning results (Alexander, 2004; Elmore, Abelmann & Fuhrman, 1996; Kennedy, 2005) of the programs for which the input had been committed (Wise, 1983; Zehr, 2009). Advocates for

public school accountability argued that adequacy cannot be determined by inputs but that educational leaders must begin to account for outcomes (Alexander, 2004; Wise, 1983).

There has been resistance to the most common calls for accountability (Hoff, 2008; Louis, Febey, & Schroeder, 2005). Some have argued that demanding that schools concentrate on making all students proficient in reading and math skills will deflect attention from educators being able to teach children other things they believe to be as important as basic academic skills (Rothstein, Jacobsen, & Wilder, 2008). There are other educators who argue that tests are not available, indeed can never be developed, that will fairly measure learning results (Nichols & Berliner, 2008). On the other hand, the call for accountability, even by educators from the most challenging student populations (Hoff, 2008) has resulted in sufficient political support in states and at the federal level to result in multiple pieces of legislation that seek to force a tighter relationship between school expenditures and student learning results.

Indiana school leaders face considerable pressure from the federal No Child Left Behind Act and Indiana's Public Law 221 to raise student achievement as demonstrated by student performance on Indiana Statewide Testing for Education Progress – Plus (ISTEP+). The federal No Child Left Behind Act outlines the following consequences for Title I schools that do not make sufficient Adequate Yearly Progress (AYP) as demonstrated by student academic performance on state accountability assessments (ISTEP+ in Indiana). After the second consecutive year of failing to make AYP the school officials must submit a turnaround plan for the school. School officials must also offer students from the *needs improvement* school the option of transferring to another school in the district which is not currently under the designation of *needs improvement*. After the third consecutive year of failing to make AYP, the school must continue to offer students from the *needs improvement* school the right to attend

another district school. In addition the school must offer supplemental services such as tutoring or remediation classes to students from low-income families. After the fourth consecutive year of failing to make AYP the school must continue to offer transfers to a school not designated as a *needs improvement* school and must also continue to offer tutoring and remediation. In addition the district must take corrective actions such as replacing school staff or substantially replacing the curriculum. After the fifth consecutive year of failing to make AYP, the district must make plans to *restructure* the school. Restructuring may include closing the school and re-opening it as a charter school, replacing most or all of the school staff, turning the operation of the school over to the state, or turning the operation of the school over to a private company that has a proven record of effectiveness. (U.S. Department of Education, 2007)

In Indiana, public school accountability regulations are codified in Public Law 221. Indiana has been explicit about benchmarks that are output indicators of performance (IDOE). These benchmarks include state assessment results (ISTEP), national and international assessment results (SAT, ACT, NAEP, TIMMS, AP), and other indicators (attendance, graduation rate, etc.). Indiana's graduation rate is 30th in the nation and ranks 46th out of the 50 states in the "education level of its population" (Indianapolis Star, 2005, E2). Based on student performance on ISTEP+, schools are placed in categories of necessary school improvement. Consequences for insufficient progress are as follows. After the first year in the lowest category the district school board must issue a public notice of the school's lack of improvement and must hold a public hearing in which the public may speak on the subject. Also the school's School Improvement Committee must revise its plan which may include shifting school resources, changing personnel or requesting the school board to appoint an outside body to help develop a new plan. After the third consecutive year in the lowest category the district school board must

establish and assign an expert team to the school made up of outside education professionals who will change the school improvement plan, including the re-allocation of resources and initiating requests for further outside intervention. After the fifth consecutive year in the lowest category the district school board must hold a hearing to consider:

1) merging this school with a more successful one,

2) assigning a special management team to the school,

3) the state department of education's recommendations,

4) other options including closing the school and

5) any other possible revisions to the school's improvement plan. The district school board must then initiate one of the recommended interventions. (Indiana Department of Education, 2009c)

Student Achievement Data

On a national level, from the late 1940s through the mid-1960s test scores such as the Iowa Test of Educational Development (ITED), Iowa Test of Basic Skills (ITBS) and Minnesota's state scholastic aptitude test showed improvement in student learning. However, from the mid-1960s through the late 1970s most scores, including SAT scores showed a steady decline in student achievement (Franciosi, 2004; Ravitch, 2000). Other tests that reflect a general decline in student performance from the 1960s to the 1980s include the American College Test (ACT), The Preliminary Scholastic Aptitude Test, the California Achievement Test, the Metropolitan Achievement Test, the Stanford Achievement Test, the Comprehensive Test of Basic Skills, the National Assessment of Educational Progress, the Graduate Record Exam, the Medical College Admissions Test, and the Graduate Management Admissions Test (Franciosi, 2004).

The National Assessment of Educational Progress (NAEP) has been given to U.S. students since 1969 as a way of measuring student proficiency. Student performance on this test has remained essentially flat in math, science, and reading proficiency from 1969 to 1999 (National Center for Education Statistics, 2005b) despite the tripling of school spending during roughly the same period of time (Hanushek, 2002; Ladd, 1996). The NAEP reveals generally declining student achievement from the 1960s to the 1980s, finally halting the decline to return to pre-decline levels in recent tests resulting in flat student performance between the 1960s and 2000 (Franciosi, 2004; Hanushek, 1996, 1998; Hoxby, 2004). Some have estimated that NAEP performance as shown in Table 1 represents a student population whose skill level would be low enough that 50% of high school graduates will have difficulty earning enough to be considered middle class without further training (Franciosi, 2004).

Table 1

NAEP Results of Student Achievement Performance

Subject	Early Year	Score	Later Year	Score
Math	1978	300	2004	307
Reading	1971	285	2004	285
Science	1996	150	2000	147
U.S. History	1994	286	2001	287

Source: National Center for Education Statistics (2006a)

More recent trend information has shown some areas of progress. The reading scores of nine year-old students have increased from 208 in 1971 to 221 in 2008 while their math scores have improved from 219 in 1973 to 243 in 2008. However, the longer children are in school the

less their progress seems to be. In 1971 the reading scores of 13 year-old students was 255 which advanced to 260 by 2008 while their math scores moved from 266 in 1973 to 281 in 2008. Over the same general period of time 17 year-old students improved their reading scores from 285 to 286 and their math scores from 304-306, basically no improvement over 35 years (National Center for Education Statistics, 2005b; Rampey, Dion, & Donahue, 2009).

It is unclear that American K12 students meet the same level of academic proficiency as the students from other nations (Ladd, 1996; Ravitch, 2000). Franciosi (2004) reviewed a large inventory of international tests in order to paint a broad picture of the performance of U.S. students in comparison to their international counterparts. He summarized his findings as follows:

1. general results show the students from Asian countries (Japan, South Korea, Singapore, and Taiwan) performing best,
2. students from the developing countries of the world perform the worst, and
3. students from the United States, Canada, Australia, and New Zealand range up and down in the middle of the pack. (Franciosi, 2004, p. 59)

Franciosi observed that "the [middle of the pack] performance of American students does not reach the world-leading level of U.S. education spending" (p. 59). The National Center for Education Statistics (2005b) confirms this observation by reporting that in the U.S. the reading achievement of U.S. students places them firmly in the average range of OECD (Organization for Economic Cooperation and Development) countries. The International Assessment of Educational Progress reveals American students from the mid-1960s to the early 1980s generally losing ground to the academic progress of international students from both developed and undeveloped countries (Hanushek, 1998). The Third International Mathematics and Science

Study (1994-1995) revealed a pattern (seen in other assessments) of the scores of American students falling the longer they are in school relative to international competitors (as cited in Franciosi, 2004). For example, fourth graders scored above the international average in math and science, but by eighth grade had fallen to average in math (still above average in science), and by 12th grade had fallen to below average in both math and science (Franciosi, 2004). Results from TIMSS (TIMSS – 1998) also reveal that U.S. schools are in the top four (out of 23) in per-student money spent on education (adjusted to U.S. dollar spending parity), but only 12th (out of 23) in student performance (Hanushek, 2002). International test score and expenditure comparisons reveal that the U.S. is about "70% less productive than the United Kingdom, half as productive as Korea, the Czech Republic, and Hungary" (Hoxby, 2004, p. 217) when considering the number of points scored on the Organization for Economic Cooperation and Development Program for International Student Assessment (PISA) and the Third International Mathematics and Science Study (TIMSS) per $1,000 of per-pupil spending in 1998.

Research indicates that children of poverty are more likely to suffer cognitive deficits that inhibit the normal educational process (Brooks-Gunn & Duncan, 1997). The proportion of money given to U.S. public K12 education to educate disadvantaged children has increased from 7% to 30% of the total. Such an increase was initiated on the presumption that added resources would make a difference in demonstrable student proficiency (Ladd, 1996), however the gap between disadvantaged students and the others remains the same over time (Hoxby, 2004).

Scholastic Aptitude Test (SAT) scores have suffered. SAT English scores were 543 in 1967, declined to less than 500 in the early 1990s, and have since recovered only to 508 in 2004-2005 (Hanushek, 1998; National Center for Education Statistics, 2005a;). The decline in SAT scores beginning in 1963 resulted in verbal scores falling about one half of a standard deviation

by 1979. Math declined as well although not as severely (Hanushek, 1986). Arguments that declining SAT scores reflect merely increased participation and not actual declining student performance may lack credibility (Franciosi, 2004) and the scores here will be allowed to speak for themselves.

Colleges are forced to offer remediation courses for incoming high school graduates who cannot read, write, or do math proficiently enough to begin college classes (Ravitch, 2000). "In 1993, nearly 50% of the freshmen entering the California State University system needed remedial English or math" (Franciosi, 2004, p. 53). This figure increased to 68% by 1999. In 1999 university systems in California and New York began to roll back remediation programs for incoming freshman increasing the likelihood that applicants incapable of reading, writing, and doing math at a high school proficiency would need to bring those skills up to par before being admitted to the universities (Blair, 1999). The deficiency leads directly back to the public school systems in this account:

> Last year, 79% of all CSU (California State University) freshmen were deemed in need of remediation in either English or math, Mr. Swisher said. Every one of those students graduated from high school with a B average after taking four years of English and three years of math, he noted. (as cited in Blair, 1999, p. 6)

The Mackinac Center estimates that high school students who leave high school with inadequate skills in reading, writing, and math cost the state of Michigan $600 million a year to remediate (Greene, 2000).

The pressure by schools for increased funding from the community resulted in pressure from the community for improved student learning by the schools, which seems to have led back

to schools demanding more money to meet the demand of improved student learning. However, although school funding doubled, student performance did not.

Connecting Adequate Funding to Improved Student Achievement

It is one thing for courts to determine that states are obligated to spend a certain amount of money on education. It is another to persuade people to consider that a "doubling or tripling of education results requires a doubling or tripling of funds" (Odden, 2000, p. 469). Getting that money is still subject to the law of scarcity (Ladd, 1996) and it is left to legislators and the political process to actually supply what the courts have mandated (Augenblick et al., 1997). For example, in 2005 New York Supreme Court Justice DeGrasse ordered that the state of New York increase the New York City public school budget from $12.9 billion to $18.5 billion (an instant increase of 43%) and to add in an additional $9.2 billion for capital projects within the next five years (West & Peterson, 2007). There may exist a difference between that which is mandated by the courts and that which can survive the political process because of the limit to which society is willing to commit financially (Ladd, 1996). When that limit is reached, the political process engages to deny more funding, sometimes to schools (Augenblick et al., 1997). One of the earlier equity/adequacy cases, *Serrano v. Priest* has been credited with launching California's 1978 property tax revolt in 1971 known as Proposition 13 (Fischel, 1989). It is within this context that the foundation is laid for the future study of productivity, or results at the right price (Jesson et al., 1987). If adequacy is defined as excellence at a lower cost, the expectations for school leaders may have become the same as they have for other professionals (Carnoy, 1983) that is, to improve quality while driving out unnecessary expenditures (Ball & Goldman, 1997; Odden, 2000; West & Peterson, 2007). Even relatively early cases in the adequacy debates have included references to efficiency and effectiveness. In 1973 the New Jersey Supreme Court in

Robinson v. Cahill called adequacy a "thorough and efficient education" a definition that is consistent with that found most commonly in state constitutions (West & Peterson, 2007).

As time progressed more people began to question the justification for the belief that increasing amounts of money was the primary thing missing in the formula for schools successful in the basic mission of schools. In *Antonio v. Rodriguez* the court accepted the idea that "cost and quality are not related in education" (Wise, 1983, p. 301). Efficiency is defined as achieving a particular goal with fewer resources, fewer resources than the competition or fewer resources than before (Carnoy, 1983, Lawlor, 1985). This forced people to return to the conversation about whether schools can learn to become more efficient. This consideration prompts the question: Do schools get the highest level of output from the input resources they have available? (Carnoy, 1983; Grosskopf et al., 1997; Odden, 2000).

But Schools Are Not Businesses!

Discussions of accountability have proven objectionable to some people (Berliner & Biddle, 1995; Kennedy, 2005). For example, under pressure from a dramatically increasing U.S. student population, many urban educators in the early 20th century began to study the new organizational structures and technologies developed by the captains of industry which enabled the rapid growth of enterprises able to deliver new products at declining costs (Tyack, 1974). Although many saw this as a progressive era in organizational development for schools, others have seen it as an initiative that took advantage of the *vulnerability* of school administrators to force a change that had a deleterious effect on education (Callahan, 1962; Nichols & Berliner, 2008). The ideological descendants of that disagreement seem to remain largely at impasse (Alexander, 2004; Ravitch, 2000). This section briefly explores some conflicting beliefs about the application to schools of quantitative analysis models from other professions.

Since the first quarter of the 20th century there were, and are, those educators and researchers, often identified as administrative progressives (Ravitch, 2000), who study the concerns of productivity (efficiency and effectiveness) in schools (Callahan, 1962; Grosskopf et al., 1997; Odden, 2000; Tyack, 1974). They argue that schools are cost-constrained producers (Barnett, Glass, Snowdon, & Stringer, 2002; Odden, 2000) and in this way are exactly like any other enterprise (Hoxby, 2004; Lawlor, 1985). Public school finance is still finance and "the issues related to performance assessment are not unique to the education service…" (Jesson et al., 1987, p. 252). As early as 1912 early administrative progressive Bobbitt from the University of Chicago observed:

> …when it is asserted that educational management must in its general outlines be different from good business management, it can be shown from such a parallel study that there is absolutely no validity to the contention. All kinds of organizations, whether commercial, civic, industrial, governmental, educational, or other, are all equally and irrevocably subject to the same general laws of good management. (as cited in Callahan, 1962, p. 163)

There are some educators who object to comparisons of education to business (Pearlstein, 2003) resisting quantitative evaluation of education and schools (Hanushek, 1986; Monk, 1990). Critics of the application of non-school models to education warn of the dangers of "creeping corporatization" (MacQueen & Wells, 2004, p. 36) and have for years been wary of those who "were primarily concerned with organizational behavior with aggregate goals rather than individual development of students" (Tyack, 1974, p. 196; Callahan, 1962, p.139). Many are resistant to comparisons with other organizations arguing that "…the other enterprise is not the same as ours', 'the figures are suspect', and so on…" (Lawlor, 1985, p. 166). For example,

Winston (1997) argued that colleges were a different kind of enterprise than firms because: a) non-profits cannot distribute profits to shareholders, b) management of non-profits are generally driven by idealistic goals, c) schools get their income differently than businesses, d) the benefits of which school one enrolls in may not be known for years, e) students in schools (colleges) contribute to the *sale price* of the education purchased there, and f) the ability of wealthy colleges to subsidize its own tuition skews the customer base of colleges (Winston, 1997).

