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Does competition improve public school efficiency: a spatial analysis

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DOES COMPETITION IMPROVE PUBLIC SCHOOL EFFICIENCY? A SPATIAL ANALYSIS

By

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Proponents of educational reform often call for policies to increase competition between schools. It is argued that market forces naturally lead to greater efficiencies, including improved student learning, when schools face competition. In many parts of the country, public schools experience significant competition from private schools; however, the literature is not clear as to whether public versus private competition generates significant improvements in technical efficiency. A major hurdle for researchers examining this issue is determining a workable definition of competition by which they can measure the degree of competition within local markets. I address this challenge by developing a School Competition Index (SCI) for Mississippi through implementation of several Geographical Information System (GIS) tools. The SCI reveals the degree of competition for each public school based on their spatial location relative to peer private schools operating within their service area. GIS is a unique way to measure the degree of competition among public schools and private schools. Including components of market structure is not sufficient to measure the effects of competition in a market; market characteristics, which vary between locations, are also important. Market

characteristics such as, religiosity, school location, and social capital are used in this dissertation as exogenous variables. Two stage stochastic frontier analysis and single equation stochastic frontier analysis are both employed to evaluate school efficiency. This dissertation finds that higher degrees of competition from private schools significantly increase public elementary school efficiency, as measured by the proficiency rates in different examinations. At the same time, competition from private schools does not improve public high schools efficiency. The results suggest that a rural-urban student academic achievement gap persists, and that community social capital stock is also important to some extent. Regardless of model or estimation procedure, students' race and socio-economic status significantly reduce public school efficiency. It is anticipated that the current results will inform policymakers regarding the viability of competition-based reforms after considering all these factors.

Key Words: *Market, Competition, Spatial Analysis, Efficiency, Education*

JEL Classification: I21, D24, R12, D61

DEDICATION

To my wife and son for their continued patient, support and encouragement

To my parents who always love

To my friends who never lost hope

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CHAPTER I

INTRODUCTION

1.1 Overview

Microeconomic theory implies that competition increases market efficiency. This should hold for all markets, including the market for education. This dissertation tests this idea which is often used by policy makers seeking educational reform. In the United States, where public school students lag behind those in other countries in standardized achievement scores, there is a sense that educational outcomes need improvement. Many believe that American public schools are inefficient, which limits their ability to improve academic outcomes (Hanushek & Woessman, 2009). In response to such perceived inefficiency, some policy makers and economists propose a greater role for school choice and competition.

The United States is a world leader in educational investment. According to the U.S. Department of Education, total expenditures on elementary and secondary schools for the 2005-06 academic year were $558.3 billion. About 92% of this amount was spent on public elementary and secondary school systems (U.S. Department of Commerce, 2006). Moreover, public school expenditures nationwide increased almost 805 times in the past 30 years. In keeping with such a large educational investment, during the academic year 2003-04, state and local governments in the state of Mississippi spent

approximately $3.4 billion dollars on public schools[1]. Unfortunately, this investment has not significantly affected standardized student test scores (Lips, 2004), and the resulting widespread concerns about public school quality have led to a public debate regarding alternative educational reforms.

1.2 Competition and Public School Efficiency

Belfield and Levin (2002) discuss two types of educational reforms: high-stakes tests and market-type reforms. In the former, policymakers propose to increase the achievement levels of standardized test scores, while in the latter, reformers propose to increase the number of school choices available to a student primarily by introducing voucher programs and tuition tax credits. A government-supplied voucher or tuition tax-credit program offsets the costs of attending a private school. Such reforms allow students to attend public schools in the district where they reside, but also provide an option for them to attend private schools instead. In turn, the promotion of private schools generates market-based competition for local public schools.

Research has yielded mixed results on the effect of such inter-school competition on public school performance. Several educational economists have attempted to quantify the impact of private schools on public school student outcomes, but reach different conclusions. For example, Hoxby (1994), Couch, Shughart, and Williams (1993), and Greene and Kang (2004) found that public versus private school competition significantly increases public school outcomes; conversely Heish and Urquiola (2002), McMillan (2000), Simon and Lovrich (1996), Sander (1999), and Newmark (1995) failed

[1] Source: U.S. Department of Commerce, Census Bureau, Governmental Finances. Retrieved on July 13, 2009, from http://www.census.gov/govs/www/estimate04.html

to find such a relationship. Thus, further research in this area is required to provide more definitive information to policy makers and educational leaders for the purpose of future policy initiatives.

A central tenet of modern economics is that market competition improves the efficiency of total surplus, particularly technical and allocative efficiency (Belfield & Levin, 2002). However, such efficiency gains from competition in education are not easily seen or measured. Nevertheless, both defining and measuring educational output are important concerns. The most frequently used proxy to measure educational output is standardized student test scores, but there is no consensus on *which* scores to use. For example, Geller, Sjoquist, and Walker (2006) used mathematics and reading standardized test scores for third grade and tenth grade students; Hoxby (2001) chose eighth, tenth, and twelfth grade reading and mathematics test scores; Cho (2009) used reading and mathematics proficiency rates, Marlow (2000) employed fourth, eighth and tenth grade reading, writing, and mathematics test scores; and Arum (1996) used mathematics, reading, and vocabulary test scores from the tenth and twelfth grades. Moreover, there is no common agreement about the observation level. Geller et al. (2006) used school districts, Arum (1996) employed individual students, counties were used by Newmark (1995), and Hanushek and Rivkin (2001) chose Metropolitan Statistical Areas (MSAs).

Thus, most of the previous research employed some form of student achievement to measure the efficiency of public schools, but there was no consistency in identifying the specific output. There are two fundamental concerns with the identification of output. The first is that the level of observation, such as state, county, school district, or city, is not adequate to disaggregate the extent to which certain factors contribute to the efficiency of a given *school*. The second is the output measurement itself. A proficiency

rate from a particular grade or for a particular subject is a significantly narrow measurement of a process and thus, has the potential to underestimate the actual results of a public school education.

Because inter-school competition has resulted in public controversy, measuring the effect of competition is the primary motivation for this dissertation. It is unclear how private schools affect public schools because it is difficult to measure the *degree of competition* across educational markets. Previous authors have employed several proxies to capture the degree of inter-school competition, but none of their techniques successfully reveal full information as they fail to include many observable attributes of a market.

The most frequently used computational techniques include the Herfindahl-Hirschman Index (HHI) (Borland & Howson, 1992), the percentage of all students in private schools (Jepsen, 2002; McMillan, 2000), grade-specific enrollment (Geller et al., 2006), and market share held by private schools (Arum, 1996). Each of these techniques is problematic as most studies use some form of market share which is just one aspect of market attributes. Most importantly, all of these techniques rely on student enrollment numbers, which are not precise estimates for competitiveness, as the level of school enrollment is correlated with many other factors, such as community wealth or religiosity (Belfield & Levin, 2002). Furthermore, comparing a public school's local market share of student enrollment may not provide actual school competitiveness, as all public school markets are, by law, geographically bounded by district lines drawn by a political process. Before investigating the effect of competition on educational quality, it is essential to identify an effective measure of school competition.

Defining the market size and including different market attributes in the analysis is the primary agenda for this dissertation. Employment of a Geographical Information System (GIS) approach provides a unique way to measure the degree of competition between the public and private schools. *A review of the literature indicates that this dissertation is the first research to accommodate three major components of market competition: the number of competitors, the size of competitors, and the geographical distance among competitors.* Most of the previous research used competition variables employing either one or two of these three components.

A stochastic frontier approach is used to model Mississippi public schools and to estimate the technical efficiency of educational production; ranking these schools based on their performance is the second goal for this dissertation. Then, I analyze the effect of private competition on public school efficiency in Mississippi. This dissertation examines the effect of competition on public schools from private schools by employing two different stochastic frontier models: a two-stage stochastic frontier model, and a one equation stochastic frontier model which incorporates exogenous variables into an education production function. This research contributes to the development of a research design that attempts to isolate competitive effects that have been difficult to quantify thus far. Therefore, examining unique *school level data* instead of state, county or school district level data should provide evidence that has policy implications for improvement of public education in Mississippi. To this end, the following null hypothesis will be tested:

Hypothesis 1: Competition from local private schools will have no effect on the technical efficiency of public schools, ceteris paribus.

1.3 School - Selection Bias

Although there is a great deal in the literature to suggest that school choice is a function of public school quality and that parents choose private schools for their children because the local public schools performs poorly, influential studies by Coleman et al. (1982) and Coleman and Hoffer (1987) suggest that this is a naïve and incomplete explanation. They found that there are other exogenous factors that also influence the demand for private schools.

Private schools in the U.S. are often religiously affiliated. Currently, 42.5% are parochial (Catholic), and 52.6% are non-catholic Christian-based. Private schools have more flexibility to create specialized programs for their students according to their needs, whereas public schools are governed by statuary bodies to serve *all* students in a politically defined school district. The flexibility of offering customized curricula makes private schools more attractive to many parents, despite their higher cost. On average, private school tuition fees range from $5,000 to $9,000 per year, whereas public schools are funded by local, district, and state governments[2].

Analyzing the effect of competition from private schools on public school performance and efficiency without acknowledging the school-selection bias may underestimate the results. School quality or academic performance is not the only criterion for school selection; a school choice by parents is also highly dependent upon other school-related factors, such as religious affiliation, racial composition, or athletics. Student sorting is pertinent to measuring school efficiency, and among the exogenous factors, school racial composition and religious affiliation are the most important reasons,

[2] Source: Council for American Private Education. Retrieved on July 20, 2009, from ttp://www.capenet.org/facts.html

especially in a state such as Mississippi, where desegregation laws took almost half a century to be implemented (Conlon and Kimenyi, 1991).

1.3.1 School-selection Bias: Racial Composition.

An important factor that influences private school choice is the demographic composition of the public school student body. Research has shown that a school's racial and socio-economic composition is an important determinant of student achievement. Numerous research articles on school demographic composition and student achievement in public schools, find that schools with a higher number of white students relative to black students leads to an increase in African American students' educational attainment (Braddcock and Elite, 2004; Schofield, 1995; Schofield and Hausmann, 2004).

Although the U.S. Supreme Court outlawed racial segregation in the public education system in the 1960s, most of the issues that surround the implementation of desegregation remain important. In some parts of the country, people believe that private schools are the byproducts of desegregation policy. When the courts desegregated public schools, many white parents responded by placing their children in private schools. Surprisingly, however, there is no consistent evidence in the literature on the effect of "white flight" on public school performance. A common argument in the school choice debate is that, due to peer group effects, white students leave public schools creating a racial imbalance in public school student population (Fairlie, 2006). In the last three decades, policymakers' failure to maintain racial balance in some public schools, due to school-selection bias and private school voucher programs, make this issue more complicated. Although voucher programs are not currently employed in Mississippi,

charter school options are available, thus the effectiveness of the desegregation policy in this state still remains unclear.

Fairlie (2006) found that racial disparities among private and public schools continue to exist, and that private school tuition credit or voucher programs lead to a greater degree of segregation, as parents enroll their children in racially homogeneous schools rather than racially heterogeneous schools. In this way, school choice and social cohesion are linked. Hence, it is important to account for the level of racial sorting between private and public schools in Mississippi. The impact of a student's demographic composition on school quality is an empirical question.

To test the proposition that public school students' racial identity indirectly affects public school efficiency, one needs to control for school-selection bias. Further, measuring the effect of market competition on public school efficiency and performance would be incomplete without taking into account the effects of desegregation, about which the literature has been silent. Thus, the following null hypothesis will be tested:

Hypothesis 2: The degree of racial and ethnic student enrollment will have no effect on the technical efficiency of public schools, ceteris paribus.

1.3.2 School-selection Bias: Student's Socio-economic Status

Hanushek (1998), Hoxby (2001) and Ching (2000) confirm that students' socio-economic characteristics significantly influence cognitive and academic abilities which increase schools' overall performance. To accommodate students' socio-economic background this analysis controls for students' race and the number of students receiving federally sponsored free lunch in a school. The federal free lunch program is a frequently employed proxy of parent's economic status, because eligibility depends on the level of

family income (Ching, 2000). Student's socio-economic status is used to measure the quality of the home environment. Low income family students are often exposed to abnormal environments, such as poverty, abandonment or foster care. Several studies considered this factor as an inefficient factor. There are other variables, such as parents' education, parents' marital status, number of siblings and students' extracurricular activities should have positive impact on student achievement. Failure to account for these inputs may leave out some explanatory power from the empirical model.

Because students' socio-economic status is directly related to academic performance, the status needs to be accounted for in estimating the technical efficiency of schools. Thus, the following null hypothesis will be tested:

Hypothesis 3: The socio-economic status of student enrollment will have no effect on the technical efficiency of public schools, ceteris paribus.

1.3.3 School-selection Bias: Religion

Another indirect way that student sorting can affect public school efficiency is through family religiosity. U.S. private schools may be divided into those that are religiously affiliated and those that are non-religiously affiliated. Nearly 81% of private schools in the U.S. are religiously affiliated,[3] while, by law, public schools are not religiously affiliated.

Preserving religious belief and instilling religious values into their children are important criteria used by many parents to select a religious private school over a public school (Cohen-Zada, 2006). When choosing a private school for their children, parents may look for schools that incorporate their own values. Zada and Sander (2007) show

[3] For more discussion please see Council for American Private Education Report on http://www.capenet.org/facts.html

that the demand for private schools is highly influenced by parents' religious affiliation. Because private schools often place a major emphasis on parents' religious values, some parents may choose a religious private school for their children to preserve their beliefs. Thus, a nearby higher-quality public school may not be a factor in their school choice decision. Private schools' curriculum typically adjusts to market demands, whereas public schools are regulated by local and state governments. To accommodate students from different religious backgrounds in public schools, local government bodies maintain strategies that ensure the religious neutrality in public schools.

There have been only a few studies regarding the effect of religious affiliation on academic achievement. Freeman (1986), Regnerus (2000), Muller and Ellison (2001), and Lehrer (2004) claim that religiosity has a positive association with educational attainment. Others, however, have found that religion is not an important factor in academic achievement (Greeley, 1981; Roof, 1981). Moreover, other researchers find that a high degree of religiosity develops students' physical and emotional well-being (Goodrich, 2003).

An education market with a higher number of religiously affiliated private schools may affect the parent's school choice in a number of ways. Research shows that private schools respond to competition in a more efficient way than do public schools, and, ultimately, they become better education providers in the market (Ni, 2007). There is little doubt that a public-private school performance gap persists, but the current estimates may be biased because researchers fail to control for school-selection bias due to students' religiosity. Most studies simply ignore the effect of students' religious beliefs on school choice.

One of the problems faced by researchers is the availability of information on a private school's religious affiliation. However, private school's religious affiliation can be determined through the National Center for Education Statistics (NECS) periodic private school survey (PSS). This information is included in the empirical models to evaluate the effect of competition from religiously affiliated private schools on public school performance and efficiency. The inclusion of this variable will provide more precise efficiency estimates for public schools in Mississippi. To this end, the following null hypothesis will be tested:

Hypothesis 4: The degree of religious affiliation of local private schools will have no effect on the technical efficiency of public schools, ceteris paribus.

1.4 Location Effect: Small-city/Rural School vs. Large-city/Urban School

The public school policy debate becomes more complicated when educational researchers attempt to compare rural and urban school performance. Not surprisingly, researchers find differences in academic outcomes between these two types of schools. For example, Snyder and West (1992) and Alspaugh (1992) found that urban or metropolitan students' mathematics, reading, and science scores are better than those of rural students. However, Alspaugh and Harting (1995) and Haller et al. (1993) show that rural students performed better than urban students on these tests. Differences in the availability and use of resources in urban versus rural schools may contribute to differences in achievement. Coe et al. (1989a, 1989b) have argued that, with fewer available resources, rural schools often limit their curricula. Kleinfeld, McDiarmid, and Hagstrom (1985), however, show that differences in the availability of resources among comparable schools did not make any difference in students' academic achievement.

If school efficiency is defined as the maximum level of academic achievement (output) obtained for a given level of school resources (Denaux, 2010), then two different conclusions can be drawn from the research. A group of public policy researchers has stated that rural schools are not efficient because either they do not use their resources efficiently, or they have insufficient inputs to produce higher quality output (academic attainment) (Reeves and Bylund, 2005). The availability of a school location variable at the individual school level is the major concern behind the lack of evidence in recent urban-rural school research. Furthermore, most of these studies suffer from an aggregation bias problem, because they employ district, county, or state level data.

Because the relationship between school location and competition in public school efficiency is not clear, ignoring the location effect may introduce bias into the estimate. One aspect of this research is to determine the effect of location on public school performance in Mississippi after controlling the effect of competition, student socioeconomic status, and other exogenous factors. Thus, the following null hypothesis will be tested:

Hypothesis 5: The technical efficiency of urban public schools will equal the technical efficiency of rural public schools, ceteris paribus.

1.5 School and Human Capital

Most believe that human capital held by schools' workers matter. There are three types of school workers: principals (administrators), staff (non-teaching) and teachers. The sources of gaining human capital for these workers are the same: education and experience. The human capital held by school workers may not affect students' performance, hence schools' technical efficiency, in similar ways. The importance of

teachers for students' performance is greater than that of principals and staff because teachers are directly delivering their school's curriculum. Many studies document that teachers contribute to their students' academic growth, but have not been very successful in indentifying the qualities of a good teacher. Judging a teacher's quality by educational attainment, experience or certification is problematic (Hanushek, 2006). Many studies have examined this issue, but the results are often contradictory and the conclusions weak. For example, Melvin and Sharma (2007) find a positive association between teacher experience and student's academic performance, but Cho (2009) fails to find this relationship. This dissertation attempts to unearth the associations between teacher quality and student academic performance, by employing school level data rather than school district or county level data.

The relationship between students' performance and human capital held by principals and staff has only recently been examined. The "instructional leadership model" was the first model where researchers tried to find the linkage between school leaders and overall school performance. The "transformational leader behaviors model" is a modified version of the instructional leadership model where authors examine the relationship between school administrators and student performance (Hoernemann, 1998 and Philbin, 1997). Philbin tested the instructional leadership model at the high school level while Hoernemann used elementary school level data to test the same. Dorward (2009) conducted a similar study using both high school and elementary school data. Philbin found evidence to support a positive relationship between administrators' and staff human capital and school output, but Heinemann and Dorward did not. The relationship between school staff and students' performance is still debatable; hence assessing these relationships is essential. Therefore, including administrators and staff

variables in an empirical model examining the factors of schools' technical efficiency is imperative. The following null hypothesis is tested:

Hypothesis 6: The degree of human capital held by teachers, staff and administrators will have no effect on the technical efficiency of public schools, ceteris paribus.

1.6 School and Social Capital

Social capital is a measure of the connectivity between individuals in a community. In comparison to the location effect, which is inherently geographic, social capital in a community is derived from a connection between individuals and social networks. Coleman (1988), who developed the concept of social capital, argues that it is an equally important factor in personal development as is financial capital and human capital. Social capital plays a significant role in explaining student educational attainment.

Social capital in a community is created through connectedness among individuals through social organizations and clubs. There are different ways social capital can influence individual development, and networking theory suggests one explanation. According to this theory, which was developed by Bryant and Norris (2002), there are three different aspects of social capital: bonding, bridging, and linking. Individuals optimize their relatedness with social organizations based on their personal goals, but all social organizations serve the common purpose of networking. One role of social networking is to inform community members about education and to provide ways to access and succeed in education.

The importance of social capital in the development of human capital (Coleman, 1988; Gregory, 2003; Putman, 1993) and economic growth (Beugelsdijk and Smulders, 2009) is well established in the literature. Putman reported a growing disconnectedness in U.S. communities and believes that higher social capital improves student performance. More recent research shows that the accumulation of social capital positively influences a community's students' academic performance (Meier, 1999). On one hand, evidence from some studies suggests that students obtain academic benefits from social capital (see Putman 2000) and on the other hand, authors such as (Meier, 2009) make the general argument that students' achievement is positively related with school's technical efficiency. But there are reasons to believe that the effects of social capital on students' academic achievement may differ from student to student. The school efficiency literature to date has not considered the effect of social capital on students' academic performance.

The influence of social capital on economic activities has been a central theme in the literature for quite a long time, but the relationship between social connectedness and school choice has not been addressed. If the primary objective of social capital is to create cohesiveness through the connectivity of community members, then it is clear that parents' school choice decisions are influenced by the groups or organizations to which they belong.

Ni (2007) argues that parents' exogenous factors not only influence students' academic performance, but also affect school expenditures. Thus, it is useful to incorporate the effect of social capital into research on school efficiency. Thus, the following null hypothesis will be tested:

Hypothesis 7: The degree of social capital available within a community will have no effect on the technical efficiency of local public schools, ceteris paribus.

1.7 Summary

As a result of many social and economic forces, some parents believe that the American public education system is not providing a quality education, which, in turn, increases the demand for private schools. Recently, this demand increased in many local communities after public policy makers introduced tuition tax credits and voucher programs. Nevertheless, public schools are still attended by nearly 80% of all American K-12 students.

The growing concern about public school quality, as compared to that of private schools, has been a focus of research for at least the last three decades. Although public schools provide a diversified, non-religious, and tax supported education opportunity for all school-aged children, there is an increasingly negative perception about public school performance, and efficiency.

In the education market, public and private schools compete with each other, and it is commonly believed that increasing competition will enhance the efficiency of public schools. The purpose of this dissertation is to determine the effect of competition on public school efficiency in Mississippi while controlling for other contributing factors.

1.8 Problem Statements and Hypotheses

Parents are the demanders in the education market while public and private schools are the suppliers. Most prior research has focused on the supply side of the market. To provide a better understanding of the effects of competition on public school efficiency, the demand side of the market must also be considered. Focusing on the

supply side is insufficient; demand factors, such as school-selection bias, racial segregation, religiosity, and other exogenous factors such as location and social capital must be taken into account.

Measuring competition is complex, because as noted earlier it has three components: the number of competitors, the size of competitors, and the geographical distance among competitors. In the existing literature, the number of private schools in a school district, or the market share of enrollment, has been used as a proxy for competition, but these measures only incorporate a few descriptive components of the market. Therefore, in this dissertation, a GIS-based school competition index is developed to accommodate each of the above-noted market components.

The goal of this research is to determine the effect of competition on public school efficiency by including observable exogenous factors in a frontier model. This study tests the following seven null hypotheses:

Hypothesis 1: Competition from local private schools will have no effect on the technical efficiency of public schools, ceteris paribus.

Hypothesis 2: The degree of racial and ethnic student enrollment will have no effect on the technical efficiency of public schools, ceteris paribus.

Hypothesis 3: The socio-economic status of student enrollment will have no effect on the technical efficiency of public schools, ceteris paribus.

Hypothesis 4: The degree of religious affiliation of local private schools will have no effect on the technical efficiency of public schools, ceteris paribus.

Hypothesis 5: The technical efficiency of unban public schools will equal the technical efficiency of rural public schools, ceteris paribus.

Hypothesis 6: The degree of human capital held by teachers, staff and administrators will have no effect on the technical efficiency of public schools, ceteris paribus.

Hypothesis 7: The degree of social capital available within a community will have no effect on the technical efficiency of local public schools, ceteris paribus.

1.9 Significance of the Study

Proponents of educational reform often call for policies to increase competition between public and private schools. However, there is insufficient understanding of the effect of such competition on the technical efficiency of public schools. Thus, to better understand how competition affects the technical efficiency of schools, this research represents the first attempt to incorporate certain exogenous factors that were overlooked in prior research, including geographic attributes, urban versus rural location; private school size; distance between private and public schools; school-selection bias, including public school racial composition and religiosity; and social capital as well as an emphasis on the allocation of resources.

Notably, this study will determine the effect of competitiveness on the education market by employing a spatial market definition and using a GIS technique, which places considerable emphasis on market structure attributes. Stochastic frontier analysis is used to measure the output-oriented technical efficiency of each public school in Mississippi. The results can be used by educators, policy makers, and school administrators for educational reform for the public schools in Mississippi.

1.10 Organization of the Remainder of the Dissertation

This chapter provided an introduction and overview of the dissertation. Chapter 2 contains a review of the relevant literature, while Chapter 3 presents the methodology. Chapter 4 provides the data analysis, and Chapters 5 and 6, presents the results. Chapter 7, which includes a summary as well as recommendations for further research, concludes the dissertation.

CHAPTER II

REVIEW OF THE LITERATURE

2.1 Overview

This chapter presents a review of the literature relevant to competition between public and private schools and how such competition affects the technical efficiency of public schools. The chapter begins with a brief review of the literature on the U.S. education system including the importance of public education as well as school reform. This is followed by literature on the effects of competition between public schools and private schools, with a focus on public school performance and efficiency. Included are such issues as selecting the output to be measured, the unit of observation, and aggregation bias, as well as definitions of and techniques used to compute the competition variable. The literature included also concerns public schools' performance and efficiency, school-selection bias, and other exogenous factors, particularly the effects of school location and social capital on public schools' technical efficiency. The chapter concludes with a summary of the dissertation.

2.2 The U.S. Education System

The development of the American educational system goes back to 1600. At that time, education was largely religious, with schools being affiliated with religious associations (Thattai, 2001). Toward the end of the eighteenth century, Thomas Jefferson, later the third President of the U.S., and other well recognized individuals, including George Washington and Benjamin Rush, saw a need for a public educational system and

for schools that offered a religion-free education environment for students of all socio-economic backgrounds. However, education was expensive, and the costs restricted access to education for middle- and lower-class students.