In spite of these objections others maintain that the economics of the for-profit firm may inform the practice of the non-profit, including schools. For example, understanding the benefits of efficiency is helpful to any stakeholder-based enterprise that consumes resources in search of results when managers of non-profits understand the difference between cost and expenditures. Simply put, cost equals the minimum it would take to provide the service at issue. Expenditure is equal to the cost plus that which was spent that could have been left unspent while still providing the service (Alexander, 2004; Fowler & Monk, 2001; Jefferson, 2005). This technical inefficiency in an organization means that there is certainly a "free lunch, i.e. that it is possible to realize a costless gain" (Monk, 1990, p. 9). Efficiency is discovered when those elements of programs are reduced that cannot justify their marginal costs against contribution to mission (West & Peterson, 2007). Drucker (1990) observed that "non-profit organizations need the discipline of organized abandonment perhaps even more than a business does. They need to face up to critical choices" (pp. 10-11).

Another argument against calculating school productivity (especially productivity improvement) in the same manner as other organizations is based on the theory that labor intensive businesses will naturally improve productivity slower because technology is unable to compensate for the human requirements. This problem has been referred to as Baumol's disease

after the researcher who discussed this problem of school finance in a 1967 paper (Baumol, 1967). Baumol's disease generally considers the rising cost of inputs i.e. the increased contract salary of certified staff. Baumol illustrates his theory by explaining that the costs for a musical quartet will rise faster than those of industries more capable of real productivity growth (technology-driven manufacturing, for example) because the quartet will always need four people in it, technology not being an acceptable substitute for quartet members (Baumol, 1967). In the same manner the argument is made that schools need a certain number of certified staff. Schooling is a labor intensive business (Alexander, 2004; Brimley & Garfield, 2002; Conant, 1973; Franciosi, 2004; Sausner, 2005) in which technology has played little productivity-improving role (Guthrie, Garms, & Pierce, 1988). Even though there are not productivity advances in education as there are in other industries, education must compete in the same labor pool with employers who, as a result of their increasing productivity, can pay higher salaries than schools. For example, a pharmaceutical company whose productivity outruns inflation by two percentage points can pay a chemist wages that rise along with inflation without requiring cuts in other areas of its budget. However, schools that need science teachers must compete with the pharmaceutical company for the chemist who considers selecting teaching as a career. If schools have declining productivity either they will fail to remain competitive with the salary opportunities in the private sector, or salary increases for teaching will come from either increased per student expenditures or budget cuts in other school areas. Since school budgets are largely payroll there is little opportunity for savings to offset raises. Therefore, according to Baumol, if schools are to remain competitive in the employment marketplace school employee wages must always outrun school productivity (Baumol, 1967; Franciosi, 2004; Hanushek, 1996).

Nevertheless, the opinion that "the issues related to performance assessment are not unique to the education service" (Jesson et al., 1987, p. 252) seems increasingly common as educators find themselves more responsible for measurable performance in models similar to those used in other professions. There does seem to be pressure for schools to constrain some portion of growth in spending while improving student performance results. The recent trend has been for society to demand an emphasis on a) student cognitive skills, b) increasing centralization and influence by legislators, judges, etc., and c) quantified analysis of achievement by standardized tests and expenditures as indicators of performance (Franciosi, 2004), a situation not dissimilar from a similar movement from 1905 to 1930 (Tyack, 1974). Scarcity of resources is a reality for schools as it is for any other part of the economy. "The difficulty is that there are also other people and other needs out there competing for the available funds, which even in the most affluent and generous society are never limitless" (Hartman, 1986, p. 17). In Indiana, education accounts for $7 billion of the $21 billion total state budget, second in size only to the Health and Human Services budget of slightly more than $7 billion. General government, public safety, conservation and environment, economic development, transportation, and other distributions together compete for the remaining $7 billion (Indiana State Budget Agency, 2006). As this illustrates, all organizations, regardless of their status as profit or non-profit, struggle with scarcity of resources, making the concern for productivity something that may transcend the boundaries of profession (Brimley & Garfield, 2002).

Education Production Function

Discussions about production function refer to the three component parts in the production process; input, process, and output (Levacic & Vignoles, 2002; Monk, 1990; Teddlie & Reynolds, 2000). This model is sometimes referred to as the IPO model, Input, Processes, and

Output. A goal of understanding the educational production function is to be able to estimate the maximum output that is available from a given input (Alexander & Salmon, 1995; Monk) or set of inputs. Dividing the value of the output by the value of the input yields a productivity indicator. Imagining the most basic of calculations it might be assumed that among enterprises similar amounts and quality of input will yield similar amounts and quality of output. In the study of different school districts, however, it may be possible to find a difference in the output even though the input is quite similar. Merely supplying the *appropriate* amount of funding to schools may be no guarantee that they will achieve equally appropriate levels of student achievement (Alexander, 2004). In the production function the process is seen as responsible for the difference. It is the process that links the input and the output variables together so that input variable A may yield output variable AA or input variable A may yield output variable AB depending on the effect of the process (Amiti & Stiroh, 2007; Hanushek, 1986; Monk, 1990). In this sense, the productivity formula (*Productivity = Output ÷ Input)* may be re-stated as *Productivity X Input = Output*. Technical inefficiency exists "when you are not getting the most out of the available resources" (Monk, 1990, p. 9). Grosskopf et al. (1997) have done research indicating that more potential exists for improved student learning results by improving efficiency than by increasing expenditures.

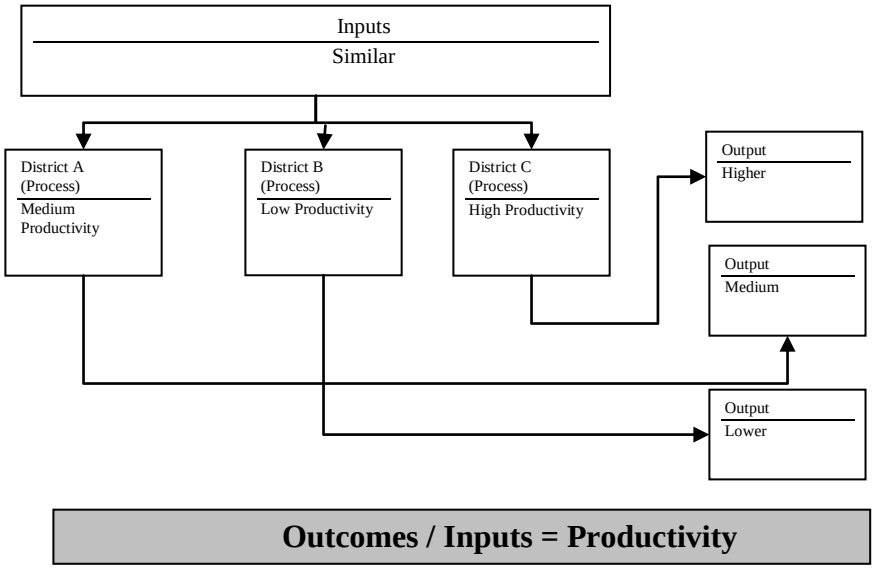

Figure 1. Production function with process productivity as a determinant of output level when inputs are similar.

Production functions may be useful for educational leaders to understand because they may indicate what it is possible to achieve with a given set of inputs. For example, if one school achieves a certain level of student achievement with the same inputs that another school uses to achieve a much higher level of student achievement, the management of the first school must consider that there could be a degree of technical inefficiency in their educational process (Hanushek, 2002; Levacic & Vignoles, 2002; Monk, 1990; West & Peterson, 2007).

Some researchers have characterized processes as those elements of the production function which are *controllable* by the educators, and input factors as those which are not (Caldas & Bankston, 1997; Hanushek, 1986; Sutton & Soderstrom, 1999). Others see it differently, suggesting that a definition of input that limits it to an uncontrolled element in the production process is not the only way to define the term, control not being a necessary defining characteristic of whether or not an element of the production model may be considered either

input or process. The Bureau of Labor Statistics considers labor an input relative to labor productivity calculations and sees labor and capital commitments as input relative to multifactor (total factor in this study) productivity calculations (United States Department of Labor, Bureau of Labor Statistics, 2006). Aligned with this view, Levacic and Vignoles (2002) suggest the Input element of the production function includes student inputs (background characteristics, generally) and resource inputs (expenditures and number of staff), and that the Process element includes those things that "act at school, class/teacher and individual pupil level" (Levacic & Vignoles, 2002, p. 316). The process component of the educational production function contains many elements: the principal's leadership, school board management, shared vision and goals, staff decision-sharing, professional development, collegiality and shared practice, orderly environment, high expectations, emphasis on learning, positive reinforcement, parental involvement, time on task, quality of instruction, attitudes toward learning (Levacic & Vignoles, 2002), internal communications, allocation of resources, peer effects, curricular arrangements, and scheduling (Vandenberghe, 1999).

When all these process variables mediate the interaction of input and output it is not surprising that similar input often yields dissimilar output. This review of the complications of the education process will remind an experienced educator that "production of education services is exposed to asymmetry of information problems, quality control challenges and non trivial coordination strains" (Vandenberghe, 1999, p. 130). In later studies these high productivity districts could be the object of case studies for the benefit of other school districts. A cautionary note; if there is any technical inefficiency within the processes of an enterprise it is risky to try to establish a firm causal relationship between the inputs (as defined here) and the outputs (Levacic & Vignoles, 2002; Monk, 1990). To go further, without an understanding of and a degree of

control over the process part of the equation it cannot be assumed that a change in inputs will yield any results, positive or negative (Monk, 1990). Therefore it is incomplete (perhaps inaccurate) to claim that an input variable *causes* an output, independent of an understanding of the effect of the process linking the input and the output (Swanson & King, 1997). In other words, some people run their organizations more effectively than other people (Fujita, 2008), the skill in controlling process as critical a factor in determining output as is the nature or quantity of the input.

Productivity Theory

In order to establish a foundational understanding of productivity and its application to education, this study will review its fundamentals in other enterprises. In the section on the elements of productivity the primary components of productivity, such as efficiency and effectiveness, will be explained. Next, the benefits of productivity to economically viable societies and enterprises are studied. This includes a historical perspective on the impact consistent productivity improvement has on living conditions and on the risks inherent in low productivity. Finally, this study will review the business record of productivity improvement over the last century to develop a sense of the effect of incremental improvement.

Simply defined, productivity is the relationship between input and output in a productive function (Coelli et al., 1998; Doms, 2009; Fabricant, 1969; Lawlor, 1985). The quantitative assignment of productivity is reached by using the formula *productivity = output ÷ input*. The analyses in this study is primarily concerned with total factor productivity (Wise & McGregor, 1975). Total factor productivity compares the output of the enterprise to the total amount of resources committed to that production (Smith, 1995). Because labor costs are only part of total inputs and the clarity that comes from considering all expenditures when calculating productivity

is important (Hanushek, 1996; Lawlor, 1985) total factor (as defined by General Fund expenditures) productivity is the focus of this study.

Supplying goods and services to consumers requires resources. These resources can generally be divided into the categories of natural resources, human resources, or capital resources, all of which are used to produce goods and provide services. Natural resources are those things found in nature such as fossil fuels, wood from forests, iron from the earth, and food grown on farms that are available for harvesting. Human resources are the people that put forth the effort to provide the goods and services for which the consumer will trade. In the case of schools, human resources make up a large part of total expenditure. Capital resources are those things that are used in the production of goods and services (Fabricant, 1969). For schools, capital resources include things such as schools buildings, textbooks, school buses, and computers.

Unfortunately, these resources are not limitless. Were they, there would be no need for an economy because there would be no scarcity of the things needed and wanted by consumers. However, the reality of that scarcity is the critical concept at the heart of the hard work needed to maintain prosperity. Since there are not enough resources to supply all the needs and wants of people or governments or societies it becomes incumbent on individuals, governments, and societies to choose what they want and need the most, leaving other desired things un-apprehended for the moment, or forever (Conant, 1973; Hanushek, 1998). The reality of scarcity forces us to give up things.

A cost is what one chooses to do without, or to exchange for something else one desires more. A benefit is what is obtained, generally at a cost, to meet one's needs or wants. Productivity is a measure of the amount of benefit that can be obtained from the cost that the

enterprise (whether family or business or school) is prepared to pay. This is an equation that can yield different (better or worse) results depending on the ability of the enterprise to learn new ways of increasing the amount of benefit derived from the same cost. Looked at it another way, the quality of the desired benefit may be measured by how effective it was in satisfying the enterprise's need or want (Lawlor, 1985). In the same manner, the appropriately proportionate cost of obtaining that effective benefit is commonly referred to as efficiency (Lawlor, 1985). Increased efficiency plays a critical role in the reliability of productivity growth (Amiti & Stiroh, 2007; Grosskopf et al., 1997). Rising efficiency may be the result of improvements in technology, the improvement in management skills, or the size of the organization (Fabricant, 1969).

While efficiency may occupy the largest section of this discussion, effectiveness is a full partner in the productivity equation. It is not difficult to see productivity initiatives as targeted primarily at cost cutting, the sense that an organization can budget its way to success (Hanushek, 1998). However Hartman's definition of productivity adds a critical element to the study when he suggests that productivity is the combination of efficiency (cost control) and effectiveness (doing something well) (Roza et al., 2009). Since both effectiveness and efficiency must be present at the same time for increasing productivity to be a desired result, in the strategic decision to *do more with less* the operative word may be *do*, not *less*. To use the example of one ton of steel requiring 40 person-hours, productivity enhancements that improved productive capacity would allow the same amount of time and effort by current employees to make 32% more steel, a rise from 1 ton to 1.32 tons. Productivity must contain both the elements of effectiveness (benefits obtained) and efficiency (acceptable cost) (Arnold & Bardhan, 1994;

Barnett et al., 2002; Garner, 2004; Hartman & Boyd, 1998; Mishan, 1988; Wise & McGregor, 1975).

Productivity is the critical keystone of a rising standard of living (Amiti & Stiroh, 2007; Fabricant, 1969; Fujita, 2008; Hanushek, 1996) as Baumol, Blackman, and Wolff (1989) observe, "nothing is as important for economic welfare as the rate of productivity growth" (p. 1). The source of prosperity is an economy's ability to produce, through the work of people and technology, more than subsistence living (Mali, 1978). Increasing productivity has been a critical factor in the success of societies in two important ways. First, the search for increasing productivity leads naturally to innovation, the creative process of discovering how things can be improved. Products and processes are developed that better meet the needs and wants of people than did earlier versions of those same things (Fabricant). Second, by making it possible for the individual to increase his capacity to provide things (products or processes) useful to others, and in surplus to his own needs, the living standards of everyone in those societies has been raised over that of economies disinterested in increasing productivity or unwilling to let productivity-improving incentives work.

Increased productivity gives the workers' families more real income to spend on their own needs and wants (National Center for Education Statistics, 2006b). The benefits of productivity have become so much an integral part of certain societies that it has inspired such dramatic statements as "this benefit of productivity growth is so self-evident and well-known that any fuller discussion of the relationship itself would be otiose" (Baumol et al., p. 10). Even anti-capitalist Lenin acknowledged that "the productivity of labor is, in the final analysis, the most important, the main tool for the victory of the new order" (Fabricant, 1969, p. viii). Nevertheless it may be an important reminder about the critical need to improve productivity to

review what the result of increased productivity has been. In the days most common to history when people hunted or gathered enough to feed self and family, prosperity was unknown. However, when people figured out how to produce more than that which filled their immediate need they were able to engage in trade which obtained goods and services that increased their standard of living (Lawlor, 1985). Prior to the major productivity watershed of the Industrial Revolution (mid-1800s), life in the United States was not much different economically than that of current third-world countries like Honduras and the Philippines (Baumol et al., 1989). In 1875, the average family might have spent 90% of their income on food, clothing, and shelter, a figure which the U.S. race to productivity would eventually drive down to less than 60% by 1978 (Baumol et al.). This then makes available resources for other needs and wants such as better medical care and education. By 1998 the Census Bureau reported that two-thirds of U.S. families officially designated as in poverty had air conditioners, 96.7% had a stove, 92.4% had enough food, 87% had a telephone, 86% had no unpaid rent or mortgage, 85.9% had no unmet need for a doctor, 89.1% had no roof or ceiling leaks, and 69.3% had no unmet essential expenses (United States Census Bureau, 2005). Of those in poverty, 95% percent had refrigerators (Trumbull, 2005). This is not to minimize poverty, but to illustrate that the criteria for poverty in high-productivity economies surpasses the wealth of low-productivity economies or low-productivity periods in history.