Early public schools proponents proposed the idea of the *common school*. A common school was a public school which served individuals regardless of their social status and religious affiliation. Proponents believed that "common schooling could create good citizens, unite society and prevent crime and poverty" (Thattai, 2001). The common-school plan was accepted by all states and it eventually became a law in each state to offer public education. In general, early common-schools were funded and managed by state government legislators.

Common schools, however, failed to satisfy the needs of some religious believers. They were skeptical about the consequences of religious-neutral public schooling for their children's future. Private schools have a long history in the U.S., but dramatic increases in their relative number occurred over the past century. Whereas public schools offer a generalized curriculum for students, regardless of race, gender, religion or socioeconomic status, private schools offer more customized curricula and serve only certain students.

Initially, public schools were funded and directed by state governments, and local school districts administered school operations. Currently, however, the major portion of public education is financed by local property taxes with some portion paid by the state government. Revenue from local property taxes and state government shrank during the latter half of the twentieth century and as a consequence the federal government increasingly financed public education. Other socio-economic trends during this time caused private schools to attract more students from public schools. The changes mainly

focused on either customizing educational services such as, magnet and, charter schools, or reforming policies such as, voucher programs, and tuition tax credits.

2.3 School Choice and Reformation

The privatization of America's educational system had a special appeal to educational reformers in the last quarter of the twentieth century. The debate about liberalization of education and school choice was revitalized by introducing different types of private schools into the education market. Today, private schools come in with wide range of varieties to attract parents frustrated with public schools.

The increased demand for private schools made state and local administrators more concerned about the quality of public schools. To maintain public school quality, and to compete with local private schools, administrators imposed various mandates on public schools. For example, student accountability reports and teacher performance reports were widely implemented during the 1990s. Hence, school administrators and educators forced public schools to compete with private schools.

2.4 Public Schools versus Private Schools

Major differences between public and private schools are readily apparent. Public schools are geographically bounded by political entities (school districts), whereas private schools do not have such boundaries. The availability of higher quality public schools generally reduce the demand for private schools in a given location (Hoxby, 1994). Additionally, in terms of economics, public schools in a given district always incur less cost to parents living in that district, because private school parents are still obliged to pay taxes where they reside in addition to private school tuition (Belfield and Levin, 2002).

Public and private schools operate in a *free market* environment. In free markets buyers are free to choose among competing options, and in response to changes in market demand, suppliers change their behavior. There are a number of reasons why students leave public school to attend private school, but as a consequence, public schools lose the state-allocated money for students making such a choice. As private schools seek to draw quality students from public schools, the quality composition of public schools is diminished. Ultimately, market operations and school choice programs not only affect the per pupil school expenditures, but also overall school performance, and, hence, the schools technical efficiency.

Although school choice programs vary from state to state, the effectiveness of these programs remains questionable. Often local educators and state policy makers debate the *value* of public expenditures on public schools. To date, empirical researchers have failed to provide a firm conclusion about the effectiveness of such programs. Ni (2007) believes that school choice programs motivate public schools to keep their students, which should result in increasing performance and improved efficiency. Other researchers such as Heish and Urquiola (2002), McMillan (2000), Simon and Lovrich (1996) provide evidence that shows school choice programs have no effect on public school performance.

It is important to understand the school education production function and inputs before empirically testing whether or not competitive pressures benefit public school efficiency. In the following sections, previously used measures of outputs and inputs for public school education production functions and their associated problems are discussed and explored. The effects concerning various exogenous factors, such as competition,

and social capital on academic performance as revealed by previous studies are then discussed in the later of part of this chapter.

2.5 Production Functions, Output, and the Unit of Observation

To estimate school technical efficiency, it is first necessary to model a production function where inputs are transformed into outputs. Selection of these inputs and outputs is the first critical step. School performance and efficiency are outcomes of every school's production function. (Hanushek, 1986; Ni, 2007).

2.5.1 Output and the Unit of Observation

In the educational production process, output, which is school performance, is generally measured as students' achievement scores after a period of formal schooling. Most authors employ various types of academic records or student achievement as a proxy of output in order to measure school efficiency. An education production function differs from traditional production frameworks, because student achievement is considered the output, not just a quantity of goods or services.

Standardized test scores are the most popular measure of student achievement for education production functions (Hanushek, 1986, 1998). The choice of the unit of this output is solely driven by the research objectives and available data. Marlow (2000) used fourth, eight, and tenth grade reading, language and mathematics score at the *county* level, Borland and Howson (1992) employed third grade *district* mean test scores for reading, language, and mathematics, Cho (2009) employed a district's average proficiency rate for reading, and mathematics, Newmark (1995) used *county* level eighth to twelfth grade z-scores, and Hoxby (2000) employed *individual* level reading and mathematics scores for twelfth grade students.

Additionally, using mean and median level output data may generate aggregation problems, which incorrectly enter into the production function and mislead the results (Ching, 2000). A standardized test score or proficiency rate**,** such as the Subject Area Test Program (SATP), or the Mississippi Curriculum Test (MCT) in Mississippi, are appropriate proxies to use as an output measure in the education production function, but concerns related to scaling of the test score or the grade level examined remain unaddressed.

The validity and reliability of test scores are often of concern. Hanushek (1986) and Ching (2000) discussed the advantages and disadvantages of using test scores as an output in education production functions. For example, test scores do not provide full information about a student's knowledge; rather, they provide a measure of the test-taker's cognitive skills. However, researchers have failed to identify a close substitute that unambiguously reflects overall school performance, leaving standardized test scores as the only viable option in this field.

While there is disagreement about appropriate explanatory variables for school output measures in the literature, in general, the choice of the right-hand side variables depends on the research question. Hanushek (1986), Ching (2000), Hoxby (2000), Arum (1996), Adkins and Moomaw (2005), and Greene and Kang (2004) used different forms of the following variables: number of students, students' race, number of teachers, teachers' degree and experience, number of instructors, percentage of low income students, and average teacher salary.

In summary, significant differences exist at the level of observation where these studies variously employed school district, county, or state level data. For example, Arum (1996) argued that using state level data is appropriate for measuring school

performance, because states are responsible for funding allocations. But higher levels of observation such as state or county or school district suffer from aggregation problems (Ching, 2000) as multiple schools are added together. School level data should resolve the aggregation issue by acknowledging school specific differences and providing a superior estimate of school performance.

2.5.2 Inputs and Explanatory Variables

For the school production function, inputs and explanatory variables are divided into three categories: discretionary inputs, non-controllable factors, and exogenous market factors. The discretionary inputs include instructional and non-instructional expenditures where the instructional expenditures include teacher's salary, numbers of teachers, general expenditures, and textbook expenditures. The non-instructional expenditures include the number of staff, principals, and their salaries. The non-controllable factors include students' socio-economic status and ethnicity. And the market exogenous factors are the school competition index, the social capital index, school location and the percent of religious enrollment.

2.5.2.1 Discretionary Inputs

The NCES reported that public elementary and secondary school instructional and non-instructional expenditures per student rose 31% from 1989-90 through 2005-06, and the average total expenditure per student per year was $11,293 in the 2005-2006 academic year. Various components of per student total expenditure increase at different times, and increments in payments of salaries for instructional and non-instructional staff are generally most important; 61 percent of the total increase over the last 20 years is due to salaries. It should be noted that most of this increment occurred during and after 1997-

1998.[4] Therefore, public school efficiency is significantly linked to the number of teachers, principals and staff.

The quality and quantity of teachers in public schools are government-supplied inputs in the education production function framework. Currently, state and local governments are putting extra effort into increasing public school teacher quality. Previously documented evidence suggests that the number of teachers and turnover rates are influenced by overall school performance. Over the last two decades researchers have focused on public school teacher quality when measuring public school performance and found positive relationship (Bomotti, Cobb, & Ginsberg, 1999; Ching, 2000; Crawford, 2001). In contrast, Rivkin, Hanushek, and Kain (2005) failed to find such relationship. These researchers stated that teacher experience, advance degrees, and teacher test scores have very little impact on student performance or school quality. Evaluation of the effect of teacher race, gender, experience, and education on academic performance and efficiency is needed, but previous researchers often fail to do so while estimating the effects of school competition.

To understand the role of public school administrators on school output is critical. Gallmeier (1992) documented that while workers are often passive, management is active. Dantley (1990) argued the importance of school principals in the context of efficiency and cost effectiveness where a school administrator supervises the teachers and staff to maintain school quality.

Over the last fifty years, the role of the principal has changed from school manager to instructional leader. Initially, some researchers, such as Austin (1979), and

[4] Source: National Center for Education Statistics (NCES). Retrieved on July 10,2009 from http://nces.ed.gov/programs/coe/2009/section4/indicator34.asp

Lorzeau (1977) found principals act as a school manager by overseeing the resources provided by the district or state. This perspective has changed over time as researchers found a positive relationship between student achievement and the principal's effectiveness (Hallinger and Murphy, 1985, 1986). Hallinger (2003) found that instructional leadership was vital in many areas of a school. Therefore, over the course of time, the literature now provides empirical evidence on how the role of the school principal has evolved. But not all scholars agreed with this vision and role of principal as an instructional leader has been challenged.

Philbin (1997) conducted a study to investigate the relationship between principal leadership style and student academic achievement. He used elementary school level data for this analysis and only used descriptive statistics to analyze the results. He found a positive relationship between actively engaged leadership style and student academic performance.

Hoernemann (1998) tested the same relationship but used high school level data. Dorward (2009) also examined the relationship between principal leadership style and student academic achievement. He used high school administrators in New York state for his analysis and employed the eleventh grade English Regents Exam as student performance. Both of these studies computed correlation coefficients and concluded that principal leadership style was not related to student performance.

Minus (2010) performed a study which evaluated instructional leadership and student achievement using middle school data for mathematics and reading. His Person product-moment correlations revealed that students' academic outcomes were positively related to principal instructional leadership behavior scores or quality.

Thus, it appears that the pertinent question has not been subject to rigorous analysis. Most prior studies used data from local surveys which may be a source of measurement problems. Therefore, sound data examined with a sophisticated econometric technique is required before make a general statement about this relationship. In addition, the existing literature fails to confirm the influence of human capital held by non-administrative staff on student performance. By including these variables, this dissertation extends the literature.

Other instructional expenditures, including classroom materials and equipment, have increased over the last two decades. Moreover, variation in instructional expenditures per student is greater between public schools within school districts than within states. Ching (2000), Adkins and Moomaw (2005), and Geller et al. (2006) noted that textbook expenditures, classroom material expenditures, and equipment costs positively influence public elementary and secondary test scores. Thus, both textbook expenditures and general expenditures are relevant factors to include in any empirical model of education production.

Aside from total instructional expenditures local and state governments also spend a major portion of tax revenue on school operations. Non-instructional pupil services such as transpiration, food service, safety, and other such expenses are included in school operation budgets. Empirical researchers have also been curious about the role and impact of these variables on student academic success. The variation in non-instructional expenditures per student overtime reflects the value of usages across schools in the amount of money they spend in this regard. Many state education departments often use different measures to evaluate the impact of these expenditures on overall school performance.

2.5.2.2 Non-controllable Inputs: Student's Race

For decades after Lincoln issued the Emancipation Proclamation in 1863[5], the literacy rate of African Americans increased dramatically. Schools, however, were divided between those for blacks and those for whites. One hundred years later when schools were ordered to desegregate; the nation saw "white flight" of students from newly integrated schools.

According to the U.S. Constitution, all citizens have equal rights. The common-school reformers believed that the public education system would be a place for all students, regardless of race, gender, or religion. In reality, however, the U.S. education system remains divided along racial lines.

Educators and public policy makers have seen that racial segregation in the public school system often results in African American students receiving an inferior education. Beginning in the 1940s, school segregation became intensely debated, and, in 1954, the Supreme Court outlawed racial segregation in public schools. The primary objective was to increase overall educational standards at reduced public expenditure. Although this law took several years to be effective in many Northern states, and it took almost 26 years to desegregate the public school systems in Southern states. Elimination of racial segregation from public schools generated private school movement, and the importance of private schools grew tremendously during the second half of the twentieth century.

The Supreme Court sought to achieve and maintain racial balance in the public schools. Clotfelter (2001) reported that desegregation caused white families to pull their children out of public schools and to enroll them in private schools, a phenomenon

[5] Source: The Cincinnati chapter of the Association for India's Development. Retrieved on July 21, 2009 http://www.servintfree.net/~aidmn-ejournal/publications/2001-11/PublicEducationInTheUnitedStates.html

known as “white flight.” Moreover, some poor white students stopped going to public school to avoid interaction with blacks, which resulted in raising school dropout rates in these schools.

However, there have been a large number of studies documenting that desegregation has had a significant positive impact on African-American student achievement (Braddcock and Elite, 2004 and Schofield, 1995). Schofield and Hausmann (2004) point out that desegregation can increase black student retention rates and significantly increase job attainment rates. Today, after fifty years of school desegregation, academicians, policy makers and government legislators still question the issues that surrounded its implementation. A primary objective of desegregation was to bring about racial balance in public schools (Rossell, 2002), but real racial balance has not been achieved in many states. In addition to that, Rossell also mentioned that overall student performances in public schools are negatively related to white flight. Hence, assessing the effect of competition on public school efficiency must acknowledge white fight within any model.

2.5.2.3 Non-controllable Inputs: Student’s Socio-economic Status

Ching (2000) defined student’s race and socio-economic status as non-controllable inputs and noted their significant role on student achievement. Geller et al. (2006) argued that students’ socio-economic characteristics influence test scores. Specifically, test scores are negatively related to poverty and minority status. Poor students may suffer from malnutrition, receive inadequate educational supplements, and are more likely to be involved in antisocial behavior. Kinnucan, Zheng, and Brehmer

(2006) believe that allocating funding, including the free or reduced lunch program, can help these students.

Education and public policy researchers often use free-lunch enrollments as a proxy for student socio-economic background. Geller et al. (2006), Greene and Kang (2004), Dee (1998), and Ching (2000) used the percent of free lunch enrollment in a school within their estimated school production functions. However, as noted before, most of these authors use school district, county, or state level data.

There is a great deal of research on the relationship between minority student status and academic achievement. In general, public elementary and secondary schools with a relatively higher numbers of minority students perform more poorly. Several explanations have been posited, including cultural and language. Hamnett, Ramsden, and Butler (2007), based on a study conducted in London, found that Indian and other Asian students, who belong to a "voluntary minority group", tend to perform better than students who belong to an involuntary minority group such as African Americans and Hispanics. A contributing factor for this difference in academic achievement may be peer effects. In these different communities, there are different social and psychological pressures that influence academic outcomes. Hence, the type of minority and their socio-economic status appears to matter and should be included in an empirical model of school performance.

2.5.2.4 Non-controllable Inputs: Primary Schools MCT Score

The importance of students' cognitive abilities, family inputs, and parents' education with respect to academic achievement is highly recognized in the social and behavioral sciences literature. Efklides et al. (1997) found that students' mathematics

scores were influenced by measured cognitive abilities. Muller (1993) documented that any form of parental involvement positively influences the academic performance of a child.

Finding a true measure of a student's cognitive ability is always problematic, however, academic performance can be used as a close proxy to measure student quality. Moreover, a school is directly associated with a student's academic performance, but individual academic report card is not readily available to the public. Unfortunately, discussion about such a variable in the previous competition studies is limited. Finding a way to control for this variable is within the scope of this dissertation.

2.5.2.5 Exogenous Factor: Competition

Competition from private schools may influence public schools in several ways, but most importantly on costs and enrollments. A significant amount of research has been conducted to investigate the effects of competition on public school *academic* outcomes and school *efficiency*. There are significant numbers of studies reporting the effect of competition on public school performance as statistically significant and positive; but there are some studies that argue against such evidence. It is important to note that both of these groups use various methodologies to measure the degree of competition.

Rhoades (1993) employed the HHI to measure the degree of competition between schools. The HHI is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. The measurement is bounded between 0 and 1. A higher number in the HHI indicates less competition and, hence, higher market power,

while a smaller number indicates the opposite. In the U.S. education market, the average value for HHI is 0.35, and, on average, elementary schools experience more competition than secondary schools (Belfield & Levin, 2002). A range of studies has employed the HHI as a proxy for competition, but the findings are inconsistent. Borland and Howson (1992) found that the effect of competition is positive for public school performance, but Hanushek and Rivkin (2001) found that the effect was insignificant. Marlow (2000) reported mixed results. He showed that competition at the eighth grade level increases public school outcomes, but that this result does not hold for the tenth grade.

Instead of using the HHI as a competition measure, some studies apply measures of private school enrollment as a proxy. Using county-level data, Couch et al. (1993) and Newmark (1995) found that private school enrollment is positively related to public school students' standardized scores. In contrast, Geller et al. (2006) and Simon and Lovrich (1996), used district-level data, found that private school enrollment has no effect on public school student performance.

Other measures, such as the total number of schools or school districts per 1,000 students, have been used as an alternative to HHI. Using this approach, Marlow (1997) determined that the effect of competition varies across grade levels. Another approach is to use instrumental variable (IV) techniques, where an instrumental variable is correlated with private school outcomes, but uncorrelated with the error term in the model. Among recent studies in education, Hoxby's (2000) contribution is notable. Hoxby used an IV approach to measure the effect of competition, employing family income as an instrument and found a significant positive relationship between private school competition and public school outcomes.

There are several limitations to these studies. First, they suffer from inadequate definitions of the educational market because most use state, county, school district, or individual student levels of observation. These units of observation, in general, suffer from estimation issues such as aggregation bias.[6] The results from the aggregate level may not reveal correct information on the individual school level, and policy prescription based upon these results may not be appropriate. To analyze *school* performance in the education market, one needs to use *school* level data instead of *school district* or county data.

The second concern is how to compute the competition variable. The HHI, private school enrollment, or instrumental techniques, are accep methods to measure the effect of competition in the education market, but all are indirect approaches. Most previous studies used a market share approach to quantify market power, but the education market is a unique one in which the industry or consumer market setting does not work very well. A school's performance is measured by students' academic outcomes, which are hard to quantify in market share terms. Earlier researchers have misspecified the educational market by assuming that it is bounded within a school district, but in reality, a public school can face competition from private schools within the district or from adjoining school districts, as private school parents can easily cross the district, county, or even state boundaries for their children's education. By redefining the market at the school level the current empirical model will provide better and more precise information about competition on public school performance.

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[6] "An aggregated view can suggest homogeneity within a group that is actually composed of distinct sub-groups. In other words, it can fail to acknowledge discrete differences" (Birks, 2003).

2.5.2.6 Exogenous Factor: School Choice Bias and Market Characteristics

As noted earlier, the education market is different from other markets. In most markets, the consumer makes purchase decisions based on price and product quality but, in the education market, school choice decisions are largely based on factors over which public schools have little control. These factors include public school location, local private school religious affiliation and social capital in a community. Thus, before assessing the effect of school choice programs promoting competition, it is crucial to know whether parents' school selection is biased or not.

There is a substantial body of research on parental school selection. Most of this research indicates that parents use non-academic criteria to select a school for their child. Tucker (1992) conducted several surveys on the effectiveness of school choice programs at different levels of aggregation, such as district, state, and local. They found that only 15% of parents selected a school based on academic quality from the entire sample[7]. In addition, 6% of these parents selected schools for religious reasons, and 30% used "other" factors as criteria.[8] Because academic performance is not the only criterion for a school selection, other factors such as religiosity, school location, and social capital must be included in any empirical model of the effects of competition on school output.

2.5.2.7 Exogenous Factor: The Market for Religious Education

Historically, private schools were affiliated with religious groups, often Catholic groups, but they have become more diversified and now include non-religious schools as

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[7] Source: http://www.policyarchive.org, p.9 on the Carnegie Foundation's Shabby Assault on School Choice Report. Retrieved on Sept., 15, 2009 from The Carnegie Foundation's Shabby Assault on School Choice

[8] Source: www.heritage.org, Retrieved on July 13, 2009 from http://www.heritage.org/Research/Education/upload/89452_1.pdf

well as home schools. Although private schools vary widely in function, size, and organization, by definition, they are all privately controlled and privately funded.

Cohen-Zada and Sander (2007) explained the increasing demand for private schools as stemming from parents' religious values. Parents want to instill their religious values and preserve their religious identity in their children. Hence, increases in religiosity and the number of religious private schools might reduce the demand for public schools.

Conlon and Kimenyi (1991), using utility theory and aggregate demand functions, focused on the demand for private schools in Mississippi. They found that private school choice is largely influenced by public school quality and religious preferences as well as poverty rates in the community.

For many parents, religious values are an important issue in school choice because they believe that educational outcomes are correlated with religious beliefs (Lehrer, 2005). Lehrer created dummy variables for religious affiliation and different types of religious participation and used frequency of attendance to measure the degree of religiosity as well as other socio-economic variables. Ordinary least square analysis showed that religious affiliation and participation positively affected the educational attainment and future income of U.S. women. Lehrer also argued that religious involvement increased childrens' ability and productivity, leading to higher educational and career attainment. Thus, many parents evaluate a private school's demographic composition and religious affiliation instead of traditional measures of school quality, as suggested by test scores, teacher-student ratios, and graduation rates.

Hoxby (1994) argued that a private school's location near its denomination's local church results in more competition for public schools. She found that private school

demand is related to location, church donations, the use of church facilities, and parents' preferences. In general, private schools located near the denomination population, which reduces transportation costs, further influences parents' decisions. Many private schools collect a significant share of revenue from the denomination's donors, which substantially reduce tuition, making it relatively more affordable. Additionally, private schools may also share the building, equipment, and personnel of the church, which also lower costs. Hoxby employed an IV approach to estimate the competitiveness between private and public schools, and her religion variable enters into the empirical model in different forms, such as a religious homogeneity index, Catholic population per square miles, Catholic churches per square miles etc.

Thus, explaining competition between public and private schools in the U.S. education market is not straight forward. Since a major focus of this dissertation is to evaluate effect of private competitiveness on public school efficiency and performance, careful consideration is needed to evaluate the characteristics of competitors before drawing any conclusions.

2.5.2.8 Exogenous Factor: School Location

Although it is widely recognized that changes in technology and competition have diminished many of the traditional roles of geographic location, this does not hold true in the education market. Geographic locations are typically divided into rural and urban. Distinguishing between rural and urban locations is important because each has unique features. Such locations differ by population diversity, health, and employment opportunities. In general, urban areas offer more choices to citizens for their daily lives than do rural areas, which make urban areas more attractive to many people. For

instance, in urban areas, parents have a greater number of choices for the education of their children. Hence, it is expected that public schools are more competitive in urban areas than in rural areas, but previous findings in this regard are inconsistent.

These inconsistent findings may be due to the unavailability of nationwide data, a lack of clarity in the definition of school location, and the lack of quality output data. For example, Fan and Chen (1998) found that previous studies used inconsistent definitions of school location. Some used rural versus urban schools, whereas others divided their sample into rural, suburban and urban or into metro versus non-metro areas. Most research in this area has been conducted since 1990, when the National Assessment of Education Progress (NAEP) and the National Longitudinal Education Study (NLES) began to collect school location data in a standardized manner (Reeves & Bylund, 2005).

McCracken and Barcinas (1991) examined the relationship between location and student educational aspirations, using twelfth graders in Ohio. They found that a large difference in test scores between rural and urban schools, with urban schools having higher scores and students reporting higher aspirations. Urban schools are larger, offer more courses, and use greater numbers of teachers and other staff.

Reeves and Bylund (2005), using Kentucky school accountability time series data, also found that geographic location is correlated with student outcomes, as did McCracken and Barcinas (1991). These latter researchers, however, defined school location based on the total population of the schools' county. They found that students in large rural schools are lower performers than are students in metro (urban) schools and that students' higher socioeconomic status and larger classroom size are key factors associated with this difference. Other researchers (Alspaugh & Harting, 1995), however,

have found that rural students perform better than do urban students as measured by standardized test scores.

Fan and Chen (1998) examined the differences in academic performance among rural, suburban, and urban public school students. They used the 1998 NELS data set, focusing on reading, math, science, and social studies scores from eighth to twelfth grade, and found no difference by school location.

There is scant research however, that considers school location as related to public school efficiency. Mancebon and Bandres (1999) and Kantabutra and Tang (2006) are among the few researchers who focused on school location. Mancebon and Bandres, studying schools in Spain, found that average efficiency in urban public schools is significantly higher than in rural schools. Kantabutra and Tang (2006), employing a sample of public schools in Thailand, found that rural schools operate at a lower level of efficiency than urban schools.

2.5.2.9 Exogenous Factor: Social Capital

The generally accepted definition of social capital is "the set of social resources of a community that increases the welfare of that community" (Glaeser, 2001). Various types of organizations, including religious, political, and social, foster social capital through norms and networks. Social capital has received a great deal of recent attention in the literature and is generally considered as an exogenous factor (Fukuyama, 1995; Putnam, 1993), endogenous influence (Knack & Keefer, 1995), or both an exogenous and endogenous factor (Radnitz, Wheatley, & Zurcher, 2009). Although researchers often hold different views about social capital formation, they all agree about its direction of influence on other socio-economic factors.

Much research on public school performance attempts to address concerns, such as class size, teachers' training and salary, curriculum, and school productivity related programs. Generally, local and state policy makers focus only on school reform programs and resource allocation. The importance of social capital on public school performance and efficiency is often over looked (Coleman, 1988 and Putman, 2000) which provided evidence for a positive relationship between social capital and economic activities. Glaeser (2001) argued that social capital can influence some unobserved characteristics that drive observed socioeconomic factors in a community. For example, connectedness between child, family member, community member, and school enhance academic achievement (Coleman, 1988).

Following the Coleman's initial investigation of social capital, economists and social scientists have studied the relationship between social capital and educational attainment or academic performance. Glaeser (2001) found a robust direct relationship between social capital and individual schooling. Meier (2009) found that social capital influences students' grade point average and student drops out rates. Meier uses parental involvement, participation in extracurricular activities, and family composition as his social capital variables when looking at grade point average; he found a positive relationship. Hence, increasing social capital stock increases students' performance.

In an international setting, research in rural Bangladesh using micro-data showed that social capital, defined parental sociability, Non-Government Organization (NGO) membership, and community work did not increase the probability of school attendance. (Asadullah, 2008).

To date, the literature in public school performance and efficiency has given little importance to social capital, although a few studies found a significant positive relation

between students' academic outcome and social capital. Thus, altering inputs or outputs may not be sufficient to increase school efficiency without considering this exogenous factor. The current investigation will explore the social capital effect on public school performance and efficiency.

2.6 Techniques to Measure Technical Efficiency

Economic theory predicts that market efficiency will increase as the degree of competition increases in the market. There is a great deal of research on the effect of competition on public school performance, but such research is often not market based. The following is a list of some no studies which evaluate the effect of competition on academic outcomes: Borland and Howson (1992), Hanushek and Rivkin (2001), Marlow (2000), Couch et al. (1993), Newmark (1995), Sander (1999), Arum (1996), Hoxby (2000, 2001), and Geller et al. (2001). In the case of research on the effectiveness of competition on *public schools*, the list is shorter and includes Marlow (1997, 2000), Arum (1996), Goldhaber (1999), Hoxby (1994, 2000, 2001), Kang and Greene (2002), and Ching (2000).

Belfield and Levin (2002) reviewed the literature on the impact of the market reformation of the U.S. educational system and conclude that only one-quarter of the literature considers public school efficiency instead of academic outcomes or educational attainment. Although they found a significant number of studies that indicate competition has positive effects on student academic outcomes, they report that studies on educational efficiency yield mixed findings about the effects of competition. For example, Grosskopf et. al. (1999) noted a positive relation between competition and efficiency, while Greene (2002) found this relationship to be insignificant.

Studies on efficiency vary greatly in their methodology. Popular methodologies for estimating efficiency include the data envelopment analysis (DEA); (Duncombe, Miner, & Ruggiero, 1997; Grosskopf, Hayes, Taylor, & Weber, 1999; Kang & Greene, 2002), the IV approach (Hoxby, 2000), stochastic frontier analysis (SFA); (Ching, 2000, Kang & Greene, 2002) and ordinary least squares and fixed effects (Ni, 2007). There are number of reasons why SFA is the best estimation technique to measure efficiency, particularly because it can estimate producer-specific technical efficiency.

Farrell (1957) formulated SFA to estimate technical inefficiency, which is the difference between observed and maximum feasible outputs. After several modifications, Aigner et al. (1977) and Meeusen and Van den Broeck (1977) introduced formal representations of the stochastic frontier model that assume the error term is randomly distributed; therefore, each producer's frontier can vary stochastically. Both the DEA and the SFA models can be used to calculate technical efficiency, whereas ordinary least squares, the IV approach, and the fixed effects model are unable to do so.

The DEA and SFA differ in the distribution of the stochastic term. DEA is based on mathematical programming and ignores the effect of random shock (stochastic component) in production function (Lovell, 1993). In comparison, the SFA technique is more appealing to researchers because in this approach, the stochastic error component and the inefficiency term are estimated separately. Overall, the frontier estimate is more precise in its approach.

Grosskopf et al. (1999) employed an input distance function to measure the efficiency of Texas public schools, using cross-sectional data for 1,055 public school districts in 1988-89. The data included the number of teachers, administrators, and staff as well as teachers' salary. A four-firm market concentration ratio and HHI measures

were used as a proxy for the degree of competition. The authors constructed a multi-output-multi-input model to estimate the relationship between competition and efficiency. Mathematics, reading, and writing test scores were used as output measures. Grosskopf et al. found that increased school competition had a significant and positive influence on school efficiency.

Using four years of district-level data, Kang and Greene (2002) employed the SFA technique to estimate the effect of competition on technical efficiency for schools in the state of New York. The percentage of honors examination takers, honors graduates, 2- and 4-year college-bound graduates, and school dropouts were used as output measures in the production function, and the number of teachers per student, staff per student, books per student, instructional rooms per student, and computers per student were used as labor and capital inputs in the production function to estimate technical inefficiency. In the second stage, Kang and Greene regressed household income, the percentage of minority enrollment, parental education, house ownership, Catholic population, and HHI on public school inefficiency. Their study resulted in ambiguous policy implications, as effect of competition was not consistent for all these schools.

Using data from Mississippi public school districts and employing a two-stage SFA technique, Chang (2000) found that the number of students in the free lunch program, number of gifted students, district enrollment, and teacher certification were significant determinants of public school efficiency. Adkins and Moomaw (2005) conducted a frontier study in Oklahoma school districts and found that increases in instructional and non-instructional expenditures improved student achievement and that school district size and teacher education, experience, and salary affect school efficiency. Gronberg, Jansen, and Naufal (2006), used a six-year panel data from Texas public

schools, estimated school-specific efficiency using the SFA approach. They found that efficiency was not correlated with school performance. All of these studies use standardized test scores as a dependent variable.

The single equation stochastic frontier analysis is another way to estimate market efficiency while including exogenous factors into a production function. Surprisingly, a majority of the studies on public and private competition have not utilized this estimation technique. Most studies have used either the DEA or SFA to analyze the effect of competition and did not use school-level data.

2.7 Summary

It is clear that further research is needed to determine whether and how private school competition affects public school performance. This research will contribute to the literature in several ways. First, it will be one of only a few studies that analyze school performance in the southern United States using school-level data. Only one such study analyzed the Mississippi public education system, but used district-level data (Ching, 2000). Second, although there were previous empirical efforts to measure the effect of competition from private schools on public school performance, it was difficult to quantify the effects based on the proxies used. Defining a school market and then computing and employing the GIS-based competition index will be used to evaluate the education market more closely than before. As such, this is the first attempt to assess the education market and inter-school competition by employing a geographic approach. Third, this study employs recent data and a unique set of school input variables to estimate an education production function at the school level. Fourth, using different market characteristics (exogenous) such as, school location, a social capital index, and

the percent of religious enrollment extend the existing literature. Lastly, the single equation stochastic frontier approach has never been employed in previous investigations. Therefore, employing this approach provides an additional perspective for public policy researchers in addition to the two-stage stochastic frontier analysis.

CHAPTER III

METHODOLOGY

3.1 Overview

The purpose of this dissertation is to examine the effects of competition from private schools on academic performance in public schools in Mississippi. Economic theory suggests that competition increases market efficiency and previous researchers find mixed evidence to support this theory. The linkage between the effects of competition and public school performance still remains undefined because one needs an appropriate way to measure competition and a methodology that incorporates exogenous factors beyond the standard set of inputs, when measuring the efficiency of public schools. In this dissertation, I use a GIS based technique to compute a school competition index, measures of religious enrollment, and local social capital. Using a stochastic frontier model, a relationship between efficiency and these exogenous factors is explored.

3.2 Estimating Technical Efficiency

Technical efficiency is the ratio of actual production to efficient production. Primarily, the two most popular approaches in the productivity field are input-reducing and output-increasing technical efficiency techniques. The first approach discusses the possibility of gaining technical efficiency by reducing inputs without changing output, and the later one explains how to gain technical efficiency by increasing output without altering the input allocation to the production process. The second approach is more

appropriate to the educational market because the goal for the school system is to achieve the maximum level of output without altering resources, which may be fixed in the short-term (Mancebon and Bandres, 1999). Rassouli-Currier (2007), Kantabutra and Tang (2006), Mante and O'Brien (2002), and Mancebon and Bandres (1999) use output-increasing approach in their production frontier estimations.

A functional form should be declared before the estimation to measure technical efficiency in the education market. There are a few types of functional forms of the production function available, e.g., translog, Cobb-Douglas, or constant elasticity of substitution, but the selection of a particular formulation depends upon the research questions and data availabilities. I employ the Cobb-Douglas production function in this paper following the former studies in technical efficiency by Herrero and Pascoe (2002), Coelli and Battese (1996) and Goyal and Suhag (2003). A representation of the functional from employed in this paper is as follows:

$$y = AK^{\alpha}L^{\beta}, \tag{1}$$

where y is the output, and K and L are capital and labor. In this production function, the percent of proficient students (MCT examination for Primary Schools; and SATP examination for High and K-12 Schools) is used as output, capital is the school building area per student, general expenditures per student and textbook and instructional expenditure per student, and labor is the number of teachers and staff per student. The variable A is the measure of the school specific technical productivity.

A stochastic frontier model is the most frequently used approach to measure the technical efficiency. In this approach a single output for each of the producers can be

estimated by using N number of inputs in a cross sectional data set as in (Kumbhakar and Lovell, 2000):

$$y_i = f(x_i, \beta).TE_i \,, \tag{2}$$

where y_i is the scalar MCT or SATP proficiency rate of the school *i, i*=1, 2,…J, x_i is a vector of *N* inputs for school *i*, and β is the technical parameter which measures the school specific technical efficiency. *TE* is the maximum feasible score that one school can achieve from this production set and it is $TE_i = 1$. Anything less than one is interpreted as technical inefficiency (Kumbhakar and Lovell, 2000).

Before 1977, Goal Programming, Corrected Ordinary Least Square (COLS) and Modified Ordinary Least Squares (MOLS) were the popular frontier estimation techniques used in the productivity analysis, but none of these techniques account for the effect of random shocks, which might have affected any production function positively or negatively. To incorporate the contribution of random shock into the production, Aigner, Lovell, and Schmidt (1977) and Meeusen and Van den Broeck (1977) developed an estimation technique called the stochastic frontier model. After converting a Cobb-Douglas production function into a log-linear function, the stochastic frontier model representation was as follows:

$$lny_i = lnf(x_i, \beta) + v_i - u_i \,, \tag{3}$$

where v_i was the noise factor and u_i was the technical inefficiency part of the frontier analysis. The technical inefficiency component was then be regressed on explanatory variables (equation 4) to determine the cause of inefficiency.

$$u_i = \alpha_0 + \sum_j \alpha_j \, z_j \,, \qquad \text{j} = 1, 2, \tag{4}$$

where j is the number of explanatory factors. This two-part estimation process is called the two-stage stochastic frontier estimation process.

In the later part of the twentieth century an extension of the two-stage stochastic frontier model was developed. This modified model advanced the stochastic frontier estimation process by relaxing the second stage estimation part. Representing school *i*, the modified frontier estimation model, after incorporating exogenous variables, was

$$lny_i = lnf(x_i, z_i; \beta) + v_i - u_i, \qquad i = 1, 2, 3\ldots\ldots J \tag{5}$$

where x is an input vector (building area per student, general expenditures per student, textbook expenditure per student, number of teachers and staff per student), z is the vector of exogenous variables (percent of black students, percent of free lunch enrollment, small-city/rural, school competition index, percent religious enrollment, and social capital index) that influence production, and y is the output (proficiency rate in MCT or SATP examinations) from this production process. β is a vector parameter for x and z. The error terms are v_i and u_i, where v_i is the two-sided error component and u_i is the technical inefficiency component. Both of these error terms are distributed identically and independently, and u_i measures the school specific technical inefficiency. This approach allows the frontier estimation technique to incorporate the influences of the exogenous variables in the efficiency measurement while still including the two components in the error term. Maximum likelihood estimation (MLE) will be used to estimate the parameters and the technical inefficiency (Kumbhakar and Lovell, 2000).

In education studies, previous authors employed various mixes of inputs and outputs, such as, one input-one output, multiple inputs-one output and multiple inputs-multiple outputs to estimate technical efficiency. Frequently, the education production

function includes school and non-school related inputs which produce one or multiple outputs. Following Kantabutra (2009), I employed a multiple inputs-one output formulation in the production function to estimate individual school efficiency.

I followed both, the two-stage and single equation approaches, to measure the technical efficiency. Analysis of results from the single equation version of stochastic frontier model was different than the two-stage model. The coefficients in the single equation model measure the impact of exogenous variables on output, not efficiency. As a result, these coefficients could not be used to determine the impact of an exogenous variable on efficiency. In an attempt to view this relationship, correlation coefficients between exogenous variables and estimated efficiency were calculated. Both of these estimation processes helped to confirm the results and to check the robustness of these results under various specifications.

3.3 Measuring School Competition

I included the constructed school competition index (SCI) as an exogenous factor in the estimation of the production function. An exogenous factor in a production function was defined as an outside factor which can affect output, and hence, efficiency. Several authors for example, Borland & Howson (1992), Jepsen (2002), and McMillan (2000) have pointed out that private school competition was an exogenous factor which influences public school performance, but a general conclusion about the effect of competition was still missing as the definition of a school market was highly controversial.

Earlier authors employed various techniques to measure the degree of competition by incorporating this exogenous factor into the model to analyze school performance.

Some frequently used techniques to measure competition include the Herfindahl-Hirschman Index (HHI), private school enrollment, the number of private schools in a school district, distance to the nearest Catholic school, and private school market share. The traditional definition of market structure was not sufficient to reveal the strength of market competition[9]. In addition to the number of competitors, knowing the size of competitors and distance between them was important to measure the competitive pressure. Therefore, a new methodology was needed to develop to measure the competition more accurately than before.

To isolate the school specific competition effect, I developed a Geographical Information System (GIS) based school competition index (SCI) employing a modified gravity-type accessibility formulation; $A_i = 1/E_i \sum_{j \neq i} E_j d_{ij}^{-2}$ where E_i is enrollment of a public school, E_j is the private school enrollment, d is the distance between the public and private school (i and j denotes public school and private school respectively). This methodology was superior to the previously used methodology because it incorporated the market size, number of schools, and distance from local competitors at the same time.

An individual school could have competed within a geographically dispersed market that did not necessarily correspond to school district boundaries. As noted earlier, the previous literature generally assumed that competition was geographically bound, but this assumption did not hold in the real world. It was not necessarily true that an elementary or secondary public school faced competition only from the same-district private schools; rather a private school in an adjacent school district may have generated more competition to public school due to the proximity. I used GIS to define the

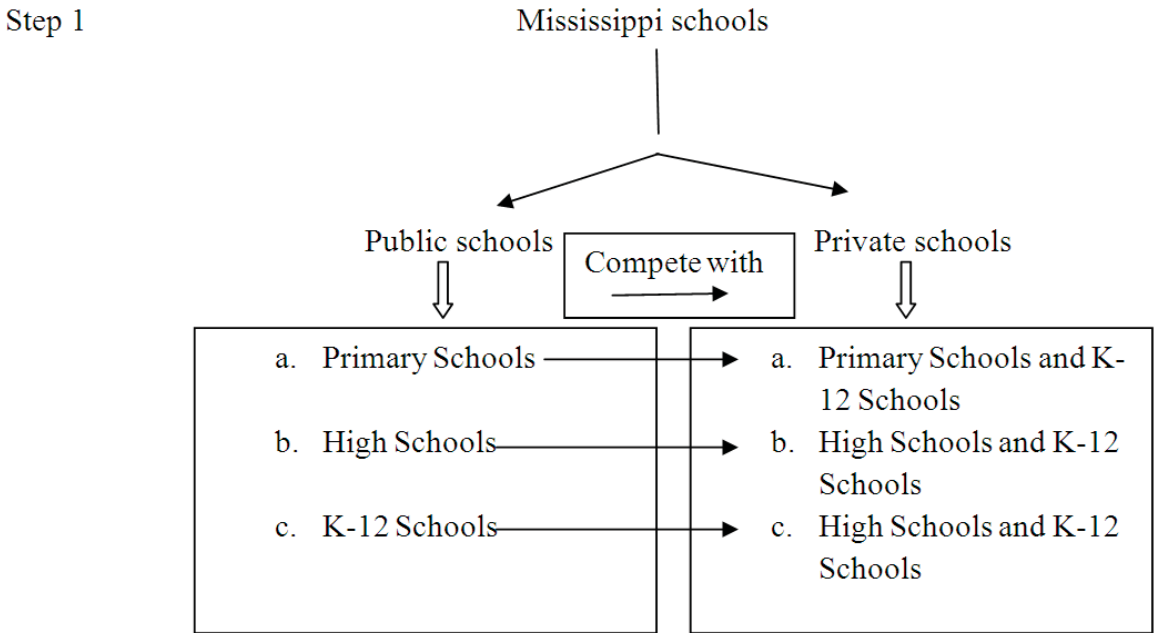
[9] Number of competitors in a market (Page 378, Market Structure and Firm Strategy, Ch-11, R. Glenn Hubbard and Anthony Patrick O'Brien, ed.2, Pearson)

individual public school market. Employing GIS was a unique way to measure competition, as compared to traditional methods used by economists, because it allowed computation of a competition variable beyond school district boundaries. To do that, I drew circles of various size, such as 5 mile, 15 mile, or 25 mile radius around each public school and counted the number of private schools, their total enrollment and the distance among them inside that circle. Although, I focus on only the 25 mile radius in this dissertation; and estimation of the other two markets are presented in the Appendix[10]. Where appropriate, I included private schools in neighboring states, such as Alabama, Tennessee, Louisiana, and Arkansas to measure the effect of competition on public schools which were located in Mississippi (Figure 3.1 through Figure 3.9).

I gathered the school's geographical location from the NCES. Employing Mississippi school level data to estimate the education production function, equation (1), allowed the estimation of school-specific technical efficiency. A conceptual model below illustrates the step by step methodology used to construct the school competition index.

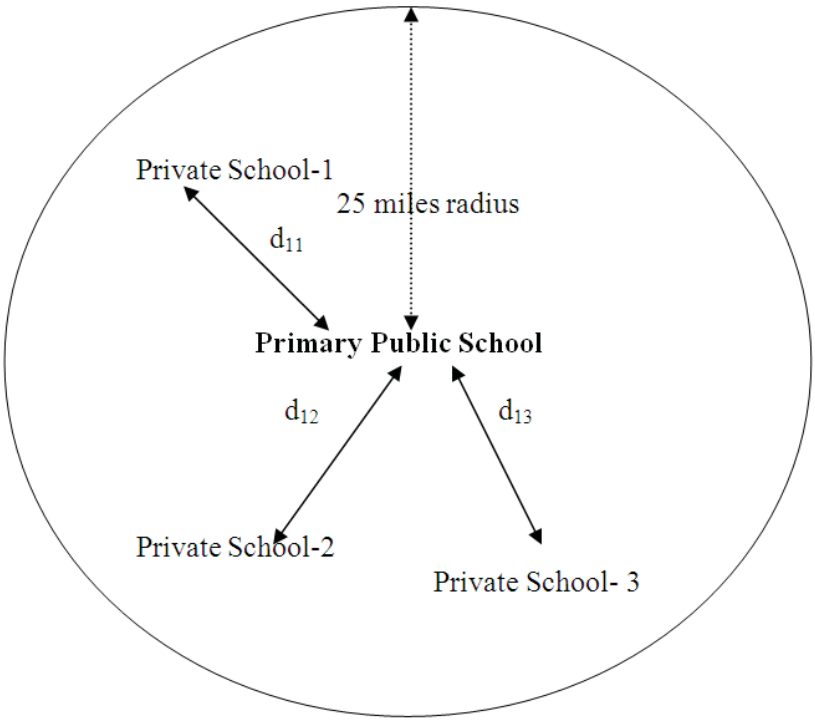
[10] Average commuting time to work in Mississippi is 23.5 minutes, which was approximately 25 miles. (www.census.gov)

3.3.1 Conceptual Model



Step 2 Include private schools from all neighboring states such as Alabama, Arkansas, Louisiana, Tennessee, and Florida with the data set.

Step 3 Create the SCI for a group of schools (e.g. Primary schools)



Here, E_i is a Primary School's enrollment, E_j is a private Primary School's enrollment, and d_{ij} = distance between the Primary School and the private Primary School. This information is incorporated into a modified Gravity-type accessibility index, $A_i = 1/E_i \sum_{j \neq i} E_j d_{ij}^{-2}$ to compute SCI. Please see Figure 3.10 and Figure 3.11 for spatial representation of the school competition indices for Primary Schools and High Schools.

The relation between SCI and estimated inefficiency for each school reflected the degree to which competition from private schools was related to public school performance. A significant negative relationship between SCI and the technical inefficiency in the two-stage model and a significant positive correlation between technical efficiency and SCI in the single equation model rejected the null hypothesis that schools facing more competition from private schools are not efficient. Inclusion of other exogenous variables allows this technique to analyze all seven hypotheses in this dissertation. Additionally, this investigation provided empirical evidence for the public policy and school choice debate in school markets.

3.4 Measuring Students' Socio-economic Status and Racial Composition

I attempted to follow previously used techniques to compute these variables. I employed the percent of free lunch enrollment and the percentage of black students in school as a proxy of student's socio-economic status and racial composition in the empirical model respectively. These techniques were previously used by Ching (2000).

3.5 Measuring Market Degree of Religiosity

I used GIS to measure the degree of religiosity for a public school market. While some private schools were affiliated with a specific religion, others have no such

connection. Thus, markets could vary in terms of the number of religious private schools across the state. To measure this variable, I counted the number of religious private schools inside the circle around a public school and computed the religious school enrollment share of that market.

3.6 Measuring School Location

School location was measured with a dummy variable based on the physical location of a public school. The data for this variable was collected from the NCES where public schools were divided into fourteen categories based on their location, such as the urban fringe of a mid-size city, urban fringe of a large size city, mid-size city, suburb-midsize, small city, large town, rural, rural inside CBSA, rural outside CBSA, rural distant, rural fringe, rural remote, small town and town remote. I clustered the first four categories into one and called it large city-urban and the rest of these locations were included in another category and defined as small-city/rural. Then, I employed the small-city/rural variable within the empirical model.

3.7 Measuring Social Capital

Social capital was another exogenous variable which I have used in my model. The micro level, the meso level and the macro level are the three levels of social capital that can be analyzed in society (Hjollund, 2000). This dissertation, analyzed social capital at the meso level, which was basically accumulated from institutions such as sports clubs, political organizations, religious organizations, social associations etc.

I gathered this variable from the Northeast Regional Center for Rural Development (NRCRD). Rupasingha and Goetz (2005) developed this variable from 1990 to 2005 at the county level. I employed their social capital measure for 2005. They

have used social units to compute this index. These types of social units included bowling centers, civic and social associations, physical fitness facilities, religious organizations, sports clubs, political organizations, professional organizations, business associations, and other labor organizations in a county. County level data was not ideal to use in this dissertation since the analysis was based on the school level data, but this was the closest data set available to the public. Another justification to use this data was its nature. If the social capital accumulation in a community was based on social networking, then it was unlikely that it was bound in a geographical area. Therefore, accessing these social, political or educational associations was not limited for any individual in a community.

3.8 Primary Schools MCT Score

For High Schools, the ability of entering students was viewed as an important factor that may influence efficiency. A school with many high performing students would be different from a school with many low performing students, so a measure of Primary Schools MCT score was used as an additional exogenous variable for High Schools. Previous studies did not control for this factor.

The student level of observation would be the ideal way to control for the level of student ability at the beginning of high school, but including this variable was not possible due to unavailability of such data. I began with two assumptions before I computed a proxy variable. The first assumption was that students from primary schools can only transfer to high schools (9^{th} grade through 12^{th} grade), since students can stay in K-12 Schools until they finish 12^{th} grade. The second assumption was that a high school

can draw students from a 15 mile radius of its location[11]. Then I calculated the 8th Grade MCT score variable using the GIS technique where I computed average school input in terms of their MCT scores for a particular high school market.