There is, however, an element of jeopardy in economies that encourage improved productivity (Baumol et al., 1989). When there is a level playing field, those organizations that develop the most effective innovations are often rewarded with increased productivity. Failing to recognize changes taking place in the environment and failing to develop the skills necessary to compete successfully can result in decision-makers being responsible for creating for their

institutions a future dramatic in its negative implications (Fabricant, 1969; Hooper, 2005; Lawlor, 1985; Mali, 1978). In a world that responds to organizations that learn to increase their productivity, this increased productivity often leads to increased market share for them and the shuttering of unproductive organizations (Amiti & Stiroh, 2007; Fujita, 2008; Lewis, 2004). On a more global level the search for increased productivity often determines the course of history since "societies with higher productivity inevitably replace societies with lower productivity" (Barnett et al., 2002, pp. 292-293).

Another risk, all things being equal, is the demonstrated tendency of information economies to lower wages and reduce the material standard of living (Lawlor, 1985). Workers who are or learn to be highly productive are more valuable than workers whose productivity remains stagnant (Fabricant, 1969). Lagging productivity can have a disastrous effect on those workers in such an occupation. As they develop the practice of being the cheap labor (labor intensive occupations as opposed to those professions enhanced by emerging innovative technologies) that portion of the workforce finds itself relegated to "hold[ing] its own in industries that make heavy use of large quantities of cheap labor and relatively little capital" (Baumol et al., 1989, p. 22). Falling relative productivity results in an economy being forced to become a supplier of cheap labor and the accompanying low living standard that goes with it (Baumol et al., 1989; Hoxby, 2004).

Productivity Data

Labor productivity is generally defined as output per labor hour (Doms, 2009; Fabricant, 1969; United States Department of Labor, Bureau of Labor Statistics, 2006). This figure alone cannot provide a definitive indication of the economic health of the organization because there

are other factors involved. For example, should wages rise faster than productivity it is possible that the company or agency would earn less money per transaction because the net cost per unit would have risen by the difference between the rise in wages and the rise in productivity.

Table 2

Yearly Change in U.S. Corporate Productivity

Year	Percent of Increase/Decrease
1996	3.7
1997	2.6
1998	3.2
1999	3.4
2000	3.6
2001	1.6
2002	3.9
2003	4.3
2004	4.0
2005	5.0

Likewise, if the cost of goods rises faster than the rise in productivity, the enterprise could be impacted in a financially negative way. Nevertheless, rising labor productivity is an important indicator of an organization that is learning to require fewer human resources to complete its task.

U.S. business productivity increases (Amiti & Stiroh, 2007; Fabricant, 1969; Fujita, 2008; Hoxby, 2004; Stiroh, 2001). From 1970 to the mid-1980s, U.S. non-farm productivity

increased 1½% per year (Baumol et al., 1989). The Bureau of Labor Statistics is the federal government's primary fact-finding agency for labor and economic statistics. A review of productivity data from the BLS database reveals that corporate productivity from 1996 to 2005 has increased every year for an average annual productivity increase of about 3.5% (United States Department of Labor, Bureau of Labor Statistics, 2006). U.S. corporate productivity increase is reflected in Table 2.

Another useful productivity indicator is a total factor or multi-factor productivity figure (Amiti & Stiroh, 2007; Doms, 2009; Fabricant, 1969; Wise & McGregor, 1975). As discussed earlier, if an organization is successful in reducing the labor input into unit production there is still the consideration that resources conserved from labor costs have been depleted someplace else, often as compensation in a shift from labor production to more technology-driven production. All things being equal, an enterprise would prefer to see total factor productivity improve as it sees labor factor productivity improve. The Bureau of Labor Statistics reports a multi-factor productivity improvement record from 1941 through 2001 that demonstrates a U.S. record of total manufacturing productivity improvement that is positive and consistent (United States Department of Labor, Bureau of Labor Statistics, 2006)

However a productivity gap that has existed between the Unites States and the rest of the world has begun to narrow. If productivity and standard of living are positively correlated as discussed in an earlier section, the one would have had reason to believe that, beginning in the 1960s, the lead in standard of living that the United States has had since the in Industrial Revolution would have begun to narrow. Beginning in the 1960s the rate of productivity growth (as differentiated from absolute productivity rate) in Japan and the European Union nations (EU-15) was 8% per year for Japan, 5% per year for the EU-15, and 3% per year for the United States

(Amiti & Stiroh, 2007). That trend has moderated somewhat recently, due perhaps to the productivity increases made possible for American enterprises by the use of new information technologies.

Innovation is an incremental process. Figure 4 graphically demonstrates the powerful cumulative effect of a modest (only an average multi-factor productivity improvement rate of 1.5% annually) productivity improvement over time. This is important (Fabricant, 1969; Lawlor, 1985). For example, productivity in the United States increased a mere 1½% per year from 1800 to 1989 (Baumol et al., 1989). However the cumulative result over that time has been a 20-fold increase in productivity and living standards. In other words, due to small increases in productivity on a consistent basis the food, shelter, medicine, education, leisure time, and countless other benefits tangible and intangible that the average American citizen could afford were twenty times as great as they had been two centuries before. On the other hand, over the last century a productivity lag of 1% dropped the United Kingdom from its status as a first-rate economy. This same drop in productivity growth cut wages in the UK from 1½ times the real wages of other European countries to a mere two-thirds of those same countries of real wages in those countries by 1989 (Baumol et al., 1989).

One of the leading indicators of economic health is an increasing productivity factor, therefore private and government researchers report regularly on labor productivity (generally output per person-hour input) and total factor productivity (output per dollar investment input). A study of school productivity must be prefaced with the observation that studies of government productivity reveal government agencies to have proven largely unsuccessful at improving productivity (Fabricant, 1969; United States Department of Labor, Bureau of Labor Statistics, 1996). Similar analysis of school productivity has been undertaken both formally and

informally. In education during the early days of the 20th century the administrative progressives considered formalized methods of quantifying operational decision-making in schools. For example Frank Spaulding analyzed per-pupil costs of course offerings as an important indicator of the program's sustainability (as cited in Callahan, 1962). These calculations were used in the three-step method in which a) researchers would measure and compare comparable results, b) analyze the conditions under which those results were achieved and c) the adoption of those means that proved successful, abandoning those unsuccessful (Callahan, 1962). Although this formalized and quantitative decision-making process seems to have fallen out of favor, informal cost-benefit analysis is common to decision-making in schools today. For example, high school courses of value are still difficult to implement if student participation cannot justify the expense of a teacher or if other course offerings are considered more important.

There seems to be less research undertaken on school productivity as a defined discipline that uses the relationship between resources and results than is common in other enterprises. Hoxby (2004) uses a productivity indicator calculated by dividing NAEP test points by $1,000 of per-pupil expenditures and finds that between 1970 and 2000 test points per $1,000 real per pupil spending showed productivity falling from 58 national percentile rank points per $1,000 spent to 30 points (Hoxby, 2004). International test score and expenditures comparisons reveal that the U.S. is about "70% less productive than the United Kingdom, half as productive as Korea, the Czech Republic, and Hungary" (p. 217) when considering the number of points scored on the Organization for Economic Cooperation and Development Program for International Student Assessment (PISA) and the Third International Mathematics and Science Study (TIMSS) per $1,000 of per-pupil spending in 1998.

In response to the perceived lack of improved student learning on certain assessments it has been argued that the aggregated improvement in learning results is well outrun by the increase in spending for schools (Ladd, 1996), what some have called "a productivity collapse unparalleled in any other sector of the economy" (Zehr, 2009). Whether or not such a statement is hyperbole-laden, it still clearly introduces again the idea of viewing student learning results in conjunction with the money spent to achieve those results. West and Peterson (2007) suggested that much of the public school policy having to do with accountability, parent choice, data-driven instruction, mayoral governance of school districts, and teacher pay have been driven by the search for improved productivity in American public schools.

There are three themes from the literature review which seemed to call for the consideration of school funding and student achievement as factors in a common metric. The first was the argument by schools that improved student learning required increased funding. The second was the judgment of the courts that states and municipalities find a way to fund not only schools, but schools in which students actually learn assigned curriculum. The third was the increasingly persistent call for schools to be held accountable to successfully educate all children in exchange for the resources given to public schools. These persistent patterns of correlation found a ready resolution in the study of productivity, the metric resulting from the combined consideration of student achievement (output) divided by school funding (input). In other words, output ÷ input = productivity.

Summary

This chapter briefly reviewed the literature on the most recently developed standard of appropriate school funding, that of *adequacy*. This court-ordered response to lawsuits brought by school districts under pressure to improve student learning has defined adequacy generally as

the amount of money a school needs to be able to reasonably ensure that students actually learn assigned academic content. However, critics of public schools have charged that student learning has not advanced at the same pace that funding has. The second section of the literature review focused on the societal and legislative discontent with levels of student learning and the resulting mandates such as No Child Left Behind and Public Law 221 that started the process of holding schools accountable for level of student learning. The data on improved student learning reveals that it seems to have risen at a slower pace than the increases in school funding. The final section of the literature review explored the perennial demands that conversations about school funding and student achievement merge into each other. Although there are those who maintain that schools should not be held accountable for student learning in the same way that factories are responsible for widget output (Nichols & Berliner, 2008), the accountability movement has seen the courts codify accountability metrics in the search for adequacy. This has led to an emerging, if immature, study of the education production function in the hope of finding the critical productivity factor that links resources and results (Ball & Goldman, 1997). In conclusion, the tendency of conversations about improved student achievement to eventually involve questions of school funding and the tendency of conversations about school funding to eventually involving demands for improved student achievement reveal these two ideas to be inextricably connected two sides of the same coin - productivity.

CHAPTER 3

Methodology

This chapter describes the methodology used in the study and is organized in the following six sections: a) type of study, including mode of inquiry and design: b) population; c) data collection, including issues related to the use and composition of the dominant cohort, instrument characteristics, and specific procedure for data collection; d) data analysis, including a discussion of the variables used in the study, and the research questions in statistical format; e) limitation; and f) delimitations.

Research Questions

1. How many students demonstrate mastery of state academic standards per General Fund expenditure in each Indiana public school district? In other words, what is each Indiana school district's productivity?
2. Is there a statistically significant relationship between the productivity of Indiana school districts (the relationship of General Fund expenditures to number of students passing the state's academic assessment ISTEP+) and the socioeconomic status of their student populations as defined by the number of district students taking part in the free lunch program?

3. Has there been a statistically significant change in the productivity of Indiana school districts since the implementation of the No Child Left Behind accountability requirements?

Null Hypotheses

$H_0$1. There is no significant difference in productivity between Indiana school districts.

$H_0$2. For Indiana school districts, there is no statistically significant relationship between the socioeconomic status of the student population and the productivity of the district.

$H_0$3. There has been no statistically significant change in the productivity of Indiana school districts since the implementation of the No Child Left Behind accountability requirements.

Study Type

This study will be non-experimental, retrospective, and descriptive (Fraenkel & Wallen, 1996; Johnson & Christensen, 2004; Mason & Bramble, 1997; Neuman, 1997) in design. Because of the archival data available from the Indiana Department of Education going back several years, it was possible to study the recent performance of schools in terms of output and then retrospectively follow the input path over the recent years to discern the relationship between input and output factors (Johnson & Christensen, 2004). The results of this retrospective could open the doors to further research (Mason & Bramble, 1997). Descriptive research generally selects random samples from a population and then analyzes the characteristics of that sample, using this new information to make inferences about the character of the population from which the sample was drawn (Johnson & Christensen, 2004). Existing statistics research is appropriate for the study of large bodies of statistics such as those gathered by government organizations (Neuman, 1997). Because we have access to data for the entire

population, use of a sample was not necessary. There was no need to manipulate the variables as this study sought primarily an understanding of what has happened in the past.

This study dealt with large data-sets and had no direct contact with people. As such it was considered a non-reactive research method in that people were being studied even though they were unaware of the scrutiny (Neuman, 1997). This was important because, even though the people were not aware of the research or were not available for interview, they left something behind which was as important as their answers to interview questions. Contained within the numbers of the data-set were the artifacts of behavior left as evidence. To the researcher who tends to prefer data quantitative, rigorous, and exact, this natural, left-behind evidence may offer the opportunity for a clearer understanding than even the subjects themselves can offer (Neuman, 1997).

Population

Because of the statistical data made available by the Indiana Department of Education this study was not restricted to the practice of random sampling, but rather analyzed the productivity record of all 292 Indiana school districts. This census approach facilitated discussions by removing some concerns common when generalizations were made on sample-based studies. "Larger sample sizes equal a more powerful test" (Johnson & Christensen, 2004, p. 483) and this research was based on the largest sampling possible.

Based on resources available at this time there were 293 school districts in Indiana. In 2008 those school districts provided services to 1,046,263 students. Using the entire population yielded means & standard deviations as parameters, not statistics (Johnson & Christenson, 2004; Mason & Bramble, 1997).

In school year 2008-2009 there were 45,885 students in Indiana public schools with limited English proficiency. Eighty percent of those students with limited English proficiency were Spanish speaking. This figure has risen dramatically from 10,616 a decade earlier. The largest ethnic groups in this population are White (76%), Black (12%), and Hispanic (7%), with Native American, Asian, and multi-racial following in much smaller percentages. Approximately 39% of this population had been registered for free or reduced-priced lunch service. Although not all students from families eligible financially for these services register, this was one of the most consistent indicators of socioeconomic status available to public schools. There were 157,000 students who were receiving Special Education services which constituted over 15% of the entire public school student population.

Data collection

Data was gathered from the Indiana Department of Education. Archival data maintained by the Indiana Department of Education has been posted to the internet and made available to the public for research purposes (Indiana Department of Education, 2009a). Most of the data used in this study was downloaded in spreadsheet format from the Indiana Department of Education. This data was then formatted and inventoried. Then, for the initial analysis to determine productivity rankings, the data was imported into a relational database for analysis. SPSS was used for descriptive, correlation and regression analysis. No surveys or tests were administered in this study.

Data Analysis

All analysis was accomplished through the use of relational databases (Microsoft Access), spreadsheets (Microsoft Excel), and statistical software (SPSS). This data analysis had three primary tasks defined by the three research questions. The first used the standard

productivity formula *Productivity = Output ÷ Input* (Hoxby, 2004; Lawlor, 1985; Mali, 1978; Smith, 1995; Wise & McGregor, 1975) to examine the productivity of Indiana school districts. The second used correlational and regression analysis to determine the relationship between the socioeconomic status of a district's student population and its productivity. Finally, this study examined the relationship between productivity and accountability legislation with the use of further regression analysis. The study used student performance and district expenditure data from 1996 through 2008.

Due to the longitudinal nature of this study, the effects of inflation were taken into consideration. For example, although Indiana state education budgets revealed that $1.9 billion was spent in 2008 for students at the grade levels contained in this study, when controlled for inflation using 1996 as baseline the effects of inflation would reduce the figure to something closer to $1.4 billion. Unless otherwise noted, the inferential statistics portion of this study used expenditure figures discounted for inflation using an inflation factoring table made available by Oregon State University (Sahr, 2009).

Research question #1. Productivity analysis requires at least two variables, one input and one output to yield a productivity figure, thus: *Number of students passing ISTEP+ ÷ General Fund = Productivity*. There are various output/input pairings in education that it could be important to study. For example, some may find it useful to study the productivity relationship between graduating athletes (output) and money spent on athletics (input). Others may find it important to focus on those students who go on to college (output) and the money spent for higher quality textbooks (input). Qualitative concerns such as student-parent as customer satisfaction (output) could be compared per-pupil spending (input). Two variables were central to this study; the district General Fund expenditures (input) and the number of

students passing both sections of Indiana Statewide Testing for Education Progress – Plus (ISTEP+) (output).