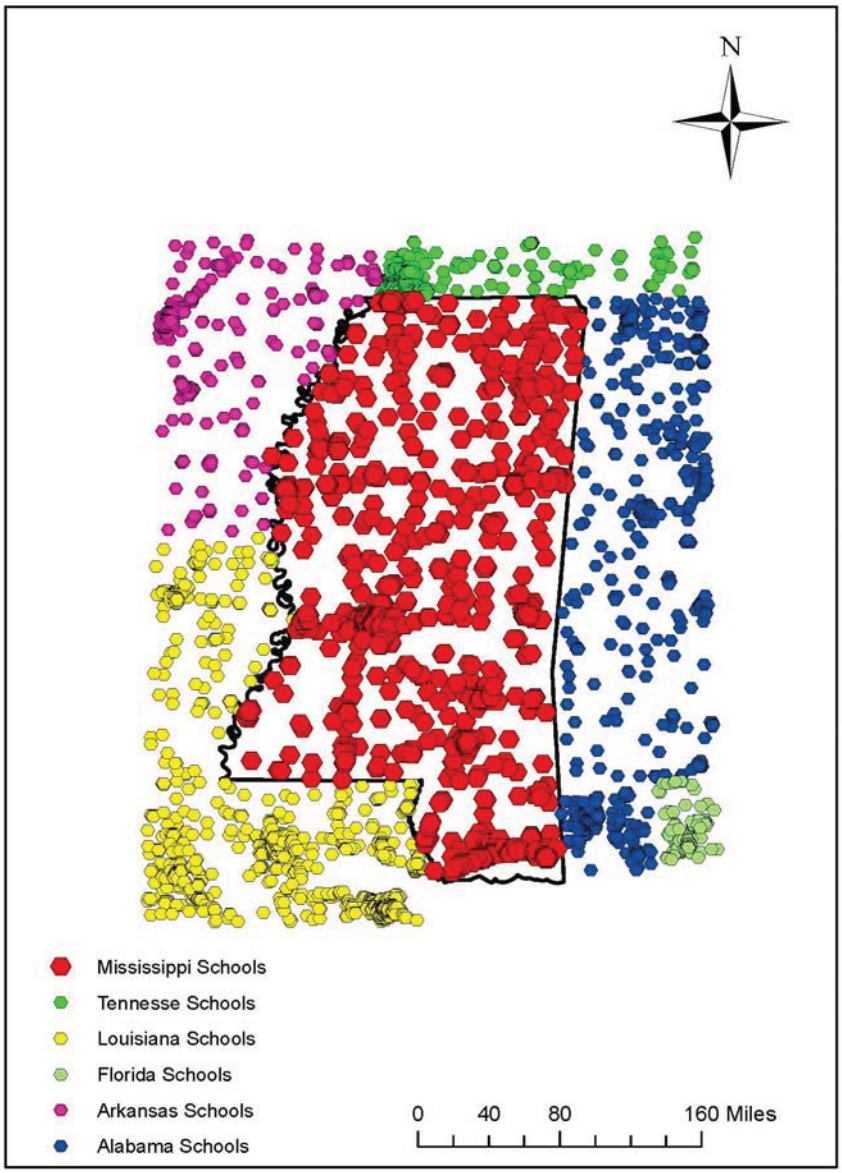


Figure 3.1 Schools in Mississippi and Neighbor States

[11] As such there is no reason to pick 15 miles radius. I have calculated the market quality index variable for 5 miles and 25 miles also. The results will be available upon request.

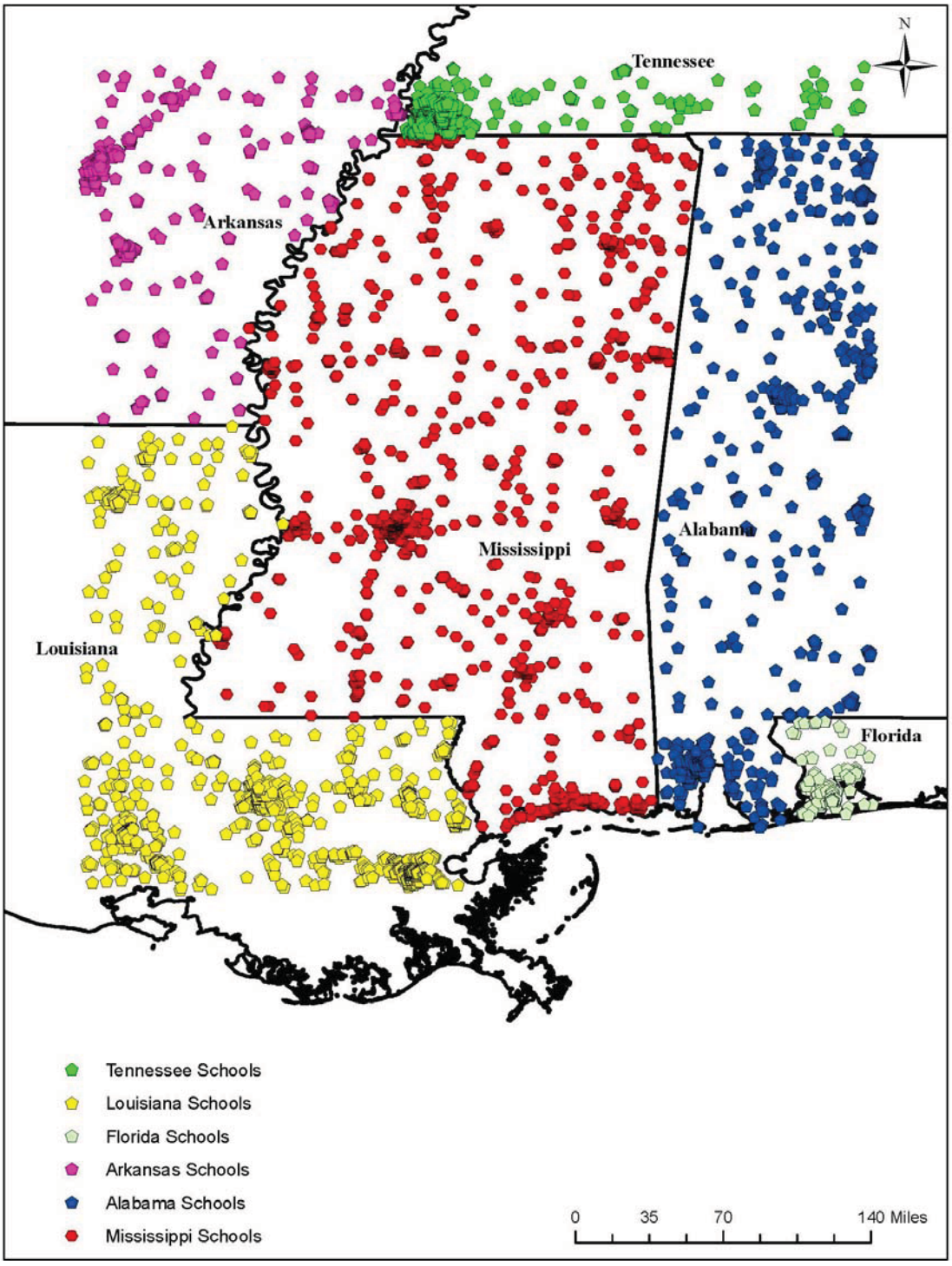


Figure 3.2 Schools in Mississippi and Neighbor States

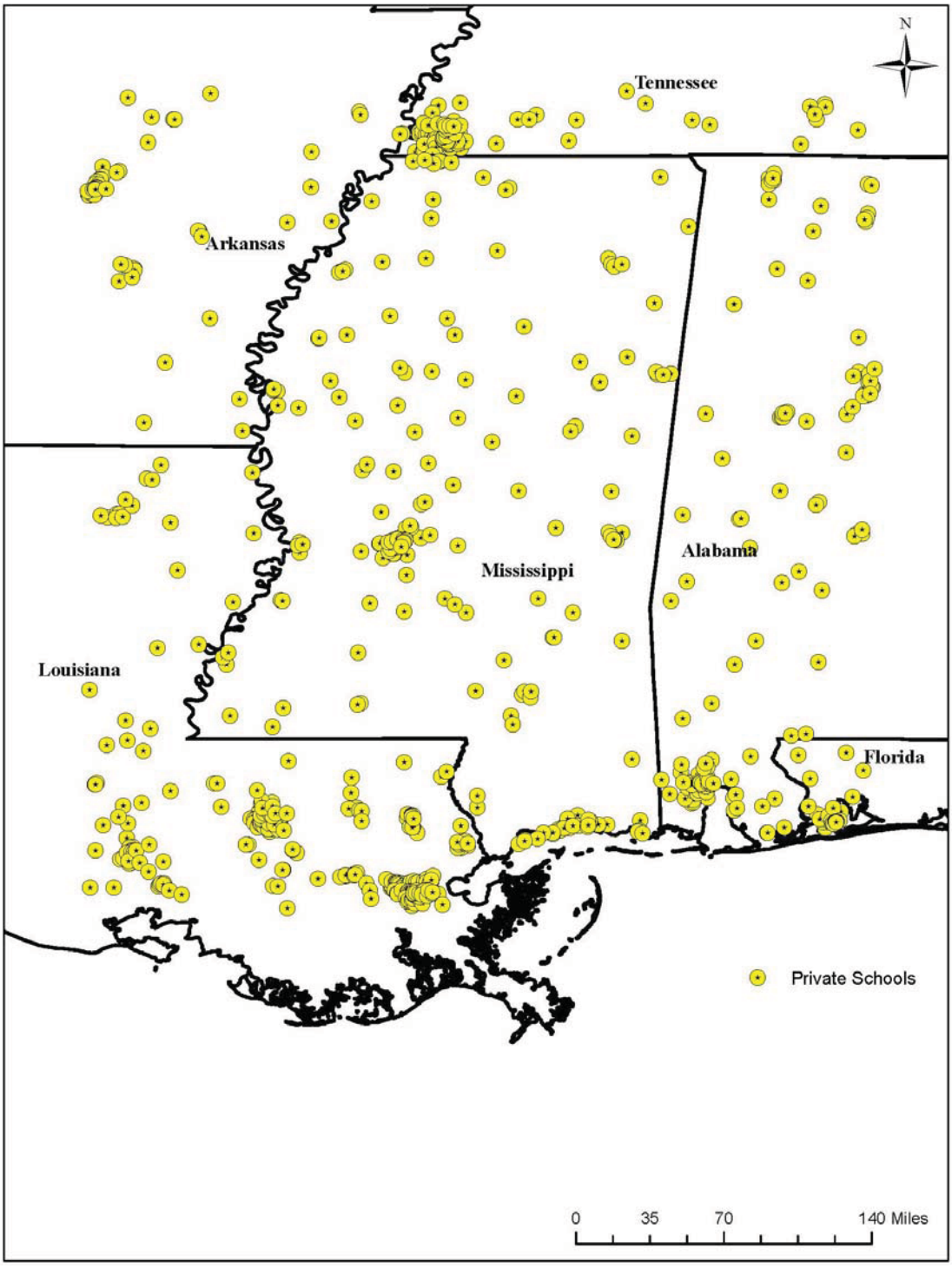


Figure 3.3 Private Schools in Mississippi and Neighbor States

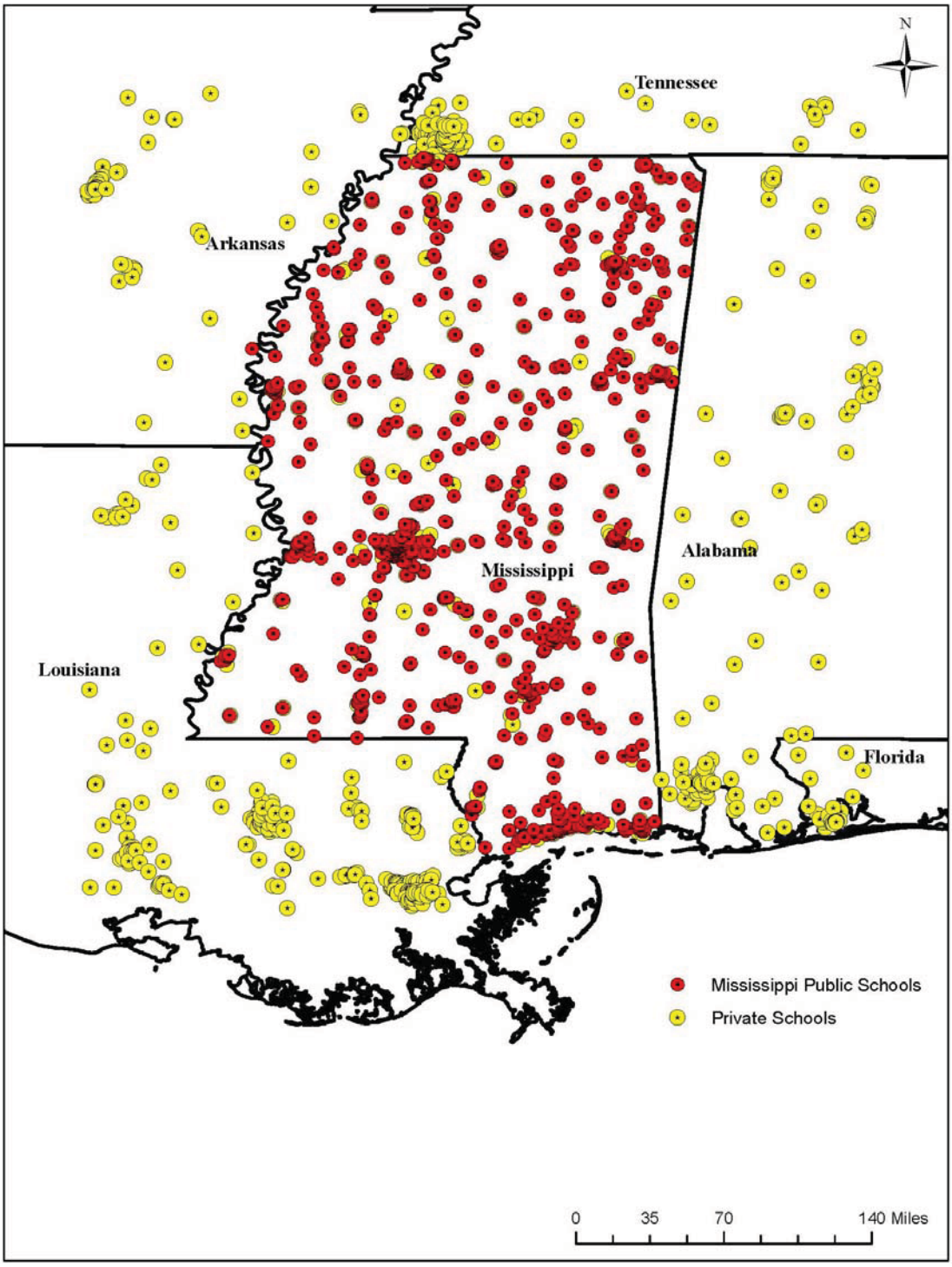


Figure 3.4 Public and Private Schools in Mississippi and Private Schools in Neighbor States

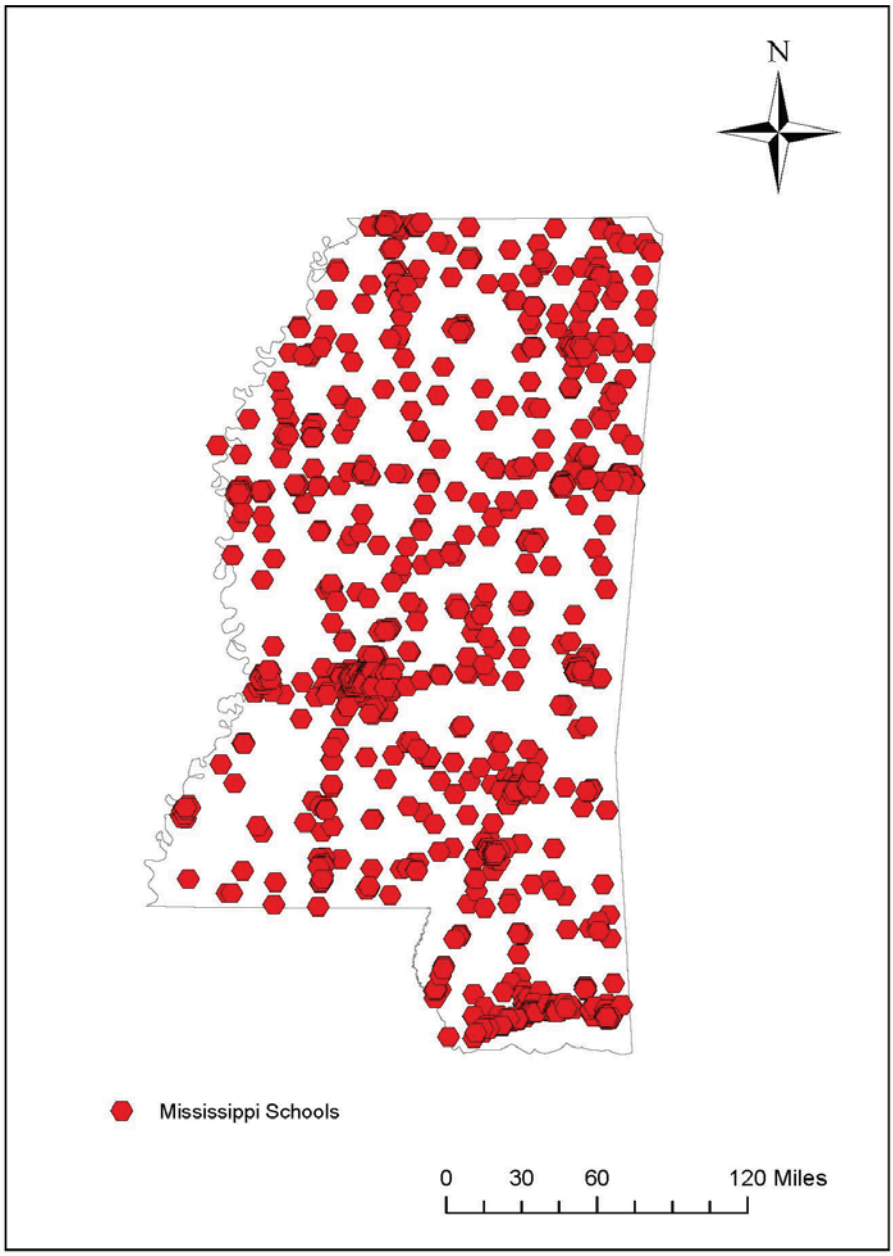


Figure 3.5 Public and Private Schools in Mississippi

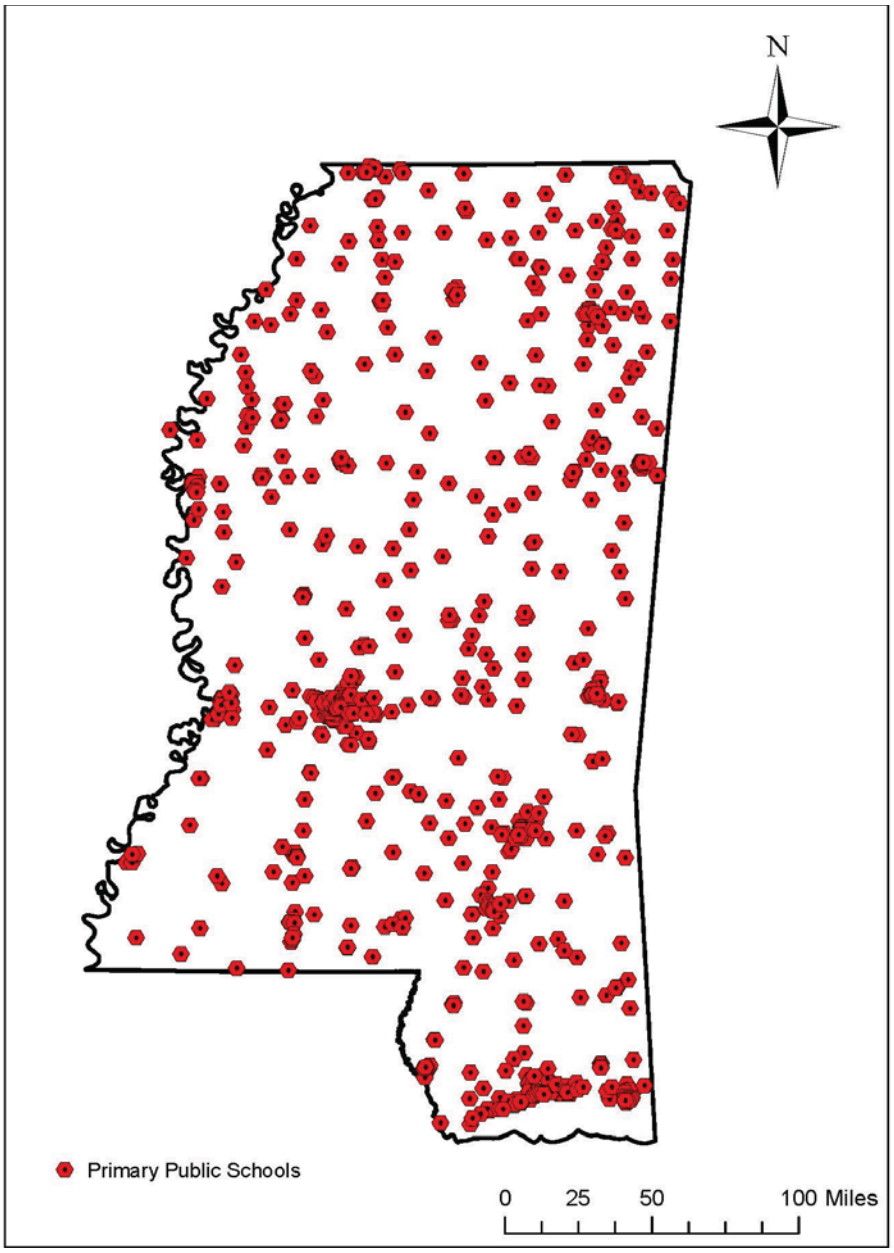


Figure 3.6 Mississippi Primary Public Schools

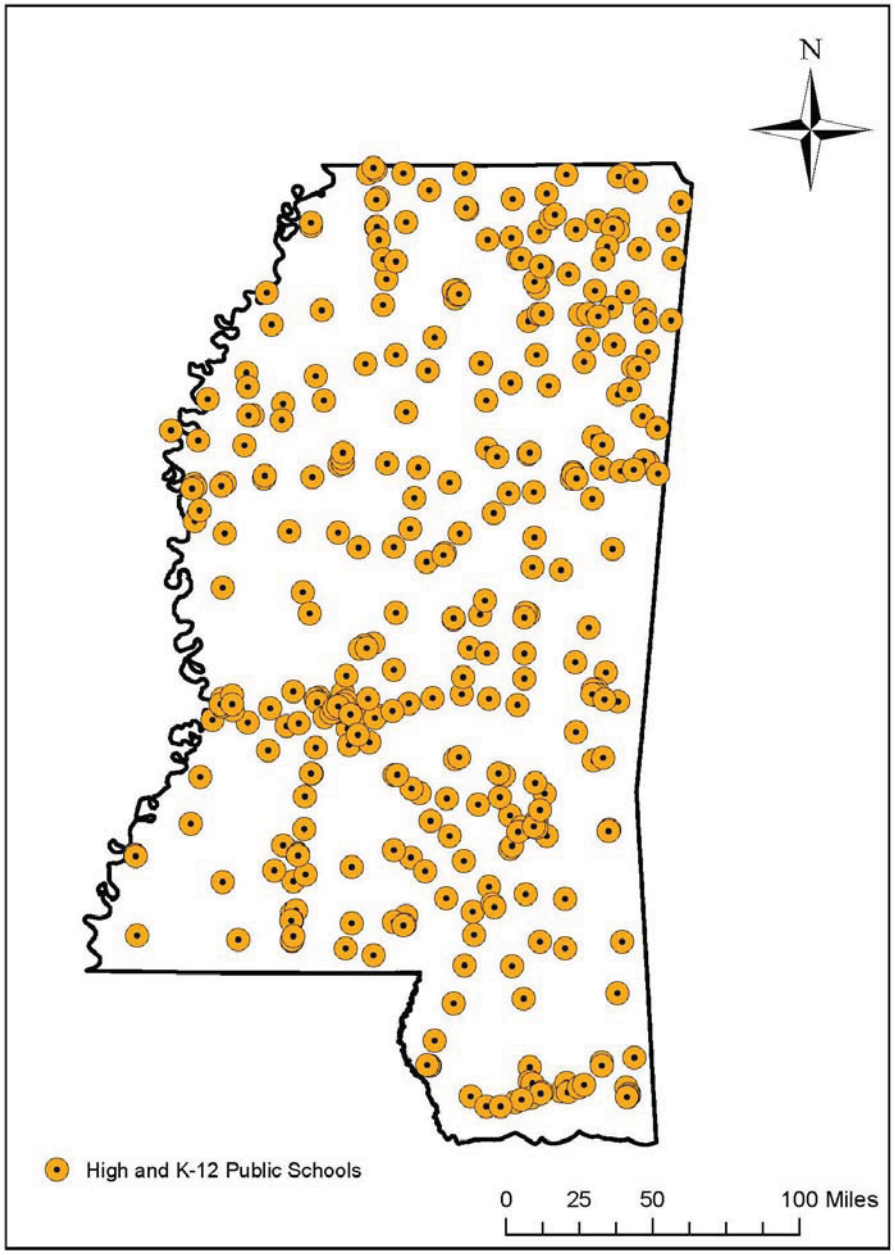


Figure 3.7 High and K-12 Public Schools in Mississippi

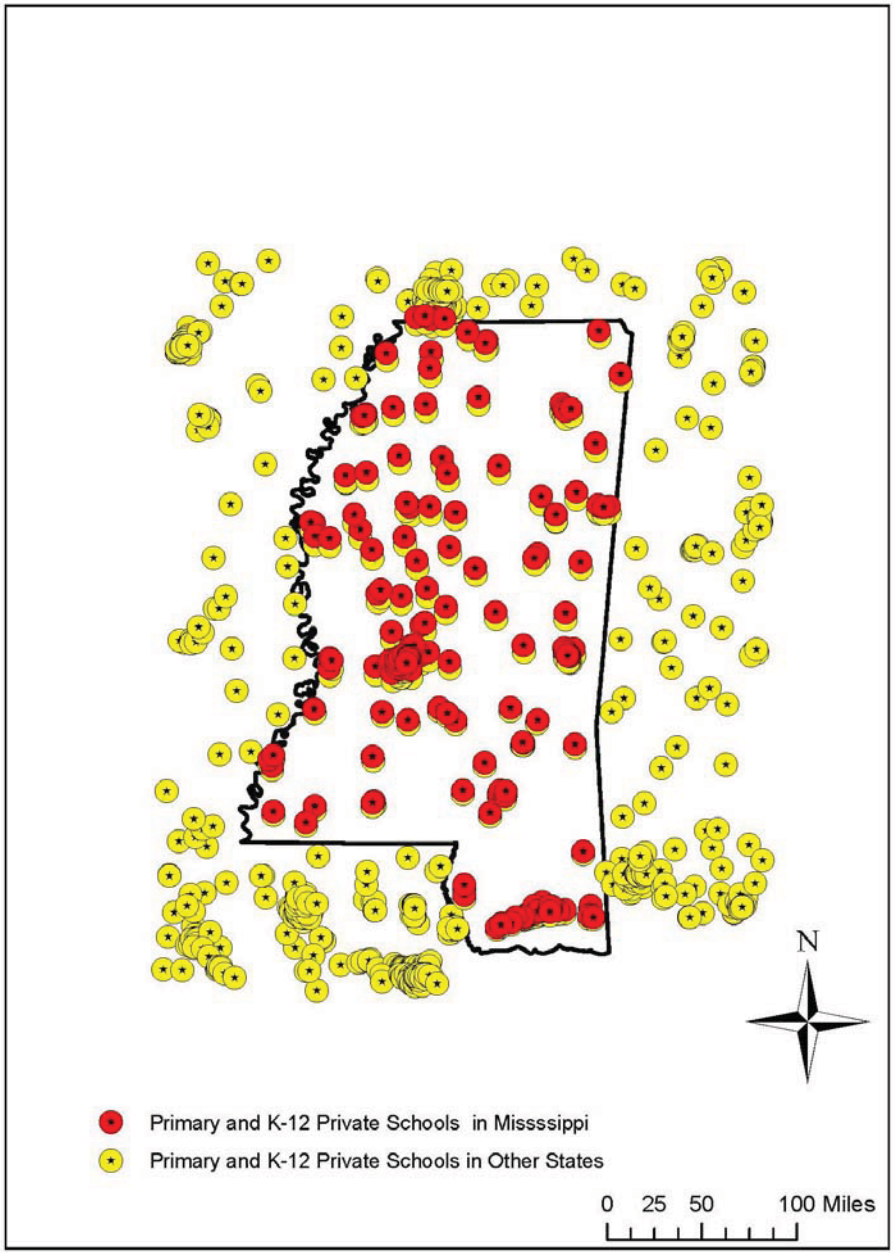


Figure 3.8 Primary and K-12 Private Schools in Mississippi and Neighbor States

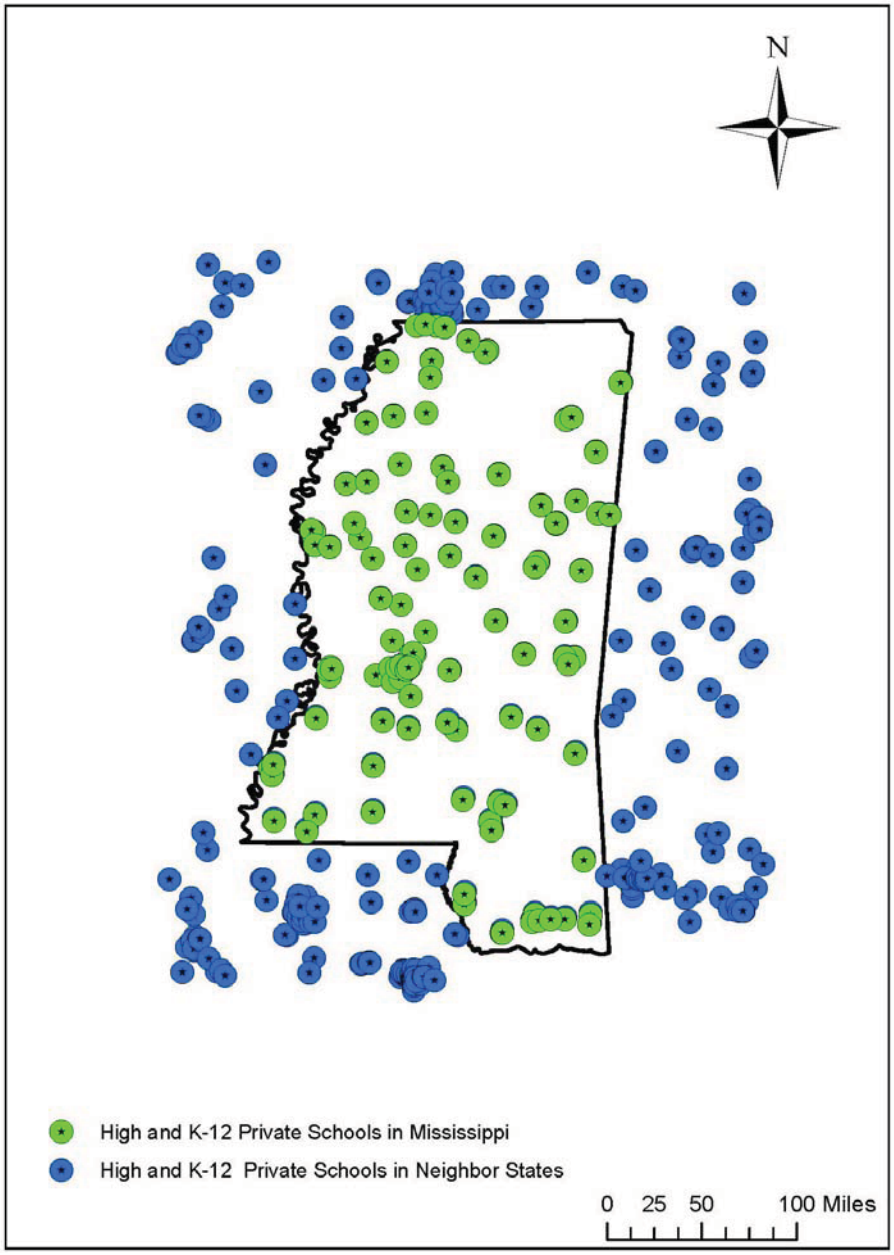


Figure 3.9 High and K-12 Private Schools in Mississippi and Neighbor States

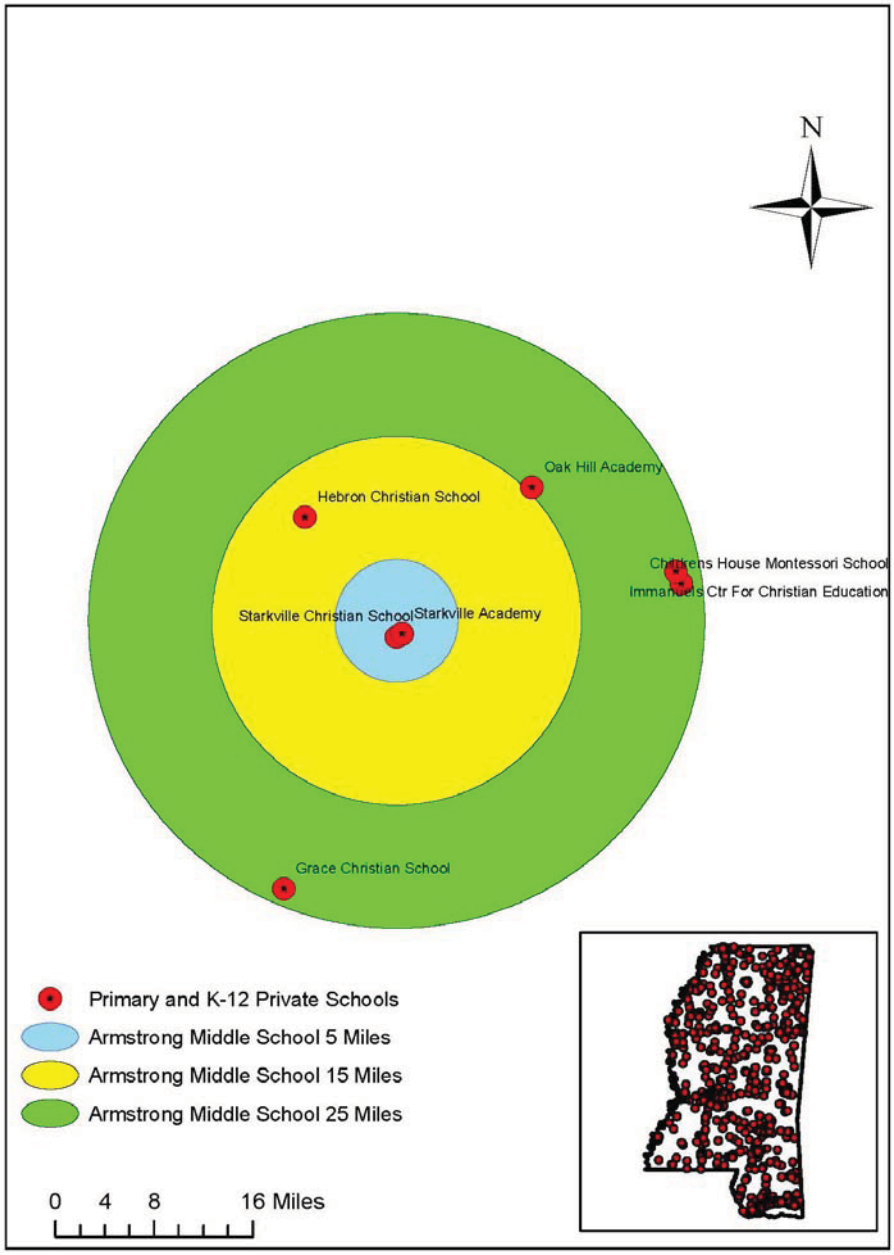


Figure 3.10 School Competition Index for Armstrong Middle School, Starkville, MS

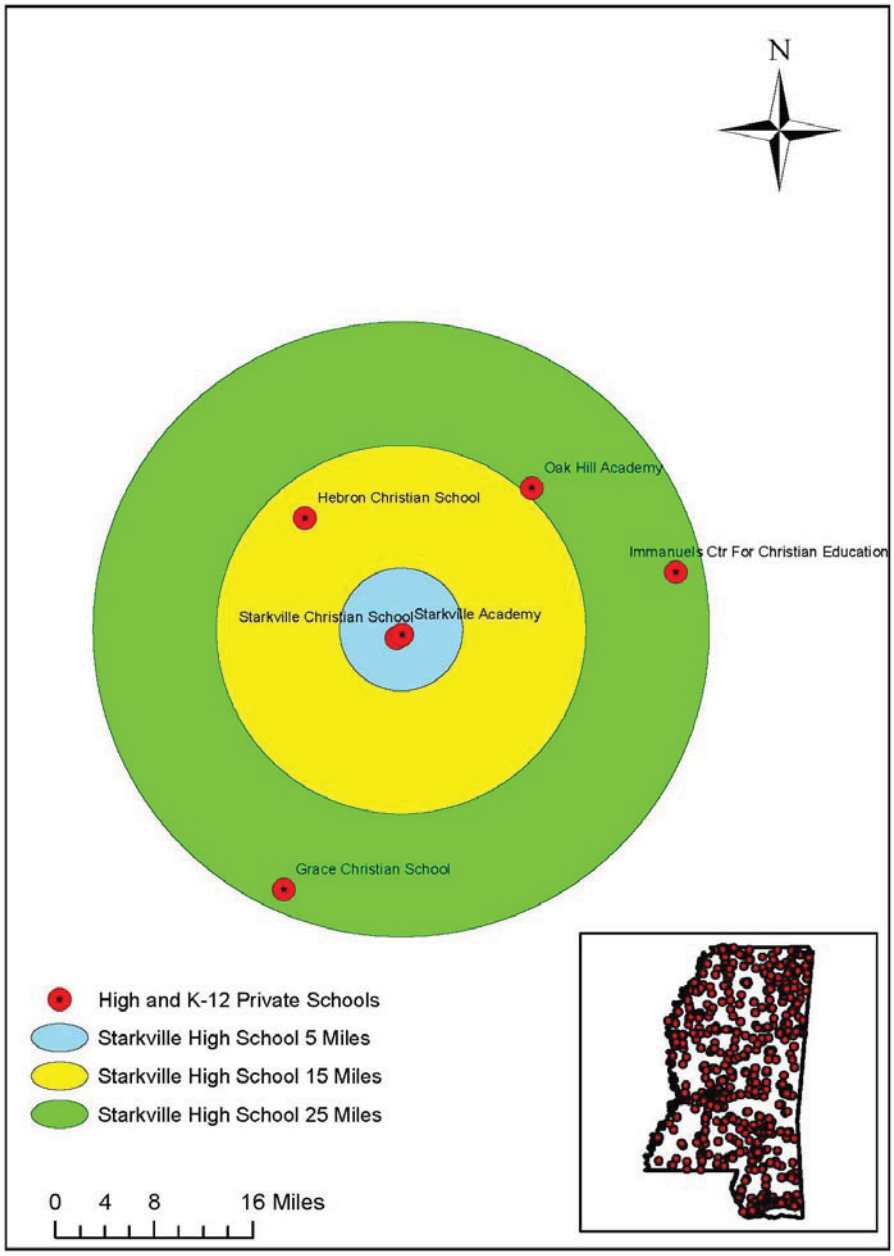


Figure 3.11 School Competition Index for Starkville High School, Starkville, MS

CHAPTER IV

DATA

The data used in this study were obtained from reports compiled by the Mississippi Department of Education. The data were for the academic year 2005-2006. Most of the variables were collected from the Mississippi Report Card (MRC), published annually by the Mississippi Board of Education. The data included the number of proficient performers on the Mississippi Curriculum Test (MCT) and Subject Area Testing Program (SATP) examinations, enrollment, students' demography, and the number of students' receiving reduced price or free lunches.

Elementary schools generally offered pre-kindergarten to fifth or sixth grade, middle schools offered sixth through eighth grade, secondary schools offered grades nine through twelve, with some high schools offering tenth through twelfth grade classes. There were also "combined schools" including combinations of any grade from one through twelve. On the other hand, private schools generally offered grades one through twelfth; hence, it was difficult to estimate the effect of competition from private schools on public schools at the individual level. In previous research, an individual grade was often isolated from the school to measure school performance. For example, Adkins and Moomaw (2005) used only third, seventh, ninth, and twelfth grades, Hanushek and Rivkin (2001) used fourth through sixth grade, and Figlo and Stone (1997) used the tenth grade. But in application it was almost impossible to isolate an individual grade from a school, since all students in a school shared the same inputs that were aggregated when

reported. Hence, measuring *school* efficiency from this isolated grade may have produced deceptive estimates.

The categorization of a school was based upon the range of grades offered by a school. For this study, I grouped Mississippi public and private schools into three categories based on grade levels: elementary and middle schools (Primary Schools, hereafter) and grades 9 to 12 (High Schools, hereafter) and combined schools (K-12 Schools, hereafter). Including K-12 private schools was reasonable because most offer combinations of classes ranging from grade one through grade twelve. I excluded a few schools from the sample since their output from the MCT or SATP examination and some other variables were not available. The final sample data set included 90 Primary Schools (8^{th} grade), 64 High Schools and 87 K-12 Schools in Mississippi. Efficiency should not be compared between these groupings because the required standardized tests (i.e. output) were different between grade levels. The MCT examination at the time of this study included three different subjects, Reading, Language and Mathematics, and the SATP examination included four different subjects, Algebra I, U.S. History, Biology I, and English II.

An education production function for each school was estimated so that the school could be ranked, in terms of technical efficiency, among its peer schools. Output in the production function, is the proficiency rate variable y as shown in equation (1), namely, the percent of proficient students on the MCT examination (Mississippi Curriculum Test) for Primary Schools and the SATP examination (Subject Area Testing Program) for High Schools and K-12 Schools. MCT and SATP were the standardized tests conducted by the Mississippi Board of Education, and the testing process was homogenous across schools in the state. Following Cho (2009), I employed the proficient performers' rate in MCT

test or SATP as output. For this dissertation I followed Marlow (1997) and Arum (1996) to select grade 8 data for Primary Schools, while High Schools and K-12 Schools used grade 12 data.

Student performance should indicate the overall learning experience which helps a student to develop his or her analytical, mathematical, and comprehensive skills. In this dissertation I used different measures of educational performance as output. The different available measures included the number of proficient performers in Overall, Reading, Mathematics and Language examinations for Primary Schools, and Overall, Algebra, History, Biology and English examinations for High Schools and K-12 Schools. The average proficiency rates for these examinations were 28.49, 28.73, 30.55 and 26.19 for grade 8 respectively. The mean proficiency rates were 50.92, 44.91, 59.10, 66.63 and 33.03 respectively for High Schools and 52.61, 48.76, 59.78, 67.64 and 34.27 respectively for K-12 Schools. Detailed definitions for these various outputs were reported in the Table 4.1 for Primary Schools and in the Table 4.2 for High Schools and K-12 Schools.

For estimation of Equations (3), (4), and (5), I divided the explanatory variables into two categories; inputs, and other explanatory variables. The inputs, which were directly related to the production function, included school building area per student, general expenditures per student, textbook and instructional expenditures per student, number of teachers and staffs (non-teaching duties) per student. For grade 8, average school enrollment was 608 students; mean school employment was 38.35 full-time and part-time teachers, and 21.98 staff for the academic year. On average, Primary Schools spent $185.39 per student on general expenditures, which included school maintenance costs, and other costs. Almost $70.42 per student went toward textbook expenditures,

which included textbooks and related materials expenditures. The average 8th grade school building area per student was 128.67 square feet.

In the case of High Schools and K-12 Schools, average school enrollment was 727 students for High Schools and 615 students for K-12 Schools. Schools employed 46.43 (41.41) full-time and part-time teachers with 26.38 (24.91) staff for each High School (K-12 School) during the academic year 2005-06. These High Schools spent approximately $301.22 per student on general expenditures and $76.97 per student for textbook expenditures per year, whereas K-12 Schools spent $269.76 per student on general expenditures and $87.79 per student on textbook expenditures. This was much higher than Primary Schools. Secondary student educational costs were always higher than those obtained for elementary students due to expenses for science laboratories, computers and other technical infrastructure. Also, the High Schools and K-12 Schools building areas were much larger than the Primary Schools in Mississippi; on average, a school building area per student was 199.21 and 161.95 square feet respectively.

Other explanatory variables that were indirectly related to the school production function were divided into three categories based on their relatedness with student outcomes, such as discretionary, non-controllable, and exogenous factors. Discretionary labor inputs included characteristics of the principal, teachers, and staff. Discretionary labor inputs employed in my model were the principal's race, gender and experience, teacher's race, gender, degree and experience and staff's race, gender and experience.

On average, 30 percent of Primary Schools in the sample had a black principal, and 36 percent were managed by a female principal. On average, Primary School principals had 21.03 years of experience. In High Schools, 37 percent of principals were black and 18 percent were female, but in K-12 Schools, only 28 percent and 18 percent

were black and female with around 22 years of experience. Primary Schools employed nearly 22 persons as staff (non-teaching workers) and 34.59 percent of them were black. Almost 73.83 percent were female with mean work experience of 11.47 years on average. The mean number of staff in secondary public schools in Mississippi was about 26 people for High Schools and 25 for K-12 Schools. On average, 38 (29) percent of staff was black and 54 (63) percent of total staff was female with an average of 13 (12) years of work experience for High (K-12) Schools. The last set of discretionary input variables included teacher's race, gender, experience and education. As Table 4.1 shows, on average, 26 percent of Primary Schools teachers were black and almost 82 percent of total teachers were female with an average of 12.28 years of teaching experience. On the other hand, 31.61 (25.50) percent and 36.52 (29.61) percent of High (K-12) public school teachers were black and female with an average of 13.22 (13.28) years of teaching experience. The mean percent of master teachers in Primary Schools was 36.92 and 37.83 (34.54) for High (K-12) Schools.

Variables in the non-controllable inputs category were associated with students' demographic background. The mean percent of black students in Primary School was 48.83 percent and almost 64.14 percent of total students received free lunches. Black student enrollment in High Schools was 58 percent and 48 percent for K-12 Schools, with 61 percent and 59 percent of students enrolled in free lunch programs respectively.

The last set of variables included in this analysis cover several exogenous factors. School geographical location, social capital index, religious enrollment and school competition index were used in this dissertation as exogenous factors. 85 percent of the total Primary Schools in the sample were located in small-city/rural areas and 82 (86) percent of total High Schools (K-12) were located in small-city/rural areas. For the other

exogenous variables, I used markets with a 5 mile radius; 15 mile radius, and 25 mile radius. Therefore, the mean for these exogenous variables varied with the market size employed. On average, social capital indices were 7.51, 36.85, and 68.24 for the market of 5, 15, and 25 mile radius respectively for Primary Schools, and 8.03 (4.59) , 23.06 (7.29) and 41.96 (26.99) for High Schools (K-12) in Mississippi. Likewise, the percentage of religious enrollment also varied depending upon the market size. In a smaller market (5 mile), medium market (15 mile), and large market (25 mile) the percentage of students enrollment in religiously affiliated private schools was 0.29 percent, 0.58 percent and 0.71 percent respectively for Primary Schools and 0.33 (0.20) percent, 0.57 (0.49) percent and 0.65 (0.64) percent respectively for High Schools (K-12). The last exogenous variable analyzed was the school competition index, which varied from 1.21 (5 miles) to 1.33 (25 mile) for Primary Schools and 0.21 (5 mile) to 0.23 (25 mile) for High Schools, but the mean competition ranged from 0.09 (5 mile) to 0.11 (25 mile) for K-12 Schools in Mississippi. Detailed descriptive statistics were provided in Table 4.1 for Primary Schools and Table 4.2 for High Schools and K-12 Schools.