In alignment with the primary indicator of performance for Indiana schools as determined by Public Law 221 and the federal No Child Left Behind Act, the number of students passing both the Math and the English sections of ISTEP+ was used as the output figure in this study's productivity calculations. Student achievement is an abstract concept which needs to be operationalized in order to be useful in a quantitative study. This was not difficult since there were sufficient test scores available from which to choose. There are those who disagree with the use of ISTEP+ as an indicator of student achievement. The reason this study used ISTEP+ as an operationalized indicator of student achievement is because the state and federal governing authorities over public schools have selected ISTEP+ as the primary operationalized indicator of student achievement. The ISTEP+ data was downloaded from the Extract Data website (Indiana Department of Education, 2009a), under the School Building Tables heading, in the ISTEP test scores by School – istep line. Because ISTEP testing at grade levels three, six, eight, and 10 have been consistently administered during the study years (1996 to 2008) the ISTEP performance at those grade levels served as the basis for this portion of the study. The resulting data is available on a per-school building basis. Since the analysis in the study was conducted at the district level, the school level results were totaled to yield district-wide ISTEP results, i.e. the number of students in grades three, six, eight, and 10 who passed both sections of ISTEP.

This study used district General Fund expenditures as the primary input variable. Indiana school districts have other significant budget categories such as funds for Debt Service, Retirement/Severance Bond Debt Service, Capital Projects, School Transportation, School Bus Replacement, Special Education Preschool, and the Local Rainy Day Fund. However, the

argument could be made that the funds outside the General Fund, due to their somewhat special purpose nature, are volatile enough in their year-to-year activity to obscure rather than clarify an analysis of a school district's spending behavior. General Fund includes salaries and related expenses, maintenance of facilities, and other expenditures necessary for the daily operation of schools (Indiana Department of Education, 2009b), those spending indicators commonly studied in analysis of Indiana public school finance. The General Fund statistic was downloaded from the Extract Indiana Education Data website (Indiana Department of Education, 2009a), under the School Corporation Tables heading, in the Expenditures, Receipts (Fiscal Year) – frfy line. Since the output factor of the study (number of student passing both sections of ISTEP) dealt with the four grade-levels consistently tested during the years of the study, the total General Fund Expenditures figure in the productivity calculation represented the proportion of total General Fund Expenditures represented by the proportion of total district students who were in grades three, six, eight, and 10. Therefore, if the student count in the four ISTEP tested grade levels equaled one-fourth of the entire district student body, the General Fund figure in the productivity calculation would equal one-fourth of the total General Fund Expenditure. Because parts of this study contain longitudinal analysis and because of the erosion of purchasing power that results from inflation, the General Fund Expenditure figures have been adjusted for inflation using 1996 as baseline. The inflation conversion factors in tables made available by the University of Oregon (Sahr, 2009) were used to make this adjustment.

These two variables were convenient to use in illustrating the functionality of productivity analysis because they are statistics with which many people are familiar and are extensively archived and readily available for study. These variables were used in Question #1 to generate the Productivity statistic which was used in Research Questions #2 and #3. Because

the resulting productivity statistic in its raw form resulted in a figure that begins four positions to the right of the decimal, it was adjusted to reflect the number of students passing both sections of ISTEP per $100,000 of General Fund expenditure. The 292 Indiana school districts in this study were also studied in socioeconomic quartiles determined by percent of students participating in the free and reduced lunch program.

Research question 2. The regression analysis in Question #2 used the variable of student participation in the free and reduced lunch program at school as an independent variable and the productivity statistic from Research Question #1 as the dependent variable in a regression analysis to study the effect of student socioeconomic status on district productivity. Toutkoushian and Curtis (2005) cite numerous studies in which the socioeconomic background of students has been found to have a strong relationship to their academic achievement. The Free and Reduced Lunch participation statistic was downloaded from the Extract Indiana Education Data website (Indiana Department of Education, 2009a), under the School Building Tables heading, in the Free Lunch Counts by School – sl line. The resulting data was available on a per-school building basis. Since the analysis in the study was conducted at the district level, the school level results were totaled to yield district-wide percentage of students who participate in the Free and Reduced Lunch program. The regression analysis used the district Free and Reduced Lunch participation percentage as the predictive variable and the district Productivity indicator as the criterion variable.

Research question 3. Research Question #3 used the same independent variable (student participation in the free lunch program) and dependent variable (district productivity) as Question #2. However, an ANCOVA testing was repeated for a series of years since the implementation of accountability legislation to see if there was any change in the productivity of

Indiana school districts since the implementation of accountability measures. This data was further analyzed by disaggregation according to socioeconomic status.

Delimitations

In order to best study the specifics of interest in this research on productivity it was necessary *not* to study certain things yet, in other words to leave more detailed study of related topics to further research. Therefore, certain related topics were largely left out of this study even though they may have had bearing on the larger topic of productivity.

General productivity was made up of three component parts; input, process, and output. This research project set its sights on input and output. This was not because the researcher believed process to be unimportant. To the contrary, the researcher anticipated that the results of this study would prompt a renewed interest in process as an element of productivity at least as important as input.

Limitations

This research faced certain limitations of which the reader should be aware. The data in the research section of this analysis was from Indiana school districts only. There was a limited number of years for which the applicable data was available. ISTEP+ and student socioeconomic status information was only available for roughly the last decade.

The reader should also be aware of the researcher's theoretical perspective which drove his presuppositions in the research design. There was a rationale for using this methodology, based on a theoretical framework that assumes an order, some of which can be discerned and "the job of the researcher is to expose that order" (Mason & Bramble, 1997, p. 38). Even in the social sciences order makes itself apparent. Behavior in social situations that elicits negative reactions is generally not repeated because we look for and count on the utility of

generalizations. This demonstrates our tendency act as if the "social universe is amenable to the development of abstract laws that can be tested through the careful collection of data" (Turner, 1985, p. 24). This research tends to be quantitative in nature and is relatively constrained by strict guidelines for sampling, validity, reliability, and generalization. Quantitative researchers will find this study of productivity familiar territory, easily conducted with methodology used on a regular basis in other professions. For researchers operating from this point of view, work that focuses on analysis of skill-based student achievement lends itself to a more quantitative foundation from which to study efficiency and effectiveness, elements important to the study of productivity (Alexander, 2004).

Summary

This chapter reviewed the methodology used in the study and was organized in the following seven sections: a) type of study, including mode of inquiry and design: b) population; c) data collection, including issues related to the use and composition of the dominant cohort, instrument characteristics, and specific procedure for data collection; d) data analysis, including a discussion of the variables used in the study, and the research questions in statistical format; e) limitation; and f) delimitations. All analysis was accomplished through the use of relational databases (Microsoft Access), spreadsheets (Microsoft Excel), and statistical software (SPSS).

CHAPTER 4

Analysis of Data

The purpose of this study was to analyze the productivity of Indiana public school districts, to determine the relationship between a district's productivity and the socioeconomic status of its students, and the effect of accountability on productivity. This data analysis had three primary tasks defined by the three research questions. The first was to use the standard productivity formula *Productivity = Output ÷ Input* (Hoxby, 2004; Lawlor, 1985; Mali, 1978; Smith, 1995; Wise & McGregor, 1975) to examine the productivity of Indiana school districts. The second was to use regression analysis to determine the relationship between the socioeconomic status of a district's student population and its productivity. Finally the researcher examined the change in productivity since accountability legislation had taken effect by conducting an Analysis of Variance (ANOVA) on Indiana school districts disaggregated by socioeconomic status (represented by participation in the free and reduced lunch program).

Research Question #1

The null hypothesis for the first research question asserted that there was no difference in district productivity among the 292 Indiana school districts in the study. Archival information made available through the Indiana Department of Education allowed the researcher to analyze the data that made up and surrounded the quantitative study of productivity and socioeconomic status (Table 3). To that purpose, the overall mean aggregate productivity of all 292 school

districts was calculated. The districts were then analyzed in socioeconomic quartiles, using analysis of variance (ANOVA) to determine if there was a statistically significant difference between Indiana schools districts according to socioeconomic status.

Table 3

Indiana School District Statistical Averages – 2008

	Mean	*SD*
Enrollment	3,524	4,348
Total Expenditures	$38,528,502	$53,300,665
General Fund Expenditures	$21,813,803	$29,017,266
General Fund Expenditures (in tested grades)	$6,594,028	$8,524,056
General Fund Expenditures (in tested grades, controlled for inflation)	$4,807,047	$6,214,037
Free and reduced lunch students	1,463	2,683
Students ISTEP+ tested	1,067	1,287
Students passing ISTEP+	666	744

A total of 292 Indiana public school districts were studied. In 2008 these school districts had a total enrollment of 1,028, 885 students. The enrollment of the districts ranged from 168 to 34,050, with a mean of 3,524. Total 2008 General Fund expenditure of $6,369,630,759 was equal to $1,925,456,306 for those students in grades taking the ISTEP+ test each year (i.e. grades three, six, eight, and 10). When controlled for inflation (1996 used as baseline year) the General Fund expenditure for all tested grades was $1,403,657,648 in 2008. The fewest number of students served by the Free and Reduced Lunch program was 40 and the maximum served was

28,281, with the average district serving 1,463 students. The number of students who took the ISTEP+ test in 2008 ranged from a low of 33 to 9,747 students, with a mean of 1,067. The district with the fewest students passing ISTEP+ had 20 passing while the district with the greatest number had 4,599 passing results, with the average district passing 666 students.

Table 4

Productivity Calculation – 2008

	General Fund
General Fund Expenditures at tested grade levels (discounted for inflation) (Input)	$1,403,657,648.0
Number of students tested ISTEP+	311,502.0
Number of students passing both English and mat ISTEP+ (Output)	194,472.0
Productivity (Output – students passed ISTEP+ ÷ Input - $100,000 General Fund Expenditure, discounted for inflation)	13.9

Using the formula *Productivity = Output ÷ Input* a productivity indicator for the state was calculated at 13.9 students passing ISTEP+ for each $100,000 in General Fund expenditures when controlling for inflation (1996 serving as the base year for inflation calculations) as reflected in Table 4. The 292 Indiana public school districts in the study were, therefore, studied in socioeconomic quartiles for each year of the study. Using the percent of district enrollment participating in the free and reduced lunch program, districts were divided into the four following groups: the group labeled FR 1 had the lowest percentage of students on free and reduced lunch, an indicator of a less socioeconomically challenged student population (Table 5). Group FR 2 had the next highest indicator of socioeconomic challenge (Table 6). Group FR 3

was higher still in free and reduced lunch population (Table 7) and group FR 4 contained the districts with the largest socioeconomic challenge as represented by the highest participation in the free and reduced lunch program (Table 8).

Table 5

Productivity Calculation FR 1 – 2008

	Mean	*SD*
Enrollment	3,427.0	3,342.0
General Fund Expenditures	4,366,022.0	4,098,567.0
Free and reduced lunch students	604.0	498.0
Students passing ISTEP+	809.0	859.0
Productivity	17.4	2.5

Free and reduced lunch group 1 (FR 1) was in the lowest quartile of free and reduced lunch participation (as measured by percentage of student enrollment) of 292 Indiana school districts. In 2008 the participation of students in the free and reduced lunch program ranged from 4.4% to 27.4% in FR 1. The percentage of students passing ISTEP+ in this quartile ranged from 59% to 89%. Productivity ranged from 8.6 to 23.3 students passing ISTEP+ for each $100,000 in General Fund expenditures when controlling for inflation (1996 serving as the base year for inflation calculations).

Free and reduced lunch group 2 (FR 2) was in the second lowest quartile of free and reduced lunch participation (as measured by percentage of student enrollment) of 292 Indiana school districts. In 2008 the participation of students in the free and reduced lunch program ranged from 27.4% to 36.6% in FR 2. The percentage of students passing ISTEP+ in this

quartile ranged from 54% to 73%. Productivity ranged from 10.2 to 18.8 students passing ISTEP+ for each $100,000 in General Fund expenditures when controlling for inflation (1996 serving as the base year for inflation calculations).

Table 6

Productivity Calculation FR 2 – 2008

	Mean	*SD*
Enrollment	2,311.0	2,351.0
General Fund Expenditures	3,034,455.0	2,977,442.0
Free and reduced lunch students	746.0	764.0
Students passing ISTEP+	461.0	475.0
Productivity	14.8	1.5

Table 7

Productivity Calculation FR 3 – 2008

	Mean	*SD*
Enrollment	2,739.0	2,682.0
General Fund Expenditures	3,650,764.0	3,539,567.0
Free and reduced lunch students	1,128.0	1,126.0
Students passing ISTEP+	522.0	497.0
Productivity	14.1	1.6

Free and reduced lunch group 3 (FR 3) was in the second highest quartile of free and reduced lunch participation (as measured by percentage of student enrollment) of 292 Indiana school districts. In 2008 the participation of students in the free and reduced lunch program ranged from 36.9% to 45.5% in FR 3. The percentage of students passing ISTEP+ in this quartile ranged from 52% to 74%. Productivity ranged from 11.0 to 17.6 students passing ISTEP+ for each $100,000 in General Fund expenditures when controlling for inflation (1996 serving as the base year for inflation calculations).

Table 8

Productivity Calculation FR 4 – 2008

	Mean	*SD*
Enrollment	5,617.0	6,780.0
General Fund Expenditures	8,178,945.0	10,079,718.0
Free and reduced lunch students	3,374.0	4,679.0
Students passing ISTEP+	871.0	949.0
Productivity	11.5	2.2

Free and reduced lunch group 4 (FR 4) made up the highest quartile of free and reduced lunch participation (as measured by percentage of student enrollment) of 292 Indiana school districts. In 2008 the participation of students in the free and reduced lunch program ranged from 45.8% to 88.9% in FR 4. The percentage of students passing ISTEP+ in this quartile ranged from 37% to 71%. Productivity ranged from 5.3 to 15.6 students passing ISTEP+ for each $100,000 in General Fund expenditures when controlling for inflation (1996 serving as the base year for inflation calculations).

The preceding descriptive statistics reveal that productivity declined as the researcher progressed from higher to lower socioeconomic status. An analysis of variance (ANOVA) study reveal if the differences between the productivity of the four socioeconomic groups was statistically significant.

Table 9

ANOVA For Productivity Between SES Quartiles – 2008

Source	*SS*	*df*	*MS*	*F*	Sig.
Between Groups	1,288.276	2	429.425300	107.2695	.000*
Within Groups	1,154.008	288	4.006973		
Total	2,442.284	290			

*The mean difference is significant at the .05 level.

A one-way ANOVA was conducted to ascertain differences in district productivity based on the socioeconomic status of the district as represented by participation in the free and reduced lunch program. There was a statistically significant difference in productivity based on the district participation in the free and reduced lunch program, $F(2,288) = 107.1695$, $p < .05$ ($\eta_p^2 = .527$), and the observed power was 1.0. Therefore the null hypothesis is rejected (Table 9).

Multiple comparisons analysis using Tukey's HSD revealed that the difference in productivity between districts in socioeconomic quartiles was significant between all socioeconomic quartiles with the exception of FR 2 and FR 3, which only had a mean difference in productivity of .6595 students passing ISTEP+ for each $100,000 in General Fund expenditures when controlling for inflation, not a statistically significant difference. This is reflected in Table 10.

Table 10

Tukey's Multiple Comparison Between SES – 2008

(I) SES Level	(J) SES Level	Mean Difference (I-J)	Sig.
1	2	2.6800*	.000
	3	3.3395*	.000
	4	5.9037*	.000
2	1	-2.6800*	.000
	3	.6595	.194
	4	3.2237*	.000
3	1	-3.3395*	.000
	2	-.6595	.194
	4	2.5642*	.000
4	1	-5.9037*	.000
	2	-3.2237*	.000
	3	-2.5642*	.000

Note. Based on observed means. The error term is Mean Square (Error) = 4.007. *The mean difference is significant at the .05 level.

Research Question #2

The second research question explored the relationship between a school district's socioeconomic status and the academic performance of its students. The null hypothesis of the second research question posits that there is no relationship between the productivity of the Indiana districts in the study and the socioeconomic status of those districts. Linear regression

analysis was conducted to determine whether or not there was a relationship and the nature of the relationship between these two variables.

Table 11

Regression ANOVA Productivity – 2008

Source	*SS*	*df*	*MS*	*F*	Sig.
Regression	1,557.569	1	1,557.569	510.544	.000*
Residual	884.715	290	3.051		
Total	2,442.284	291			

Note. The mean difference is significant at the .05 level.

Table 12

Regression For Productivity and SES – 2008

Variable	*B*	*SE*(*B*)	*β*	*t*	Sig.
Free and reduced lunch participation (percent of students)	-.161	0.0071	-.799	-22.595	.000

Note. R^2 = .638

In a test to explore the ability of free and reduced lunch participation to predict district productivity a linear regression was run using free and reduced lunch participation as the predictor variable and district productivity as the criterion variable. There was a statistically significant relationship between free and reduced lunch participation and district productivity in 2008 for the studied Indiana school districts. The R^2 (.638) was statistically significant, $F(1,290) = 510.554$, $p < .05$ and is presented in Table 11. The slope (-.161) was significantly different

from zero, $t(290) = -22.595$, $p < .05$ and is presented in Table 12. Therefore, the predictor variable (participation in the free and reduced lunch program) is a statistically significant predictor of the criterion variable (district productivity).

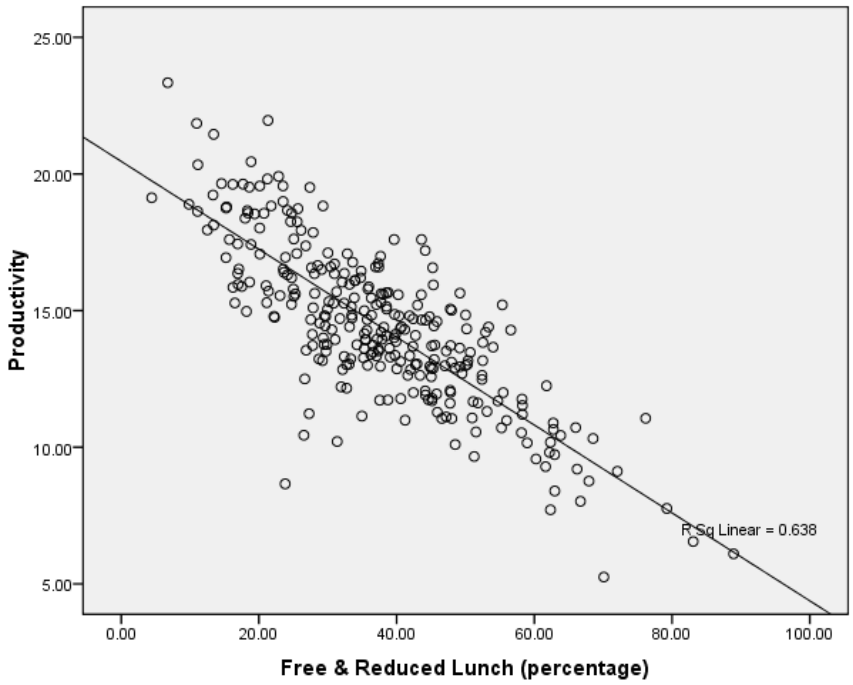

Figure 2. Regression plot of Indiana school district productivity and socioeconomic status - 2008

The previous regression analysis determined that an Indiana school district's percentage of student participation in the free and reduced lunch program was a statistically significant predictor of district productivity. However, although socioeconomic status as represented by participation in the free and reduced lunch program may predict productivity overall, further exploration was used to reveal the consistency of the relationship throughout the four socioeconomic quartiles.

Table 13

Regression ANOVA Productivity FR 1 – 2008

Source	*SS*	*df*	*MS*	*F*	Sig.
Regression	103.292	1	103.292	20.746	.000*
Residual	353.505	71	4.979		
Total	456.798	72			

Note. *The mean difference is significant at the .05 level.

Table 14

Regression Productivity FR 1 – 2008

Variable	*N*	*B*	*SE*(B)	*β*	*t*	Sig.
Free and reduced lunch percent – Overall	292	-.161	0.0071	-.799	-22.595	.000
Free and reduced lunch percent – FR 1	73	-.231	0.0510	-.476	-4.555	.000
Free and reduced lunch percent – FR 2	73	-.115	0.0650	-.206	-1.773	.081
Free and reduced lunch percent – FR 3	73	-.130	0.0620	-.240	-2.086	.041
Free and reduced lunch percent – FR 4	73	-.176	0.0190	-.734	-9.104	.000

In a test to explore the ability of free and reduced lunch participation to predict district productivity within FR 1 a linear regression analysis was conducted using free and reduced lunch participation as the predictor variable and district productivity as the criterion variable. There was a statistically significant relationship between free and reduced lunch participation and district productivity in 2008 for the 73 studied Indiana school districts contained in the quartile FR 1. The R^2 (.226) is statistically significant, $F(1,71) = 20.746$, $p < .05$ and is presented is

Table 13. The slope (-.231) is significantly different from zero, $t(71) = -4.555$, $p < .05$. Table 14 reflect these figures. Therefore, the predictor variable (participation in the free and reduced lunch program) is a statistically significant predictor of the criterion variable (district productivity) within FR 1.

Table 15

Regression ANOVA Productivity FR 2 – 2008

Source	*SS*	*df*	*MS*	*F*	Sig.
Regression	7.231	1	7.231	3.144	.081
Residual	163.315	71	2.300		
Total	170.546	72			

In a test to explore the ability of free and reduced lunch participation to predict district productivity within FR 2 a linear regression analysis was conducted using free and reduced lunch participation as the predictor variable and district productivity as the criterion variable. There was not a statistically significant relationship between free and reduced lunch participation and district productivity in 2008 for the 73 studied Indiana school districts contained in the quartile FR 2. The R^2 (.042) is not statistically significant, $F(1,71) = 3.144$ as reflected in Table 15. The slope (-.115) is not significantly different from zero, $t(71) = -1.773$. Therefore, the predictor variable (participation in the free and reduced lunch program) was not a statistically significant predictor of the criterion variable (district productivity) within FR 2.

Table 16

Regression ANOVA Productivity FR 3 – 2008

Source	*SS*	*df*	*MS*	*F*	Sig.
Regression	10.038	1	10.038	4.353	.041
Residual	163.404	71	2.306		
Total	173.745	72			

In a test to explore the ability of free and reduced lunch participation to predict district productivity within FR 3 a linear regression analysis was conducted using free and reduced lunch participation as the predictor variable and district productivity as the criterion variable. There was a statistically significant relationship between free and reduced lunch participation and district productivity in 2008 for the 73 studied Indiana school districts contained in the quartile FR 3. The R^2 (.058) is statistically significant, $F(1,71) = 4.353$, $p < .05$. The slope (-.130) is significantly different from zero, $t(71) = -2.086$, $p < .05$. Therefore, the predictor variable (participation in the free and reduced lunch program) is a statistically significant predictor of the criterion variable (district productivity) within FR 3. This is documented in Table 16.

In a test to explore the ability of free and reduced lunch participation to predict district productivity within FR 4 a linear regression analysis was conducted using free and reduced lunch participation as the predictor variable and district productivity as the criterion variable. There was a statistically significant relationship between free and reduced lunch participation and district productivity in 2008 for the 73 studied Indiana school districts contained in the quartile FR 4. The R^2 (.539) was statistically significant, $F(1,71) = 82.880$, $p < .05$ and is documented in Table 17. The slope (-.176) is significantly different from zero, $t(71) = -9.104$, $p < .05$.

Therefore, the predictor variable (participation in the free and reduced lunch program) is a statistically significant predictor of the criterion variable (district productivity) within FR 4.

Table 17

Regression ANOVA Productivity FR 4 – 2008

Source	*SS*	*df*	*MS*	*F*	Sig.
Regression	190.082	1	190.082	82.880	.000[a]
Residual	162.837	71	2.293		
Total	351.919	72			

*The mean difference is significant at the .05 level.

As revealed in the preceding regression, although there was a statistically significant negative relationship between the productivity and the socioeconomic status of the 292 studied Indiana school districts, the closeness of that relationship changed when studied at the level of socioeconomic quartile.

This is demonstrated graphically in Figure 7 and Figure 8 and statistically in the regression statistics which confirm that, whereas the R^2 for the regression of all 292 school districts (.638) declares that nearly 64% of the variance in district productivity is being explained by socioeconomic status, the R^2 of FR 3 (Figure 8) (.058) reveals that slightly less than 6% of the variance in district productivity is being explained by socioeconomic status in that quartile. Table 18 extends this analysis.

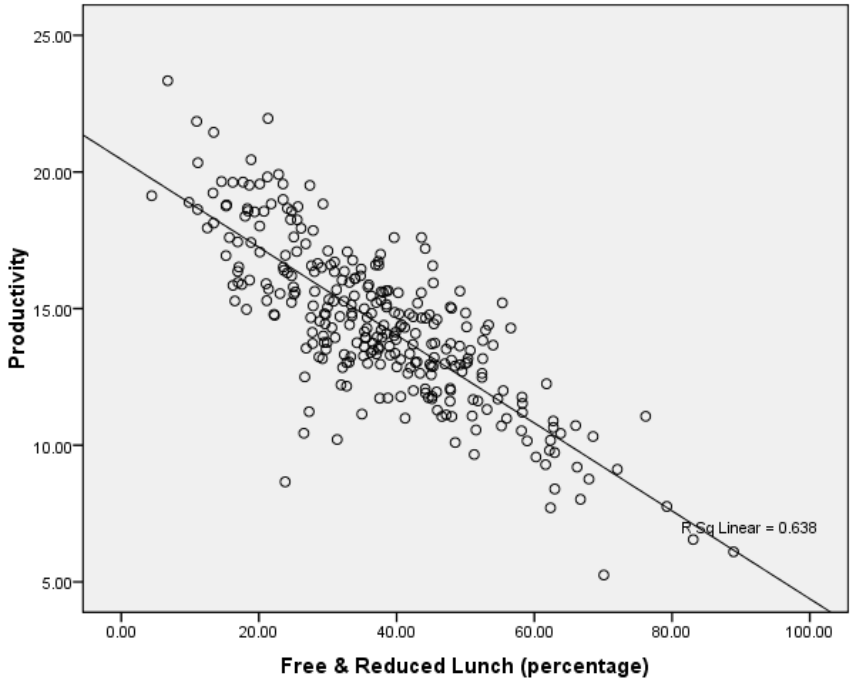

Figure 3. Regression plot of Indiana school district productivity and socioeconomic status - 2008

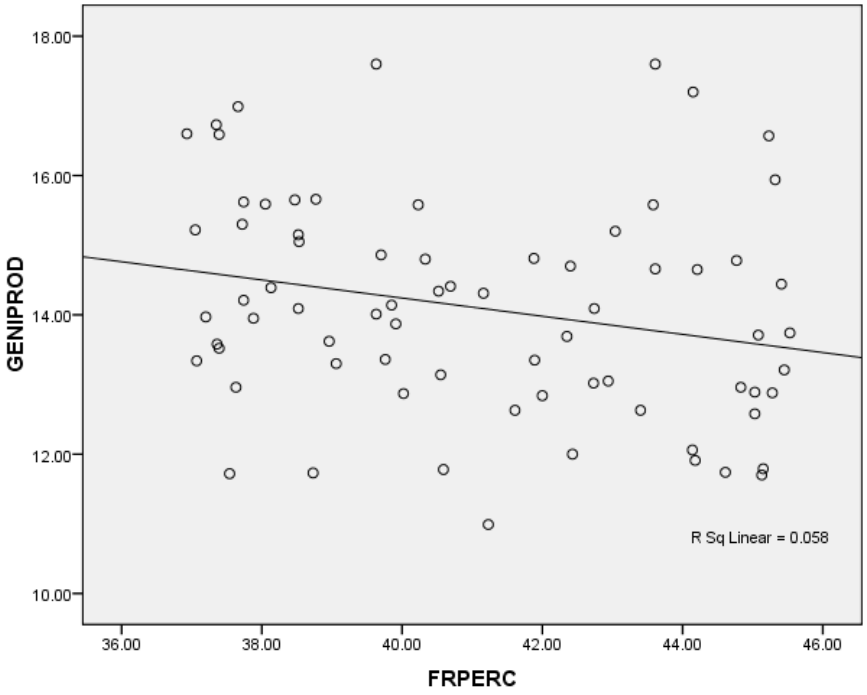

Figure 4. Regression plot of Indiana school district productivity and SES status, 73 districts FR 3 - 2008

Table 18

Regression Significance Analysis Productivity by SES and Year

	Overall		F&R 1		F&R 2		F&R 3		F&R 4	
Year	*B*	Sig.	*β*	Sig.	*B*	Sig	*β*	Sig.	*B*	Sig.
1996	-.738	*	-.442	*	-.229	.052	-.161	.179	-.710	*
1997	-.732	*	-.343	*	-.150	.206	-.200	.090	0.731	*
1998	-.743	*	-.480	*	-.222	.060	-.273	*	-.696	*
1999	-.780	*	-.461	*	-.138	.244	-.300	*	-.724	*
2000	-.783	*	-.610	*	-.152	.199	-.213	.071	-.724	*
2001	-.752	*	-.543	*	-.262	*	-.313	*	-.753	*
2002	-.767	*	-.549	*	-.222	.061	-.188	.112	-.760	*
2003	-.710	*	-.447	*	-.217	.065	.282	*	-.477	*
2004	-.715	*	-.315	*	.103	.385	-.357	*	-.539	*
2005	-.751	*	-.522	*	-.345	*	-.172	.147	-.761	*
2006	-.776	*	-.439	*	-.143	.228	-.112	.344	-.755	*
2007	-.768	*	-.485	*	-.185	.118	-.318	*	-.766	*
2008	-.799	*	-.476	*	-.206	.081	-.240	*	-.734	*

Note. *The mean difference is significant at the .05 level.

Table 18 includes 54 cells that make up 13 years of regression analysis across four socioeconomic quartiles of school districts. Seventeen of the cells report relationships between socioeconomic status and district productivity that is less than significant at the .05 level. Additionally (though not shown in the table) there are 11 additional cells in which the

relationship between socioeconomic status and district productivity was significant at the .05 level but would not have been at the .001 level.