Table 4.1 Variable Descriptions and Summary Statistics for Primary Schools (8th Grade) [a]

Dependent variable	Variable definition and source	Mean (Std. dev.) Graduating Grades (N=344)	Mean (Std. dev.) 8th Grade (N=90)
MCT Overall	Mean percent of students passed Mississippi Curriculum Test at proficient and above levels across all subjects. (% of students passed MCT Reading at proficient and above levels + % of students passed MCT Mathematics at proficient and above levels + % of students passed MCT Language at proficient and above levels / 3)	35.72 (8.09)	28.49 (7.88)
MCT Reading	Mean percent of students passed Mississippi Curriculum Test at proficient and above levels in Reading examination. (Number of students passed MCT Reading at proficient and above levels / total number of students tested in MCT Reading examination in that grade)	37.55 (8.56)	28.73 (8.44)
MCT Mathematics	Mean percent of students passed Mississippi Curriculum Test at proficient and above levels in Mathematics examination. (Number of students passed MCT Mathematics at proficient and above levels / total number of students tested in MCT Mathematics examination in that grade)	36.20 (8.69)	30.55 (8.79)
MCT Language	Mean percent of students passed Mississippi Curriculum Test at proficient and above levels in Language examination. (Number of students passed MCT Language at proficient and above levels / total number of students tested in MCT Language examination in that grade)	33.41 (8.46)	26.19 (7.68)
Explanatory variables:			
Inputs:			
School Building Areas per Student	Total area of a school in square feet	128.67 (55.51)	142.53 (64.11)
General Expenditures per Student	Total general expenditure including school maintenance cost and other supplies in dollar	200.82 (119.02)	185.39 (74.81)
Textbook Expenditures per Student	Total text book and instructional expenditure in dollar	76.33 (73.26)	70.42 (59.04)

4.1 (continued)

Dependent variable	Variable definition and source	Mean (Std. dev.) Graduating Grades (N=344)	Mean (Std. dev.) 8th Grade (N=90)
Students per Teacher	Mean number students per teachers in a school	14.29 (68.96)	13.33 (76.00)
Students per Staff	Mean number of staff per student in a school	17.85 (38.46)	20.83 (38.46)
Discretionary Inputs:			
Principal's Race	Principal's race, Dummy variable 0 = Black principal 1= White principal	0.37 (0.49)	0.28 (0.45)
Principal's Gender	Principal's gender, Dummy variable 0= Female principal 1=Male Principal	0.18 (0.39)	0.13 (0.33)
Principal's Experience	Mean years of experience	22.19 (9.05)	22.29 (8.76)
Staff	Mean number of staff	22.79 (12.56)	21.98 (10.99)
Staff's Race	Percentage of staff that is black (total number of black staff / total number of staff)	42 (33)	34.59 (32.86)
Staff's Gender	Percentage of non-teaching staff that is female (total number of female staff / total number of staff)	89 (12)	73.83 (12.08)
Staff's Experience	Mean number of years experience	10.79 (2.93)	11.47 (2.77)
Teacher	Mean number of teachers	32.48 (14.69)	38.35 (17.49)
Teacher's Race	Percentage of teachers that is black (total number of black teachers / total number of teachers)	28 (27)	26 (28.49)
Teacher's Gender	Percentage of teachers that is female (total number of female teachers / total number of teachers)	92 (8.00)	82 (7.02)
Teacher's Experience	Mean number of years experience	12.84 (2.98)	12.28 (2.62)
Teacher's Education	Percentage of teachers with master degree (total number if master degree holder teachers / total number of teachers)	38 (12)	36.92 (10.52)
Enrollment	Mean number of students in school	517	608

4.1 (continued)

Dependent variable	Variable definition and source	Mean (Std. dev.) Graduating Grades (N=344)	Mean (Std. dev.) 8th Grade (N=90)
Non-controllable Inputs:			
Black Students	Percentage of students that is black (total number of black students/total number of students)	56 (33)	48.43 (34.08)
Free Lunch Program Students	Percentage of students receiving free lunch (total number of students receiving free lunch /total number of students in a school)	69 (25)	64.14 (22.95)
Exogenous Factors:			
Small-city/rural	School Location Dummy 0 = urban fringe of a mid-size city, urban fringe of a large city, mid-size city, suburb-Midsize 1 = Small city, large town, rural, rural inside CBSA, rural outside CBSA, rural distant, rural fringe, rural remote, small town, town remote	0.79 (0.41)	0.85 (0.35)
Social Capital Index	Number of social organizations around†		
	5 miles of a public school	7.92 (17)	7.51 (18.65)
	15 miles of a public school	40.63 (68.59)	36.85 (66.34)
	25 miles of a public school	71.43 (91.88)	68.24 (96.54)
Religious Enrollment	Percentage of students enrolled in a religiously affiliated school around††		
	5 miles of a public school	0.42 (0.46)	0.29 (0.44)
	15 miles of a public school	0.66 (0.40)	0.58 (0.43)
	25 miles of a public school	0.73 (0.28)	0.71 (0.32)
School Competition Index	School competition index computed from total number of private schools using gravity access model ($A_i = 1/E_i \sum_{j \neq i} E_j d_{ij}^{-2}$) around†††		
	5 miles of a public school	1.21 (7.79)	0.52 (1.18)
	15 miles of a public school	1.25 (7.80)	0.54 (1.82)
	25 miles of a public school	1.33 (7.81)	0.56 (1.83)

[a] This is a subset of the total public schools in Mississippi which include Primary Schools and 8th grade public schools

Source: Dependent variables, inputs variables, discretionary inputs variables, non-controllable inputs variables - Mississippi Department of Education
†- National Center for Education Statistics (NCES)
†† - The Northeast Regional Center for Rural Development
††† - Mississippi Department of Education and National Center for Education Statistics (NCES)

Table 4.2 Variable Descriptions and Summary Statistics for High Schools and K-12 Schools [b]

Dependent variable	Variable definition and source	Mean (Std. dev.) High Schools (N=87)	Mean (Std. dev.) K-12 Schools (N=64)
SATP Overall	Percent of students passed in Subject Area Test Program at proficient and above level across all subjects. (Percent of students passed Algebra I at proficient and above levels+ Percent of students passed History at proficient and above levels + Percent of students passed Biology at proficient and above levels + Percent of students passed English at proficient and above levels / 4)	50.92 (13.32)	52.61 (14.40)
SATP Algebra	Percent of students passed in Subject Area Test Program in Algebra I at proficient and above level (Number of students passed SATP Algebra I at proficient and above levels / total number of students tested in SATP Algebra examination in that grade)	44.91 (20.55)	48.76 (19.81)
SATP History	Percent of students passed Subject Area Test Program in History at proficient and above level (Number of students passed SATP History at proficient and above levels / total number of students tested in SATP History examination in that grade)	59.10 (16.37)	59.78 (18.46)
SATP Biology	Percent of students passed in Subject Area Test Program in Biology at proficient and above level (Number of students passed SATP Biology at proficient and above levels / total number of students tested in SATP Biology examination in that grade)	66.63 (18.38)	67.64 (18.15)
SATP English	Percent of students passed in Subject Area Test Program in English at proficient and above level (Number of students passed SATP English at proficient and above levels / total number of students tested in SATP English examination in that grade)	33.03 (13.32)	34.27 (15.18)
Explanatory variables:			
Inputs:			
School Building Areas per Student	Total area of a school in square feet	199.21 (84.46)	161.95 (51.28)
General Expenditures per Student	Total general expenditure including school maintenance cost and other supplies in dollar	301.22 (224.77)	269.76 (112.63)
Textbook Expenditures per Student	Total text book and instructional expenditure in dollar	76.97 (52.39)	87.79 (36.26)

4.2 (continued)

Dependent variable	Variable definition and source	Mean (Std. dev.) High Schools (N=87)	Mean (Std. dev.) K-12Schools (N=64)
Students per Teacher	Number of students per teachers in a school	15.15 (87.72)	14.29 (67.56)
Students per Staff	Total number of non-teaching workers in a school	26.31 (76.92)	25.00 (64.00)
Discretionary Inputs:			
Principal's Race	Principal's race, Dummy variable 0 = Black principal 1= White principal	0.37 (0.49)	0.28 (0.45)
Principal's Gender	Principal's gender, Dummy variable 0= Female principal 1= Male Principal	0.18 (0.39)	0.13 (0.33)
Principal's Experience	Mean years of experience	22.19 (9.05)	22.29 (8.76)
Staff	Mean total number of non-teaching staff	26.28 (15.31)	24.91 (9.17)
Staff's Race	Percentage of non-teaching staff that is black (total number of black staff / total number of staff)	38.08 (32.91)	29.77 (34.43)
Staff's Gender	Percentage of non-teaching staff that is female (total number of female staff / total number of staff)	54.17 (10.45)	63.00 (12.22)
Staff Experience	Mean number of years experience	13.21 (2.78)	12.28 (2.13)
Teacher	Mean total number of teachers	46.43 (22.93)	41.41 (14.16)
Teacher's Race	Percentage of teachers that is black (total number of black teachers / total number of teachers)	31.61 (30.47)	25.50 (31.03)
Teacher's Experience	Mean number years of experience	13.22 (2.49)	13.28 (2.02)
Teacher's Education	Percentage of teachers with master degree (total number if master degree holder teachers / total number of teachers)	37.83 (10.80)	34.54 (9.49)
Enrollment	Total number of students in school	727 (400)	615 (254)

4.2 (continued)

Dependent variable	Variable definition and source	Mean (Std. dev.) High Schools (N=87)	Mean (Std. dev.) K-12Schools (N=64)
Non-controllable Inputs:			
Black Students	Percentage of students that is black (total number of black students/total number of students)	58 (33.30)	46.81 (32.82)
Free Lunch Program Students	Percentage of students receiving free lunch students (total number of students receiving free lunch /total number of students in a school)	61.09 (25.14)	59.50 (22.07)
Exogenous Factors			
Small-city/rural	School Location Dummy 0 = urban fringe of a mid-size city, urban fringe of a large city, mid-size city, suburb-Midsize 1 = Small city, large town, rural, rural inside CBSA, rural outside CBSA, rural distant, rural fringe, rural remote, small town, town remote	0.82 (0.38)	0.96 (0.18)
Social Capital Index	Number of social organizations around†		
	5 miles of a public school	8.03 (11.44)	4.59 (1.09)
	15 miles of a public school	23.06 (38.90)	7.29 (4.79)
	25 miles of a public school	41.96 (50.21)	26.99 (32.16)
Religious Enrollment	Percentage of students enrolled in a religiously affiliated school around††		
	5 miles of a public school	0.33 (0.46)	0.20 (0.41)
	15 miles of a public school	0.57 (0.35)	0.49 (0.47)
	25 miles of a public school	0.65 (0.35)	0.64 (0.36)

4.2 (continued)

Dependent variable	Variable definition and source	Mean (Std. dev.) High Schools (N=87)	Mean (Std. dev.) K-12 Schools (N=64)
School Competition Index	School competition index computed from total number of private schools using gravity access model ($A_i = 1/E_i \sum_{j \neq i} E_j d_{ij}^{-2}$) around†††		
	5 miles of a public school	0.21 (0.63)	0.09 (0.31)
	15 miles of a public school	0.22 (0.64)	0.10 (0.32)
	25 miles of a public school	0.23 (0.63)	0.11 (0.32)

[b] This is a subset of the total public schools in Mississippi which include public High Schools and K-12 Schools
Source: Dependent variables, inputs variables, discretionary inputs variables, non-controllable inputs variables - Mississippi Department of Education
†- National Center for Education Statistics (NCES)
†† - The Northeast Regional Center for Rural Development
††† - Mississippi Department of Education and National Center for Education Statistics (NCES)

This dissertation has different avenues to advance the existing research on public and private school competition. By far, the existing research in this field has not included some unique input variables, which are directly related to the school productivity and student performance. For example, school size (total square feet), instructional expenditures, textbook and other technical expenditures are input variables, which can influence the school productivity and hence student performance. Previous studies fail to incorporate such variables into their models. Another major contribution is the competition variable. *The key purpose for this dissertation is to estimate the effect of competition from private schools on public school efficiency in Mississippi by defining a market based on the geographical definition and then create school competition index*

that accounts for observable market attributes. Employing this unique set of input variables along with the different exogenous factors should provide a more comprehensive set of results than previously obtained.

CHAPTER V

RESULTS I

5.1 Overview

This chapter represents the findings from the estimated models. Results from the two-stage stochastic frontier model are reported in this chapter. Further, it is segregated into three sections. The first section reports results from the production frontier and second stage analysis for 8th grade Primary Schools. The second section repeats this approach for High Schools while section three uses K-12 Schools for the analysis. I estimate other grades and subjects to check the robustness of my results and in the interest of brevity I include only selected results in this dissertation. This chapter concludes with a discussion of other specifications of the model. The results from the single equation approach are reported in Chapter VI.

5.2 Primary School Results

Following Aigner, Lovell and Schmidt (1977) and Meeusen and Van den Broeck (1977), maximum likelihood estimation was employed to estimate the parameters of a stochastic production frontier (equation 3 and 6) and then used to examine the factors contributing to this inefficiency. The software program Limdep (NLOGIT 4.0) was used to perform this parameter estimation.

The school-level analysis used the percentage of proficient performers, based on the MCT Overall examination in 8th grade, as a dependent variable, which was a proxy for Primary School output. Input variables, including capital (building area, general

expenditures and textbook expenditures per student) and labor (number of teachers and instructors per student), were included in the production frontier model.

5.2.1 Stochastic Frontier Results: Primary Schools

I presented the stochastic frontier results in Table 5.1. These results were based on students' performance in 8th grade, using the MCT Overall scores. It was clear from this table that some of these inputs were significantly associated with output. The building area per student and general expenditures per student were positively related with a school's MCT Overall proficiency rate. Thus, schools with more space and higher levels of expenditures had a higher student performance. The textbook expenditures and number of teachers and staff variables were negatively related to students' performance, but both of these variables were insignificant. Hence, increasing textbook expenditures and hiring more teachers and staff will not significantly increase the number of proficient performers in these public schools in Mississippi. Technical efficiency was reported in the last row of this table. On average, Mississippi 8th grade public schools were 75 percent efficient.

Table 5.1 Results from Stochastic Frontier Analysis for 8th Grade

Variables /Dependent Variable	Log MCT Overall
Constant	2.36***
	(0.45)
Log of Building Area per Student	0.24**
	(0.13)
Log of General Expenditures per Student	0.26**
	(0.12)
Log of Textbook Expenditures per Student	-0.05
	(0.05)
Log of Number of Teachers and Staff per Student	-0.25
	(0.24)
Log likelihood function	-6.57
Technical Efficiency	
Mean	0.75
Min	0.28
Max	0.97

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

5.2.2 Determinants of Efficiency: Primary Schools

I used equation (4) to estimate the second stage of the frontier model where I employed inefficiency scores from the first stage of the frontier model as the dependent variable. In Table 5.2 I reported the 8th grade regression results. This table showed how discretionary inputs, non-controllable inputs and exogenous factors influenced technical efficiency. In this school market, the variables for black principal, the percent of black students, the percent of free lunch students, and the school competition index were significant at least at the 10 percent level with the expected signs. The variable for black principal was positively associated with public school inefficiency. The result suggested that a black principal was associated with more inefficiency as compared to a white principal for Primary Schools, while keeping all other factors in the model constant. Hence, an administrator's race was an important factor related to technical efficiency in Primary Schools (Clotfelter, Ladd, Vigdor and Wheeler, 2006).

Table 5.2 Determinants of Efficiency: Primary Schools (8th Grade)

Variables	8th Grade(25 Mile) Coefficient	Std. Error
Dependent variable		
Inefficiency Score in Proficient Rate in MCT Overall		
Independent variables		
Constant	-0.119	0.414
Black Principal	0.091**	0.038
Female Principal	0.034	0.031
Experience Principal	-0.003	0.007
Square Experience Principal	0.000	0.000
Percent of Black Staff	-0.059	0.142
Percent of Female Staff	-0.058	0.125
Experience Staff	-0.010	0.034
Square Experience Staff	0.000	0.001
Percent of Black Teachers	0.134	0.157
Percent of Female Teachers	-0.345	0.245
Percent of Master Teachers	-0.196	0.151
Experience Teachers	0.057	0.042
Square Experience Teachers	-0.001	0.002
Percent of Black Students	0.484***	0.095
Percent of Free Lunch Students	0.269***	0.070
Small-city/rural	0.039	0.031
School Competition Index	-0.037***	0.010
Social Capital Index	0.000	0.000
Percent of Religious Enrollment	-0.049	0.035
R-square	0.954	
Adj-R-square	0.942	

N =90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Heteroskedasticty corrected model

Among the non-controllable inputs, the percent of black students and the percent of free lunch students were significant at least at the 10 percent level with the expected sign. Schools with more black students and more students receiving free lunches were less efficient, or else constant. These findings coincided with prior literature.

The school location variable was not significant. Hence, it was hard to claim that a school located in small-city/rural area was less efficient than a school located in an urban area, holding all else equal. Among all other exogenous factors, the school

competition index variable was negatively associated with school inefficiency. *Thus, competition from private schools significantly increased public school efficiency in Mississippi, while keeping all other factors constant.* The last two variables were the social capital index and the percent of religious enrollment. The social capital index was insignificant, hence the social capital stock in a community did not have a significant impact on Primary School efficiency. The last exogenous variable I examined was the percent of religious enrollment, which was insignificant in the equation. Thus, the market share held by religious private schools around a Primary School in Mississippi did not have an effect on Primary School efficiency, while keeping all other factors in the model constant. Therefore, competition from private schools increased public school efficiency in Mississippi, but at the same time private school religious enrollment did not provide any significant competitive pressure on Primary School efficiency.

5.2.3 Discussion

The variables for black principal, the percent of free lunch students, the percent of black students, and the school competition index all had a significant impact on Primary Schools efficiency. At the same time, other variables such as female principal, principal's experience and experience squared, staff's gender, race and experience, teachers' gender, race, experience and degree, school location, social capital index and the percent of religious enrollment were insignificant in this model.

The first hypothesis addressed the relationship between competition and efficiency. Since the effect of competition from private schools had a significant and positive impact on public school efficiency, higher competition was associated with increased public school efficiency, which provided sufficient evidence to reject the first

null hypothesis. This result supported the previous work of Hoxby (1994), Couch, Shughart, and Williams (1993) and Greene and Kang (2004).

The second and third hypotheses addressed students' racial and ethnic backgrounds and their socio-economic status. The results from the Primary School model indicated that the percent of free lunch students related to the inefficiency score positively which lead to a rejection of the null hypothesis that the socio-economic status of students' enrollment had no effect on public school efficiency. This result was similar to previous education studies by Ching (2000), and Dee (1998). The degree of racial and ethnic student enrollment, which was the percent of black students in a school, also had a significant positive relationship with Primary School inefficiency. Thus, Primary School inefficiency was higher if the percent of black students was relatively large. Hence, the degree of racial and ethnic student enrollment was negatively related to Primary School efficiency, leading to a rejection of the null hypotheses. This finding was similar to other studies (Adkins and Moomaw, 1997, Fairlie, 2006) where they showed that students' socioeconomic background was related to their academic performance.

The fourth null hypothesis presented in this dissertation stated that the religious affiliation of private schools was unrelated to technical efficiency. In other words, religious private schools did not generate competitive pressure on public schools. Since the coefficient with this variable was statistically insignificant, there was not enough evidence to reject this null hypothesis, and I concluded that religious private schools did not have an impact on Primary School technical efficiency. This result was contrary to the findings of to Cohen-Zada and Sander (2007).

The next null hypothesis dealt with public school location and technical efficiency, where location was measured with a dummy variable for rural areas. The

coefficient for this variable was insignificant which lead to a failure to reject this hypothesis. Therefore, Primary School technical efficiency did not depend on location. This result confirmed the findings by Kleinfeld, McDiarmid, and Hagstrom (1985), but it differed from other studies. Snyder and West (1992) and Alpaugh's (1992) argued that urban public schools were better than rural public schools while Alspaugh and Harting (1995) and Haller et al's (1993) found the opposite result.

The sixth null hypothesis examined the relationship between human capital and schools' technical efficiency. This hypothesis stated that the degree of human capital (experience and education) held by the chief administrator (principal), staff and teachers should had no effect on technical efficiency after controlling for other factors in the model. None of these human capital related variables were found to be statistically significant in this model. Therefore, the degree of human capital held by teachers, staff and administrators did not have an affect on Primary School technical efficiency. Hence, I failed to find enough evidence to reject the null hypothesis.

The last hypothesis addressed the relationship between social capital and technical efficiency. The coefficient of the social capital index variable was not significant which indicated that social capital was not related to efficiency. This result did not support previous literature. For example, in Meier (2009), and Glaser (2001), the authors argued that there was a direct relationship between social capital and academic performance.

5.3 High School Results

This part of the results section repeats the analysis for another set of schools, High Schools in Mississippi. Analysis of High Schools provided the opportunity to evaluate the results of Marlow (2000), Zanzig (1997), Figlio and Stone (1999), and Newmark

(1995) where all of these focused on High Schools when examining the effects of competition on academic achievement. I followed steps similar to the Primary School analysis to develop this sub section. In the following, the results from the frontier models were discussed first, and at the end, I presented a model of the factors related to inefficiency at High Schools in Mississippi.

5.3.1 Stochastic Frontier Results: High Schools

In Table 5.3, I reported the frontier estimation results from the High School model including schools with grades 9 to 12 only. The stochastic frontier was estimated based on the SATP Overall proficiency rate as a measure of output. The constant term was positively associated with output and significant. Among all other inputs, only general expenditures per student were significant in this frontier, which indicates that increasing general expenditures per student will increase students' Overall proficiency rate while holding all other variables in the model constant. The rest of the inputs such as, building area per student, textbook expenditures per student and the number of teachers and staff per students were insignificant factors in producing proficient students in High Schools in Mississippi. Summary statistics of technical efficiency for this output were reported in the last row of this table. Mean efficiency was 72 percent while it ranged from 35 percent to 97 percent.

Table 5.3 Results from Stochastic Frontier Analysis for High Schools

Variables /Dependent Variable	Log SATP Overall
Constant	3.715***
	(0.548)
Log of Building Area per Student	0.018
	(0.049)
Log of General Expenditures per Student	0.083**
	(0.039)
Log of Textbook Expenditures per Student	0.285
	(0.022)
Log of Number of Teachers and Staff per Student	-0.021
	(0.143)
Log likelihood function	-10.425
Technical Efficiency	
Mean	0.726
Min	0.350
Max	0.976

N = 87, only High Schools included in this sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

5.3.2 Determinants of Efficiency: High Schools

The High School results were not quite similar to the Primary School results reported above. The same set of explanatory variables was used in the empirical model for High Schools with one exception. A Primary Schools MCT Score variable was also incorporated in the High School data set to control for the level of students when they began High School. The dependent variable was the inefficiency score, which was derived from the stochastic frontier model as described above. In Table 5.4, regression results for the High School model employing the SATP Overall inefficiency score as the dependent variable were given. The constant term was positive and significant.

Principal's experience and experience squared, the percent of black staff, the percent of female staff, staff experience, staff-experience squared, the percent of black teachers, the percent of master teachers, the percent of black students, the percent of

religious enrollment and the Primary Schools MCT Score variables were all significant at the 10 percent level. All other variables remained statistically insignificant in this model.

Table 5.4 Determinants of efficiency: High Schools

Variables	25 Mile Coefficient	Std. Error
Dependent variable		
Inefficiency Score in Proficient Rate in SATP Overall		
Independent variables		
Constant	1.979*	1.001
Black Principal	-0.051	0.055
Female Principal	-0.018	0.038
Experience Principal	-0.017**	0.007
Square experience Principal	0.000**	0.000
Percent of Black Staff	-0.432*	0.239
Percent of Female Staff	-0.262**	0.119
Experience Staff	0.086*	0.045
Square Experience Staff	-0.003*	0.002
Percent of Black Teachers	0.482*	0.276
Percent of Female Teachers	0.097	0.278
Percent of Master Teachers	-0.327***	0.105
Experience Teachers	-0.033	0.052
Square average Experience Teachers	0.001	0.002
Percent of Black Students	0.444***	0.107
Percent of Free Lunch Students	0.092	0.085
Small-city/rural	0.041	0.039
School Competition Index	0.026	0.056
Social Capital Index	0.000	0.000
Percent of Religious Enrollment	-0.103*	0.052
Primary Schools MCT Score (15 Mile)	-2.256**	1.055
R-square	0.812	
Adj-R-square	0.755	

N =87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Heteroskedasticty corrected model

The principal's race and gender variables were insignificant in the model, which indicates that principal's race and gender was unrelated to student efficiency. The principal's experience and experience squared, had a significant relationship with school

efficiency as expected. These findings indicated that the principal's human capital linked to High School efficiency while keeping all other variables in this model constant.

The percent of black staff was significant and negatively related with output in this model. Hence, a higher number of black staff was associated with less inefficiency. Similarly, the percent of female staff was negatively associated with the inefficiency score. Hence, a larger number of female staff relative to male staff was found with lower inefficiency in High Schools. Staff experience and its squared were also significant at a 10 percent level but with the opposite sign. Theoretically staff attributes did not have any impact on student performance, so, staff (non-instructional) experience should not be a deciding factor for High School student performance.

The last two significant discretionary variables were the percent of black teachers and the percent of master teachers. Both of these variables had the expected signs. The percent of black teachers was found with more inefficiency while the percent of master teachers was associated with less inefficiency in Mississippi High Schools. Hence, both teachers' race and human capital were very important ingredients for student performance.

Among the non-controllable inputs the percent of black students variable was significant with the expected sign. This finding was consistent with previous literatures. Hence, higher black student enrollment in a school decreases efficiency in High Schools. In contrast, the percent of free lunch students was insignificant which indicates that students' socio-economic status was not an important factor in this model.

The last set examined were exogenous variables, which include school location, school competition index, the percent of religious enrollment and Primary Schools MCT

score. Among all these exogenous variables, only the percent of religious enrollment and the Primary Schools MCT Score coefficients were significant at the 10 percent level.

The percent of religious enrollment variable was significant in this model and with a negative sign, which implies that a market with relatively larger religious enrollment had more efficiency. Thus, parents' school selection did have an impact on public High School efficiency in Mississippi. The last significant variable in this model was the Primary Schools MCT Score, which was significant at a 10 percent level. Hence, High Schools were more efficient when more students were beginning High School well-prepared by local elementary and middle schools.

All other variables in these models were insignificant including the school competition index and the social capital index. Competition from Secondary, High and K-12 private Schools did not have a statistically significant impact on public High School efficiency. This relationship was also true for the social capital index variable. Hence, school competition and social capital were not found to be related to High School efficiency.

5.3.3 Discussion

From this part of the analysis, the results showed that some inputs were important factors but not all. For High Schools in Mississippi, general expenditures per student were extremely important inputs for producing proficient students. On average, High Schools were 72 percent technically efficient in producing proficient students. The technical efficiency score ranged from 35 percent to 97 percent, which indicated that many High Schools were producing a sizable number of inefficient performers.

There were several variables from the second stage of the frontier analysis that were significant. These significant variables included principal's experience, the percent of black staff, the percent of female staff, staff experience, the percent of black teachers, the percent of master teachers, the percent of black students, the percent of religious enrollment and Primary Schools MCT score.

The first hypothesis addressed the relationship between competition and technical efficiency. Since, the coefficient on the school competition index variable was insignificant; competition and technical efficiency were unrelated for High Schools. This result failed to find the evidence to reject the null hypothesis and concluded that competition from private schools did not have any effect on public High Schools' technical efficiency. This result disagreed with the previous literature (Hoxby 2000, Dee 1998, and Couch, Shughart and Williams 1993) that students' performance in public schools was associated with competition from private schools. Further, this study confirmed the findings by Newmark (1995), Sander (1999), McMillan (2000) that competition from private schools did not effect public school outcomes.

The second and third hypotheses dealt with the racial mix of students and their socio-economic status and public school technical efficiency. The racial makeup of students appeared to be a significant factor related to High School technical efficiency. This suggested the greater the proportion of black students enrolled, the higher the inefficiency score, which leads to a rejection of the null hypothesis. I did not find any evidence to reject the null hypothesis associated with students' socio-economic status since, the free lunch variable was insignificant.

The fourth hypothesis in this dissertation asserted that private school religious affiliation did not have an effect on public school technical efficiency. Among all the

exogenous variables, the percent of religious enrollment was statistically significant in explaining the variation in High School technical efficiency. This negative coefficient implied that competition from religious private schools was related to High School technical efficiency, so I rejected the null hypothesis in this dissertation. This result was similar to what Zada and Sander (2007) find in their paper.

The relationship between school location and technical efficiency was the fifth hypothesis in this dissertation. Similar to Primary Schools, the school location variable was insignificant in the High School sample, which indicated that High School technical efficiency did not vary with location. Hence, small-city/rural High Schools were equally well in producing proficient students as large-city/urban High Schools in Mississippi. This result confirmed the Kleinfeld, McDiarmid, and Hagstrom (1985) study.