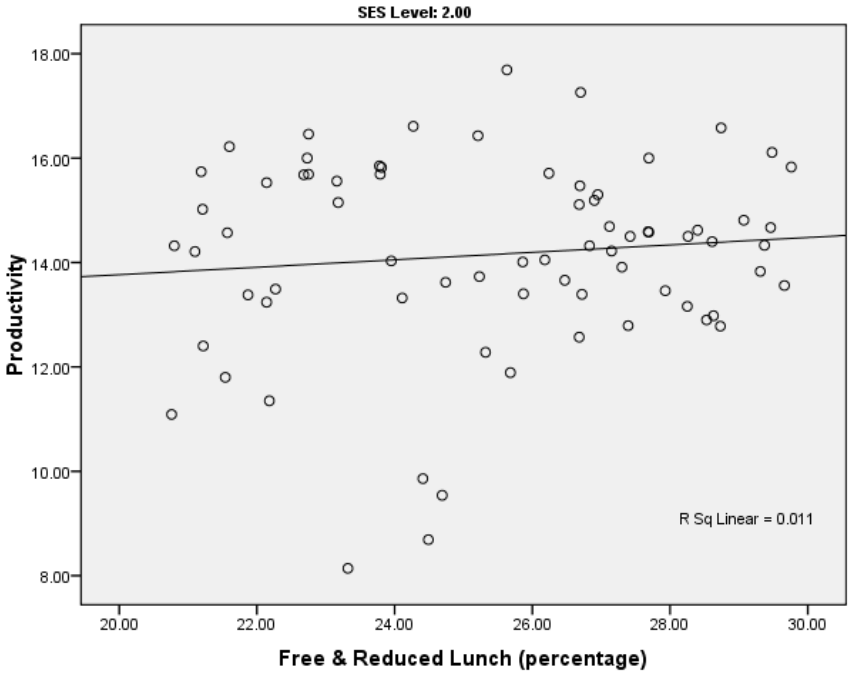

Figure 5. Regression plot of Indiana school district productivity and SES, 73 districts FR 2-2004

In the case of FR2 in 2004 as demonstrated in Figure 9, the relationship was positive, although insignificant, between low socioeconomic status and district productivity. This revealed 73 districts that year in which district productivity seemed not to have been obstructed by low socioeconomic status.

In summarizing Research Question #2, although there was a statistically significant overall negative relationship between low socioeconomic status and district productivity, thus rejecting the null hypothesis, a disaggregated analysis revealed that, although the relationship may be statistically significant overall it was not statistically significant everywhere (i.e. in all socioeconomic quartiles).

Research Question #3

Research Question #2 explored the effect of socioeconomic status on district productivity. Overall, the data revealed a statistically significant negative relationship between low socioeconomic status and district productivity. Research Question #3 sought to determine the degree to which productivity has changed since implementation of accountability legislation, specifically the No Child Left Behind Act enacted in 2002.

A one-way ANOVA was conducted to ascertain differences in district productivity on a year-by-year basis with a special emphasis from 2002, the year the No Child Left Behind Act was put into effect, as well as the years before and after. There was a statistically significant difference in the productivity of districts over the 13 years from 1996 through 2008, $F(12, 3783) = 21.882$, $p < .05$ ($\eta_p^2 = .065$).

Table 19

ANOVA Productivity of the 292 Indiana School Districts from 1996-2008

Source	*SS*	*df*	*MS*	*F*	Sig.
Between Groups	2,022.045	12	168.504	21.882	.000*
Within Groups	29,130.668	3,783	7.700		
Total	31,152.713	3,795			

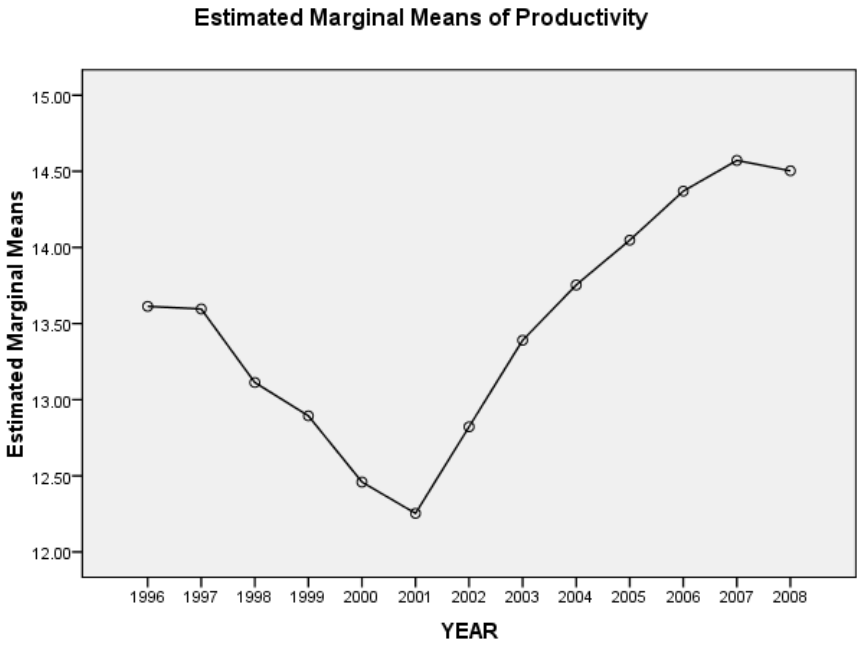

Figure 6. Mean productivity 1996-2008 of the 292 Indiana school districts

The profile plot of the ANOVA in Figure 10 illustrates the dramatic shift in the trajectory of productivity change from negative in the years 1996 to 2001 to positive beginning 2002 through 2007, with a slight fall-off in 2008. Multiple comparisons analysis using Sheffé's Post Hoc testing revealed statistically significant positive productivity changes between the year 2001 and the subsequent years 2003 through 2008 as reflected in Table 20.

Table 21 and Figure 11 summarize the changes in productivity disaggregated by socioeconomic quartile and among all 292 districts in the study. Tables 22, 23, 24, and 25 contain four analyses of variance (ANOVA) that were conducted in order to determine whether the significant difference between the productivity change of 292 Indiana school districts in the years between 1996 and 2008 was reflected in the productivity change of the 73 districts in each of the socioeconomic quartiles.

Table 20

Multiple Comparison Analysis – Productivity 1996-2008

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1996					x	x							
1997					x	x							
1998											x	x	x
1999										x	x	x	x
2000	x	x							x	x	x	x	x
2001	x	x						x	x	x	x	x	x
2002										x	x	x	x
2003						x						x	x
2004					x	x							
2005				x	x	x	x						
2006			x	x	x	x	x						
2007			x	x	x	x	x	x					
2008			x	x	x	x	x	x					

Note. *The mean difference is significant at the .05 level.

Table 21

Yearly Productivity Disaggregated by SES

	FR 1 (*N*=73)		FR 2 (*N*=73)		FR 3 (*N*=73)		FR 4 (*N*=73)		Overall (*N*=292)	
Year	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
1996	16.1	2.5	14.0	1.9	13.3	1.8	10.9	2.7	13.6	2.9
1997	15.9	2.7	14.2	1.8	13.3	1.4	10.9	2.7	13.6	2.8
1998	15.6	2.4	13.8	2.0	12.7	1.6	10.6	2.5	13.2	2.8
1999	15.3	1.8	13.3	1.8	12.6	1.3	10.3	2.4	12.9	2.6
2000	14.7	2.0	13.2	1.8	12.0	1.3	9.9	2.3	12.5	2.6
2001	14.5	2.2	12.8	1.7	11.8	1.6	10.0	2.2	12.3	2.6
2002	15.0	2.4	13.4	1.7	12.5	1.3	10.3	2.0	12.8	2.5
2003	15.6	2.3	13.9	1.8	13.1	1.4	10.9	2.1	13.4	2.6
2004	16.4	2.5	14.1	1.9	13.3	1.4	11.1	2.3	13.7	2.8
2005	16.5	2.8	14.6	2.0	13.8	1.6	11.3	2.1	14.1	2.9
2006	17.2	2.7	14.8	1.7	14.0	1.7	11.4	2.3	14.4	3.0
2007	17.4	2.5	14.9	1.9	14.2	1.8	11.8	2.3	14.6	2.9
2008	17.4	2.5	14.8	1.5	14.1	1.6	11.5	2.2	14.5	2.9

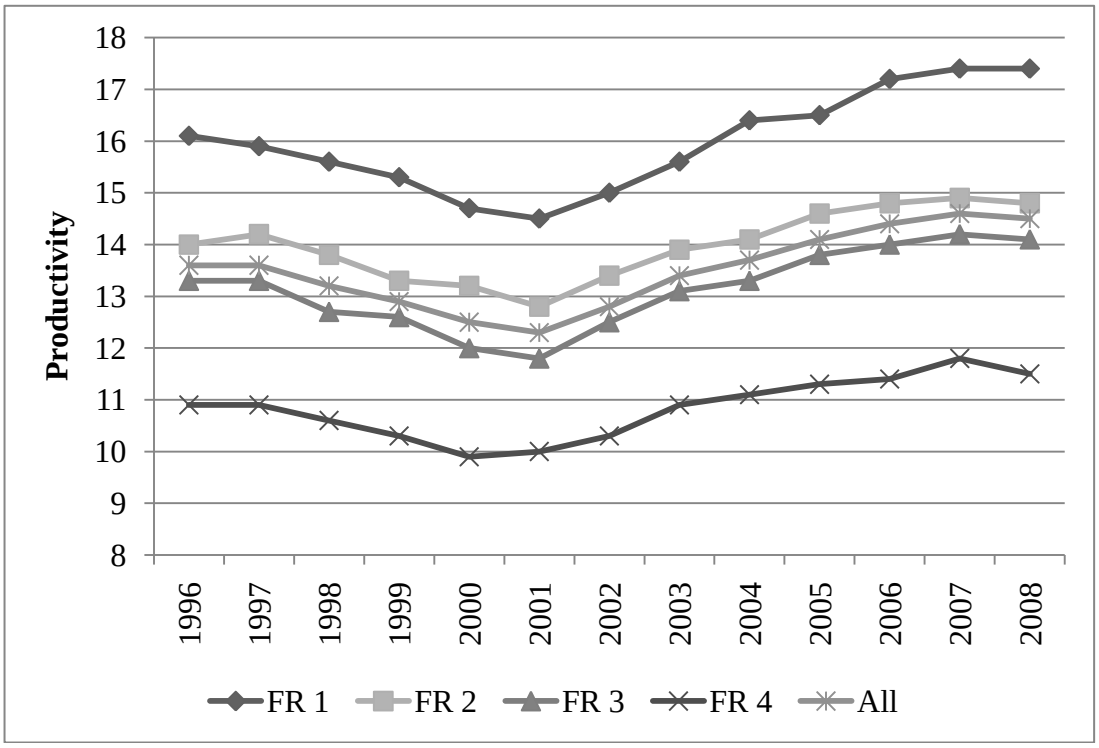

Figure 7. Mean productivity by SES and by total 1996-2008

Table 22

ANOVA for Dependent Variable Productivity FR 1

Source	*SS*	*df*	*MS*	*F*	Sig.
Between Groups	856.700	12	71.392	12.151	.000*
Within Groups	5,499.320	936	5.875		
Total	6,356.021	948			

Note. *The mean difference is significant at the .05 level.

Table 22 illustrates that there was a statistically significant difference in the productivity of FR 1 districts over the 13 years from 1996 through 2008, $F(12,936) = 12.151$, $p < .05$ ($\eta_p^2 = .135$). Multiple comparisons analysis using Sheffé's Post Hoc testing revealed statistically

significant positive productivity changes between the year 2001 and the subsequent years 2004 through 2008.

Table 23

ANOVA for Dependent Variable Productivity FR 2

Source	*SS*	*df*	*MS*	*F*	Sig.
Between Groups	388.901	12	32.408	9.939	.000*
Within Groups	3,052.085	936	3.261		
Total	3,440.985	948			

Note. *The mean difference is significant at the .05 level.

Table 23 reflects that there was a statistically significant difference in the productivity of FR 2 districts over the 13 years from 1996 through 2008, $F(12,936) = 9.939$, $p < .05$ ($\eta_p^2 = .113$). Multiple comparisons analysis using Sheffé's Post Hoc testing revealed statistically significant positive productivity changes between the year 2001 and the subsequent years 2004 through 2008.

Table 24

ANOVA for Dependent Variable Productivity FR 3

Source	*SS*	*df*	*MS*	*F*	Sig.
Between Groups	537.061	12	44.755	19.104	.000*
Within Groups	2,192.774	936	2.343		
Total	2,729.835	948			

Note. *The mean difference is significant at the .05 level.

Table 24 reveals that there was a statistically significant difference in the productivity of FR 3 districts over the 13 years from 1996 through 2008, $F(12,936) = 19.104$, $p < .05$ ($\eta_p^2 = .197$). Multiple comparisons analysis using Sheffé's Post Hoc testing revealed statistically significant positive productivity changes between the year 2001 and the subsequent years 2003 through 2008.

Table 25

ANOVA for Dependent Variable Productivity FR 4

Source	*SS*	*df*	*MS*	*F*	Sig.
Between Groups	308.831	12	25.736	4.728	.000*
Within Groups	5,095.276	936	5.444		
Total	5,404.107	948			

Note. *The mean difference is significant at the .05 level.

Table 25 shows that there was a statistically significant difference in the productivity of FR 4 districts over the 13 years from 1996 through 2008, $F(12,936) = 4.728$, $p < .05$ ($\eta_p^2 = .057$). As regards this consideration of productivity change, since the enactment of accountability legislation (NCLB) the multiple comparisons analysis using Sheffé's Post Hoc testing for this quartile (FR 4, the lowest socioeconomic quartile from each year) revealed statistically significant positive productivity changes only between the year 2001 and the year of 2007.

Summary of Analysis

Research Question #1 established a baseline of data for the balance of the study by calculating district productivity of 292 Indiana school districts. The null hypothesis was that there was no significant difference between the productivity of the districts studied, however analysis of variance (ANOVA) revealed statistically significant differences between the productivity of the districts divided into socioeconomic quartiles. Therefore the null hypothesis was rejected for Research Question #1.

Research Question #2 sought to discover if there existed a relationship between the productivity of Indiana school districts and their socioeconomic status in 2008. Regression analysis revealed there to be a statistically significant overall negative relationship between low socioeconomic status and district productivity, thus rejecting the null hypothesis for Research Question #2. However, a disaggregated analysis reveals that, although the relationship may be statistically significant overall it is not statistically significant everywhere (i.e. in all socioeconomic quartiles).

Research Question #3 analyzed productivity through the years from 1996 to 2008 to determine if there were any significant patterns in productivity relative to the enactment of accountability legislation. The null hypothesis stated that there would be no significant change in the productivity of Indiana school districts since the advent of accountability legislation such as the No Child Left Behind Act (2002). Analysis of variance (ANOVA) revealed a statistically significant difference between the annual district productivity from year-to-year coincident with the implementation of No Child Left Behind, thus rejecting the null hypothesis for Research Question #3.

CHAPTER 5

Discussion and Recommendations

The premise of this study has been that conversations about school funding may lack resolution outside of the context of student achievement and, conversely, that demands for student achievement which ignore the constraints of available funding may suffer from the same lack of satisfactory resolution. In Indiana, advocates for accountability demand better ISTEP+ test results (output), impatient with demands for a further expansion of the $7 billion already spent on schools in the state. On the other hand, the demand for adequate funding from educators predicates any further expectation for results on increased spending first (input), believing those who call for improved student learning to be ignorant, perhaps willfully, of the challenges faced in trying to move challenging populations to literacy against a tide of societal pathologies. Each argues his own variable to the exclusion of the other.

However, the faint boundaries of common ground may be discerned in the characterization by Barnett et al. (2002) of schools as cost-constrained producers, concisely capturing the essence of the conflict in public education which resides at the nexus of input and output. The term *cost-constrained* forces us to consider both the need for resources and our unavoidable need to acknowledge the inevitable scarcity which demands accountability for the efficient use of inputs. Equally important is the term *producers* which acknowledges the performance requirements of output, the measure of an enterprise's effectiveness.

Discussion

Research question 1. From the joint consideration of the demands for student achievement (output) and the need for adequate school funding (input) emerges the study of school productivity, the relationship between results (output) and resources (input). With the use of productivity analysis, common ground is established in which the conversation meets at the juncture of the primary concerns of each. Within the context of productivity analysis we can now understand on an empirical basis that 13.9 students demonstrate mastery of Indiana standards for every $100,000 of General Funds spent on behalf of those students.

The strength of productivity analysis revealed itself in the questions that it produced. In the case of 292 Indiana school districts, a productivity indicator of less than 13.9 (the state average) forced an exploration of the deviation. For example, is a productivity indicator which is smaller than the *mean* indicative of anemic student learning results (an atypically weak output)? Or, rather, does a lower than average productivity figure indicate overfunding and waste (an input factor disproportionate to efficient use)? Conversely, a productivity figure greater than 13.9 indicates possible deviations of another sort. For example, does a greater than average productivity indicator point to a district of unusually effective instruction resulting in unexpectedly positive student learning results (larger than expected output)? Or does the larger than average productivity figure lead to discovery of an underfunded district (a deviation of input) when compared to similar districts?

This demonstrates how productivity analysis yields a metric that grants superior insight into the balance between the interrelated yet individual elements of school management responsibility. Such may be this study's primary contribution to the discourse that included the topics of accountability and adequacy. A consistent use of productivity analysis would bring

balance into discussions in which arguments for results could no longer be made without consideration of resources and, conversely, arguments for resources could no longer be made absent a demonstration of results.

Analysis such as this not only includes both sides of this generation's fundamental educational debate (resources versus results) but also encourages exploration of the more interesting conversations about what is happening away from the mean, a topic generally of disinterest to inferential statistics. For example, there is a wide and statistically significant difference in the productivity of Indiana school districts. In 2008 the least productive of the state's districts had 5.2 students who were able to demonstrate mastery of Indiana academic standards for every $100,000 spent on behalf of those children. The district with the highest productivity during the same period of time had 23.3 students demonstrating academic proficiency per $100,000 of General Fund expenditures. Is the only conclusion available one suggesting it must, of necessity, take nearly five times the money to educate one school district's children to the same level as it does to educate the children of another school district?

This data prompts the question of whether five times the expenditure per result for one district than for another is justifiable, sustainable financially and politically, or whether other options need to be considered. As demonstrated here, productivity analysis is unique in its ability to shine light precisely on points where change can result in an improved relationship between resources and results.

Research question 2. Those who argue that increased spending on schools is necessary to help students achieve academic proficiency base their assertions primarily on arguments of economic class rather than race, parental education, or other indicators of what have been seen as demographics of disadvantage. Illustrative of this is Indiana's migration from use of a

Complexity Index that includes multiple factors of disadvantage to a simple calculation based on participation of students in the free and reduced lunch program, an indicator of socioeconomic status when calculating school funding distributions (Toutkoushian & Michael, 2007). Research Question #2 demonstrates that there is a statistically significant negative relationship between a district's productivity and the socioeconomic status of its students. Districts in the least socioeconomically disadvantaged communities (FR 1) were productive at the level of 17.4, FR 2 at 14.8, FR 3 at 14.1, and FR 4, the most socioeconomically disadvantaged districts, at 11.5. This is not to say that this is either a necessary or unnecessary state of affairs because the state formula based on the complexity of the student bodies sent more money to the higher free and reduced lunch districts, and the productivity figures merely reflect that those districts spent the money. In any case, figures such as these are used in court cases as arguments of adequate or arguments of inadequate funding.

If the productivity of Indiana's 292 studied districts revealed districts in which there was a statistically significant negative relationship between their productivity and their socioeconomic status, it is notable that the relationship does not carry through to an analysis of the socioeconomic quartiles. The basis for the adequacy argument was that demography is a primary determinant of academic proficiency. However, the disaggregated results from Research Question 1 revealed that the 73 poorest Indiana school districts were more productive (11.5 students passing ISTEP+ per $100,000 of General Fund expenditures) at the mean than the low end (8.6 students passing ISTEP+ per $100,000 of General Fund expenditures) of the richest 73 districts. Such results call for exploration into the conditions under which socioeconomic advantage is not a predictor of academic proficiency. Regression analysis of the quartiles over the 13 years of the study revealed that, out of 26 cells of analysis (Table 18) in FR 2 and FR 3,

the relationship between productivity and socioeconomic status was not statistically significant. Indeed, one quartile made up of 73 districts had a year in which it demonstrated (although statistically insignificantly) the shadow of higher productivity for those schools most economically disadvantaged. A glance at Figure 5 and Figure 6 may at least give one pause before declaring a necessary relationship between socioeconomic advantage and academic performance, or a necessary relationship between funding and academic performance or, finally, a necessary relationship between productivity and socioeconomic status.

Perhaps the weakness of inferential statistics is that it is by nature a study of the means, and one therefore that remains unaware of the points of influence where things change. In 1995 the Aldine, Texas school district of 63,000 students, 84% of whom were eligible for free and reduced lunch and 31% of whom were English-language learners, struggled academically with a wide disparity (30 points or more) between the performance of demographic groups. In 2009 Aldine was awarded the Broad Prize for Urban Education because the district's operational changes resulted in improved student performance that broke the "predictive power of poverty" (Maxwell, 2009, p. 16). Instead of a 30 point gap in academic performance, in 2007-2008 89% of Hispanic students demonstrated mastery in reading (compared with 92% for White students) and 84% of Hispanic students demonstrated mastery in mathematics (compared with 84% for White students) (Aldine Independent School District, 2008).

Improvement merely reverberates to the mean, it is probably not created there. In any case, it may be time for educators to reexamine the default orthodoxy that demography equals destiny. The second research question revealed that, although socioeconomic status and productivity currently demonstrate a positive relationship overall, it was an uneven one, not consistently reflected in a disaggregated analysis.

Research question 3. Did it require outside pressure from legislators and taxpayers to force educators to become more effective and efficient?

Productivity improvement results when schools are able to increase outputs "more than the corresponding change in resources employed" (Bessent, Bessent, Elam, & Long, 1984, p. 5). This is not a new concern. Because of the growing industrial influence in the country in the early days of the 20th century, the most readily available model for improving efficiency was the factory model. Educators at the time, in light of the pressures under which they worked, were not against using what they could from another industry for their own purposes (Tyack, 1974). The lessons learned by other enterprises indicate that the mastery of efficiency and effectiveness (the component elements of productivity) are necessary prerequisites for organizational health. Increasing productivity enables schools to deliver more extensive services to their students without drawing down further community resources in the form of increased taxes. Recent accountability legislation, including the No Child Left Behind Act, has focused our attention again.

It is not difficult to find educators who chafe under accountability measures such as the No Child Left Behind Act. Advocates for accountability who insist that schools must deliver students who can demonstrate mastery of academic standards in exchange for the resources consumed to maintain the organization often find resistance from educators on philosophical grounds or on the grounds of practical operational limitations. Although it is one thing to argue that accountability legislation such as NCLB is flawed to a greater or a lesser degree, it is another thing to argue that it is ineffective. The results from Research Question #3 show productivity trending noticeably down from year-to-year until the enactment of NCLB, at which time the downward trajectory of productivity among Indiana school districts reversed in a dramatic

fashion and headed up. The year-to-year differences in productivity after NCLB were positive and statistically significant, not only across Indiana districts as a whole, but across the individual socioeconomic quartiles as well (Figures 10 and 11). It may be difficult to attribute causation to this effect, but the consistency of the correlation on such a broad-based aggregated and disaggregated basis might make the argument for coincidence a challenging one to make.

Although it may be true that education is seen as an institution different than, or of more consequence perhaps, the transactional world of business, in light of the size of the K12 economy it would seem risky to ignore schooling's economic realities. Etzioni (1964) draws attention to the value that society places on "rationality, effectiveness, and efficiency" (p. 1). Indeed the very credibility of a publicly funded institution rests on its stewardship of the public's purse and purpose.

Just as a nation's overall economy benefits from increasing productivity, the overall economy needs education to be productive. Society sees schools as producers of citizens and a workforce, and schools are called on to productively and "efficiently transform inputs into skill" (Hoxby, 2004, p. 210). There may, therefore, be a risk if K12 schools do not sufficiently exploit the opportunities to improve productivity by increasing both efficiency and effectiveness. "The elites in poor countries have not accepted the hard lessons from the economic experiments of the past 50 years" (Lewis, 2004, p. 11). Educational leaders who do not accept making the connection between their economy and that of the larger world may risk other poverties. Increasing taxpayer and legislator resistance to school budgets may give an early indication that "the throwing of money at schools at rates consistently faster than that of inflation in general cannot continue" (Odden & Clune as cited in Hartman & Boyd, 1998, p. vii). Loss of public support for schools as they are run is unlikely to result in increased financial resources.

According to Garner (2004), in order to maintain credibility, schools may benefit if they "continually conduct self-evaluations" (p. 202) to determine the extent to which they are meeting the goals they were assigned (effectiveness) and the extent to which they are doing it at the least expense possible (efficiency). In other words, if they regularly conduct productivity analysis on their own school districts. Schools seeking to improve productivity may benefit by increasing both efficiency and effectiveness (Bessent et al., 1984). According to Brimley and Garfield (2002), if schools do not develop systems which "… reach their objectives with the smallest outlay of money (wise and defensible expenditures of the limited tax dollar), they run the risk of being seen by society as having a "…lack of concern for efficiency" (p. 23). Whether or not these arguments account for every consideration may be less important than the weight of doubt that society has expressed about public school finance that is represented by these and other researchers.

There is a statistically significant difference between district productivity before and after the passage of accountability legislation. This result would be difficult to understand if success at learning was primarily a function of demography. The results from Research Question #3 revealed that greater numbers of even the students from the very lowest socioeconomic populations demonstrated proficiency in state academic standards in spite of the fact that there was no proportionate increase in spending. If it was not a change in the demographic standing of the students that led to an increase in educational productivity, another possible explanation for the correlation in productivity change since the advent of accountability legislation is that accountability legislation resulted in educators changing their behavior. And if legislation resulted in schools being able to increase productivity (i.e. to move more students to proficiency in state academic standards without a proportionate increase in resources), is it reasonable to

wonder if it must always require the weight of statute to motivate educators to confront the notable technical inefficiencies that have proven to be present in the current school model?

Recommendations

Some educators, however, have long resisted what they see as an impulse to engage in an overly mechanized analysis of schooling, a tendency on the part of efficiency studies to see schools as a mere variation of any other economic enterprise (Callahan, 1962). In any case, in light of the current size of its consumption of resources, trying to maintain education as "a quaint cottage industry" (Pearlstein, 2003, p. E1) seems impossible.

Mali (1978) stated that teachers and administrators fit into the broad category of white collar workers which include

> managers, teachers, accountants, engineers, medical doctors, dentists, nurses, lawyers, supervisors, public administrators, publishers, government workers, social workers, real estate workers, quality control staff, draughtsmen, bank tellers, computers programmers and analysts, sales representatives, production controllers and planners, clerks and the self employed. (p. 169)

Each of these may be justly proud of the unique elements of their particular profession. But the economic laws of scarcity and supply and demand are like the law of gravity that applies to all regardless of personal perceptions. Whatever feelings educators may have about the reasons they entered education and the culture they value for themselves within the workplace, it seems impossible to insist that an enterprise that consumes as many resources as American public education can avoid the same conversations as other enterprises to which the basic economic principle of scarcity applies. State governments now regularly remind schools that educators should get familiar with the idea of budget cuts. There is never an unlimited availability of

desired resources, and we are thus forced to take decisions about how many and which resources to allocate to the endeavor (Hanushek, 1998).

One of the earliest and perhaps most important innovations in the pursuit of increased productivity was specialization, the division of labor. With the increased effectiveness and efficiency generated by specialized areas of endeavor productivity increased. When considering current access to food, shelter, and medical care it is partly because of specialization that the standard of living in developed countries now stands at a summit unknown previously in history. Peters and Waterman (1982) call specialization "sticking to the knitting" (p. 99). The organization prospers that chooses a limited, mission-critical range of functions on which it may consistently perform at high levels and leave secondary needs to other enterprises. "The belief that every institution can do everything is just not true" (Drucker, 1990, p. 7). Drucker expanded on this point when he discussed the tendency of non-profits to consider everything they do to be worthwhile, and if worthwhile then a necessary mission of the school itself. Schools cannot be accused of never trying anything new, fads and short-lived initiatives are common. However, schools seem to struggle with putting a mechanism in place which would accommodate the management of a continuous organizational improvement process "for discovering which programs work and which do not, for promoting the good ones and weeding out the bad" (Hanushek, 1998, p. xvi). This is a condition that may be aggravated by the inability of educators to agree on the mission and the metrics of schooling. Drucker suggests that this results in many things occupying the time of schools which siphon resources away from their declared mission and at which schools may not be as effective as other organizations.

Catalytic and critical to improving productivity is an environment in which innovation, the creative process of bringing new thinking to old challenges that leads to solutions not

considered previously, can thrive (Ahamed & Lawrence, 2005). Any enterprise that seeks to deliver a better product or service to the people it serves takes a risk that the cost of developing the innovations leading to delivery of a better product at a lower cost (improving productivity) may be lost if society determines that the added cost is not worth the benefit. Thus is revealed the fact that, even when producers are not conducting cost-benefit analyses, society is. Innovation drives productivity improvement as the producer discovers new ways to deliver a better product to the customer while driving down cost. A lack of innovation in an organization can be a leading indicator that an organization is no longer viable. Lawlor (1985) cites the British motorcycle and shipbuilding industries as examples of organizations that failed because they did not exploit change to their competitive advantage. In the same manner that competition exists, change exists. The ability of an organization to realize an advantage from change is critical for its survival (Mali, 1978). This threat of decline is compounded when the people in an institution become concerned primarily with maintenance of job status and organizational status quo. Innovation has learning at its core. This predisposition for learning, in a perpetual state of dissatisfaction, remains in the constant state of knowing how to do now what it did not just previously, and seeking to learn how to do something that it currently cannot.

Senge's (1994) work refers to the learning organization. By definition it would seem that schools would exemplify the learning organization, constantly in the pursuit of new technologies and skills necessary for a more complete accomplishment of their mission (improved student learning). Yet Dr. Tom Jandris, chairman of the Progress Education Corporation consulting firm observed "education is the last of the great unrestructured industries in America that doesn't understand its own economics" (as cited in Sturgeon, 2006, p. 40).

> To the extent that our knowledge about the education production function is weak or nonexistent, as some claim, apathy about educational productivity is understandable…. Though the deficiencies of our knowledge in this area represent a major constraint on our ability to operate schools more efficiently, research on systematic instruction, effective schools, use of school time and time on-task, and cost-effectiveness has provided a basis for far more than random or superstitious behavior. Consequently, ignorance about the technology of education cannot be used as an excuse for doing nothing to improve the effectiveness of schools and teaching. (Hartman & Boyd, 1998, p. 35)

The data in this study revealed indications of districts with similar (what some may call) predictive characteristics who achieve dramatically different productivity results. Further research into the specifics of those outliers may yield information which would help to define the difference between those educator behaviors that improve district productivity and those that dissipate available resources wastefully.

A 1912 newspaper editorial once queried, "Are educators supposed to be such experts that their methods cannot be improved?" (as cited in Callahan, 1962, p. 96). There is a fair amount of research on the production function of education, i.e. a study of the relationship between inputs and outputs of schooling. Although there is little consensus on what inputs indeed make for successful student learning and the subject of production function is beyond the scope of this study, it would seem as though operating in contravention to what is known could cause a problem for the credibility of educational leadership (Alexander & Salmon, 1995; Hartman, 1986; Monk, 1990; Owings & Kaplan, (2006). In other words, do educational leaders have an obligation to maximize assigned results from available resources? If so, meeting this

obligation may require educational leaders to confront inefficiency, ineffectiveness, and political manipulation of the educational setting in order to make the kind of changes necessary to fulfill the obligations of stewardship. Productivity analysis offers a usable metric which, by its very nature, forces a unified consideration of efficiency and effectiveness; of adequacy and accountability; of resources and results.

REFERENCES

Ahamed, S.V., & Lawrence, V.B. (2005). *The art of scientific innovation: Cases of classical creativity.* Upper Saddle River, NJ: Pearson Prentice Hall.

Aldine Independent School District. (2008). *Adequate yearly progress report.* Retrieved from http://www.aldine.k12.tx.us/pdfs/accountability/AYP_0708/district_report.pdf

Alexander, K., & Salmon, R. (1995). *Public school finance*. Boston, MA: Allyn & Bacon.