The sixth hypothesis in this dissertation focused on explaining the effect of human capital on the technical efficiency of public schools. The principal's experience and percent of master teachers' variables were significant, which suggested that higher human capital held by administrators and teachers was good for High Schools in terms of efficiency. The staff's experience and its squared term coefficients were also significant but with the opposite signs. Staff experience was directly related to school's operation rather to the student's performance. Therefore, the degree of human capital held by teachers, and administrators will have an effect on the technical efficiency of public schools after controlling for other factors in the model. This result helped to reject the null hypothesis and concluded that teacher's and administrators' human capital did matter for High School technical efficiency.

Understanding the effect of social capital on public High School technical efficiency was the last hypothesis for this dissertation. This hypothesis stated that the

degree of social capital available within a community would have no effect on the technical efficiency of public schools. This variable was insignificant which indicated that social capital was not an important factor for High School technical efficiency. Therefore, I failed to find enough evidence to reject the null hypothesis and concluded that community social capital stock did not effect High School performance in Mississippi, disagreeing with Meier's (1999) study.

Similar to Primary Schools in Mississippi, staff gender and race variables were significantly related to High School technical efficiency. The estimated coefficient suggested that schools with higher proportions of black and female staff were relatively more efficient.

The Primary Schools MCT Score variable was employed to control for the incoming students. Although this was not a perfect proxy, this was the closest approximation available in this data set. This variable was extremely significant and entered into the model with an expected sign. Hence, High Schools surrounded by better Primary Schools were also more efficient producers of proficient students.

5.4 K-12 School Results

This section analyzes the factors associated with inefficiency for K-12 Schools, following the same steps as in sections 5.2 and 5.3. Here the sample used is comprised of K-12 Schools and frontier output is measured by the SATP Overall proficiency rate.

5.4.1 Stochastic Frontier Results: K-12 Schools

In Table 5.5 I gave the stochastic frontier results for K-12 Schools using the SATP Overall proficiency rate for output. The constant term in the following model entered into the equation with a positive sign, and this variable was significant at least at

10 percent level in this model. None of these inputs in this model were significant. Thus, adding more building area, increasing general expenditures, increasing textbook expenditures and hiring more teachers and staff did not necessarily improve output at K-12 Schools in Mississippi. The summary statistics of technical efficiency were reported in the last row of this table. The average technical efficiency was 73 percent but it ranged from 23 percent to 97 percent.

Table 5.5 Results from Stochastic Frontier Analysis for K-12 Schools

Variables /Dependent Variable	Log SATP Overall
Constant	3.295***
	(0.775)
Log of Building Area per Student	0.007
	(0.072)
Log of General Expenditures per Student	0.035
	(0.064)
Log of Textbook Expenditures per Student	0.048
	(0.062)
Log of Number of Teachers and Staff per Student	-0.251
	(0.162)
Log likelihood function	-7.623
Technical Efficiency	
Mean	0.732
Min	0.238
Max	0.972

N = 64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

5.4.2 Determinants of Efficiency: K-12 Schools

In Table 5.6 I summarized the results for discretionary, non-controllable and exogenous factors and inefficiency at K-12 Schools. The empirical model for K-12 Schools was different than High Schools because the Primary Schools MCT score variable was not included in the K-12 Schools. Here I assumed that students were not

admitted from Primary Schools, so the Primary Schools MCT score variable was unnecessary.

Among all the discretionary variables, black principal, female principal, principal experience, the percent of female staff and staff experience were significant at the 10 percent level. The black principal in K-12 Schools variable was more effective than the white principal variable. Therefore, schools' with a high number of black principals increased efficiency compared to schools with a white principal in producing proficient number of students, while holding all other variables constant in the model. But the female principal variable increased inefficiency more than the male principal variable. Principal experience, staff experience and squared terms were significant, but each had an unexpected sign. These variables were related to a school's operation, but not directly to student performance. Hence, a school with a more experienced principal and staff may have been more efficient than a school with a less experienced principal and staff.

Table 5.6 Determinants of Efficiency: K-12 Schools

Variables	25 Mile Coefficient	Std. Error
Dependent variable		
Inefficiency Score in Proficient Rate in SATP Overall		
Independent variables		
Constant	-2.564**	1.144
Black Principal	-0.353***	0.108
Female Principal	0.203*	0.107
Experience Principal	0.025**	0.011
Square Experience Principal	-0.000*	0.000
Percent of Black Staff	-0.246	0.368
Percent of Female Staff	0.429*	0.232
Experience Staff	0.196***	0.047
Square Experience Staff	-0.007***	0.002
Percent of Black Teachers	0.536	0.344
Percent of Female Teachers	-0.031	0.368
Percent of Master Teachers	-0.281	0.231
Experience Teachers	0.092	0.152
Square Experience Teachers	-0.003	0.006
Percent of Black Students	0.305*	0.167
Percent of Free Lunch Students	0.934***	0.211
Small-city/rural	-0.062	0.182
School Competition Index	0.005	0.106
Social Capital Index	0.001	0.001
Percent of Religious Enrollment	-0.068	0.054
R-square	0.857	
Adj-R-square	0.795	

N =64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Heteroskedasticty corrected model

The percent of free lunch students was significant in this model with an expected sign. Thus, schools with more free lunch students were more inefficient, while holding all other factors constant in the model. The percent of black students was significant in this model, so larger numbers of black students were associated with more inefficiency. Hence, both of these non-controllable inputs were important determinants of efficiency for K-12 Schools in Mississippi.

The exogenous variables, school location (small-city/rural), the school competition index, the social capital index and the percent of religious enrollment were not significant in this model. Hence, none of these exogenous factors improved K-12 School efficiency.

5.4.3 Discussion

The results from this section of analysis showed that none of the inputs in the frontier model were significant and the average technical efficiency was 73 percent. Technical efficiency ranged from 23 percent to 97 percent, which indicated that the determinants of efficiency were important for policy decisions designed to improve the efficiency of K-12 Schools.

The first hypothesis addressed the relationship between competition and technical efficiency. The school competition index variable was insignificant; hence, competition from private schools did not influence public school technical efficiency. Therefore, I did not reject the null hypothesis. In other words, K-12 Schools in Mississippi did not respond to competition from private schools. This result confirmed Newmark (1995), and Sander's (1999) study while disagreeing with Hoxby (1994), Couch, Shughart and Williams (1993) and Greene and Kang's (2004) findings.

The next two hypotheses were related to students' race and socio-economic status. These hypotheses claimed that public school technical efficiency did not depend on the students' racial and socio-economic characteristics. Both of these variables, the percent of black students and the percent of free lunch enrollment were significant and positive. These results indicated that increasing the percent of black students and the percent of

free lunch enrollment was related to increasing inefficiency in K-12 Schools. This result confirmed the studies of Ching (2000) and Dee (1998).

The fourth hypothesis stated that private school religious affiliation did not have any effect on public school technical efficiency. I did not find the evidence to reject the null hypothesis, since this variable was insignificant. Hence, the effect from religious private schools did not significantly improve K-12 technical efficiency.

The fifth hypothesis was related to public school location and technical efficiency. The claim in this hypothesis was that public school technical efficiency did not vary with its location. The coefficient with this variable was insignificant, which lead to a failure to reject this hypothesis and concluded that K-12 School technical efficiency did not depend on their location. This result confirmed Kleinfeld, McDiarmid, and Hagstrom's (1985) study.

Evaluating the relationship between human capital and school technical efficiency was the sixth hypothesis in this dissertation. According to this hypothesis the degree of human capital held by administrators, staff and teachers had no effect on technical efficiency. The experience variables for principal and staff were the only significant human capital variables in this model, but they appeared with unexpected signs. Hence, I rejected the null hypothesis and concluded that human capital did influence public school technical efficiency although the direction of the effect was not expected. These variables were not directly related to student performance (Clotfelter, Ladd, Vigdor, and Wheeler, 2006), so the direction of these variables was not be a major concern. Teacher experience or degree variables were not significant, but theoretically these variables were directly related to student performance. This evidence failed to find support to reject the hypothesis in this model. This result differed from Meier's (1999) study.

The last hypothesis addressed the relationship between social capital and technical efficiency. The alternative hypothesis stated that community social capital influenced public school technical efficiency, but the coefficient for this variable was statistically insignificant. Therefore, I failed to reject the null hypothesis. Thus, social capital was not related to K-12 efficiency. Once again this evidence disproved earlier findings by Meier (1999), and Glaser (2001) where they showed how community social capital influenced academic outcomes.

5.5 Further Specifications of the Model

To expand the analysis, the sample was divided by grade: grade 5 (N = 70), grade 6 (N = 111), and grade 8 (N = 90). Another sample was constructed for the highest grade at a particular school, and labeled as graduating grade (N = 344). The MCT Overall, MCT Reading and MCT Mathematics examinations were used to report the frontier estimation results for 6^{th} grade, 8^{th} grade and graduating grade Primary Schools in Table A.1 to Table A.3. Similarly, High School and K-12 School results were presented in Table B.1 to Table B.3 in the Appendix. Geller, Sjoquist and Walker (2006), Hoxby (2001), Marlow (2000), and Arum (1996) followed a similar approach, looking at Reading and Mathematics scores for various grades ranging from 3^{rd} to 12^{th} grade. Using the estimate of inefficiency from these frontier models as dependent variables, additional regressions were estimated as above. Another extension was applied at this stage: markets were estimated using a 5 and 15 mile radius in addition to the 25 mile radius used previously.

A review of the frontier estimates provided mixed results. Coefficients for the inputs representing the building area and general expenditures were occasionally

significant and positive as found above, but they were not consistently significant. Inputs for textbooks and labor were rarely significant, and they had an unexpected negative sign in some cases.

Additional comparisons of these frontier models were conducted through the computation of rank correlation across the different models estimated. For each frontier estimated, individual schools were assigned a relative ranking based on the estimated technical efficiency. The technical efficiency score of Primary Schools were reported in the Table A.4 in the Appendix, and the same ranking was reported for High and K-12 School in Table B.4 in the Appendix. Within an individual sample, standard correlation coefficients could then be calculated for these rankings to see if the relative position of schools varied, or if it was consistently stable for different subject tests. For Primary Schools, the rank correlation between the Overall proficiency rate and Reading, Mathematics, and Language proficiency rates were 0.94, 0.91, and 0.96 respectively. This showed that they were highly correlated. For High Schools, the rank correlations between the Overall proficiency rate and Algebra, History, and English proficiency rates were 0.68, 0.63, and 0.77 respectively. This showed that they were also positively correlated with the Overall proficiency rate for these schools. Therefore, estimated results from the Overall proficiency rate model should reveal fairly similar results when using the proficiency rates from other subjects.

For the second-stage models, some results were confirmed while others showed mixed results. Complete results were given in the Appendix, Tables C through H. The discussion here will focus on the variables related to the main hypotheses. *The school competition index was generally negative and significant for Primary Schools but insignificant for High Schools and K-12 Schools, confirming the results above on*

competition. For both ethnicity and economic status, coefficients were largely positive and significant, even for High Schools where they were insignificant above. These results supported the rejection of the null hypothesis for both of these variables. The variable for religious competition was generally insignificant as above, but did occasionally become negative and significant, providing weak evidence to reject the null hypothesis. The small-city/rural variable was mostly insignificant, supporting the null hypothesis as above. Results on experience were mixed. For Primary Schools, experience was consistently insignificant. With High Schools, the results on experience were not consistent at all. The experience of principal and staff at K-12 Schools were significant with the expected sign consistently, supporting rejection of the null hypothesis for this group. For the last hypothesis related to social capital, the coefficients were mostly insignificant, as before.

5.6 Overall Conclusions

In summary, this chapter analyzed the determinants of Primary, High, and K-12 Schools inefficiency under various models. First, this chapter began by estimating production frontiers, resulting in school level estimates of inefficiency. These inefficiency estimates were then used in a second regression model to examine the factors related to school inefficiency.

In the 8th grade frontier model, school building area and general expenditures inputs were significant. The same relationship was found in High Schools, and K-12 Schools. Therefore, as expected general expenditures were an important input in school production frontiers.

The percent of black staff, the percent of female staff, the percent of black teachers, the percent of black students, and the percent of free lunch students were significantly related to school technical efficiency. These results lead to the rejection of the null hypothesis and suggested that student racial and socio-economic status were related to inefficiency in all Primary, High, and K-12 Schools. These relationships were confirmed in most of the models that I have included in the Appendix. This finding also showed how human capital held by teachers, staff and administrators were important, but not in all models. Interestingly, the majority of these models indicated that race and gender were more important factors than the experience or education of teachers, staff, and administrators.

The exogenous factors were measured by the percent of religious enrollment, and the school competition index variables were significant. The competition from religious schools was significant in most of these models with the expected sign. This suggested that the degree of religious affiliation of local private schools was related to technical efficiency in public schools in Mississippi. Hence, Primary Schools, High Schools and K-12 Schools experienced competitive pressure from local religious private schools. In addition to that, competition from local private schools also increased technical efficiency in Primary Schools, but this relationship appeared to be insignificant in most of the High, and K-12 School models. This result replicated findings from Marlow (2000), Figlio and Stone (1999), and Newmark (1999) where they employed 10^{th} grade – Reading, Mathematics and Writing scores, 10^{th} grade –Mathematics score, and 12^{th} grade-Mathematics score respectively.

CHAPTER VI

RESULTS II

6.1 Single Equation Model: Overview

The primary goal of this chapter was to compare and confirm the results from the previous chapter and provide robust arguments about the influences of these exogenous variables on technical efficiency. The single equation stochastic frontier model was employed to understand the effect of exogenous variables on the technical efficiency of public schools. The inclusion of all exogenous variables into the education production function was the main modification in this estimation methodology. These results were divided into three sections. The first section included the discussions about the frontier results on Primary Schools in Mississippi and the results from the High and K-12 Schools were presented in the second and third sections in this chapter, respectively.

The coefficients on exogenous variables could not be interpreted the same way as in Chapter V. To relate exogenous factors to efficiency, correlation coefficients were calculated between the efficiency estimates and exogenous variables needed for the hypotheses. On one hand, an insignificant correlation coefficient suggested no relationship and supported a failure to reject the null hypothesis. On the other hand, a significant correlation coefficient suggested a relationship leading to a rejection the null hypothesis.

6.2 Single Equation Model: Primary School Results

I represented the results for 8th grade schools in Table 6.1. The input variables I included in this frontier were similar to the two-stage stochastic frontier model. The variables for general expenditures per student, teachers and staff per student, and textbook expenditures per student were all insignificant in the model whereas the building area per student variable was significant with the expected sign.

In addition to these inputs, I included several exogenous variables in the production function; the percent of black students, the percent of free lunch students, school location, the school competition index, the social capital index, and the percent of religious enrollment. Among all of these exogenous factors, the percent of black students and the percent of free lunch students alone were statistically significant at the 1 percent level. All other variables in this model were insignificant. The summary statistics for technical efficiency were reported in the last row of Table 6.1. On average, technical efficiency was 82 percent and ranged from 42 percent to 95 percent. The technical efficiency was higher in this model than in the two-stage frontier model. Hence, the difference in technical efficiency confirmed the important influence of exogenous factors in the single equation frontier model.

Table 6.1 Results from Single Equation Model: Primary Schools (8th Grade)

Dependent Variable: MCT Overall Proficiency Rate		**25 Mile Coefficient**
Constant		2.358***
		(0.501)
Log of Building Area per Student		0.499***
		(0.137)
Log of General Expenditures per Student		-0.043
		(0.163)
Log of Textbook Expenditures per Student		0.006
		(0.069)
Log of Number of Teachers and Staff per Student		0.158
		(0.538)
Log Percent of Black Students		-0.064***
		(0.019)
Log Percent of Free Lunch Students		-0.302***
		(0.071)
Small-city/rural		0.011
		(0.080)
Log School Competition Index		-0.007
		(0.011)
Log Social Capital Index		0.019
		(0.022)
Log Percent of Religious Enrollment		0.001
		(0.039)
Log likelihood function		13.143
Technical Efficiency		
	Mean	0.824
	Min	0.421
	Max	0.959

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

I computed Pearson Correlation Coefficients to check the relationship between exogenous factors and estimated technical efficiency in 8th grade, and I reported correlation coefficients and p-values in Table 6.2. The percent of black and the percent of free lunch enrollment variables were significant and were negatively correlated with

technical efficiency. Therefore, an 8th grade school with a higher number of black students should have less technical efficiency. Hence, I rejected the null hypothesis and concluded that the racial and ethnic background of students were associated with their academic performance, providing support for the results of Ching (2000) and Dee (1998). Similarly, the free lunch enrollment variable was also negatively correlated with technical efficiency. This result provided support to reject the null hypothesis and concluded that the socio-economic status of students was significantly related to their academic achievement, confirming Adkins and Moomaw (1997) and Fairlie's (2006) results.

All other exogenous variables such as school location, the school competition index, the social capital index and the percent of religious enrollment were not significantly correlated with efficiency. Thus, school location, the school competition index, the social capital index and the percent of religious enrollment were not related to Primary Schools' technical efficiency. This result was quite similar to the two-stage frontier model except for the school competition index variable. In the two-stage frontier model, the school competition index variable was significantly related to the technical inefficiency.

Table 6.2 Pearson Correlation Coefficients: Primary Schools (8th Grade)

Variable	Technical Efficiency Overall Proficiency Rate -25 Miles
Percent of Black Students	-0.426***
	[0.000]
Percent of Free lunch Enrollment	-0.324***
	[0.001]
Small-city/Rural	-0.057
	[0.596]
School Competition Index	0.048
	[0.652]
Social Capital Index	0.043
	[0.685]
Percent of Religious Enrollment	0.029
	[0.779]

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in bracket

6.3 Single Equation Model: High Schools Results

I represented the results for High Schools in this sub-section. To estimate the High School stochastic frontier model I employed similar inputs and exogenous factors that I used earlier in the Primary School model in the previous part of this chapter. The only new variable which I have added to these models was the Primary Schools MCT Score variable. Table 6.3 represents the single equation frontier results for High Schools. On average technical efficiency was 82 percent and ranged from 42 percent to 96 percent in this model, where output was measured by the Overall proficiency rate. Technical efficiency was higher in the single equation frontier model than in the two-stage frontier model for the same output.

The operating expenses such as general expenditures per student significantly entered into the frontier. This input was significant and positive in the model. All other inputs were insignificant. For the exogenous variables, the percent of black students, the

percent of free lunch students, and the Primary Schools MCT Score were significant with the expected sign. Similar to the Primary School frontier model, the percent of black students and the percent of free lunch students' variables were also statistically significant and negatively associated with the school proficiency rate in the Overall SATP examination. The last significant exogenous factor was Primary Schools MCT Score, and this factor was positively associated with the school's proficiency rate in these examinations.

Table 6.3 Results from Single Equation Model: High Schools

Dependent Variable: SATP Overall Proficiency Rate	**15 Mile Coefficient**
Constant	4.113***
	(0.634)
Log of Building Area per Student	0.061
	(0.068)
Log of General Expenditures per Student	0.069*
	(0.042)
Log of Textbook Expenditures per Student	-0.041
	(0.026)
Log of Number of Teachers and Staff per Student	-0.001
	(0.119)
Log Percent of Black Students	-0.095***
	(0.029)
Log Percent of Free Lunch Students	-0.159***
	(0.048)
Small-city/rural	-0.050
	(0.074)
Log School Competition Index	0.006
	(0.010)
Log Social Capital Index	-0.004
	(0.031)
Log Percent of Religious Enrollment	0.106
	(0.093)
Log Primary Schools MCT Score	3.073***
	(1.046)
Log likelihood function	15.217
Technical Efficiency	
Mean	0.816
Min	0.421
Max	0.968

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis, SATP Overall didn't converge for 25 Miles market

To evaluate the hypotheses for High Schools, I computed Pearson Correlation Coefficients between technical efficiency and the exogenous variables. I reported

correlation coefficients and p-values in Table 6.4. The percent of the black and the free lunch enrollment variables was significantly correlated with the technical efficiency. Therefore, a High School with a higher number of black students was less efficient. Hence, I rejected the null hypothesis and concluded that students' racial and ethnic backgrounds were associated with their academic performance. Similarly, the free lunch enrollment variable was also negatively correlated with technical efficiency. This result again provided the support to reject the null hypothesis and lead me to conclude that students' socio-economic status significantly relates to their academic achievement. Interestingly, the correlation between the technical efficiency and the social capital index was significant and negative, which indicated that a higher social capital stock in a community was associated with less technical efficiency at High Schools. Of course, this evidence provided support to reject the null hypothesis, and I concluded that while social capital did effect technical efficiency, the direction of the effect was opposite than expected. However, this was similar to the two-stage frontier results from Chapter V. Additional research was needed to explain this result.

The exogenous variables such as school location, the school competition index, and the percent of religious enrollment remained insignificant in the model. Hence, school location, the school competition index, and the percent of religious enrollment did not increase High Schools' technical efficiency.

Table 6.4 Pearson Correlation Coefficients: High Schools

Variable	Technical Efficiency Overall Proficiency Rate -15 Miles
Percent of Black Students	-0.361***
	[0.000]
Percent of Free lunch Enrollment	-0.243***
	[0.023]
Small-city/Rural	0.114
	[0.294]
School Competition Index	-0.119
	[0.272]
Social Capital Index	-0.028**
	[0.016]
Percent of Religious Enrollment	0.123
	[0.256]
Primary Schools MCT Score	-0.048
	[0.662]

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in bracket

6.4 Single Equation Model: K-12 Schools Results

I presented the results for K-12 schools in this sub-section. I employed similar inputs and exogenous factors to estimate the single equation frontier model for K-12 Schools as with the previous frontier models in this chapter. I excluded the Primary Schools MCT Score variable from this model as I used the similar assumption that students were not admitted from elementary or middle schools to K-12 Schools. I represented the single equation frontier results for K-12 Schools in Table 6.5. On average technical efficiency was 84 percent and ranged from 35 percent to 95 percent in this model using the Overall proficiency rate as output. Again, technical efficiency was higher in the single equation frontier model than in the two-stage frontier model for the same output.

Three explanatory variables were statistically significant other than the constant term in this model, and they were general expenditures per student, the percent of black students and the percent of free lunch students. The general expenditures per student variable was significant with a positive sign in this frontier. The significant exogenous factors included the percent of black students, and the percent of free lunch students, expected sign, which was similar to the Primary School frontier model.

Table 6.5 Results from Single Equation Model: K-12 Schools

Dependent Variable: SATP Overall Proficiency Rate	**25 Mile Coefficient**
Constant	2.492***
	(0.782)
Log of Building Area per Student	0.052
	(0.082)
Log of General Expenditures per Student	0.153**
	(0.061)
Log of Textbook Expenditures per Student	0.029
	(0.034)
Log of Number of Teachers and Staff per Student	-0.088
	(0.169)
Log Percent of Black Students	-0.129***
	(0.041)
Log Percent of Free Lunch Students	-0.251***
	(0.095)
Small-city/rural	-0.143
	(0.149)
Log School Competition Index	-0.001
	(0.015)
Log Social Capital Index	0.019
	(0.037)
Log Percent of Religious Enrollment	0.034
	(0.029)
Log likelihood function	12.831
Technical Efficiency	
Mean	0.844
Min	0.346
Max	0.959

N = 64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

The Pearson Correlation Coefficients were again computed to identify the relationship between the exogenous factors and technical efficiency. I reported the correlation coefficients and p-values in Table 6.6. Unfortunately, none of these variables were significantly correlated with technical efficiency for this group of public schools.

Therefore, these exogenous factors were unrelated to technical efficiency. Hence, I did not reject all the hypotheses, and this was similar to the results from the two-stage frontier model in the earlier chapter.

Table 6.6 Pearson Correlation Coefficients: K-12 Schools

Variable	Technical Efficiency Overall Proficiency Rate -25 Miles
Percent of Black Students	-0.108
	[0.395]
Percent of Free lunch Enrollment	-0.058
	[0.647]
Small-city/Rural	0.078
	[0.541]
School Competition Index	0.073
	[0.564]
Social Capital Index	-0.006
	[0.957]
Percent of Religious Enrollment	0.156
	[0.217]

N = 64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in bracket

6.5 Additional Specifications

As in section 5.5, other versions of the single equation model were estimated with results in Appendix. Results from these models for the main hypotheses were generally consistent with results above. Regardless of the type of schools, technical efficiency was highly correlated with students' race and their socio-economic status. All other exogenous factors remained statistically insignificant. Therefore, competition from local private schools was found to be unrelated to technical efficiency for Primary Schools, High Schools, and K-12 Schools in Mississippi. The school competition index and technical efficiency distribution maps for each type of these schools were created to find

strong support of the earlier findings. Figure 6.1 through Figure 6.4 illustrated the visual evidence of the relationship between the school competition index and technical efficiency. Both of these variables were divided into four categories for Primary Schools, and High and K-12 Schools. These categories represented various degrees of competition and technical efficiency. I reached the same conclusions as before after comparing Figure 6.1 and Figure 6.2, or Figure 6.3 and Figure 6.4 that the degree of competition was not significantly related to schools' technical efficiency. Hence, a public school may have faced a higher degree of competition, but they may not have been efficient.