Alexander, N. (2004). Exploring the changing face of adequacy. *Peabody Journal of Education, 79*(3), 81-103.

Amiti, M., & Stiroh, K. (2007). Is the Unites States losing its productivity advantage? *Current Issues in Economics and Finance 13*(8). Retrieved from http://www.newyorkfed.org/research/current_issues/ci13-8.html

Arnold, V., & Bardhan, I. (1994, February). Excellence and efficiency in Texas public schools. *Texas Business Review, 9*, 5-7.

Augenblick, J., Myers, J., & Anderson, A. (1997). Equity and adequacy in school funding. *Financing Schools, 7*(3), 63-78.

Ball, G., & Goldman, S. (1997). Improving education's productivity: Reexamining the system to get the schools we need. *Phi Delta Kappan 79*, 228-232.

Barnett, R., Glass, J., Snowdon, R., & Stringer, K. (2002). Size, performance and effectiveness: Cost-constrained measures of best-practice performance and secondary-school size. *Education Economics, 10*, 291-311.

Baumol, W. (1967). Macroeconomics of unbalanced growth: The anatomy of urban crisis. *American Economic Review, 57*, 415-26.

Baumol, W., Blackman, S., & Wolff, E. (1989). *Productivity and American leadership.* Cambridge, MA: The MIT Press.

Berliner, D., & Biddle, B. (1995). *The manufactured crisis: Myths, fraud, and the attack on America's public schools.* Reading, MA: Addison-Wesley.

Bessent, A., Bessent, W., Elam, J., & Long, D. (1984). Educational productivity council employs management science methods to improve educational quality. *Interfaces, 14*(6), 1-8.

Blair, J. (1999). New York, California cracking down on college remediation. *Education Week, 19*, 6.

Brimley, V., & Garfield, R. (2002). *Financing education in a climate of change*. Boston, MA: Pearson/Allyn & Bacon.

Brooks-Gunn, J., & Duncan, G. (1997). The effects of poverty on children. *The Future of Children, 7*(2), 55-71.

Caldas, S. (1993). Reexamination of input and process factor effects on public school achievement. *Journal of Education Research, 84,* 206-214.

Caldas, S., & Bankston, C. (1997). Effect of school population socioeconomic status on individual academic achievement. *The Journal of Educational Research, 90,* 269-277.

Callahan, R. (1962). *Education and the cult of efficiency.* Chicago, IL: The University of Chicago Press.

Carnoy, M. (1983). Educational adequacy: Alternative perspectives and their implications for educational finance. *Journal of Education Finance, 8,* 286-299.

Cervantes, N. (2005, March 14). Schools brace for next revolt. *The Buffalo News,* A1.

Coelli, T., Rao, D., & Battese, G. (1998). *An introduction to efficiency and productivity analysis.* Boston, MA: Kluwer Academic Publishers.

Conant, E. (1973). *Teacher and paraprofessional work productivity: A public school cost effectiveness study.* Lexington, MA: Lexington Books.

Doms, M. (2009). The outlook for productivity growth: Symposium summary. *FRBSF Economic Review 2009 (Federal Reserve Bank of San Francisco).* Retrieved from http://www.frbsf.org

Drucker, P. (1990). *Managing the nonprofit organization: Principles and practices*. New York, NY: HarperCollins.

Elmore, R., Abelmann, C., & Fuhrman, S. (1996). The new accountability in state education reform: From process to performance. In H. Ladd (Ed) *Holding schools accountable: Performance based reform in education* (pp. 65-98). Washington, DC: The Brookings Institution.

Etzioni, A. (1964). *Modern organizations.* Englewood Cliffs, NJ: Prentice-Hall.

Fabricant, S. (1969). *A primer on productivity.* New York, NY: Random House.

Fischel, W. (1989). Did *Serrano* cause proposition 13? *National Tax Journal 42*, 465-473.

Fowler, W., & Monk, D. (2001). *A primer for making cost adjustments in education.* Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2001323

Fraenkel, J. R., & Wallen, N. E. (1996). *How to design research in education* (3rd ed.). New York, NY: McGraw-Hill.

Franciosi, R. J. (2004). *The rise and fall of American public schools: The political economy of public education in the twentieth century.* Westport, CT: Praeger.

Fujita, S. (2008). Creative destruction and aggregate productivity growth. *Business Review (Federal Reserve Bank of Philadelphia).* Retrieved from http://www.philadelphiafed.org

Garner, C. W. (2004). *Education finance for school leaders: Strategic planning and administration.* Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.

Greene, J. (2000). *The cost of remedial education: How much Michigan pays when students fail to learn basic skills*. Retrieved from http://www.mackinac.org/archives/2000/s2000-05.pdf

Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research, 66,* 361-396.

Grosskopf, S., Hayes, K., Taylor, L., & Weber, W. (1997). Budget-constrained frontier measures of fiscal equality and efficiency in schooling. *The Review of Economics and Statistics, 79*(1), 116-124.

Guthrie, J. W., Garms, W. I., & Pierce, L. C. (1988). *School finance and education policy: enhancing educational efficiency, equality.* Englewood Cliffs, NY: Prentice Hall.

Hanushek, E. (1986). The economics of schooling: Production and efficiency in public schools. *Journal of Economic Literature, 24,* 1141-1177.

Hanushek, E. (1996). The productivity collapse in schools. *Development in School Finance 1996.* Retrieved from http://nces.ed.gov/publs97/97535/97535k.pdf

Hanushek, E. (1998). *Making schools work.* Washington, DC: The Brookings Institution.

Hanushek, E. (2002). *The failure of input-based schooling policies.* Cambridge, MA: National Bureau of Economic Research.

Hartman, W. (1986). *Resource allocation in high schools.* Eugene, OR: Center for Educational Policy and Management College of Education University of Oregon.

Hartman, W., & Boyd, W. (Eds) (1998). *Resource allocation and productivity in education - theory and practice*. Westport, CT: Greenwood Press.

Hoff, D. (2008). City leaders back stronger accountability. *Education Week, 27*(44), 19-21.

Hooper, K. (2005, October 16). IPS must slash its budget. *Indianapolis Star*. B1.

Hoxby, C. (2004). Productivity in education: The quintessential upstream industry. *Southern Economic Journal, 71*, 209-231.

Indiana Department of Education. (2009a). *Extract Indiana education data.* Retrieved from http://mustang.doe.state.in.us/SAS/sas1.cfm

Indiana Department of Education. (2009b). *Indiana State Snapshot.* Retrieved from http://www.doe.state.in.us/asap/statesnap3.html

Indiana Department of Education. (2009c). *Public Law 221.* Retrieved from http://www.doe.state.in.us/asap/pdf/PL221-Statute.pdf

Indiana State Budget Agency. (2006). *2005-2007 as-passed budget*. Retrieved from http://www.in.gov/sba/budget/2005_budget/as_passed/index.html

Indianapolis Star. (2005, April 24). Push for improved school efficiency, but handle urban districts with care. *The Indianapolis Star*, E2.

Jefferson, A. (2005). Student performance: Is more money the answer? *Journal of Education Finance, 31*(2), 111-124.

Jesson, D., Mayston, D., & Smith, P. (1987). Performance assessment in the education sector: educational and economic perspectives. *Oxford Review of Education, 13*, 249-266.

Johnson, B., & Christensen, L. (2004). *Educational research: Quantitative, qualitative, and mixed approaches* (2nd ed.). Boston, MA: Pearson Education.

Kennedy, E. (2005). The No Child Left Behind Act. *Journal of the Section of Individual Rights & Responsibilities, 32*(4), 16-18.

Klingele, W., & Warrick, B. (1990). Influence of cost and demographic factors on reading achievement. *Journal of Educational Research, 83*, 279-282.

Ladd, H. (Ed.). (1996). *Holding schools accountable: Performance-based reform in education.* Washington DC: The Brookings Institution.

Lawlor, A. (1985). *Productivity improvement manual.* Westport, CT: Quorum Books.

Levacic, R., & Vignoles, A. (2002). Researching the links between school resources and student outcomes in the UK: A review of issues and evidence. *Education Economics, 10,* 313-331.

Lewis, W. (2004). *The power of productivity: Wealth, poverty, and the threat to global stability.* Chicago, IL: The University of Chicago Press.

Louis, K., Febey, K., & Schroeder, R. (2005). State-mandated accountability in high schools: Teachers' interpretations of a new era. *Educational Evaluation and Policy Analysis, 27*(2), 177-204.

MacQueen, K., & Wells, P. (2004). Class revolution. *Maclean's, 119,* 36-39.

Mali, P. (1978). *Improving total productivity.* New York, NY: John Wiley & Sons.

Mason, E. J., & Bramble, W. (1997). *Research in education and the behavioral sciences: Concept and methods*. Madison, WI: Brown & Benchmark.

Maxwell, L. (2009). Tight focus on instruction wins Texas district prize. *Education Week, 29*(6), 1-16.

Mishan, E. (1988). *Cost-benefit analysis: An informal introduction.* London, England: Routledge.

Monk, D. (1990). *Educational finance: An economic approach*. New York, NY: McGraw-Hill.

National Center for Education Statistics (2000). *Table 65. Public and private elementary and secondary teachers and pupil/teacher ratios, by level: Fall 1955 to fall 1999.* Retrieved from http://nces.ed.gov/programs/digest/d00/dt065.asp

National Center for Education Statistics (2005a). *Table 127. SAT score averages of college-bound seniors, by sex: 1966-67 through 2004-05*. Retrieved from http://nces.ed.gov/programs/digest/d05/tables/dt05_127.asp

National Center for Education Statistics. (2005b). *Youth indicators, 2005: Trends in the well-being of American youth.* Washington DC: Author.

National Center for Education Statistics. (2006a). *NAEP 2004 long-term trend summary data tables.* Retrieved from http://nces.ed.gov/nationsreportcard/ltt/results2004/2004_sdts.asp

National Center for Education Statistics. (2006b). *Indicator 34: Productivity*. Retrieved from http://nces.ed.gov/pubs/eiip/eiipid34.asp

Neuman, W. L. (1997). *Social research methods: Qualitative and quantitative approaches* (3rd ed.). Boston, MA: Allyn & Bacon.

Nichols, S., & Berliner, D. (2008). Why has high-stakes testing so easily slipped into contemporary American life? *Education Digest 74*(4), 41-47.

Odden, A. (2000). The new school finance: Providing adequacy and improving equity. *Journal of Education Finance, 25*, 467-487.

Owings, W., & Kaplan, L. (2006). *American public school finance*. Belmont, CA: Thomson Learning/Wadsworth.

Pasciak, M. (2005, May 2). Spending vs. achievement: Doing the math is revealing. *The Buffalo News,* A1.

Pearlstein, S. (2003, December 17). The lesson colleges need to learn. *The Washington Post*, E1.

Peters, T., & Waterman, R. (1982). *In search of excellence: Lessons from American's best-run companies.* New York, NY: Harper & Row.

Plucker, J., Chien, R., Edmonds, B., Hansen, J., Michael, R., Spradlin, T., Toutkoushian, R., & Zapf, J. (2007). *Special education service delivery in Indiana: Year 2 study.* Bloomington, IN: Center for Education and Evaluation Policy.

Rampey, B.D., Dion, G.S., & Donahue, P.L. (2009). *NAEP 2008 trends in academic progress* (NCES 2009–479). Washington, DC: National Center for Education Statistics, Institute of Education Sciences.

Ravitch, D. (2000). *Left back: A century of battles over school reform.* New York, NY: Touchstone.

Rothstein, R., Jacobsen, R., & Wilder, T. (2008). *Grading education: Getting accountability right.* Washington, DC: Economic Policy Institute.

Rothstein, R., & Mishel, L. (1996). Alternative options for deflating education expenditures over time: Appendix 1. Inflation and the measurement of school spending. *Developments in School Finance.* Retrieved from http://nces.ed.gov/pubs97/97535/97535jx1.asp

Roza, M. Goldhaber, D., & Hill, P. (2009). The productivity imperative: Getting more benefits from school costs in an era of tight budgets. *Education Week, 28*(16), 34-48.

Sahr, R. (2009). *Inflation conversion factors for dollars 1774 to estimated 2019.* Retrieved from http://oregonstate.edu/cla/polisci/faculty-research/sahr/sahr.htm

Sausner, R. (2005). 5th annual report on school spending: How to you spend your money? *District Administration*, 37-43.

Senge, P. (1994). *The fifth discipline.* New York, NY: Currency/Doubleday.

Smith, E. (1995). *The productivity manual.* Houston, TX: Gulf Publishing.

Stiroh, K. (2001). Investing in information technology: Productivity payoffs for U.S. industries. *Current Issues in Economics and Finance 7*(6). Retrieved from http://www.newyorkfed.org/research/current_issues/ci7-6.html

Sturgeon, J. (2006, April). Underfunded: Educators speak out on latest federal budget cuts. *District Administration, 42,* 38-40.

Sutton, A., & Soderstrom, I. (1999). Predicting elementary and secondary school achievement with school-related and demographic factors. *The Journal of Educational Research, 92,* 330-338.

Swanson, A., & King, R. (1997). *School finance: Its economics and politics.* New York, NY: Longman.

Teddlie, C., & Reynolds, D. (2000). *The international handbook of school effectiveness research.* London, England: Falmer Press.

Toutkoushian, R., & Curtis, T. (2005). Effects of socioeconomic factors on public high school outcomes and rankings. *Journal of Educational Research, 98,* 259-271.

Toutkoushian, R., & Michael, R. (2007). What is the complexity index? *Education Policy Brief, 5*(2), 1-8. Bloomington, IN: Center for Education and Evaluation Policy.

Trumbull, M. (2005, December 30). Better living… as measured by PCs and VCRs. *Christian Science Monitor.* Retrieved from http://www.csmonitor.com

Turner, J. H. (1985, Fall). In defense of positivism. *Sociological Theory, 3,* 24-30.

Tyack, D. (1974). *The one best system: A history of American urban education.* Cambridge, MA: Harvard University Press.

United States Census Bureau. (2005). *Supplemental measures of material well-being: Basic needs, consumer durables, energy, and poverty, 1981 to 2002.* Retrieved from http://www.census.gov

United States Department of Education (1983). *A nation at risk: The imperative for educational reform.* Retrieved from http://www.ed.gov/pubs/NatAtRisk/index.html

United States Department of Education. (2007). *Stronger accountability: Questions and answers on No Child Left Behind.* Retrieved from http://www.ed.gov/nclb/accountability/schools/accountability.html#5

United States Department of Labor, Bureau of Labor Statistics. (1996*). Federal Productivity Measurement Program*. Retrieved from ftp://ftp.bls.gov/pub/special.requests/pf/totalf1.txt

United States Department of Labor, Bureau of Labor Statistics. (2006*). Multifactor productivity*. Retrieved from http://www.bls.gov/mfp/home.htm

Vandenberghe, V. (1999). Economics of education. The need to go beyond human capital theory and production function analysis. *Educational Studies, 25*(2), 129-143.

Wenglinsky, H. (1998). Finance equalization and within-school equity: The relationship between education spending and the social distribution of achievement. *Educational Evaluation and Policy Analysis, 20,* 269-283.

West, M., & Peterson, P. (2007). *School money trials.* Washington DC: Brookings Institution Press.

Winston, G. (1997). Why can't a college be more like a firm? *Change*, *29*(5), 32-38.

Wise, A. (1983). Educational adequacy: A concept in search of a meaning. *Journal of Education Finance, 8,* 300-315.

Wise, C., & McGregor, E. (1975). *Productivity and program evaluation: Challenge for the public service: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota*. Bloomington, IN: MITC Publications.

Zehr, M. (2009). H. S. reformers seize on NAEP scores to help make case; Advocates want to step up NCLB accountability at secondary level. *Education Week, 28*(31), 9.