6.6 Conclusions

The primary goal for this chapter was to confirm the results from the previous chapter while employing the modified stochastic frontier approach. Although the interpretation of variables in this model was different from the two-stage stochastic frontier model, Pearson Correlation Coefficients were used to examine the relationship between technical efficiency and exogenous factors in these models. The percent of black students and the percent of free lunch enrollment students' variables were significant for Primary Schools, High Schools, and K-12 Schools. These results were strong and robust across all available subjects, grade and markets. These results were quite similar to the previous chapter's results also. The competition from religious private schools was somewhat important but only for the Reading examination of Primary Schools' graduating grade. Overall, the competition from local private schools did not significantly influence the technical efficiency of public schools in Mississippi

according to this method of estimation. McMillan (2000), Simon and Lovrich (1996) published similar results in their papers.

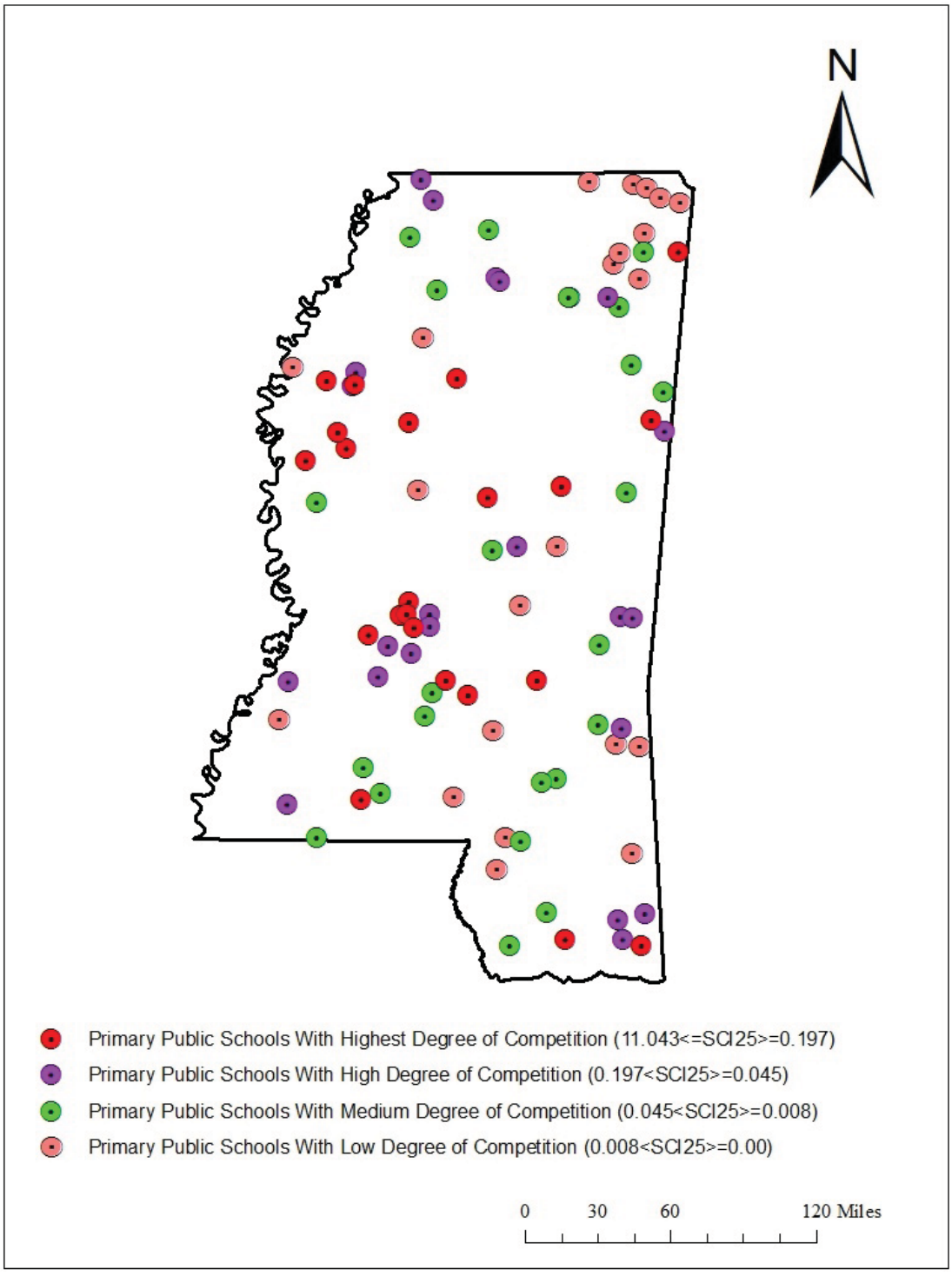


Figure 6.1 School Competition Index Distribution Map for Primary Schools

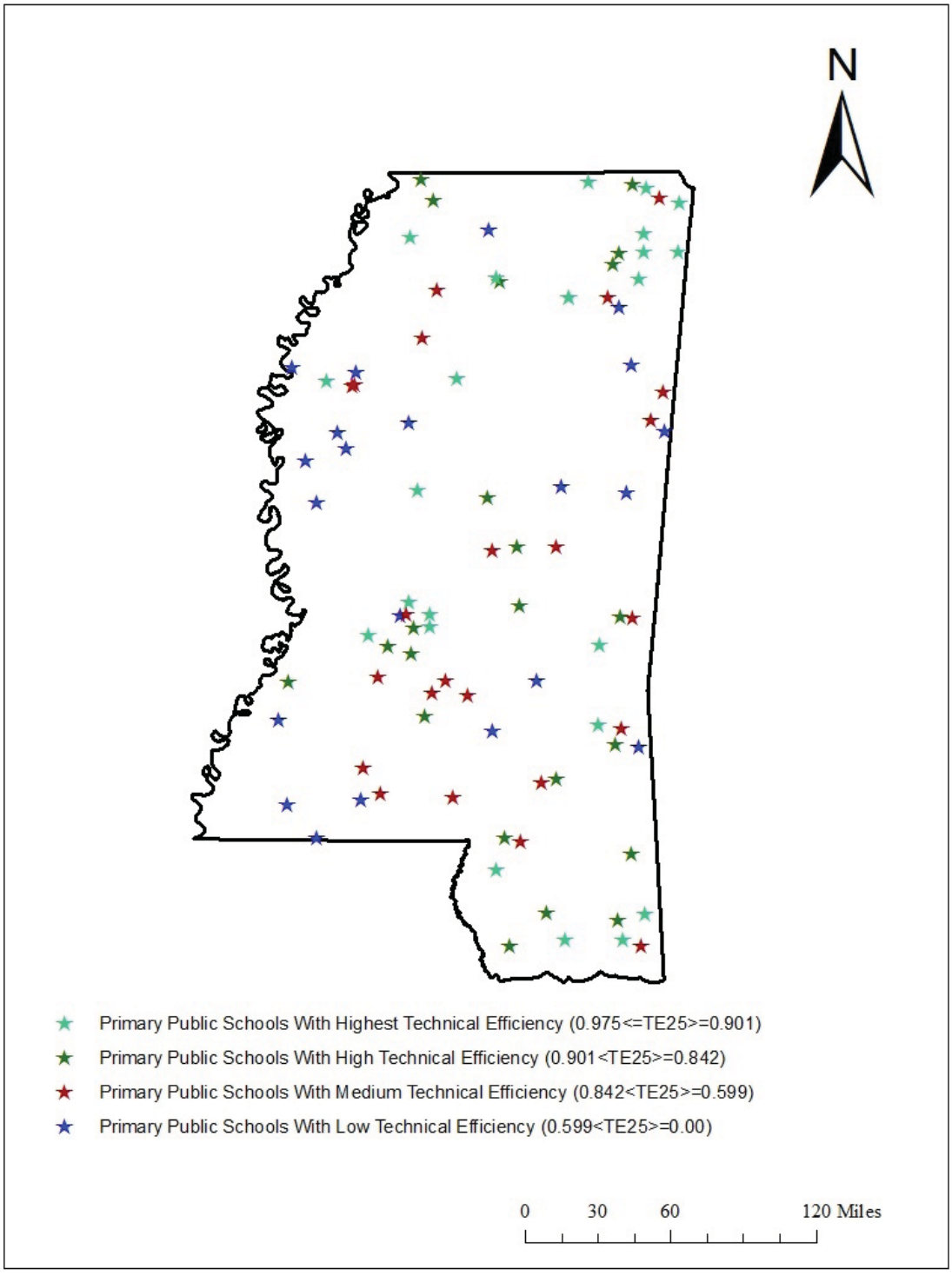


Figure 6.2 Technical Efficiency Distribution Map for Primary Schools

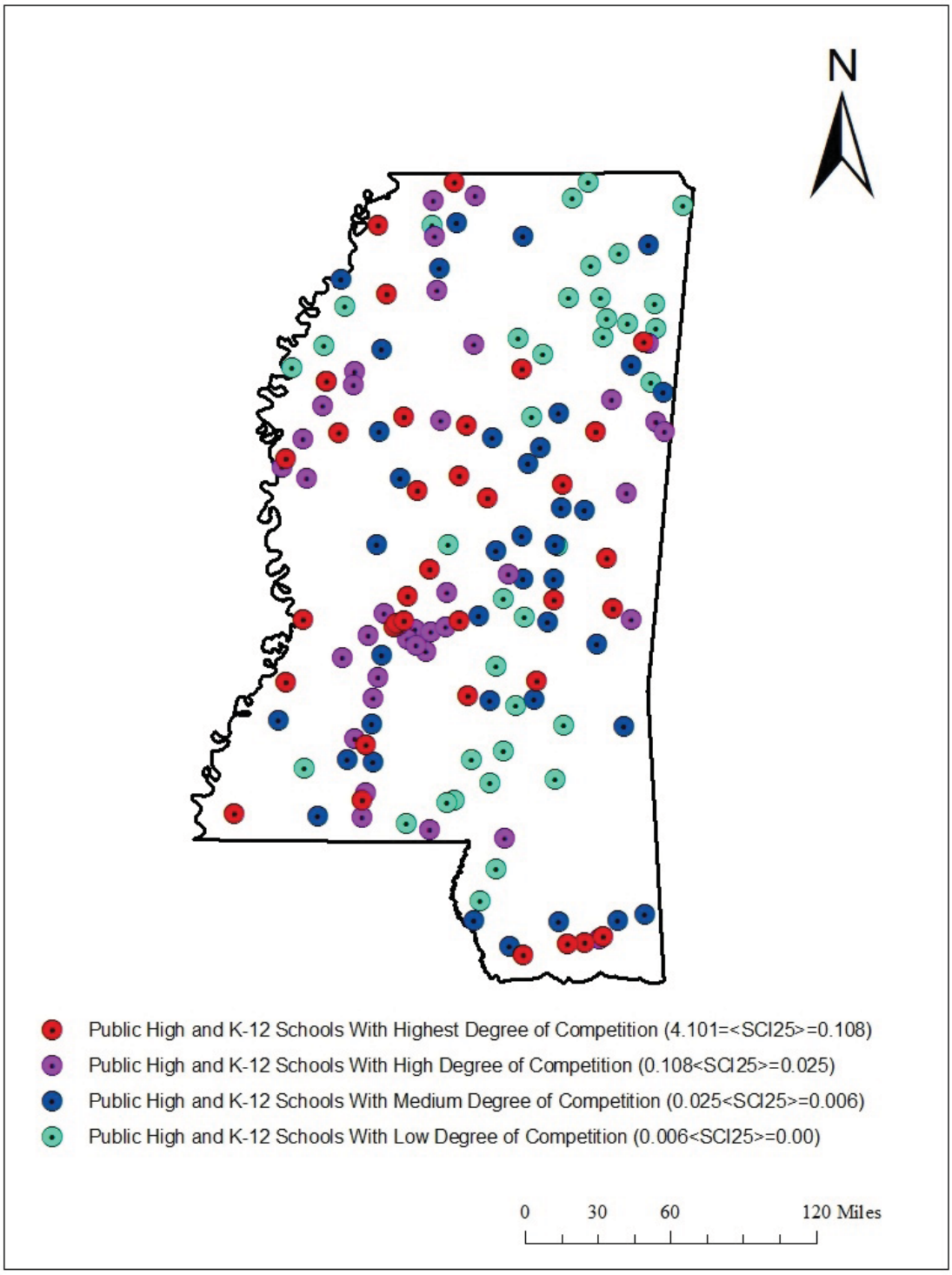


Figure 6.3 School Competition Index Distribution Map for High and K-12 Schools

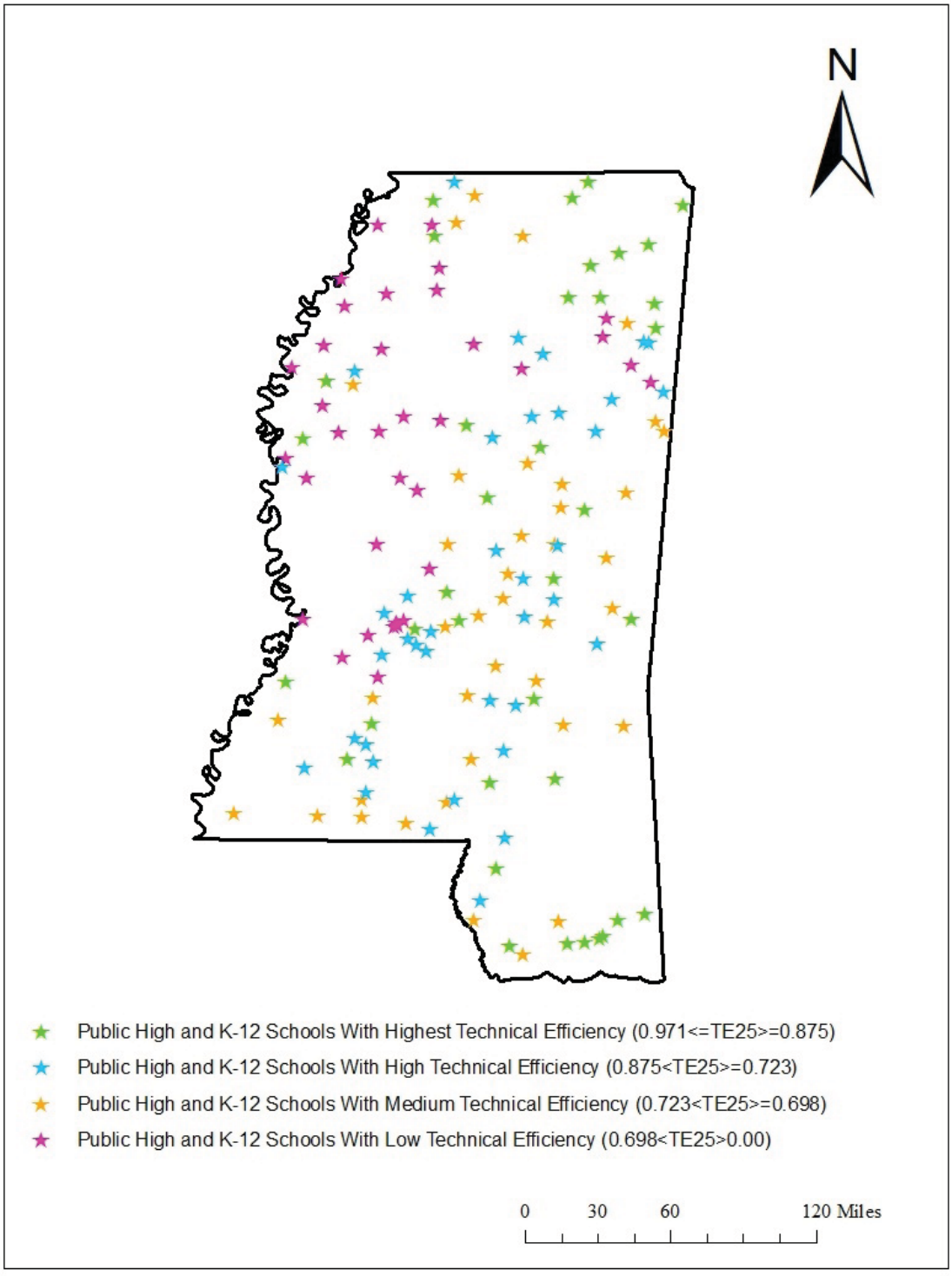


Figure 6.4 Technical Efficiency Distribution Map for High and K-12 Schools

CHAPTER VII

SUMMARY, CONCLUSIONS, LIMITATIONS AND POLICY RECOMMENDATIONS

7.1 Summary

The purpose of this study was to examine if traditional market theory could predict whether competition increases technical efficiency in the education market. Previous research in education efficiency lacked a proper definition of a school market, necessary components of such markets and individual school level data to test this theory. These issues drove the interest, and provided the scope for this dissertation.

This dissertation examined factors associated with the technical efficiency of public schools in the state of Mississippi. An empirical investigation of efficiency in Mississippi Primary, High and K-12 public schools was conducted for this dissertation. School level data from the Mississippi Board of Education was employed to estimate the technical efficiency for the year 2005-2006. Proficiency rates on MCT and SATP examinations were used to reflect the performance of students as a basis for measuring school output. The 8^{th} grade proficiency rates on Overall MCT tests were employed as a dependent variable in the Primary Schools model, while the proficiency rates on Overall SATP tests were used as a dependent variable in High Schools and K-12 Schools. Analyses of these models were conducted using a market area of 25 miles.

The two versions of stochastic frontier analysis were employed using the school competition index to estimate technical efficiency. The results of each model were then

compared to check the hypotheses. The two different estimation approaches were as follows: the two-stage stochastic frontier model and the single equation stochastic frontier model. The first step of the two-stage stochastic frontier model was to calculate inefficiencies for each school using a school production function. In the second step the ordinary least square was used to explain the variations in inefficiency. The single equation stochastic frontier model employed exogenous variables, such as the school competition index and the social capital index, along with various school inputs in the school production function in the calculation of technical efficiency. Both of these methodologies provided an opportunity to estimate the technical efficiency for individual schools, and the methodologies examined the contributing factors associated with inefficiency.

Mean technical efficiency for 8th grade Primary Schools, High Schools and K-12 Schools were estimated to be 75%, 72% and 73%, respectively, from the two-stage stochastic frontier model and 82%, 81% and 84%, respectively, from the single equation stochastic frontier model. Individual schools were ranked by their technical efficiency. Primary School technical efficiency was estimated based on Overall performance on MCT examinations, as well as performance on Reading, Mathematics and Language individual examinations. Similarly, Overall performance on SATP examination and separate results from the Algebra, History, Biology and English components were used to compute the technical efficiency for High and K-12 Schools in Mississippi. Based on the Overall technical efficiency score, George Elementary School was the most efficient Primary School in Mississippi, while Nichols Middle School was the least efficient. Respectively, Southeast Attendance Center and Yazoo County High School were the most and least efficient High Schools in Mississippi. Senatobia Jr. High School was the

most efficient of the K-12 Schools while Williams Sullivan High School was least efficient of the K-12 Schools in Mississippi. Once again, this efficiency ranking was done for individual schools, not for school districts or counties, which was one of the most important contributions of this dissertation.

Inputs used in the stochastic frontier models included building area, general expenditures, textbook expenditures and number of teachers and instructors. These were a much better set of inputs than what has been used in previous studies. Other studies assumed that all of these inputs would have a positive effect on proficiency rates in MCT and SATP examinations of Primary, High and K-12 Schools. Several different models were estimated, but only the results from the models using the MCT Overall and SATP Overall proficiency rates were included in the body of this dissertation. I included estimates from all other models in the Appendices.

Inputs requirements differed based on the type of schools. School building area and general expenditures were significant inputs for 8^{th} grade Primary Schools, while general expenditures were the only significant input for High Schools. However, none of these employed inputs were significant for K-12 Schools. Therefore, a general conclusion about the input requirements was hard to make. After I compared these three groups of schools, I concluded that general expenditures are a crucial input for a majority of Public schools. This may be because a school's general expenditures per student can vary in a short period of time due to changes in day-to-day operating expenses. School building area per student, textbook expenditures per student and number of teachers and instructors per student were fixed inputs based on individual school demand supplied by the local government, varies infrequently. Hence, these fixed inputs were not a good fit for cross section analysis.

The following part of the summary was drawn from the second stage of the stochastic frontier model where several explanatory variables were regressed on inefficiency. Principal's race, the percent of free lunch students, the percent of black students, and the school competition index variables were extremely significant in the 8th grade Primary Schools model. Hence, I concluded that these variables were Primary School inefficiency determinants. The effect of competition from private Primary and K-12 Schools on public Primary School was significant.

For High Schools, the significant variables were principal's experience, staff's race and gender, teacher's experience, the percent of black students, the percent of religious enrollment and Primary Schools MCT Score. Hence, I concluded that these variables were High School inefficiency determinants. Also, the results suggested that High Schools did respond to competition, but only from private schools with religious ties. Therefore, general competition may not generate enough competitive pressure to public schools as compared to religious private schools. This gave some credibility to the proposed explanation of the importance of understanding market characteristics.

The significant inefficiency determinants for K-12 Schools were the percent of black students, the percent of free lunch enrollment, principal's race and gender, and staff gender. The effect of the human capital of the administrators and staff mattered, but it did not have a great influence on student achievement. However, teacher's human capital variables were not significant. All exogenous factors in this model were insignificant, which suggests that competition from private schools, competition from religious private schools, community social capital and school location did not affect the technical efficiency of K-12 Schools.

In the specification test section, different outputs from various grades were employed and found that the results at the individual grade level were different than at the graduating grade level. Some factors, however, remained robust across outputs and grades. For example, the percent of female staff, the percent of black students, the percent of free lunch students and the school competition index variables were extremely significant in all models. Hence, competition from private schools significantly increased efficiency of producing proficient students in Primary Schools. Results also suggested that students' race and socio-economic status were very important factors, and were both positively related with inefficiency in most of these models. As expected, the percent of black students and the percent of free lunch enrollment in Primary Schools increased the inefficiency in producing proficient students in Overall, Reading, Mathematics and Language examinations.

Several factors were also significant at the individual grade level. Most interestingly, school location became a significant factor in these models. This result indicated that Primary Schools located in rural or small city areas were less efficient at producing proficient students. However, this result only held for 6^{th} grade and 8^{th} grade, particularly in Reading, Mathematics and Language examinations.

The social capital index variable was positively associated with proficiency rates in different subjects indicating Primary School efficiency increases with a community's social capital stock. Interesting, the percent of religious enrollment had a negative sign in some cases, such as graduating grade models, but this relationship did not hold at the individual grade levels. Principal's experience, staff experience, teacher's experience, and teacher's education were insignificant in most of these models.

Single equation stochastic frontier analysis was also used to evaluate the hypotheses in this dissertation. This frontier allowed for the inclusion of exogenous factors along with school inputs into the same model. However, interpretation of these variables was not straightforward. Thus, the Pearson Correlation Coefficients were computed to check the association between the technical efficiency and all explanatory variables. The percent of black students and the percent of free lunch enrollment variables were significant regardless of school types. To check the robustness, I followed similar steps using different outputs, but I came to the same conclusions.

In Primary Schools specification tests, other than students' race and their socio-economic status, the percent of religious enrollment variable was also significant, but only in the graduating grade model. Thus, competition from general private schools had no affect on public school efficiency, but a nearby religious private school did increases Primary Schools' efficiency.

The specification tests for a different set of outputs were also conducted for High and K-12 Schools. Once again, students' race and socio-economic status were positively correlated with technical efficiency, while other exogenous factors remained insignificant in explaining variation in proficiency rates in these schools.

7.2 Conclusions

It appears that the human capital held by teachers, staff and administrators, such as teaching experience and education attainment, were insignificant in Primary Schools, K-12 Schools, but significant in High Schools. The degree of effectiveness may have depended on student population. High Schools students were mostly teenagers; therefore an effective teaching or instructional leadership style needed experienced teachers with

higher levels of education. However, Primary Schools, mostly served children where experience and higher education held by teachers, staff and administrators might not have mattered as much for the students' academic success.

Interestingly, staff and teacher's gender and race variables were significantly related to High Schools technical efficiency. Staffs were related to school operation through non-instructional duties, which may require patience and greater physical abilities. Female and black staff members definitely supplied these needs to schools and helped non-academic operations function more smoothly (Kong, 2009).

Using these results, student academic performance was significantly related to the teacher's race which was consistent with Hanushek (1999) and King (1993). At the same time, it failed to support the results presented in Dee (2004) that racial parity between teacher and students supposedly increases student academic performance. In this study black teachers increased High School inefficiency at producing a proficient number of students. For example, on average 56 % of students in Mississippi High Schools were black. Unfortunately, the results presented in this dissertation concluded that adding more black teachers will decrease a school's efficiency at producing proficient students, even if these students are at-risk minority students. Hence, restructuring school personnel may be important to improving school performance.

Not surprisingly, the percent of black students and the percent of free lunch enrollment variables were significant in different models, regardless of estimation techniques. These results further confirmed previous findings that a student's family background and income were important factors to academic performance. Previous research has pointed out a number of reasons that black and poor students are at risk of poor academic performance. For example, Ching (2000) mentioned that a student's

cognitive abilities were related to family income and a high number of black students' families live below the poverty line in this state[12]. A number of interventions could be used to improve the performance of these students, such as effective teaching, parental education, reward programs, etc., which will guide these students toward success.

A clear-cut conclusion about the school location effect was not easy to draw. Although this variable was not significant in Primary, High and K-12 Schools Overall output models, it was significant in most of the individual subject level models, especially in Primary Schools. At the individual subject level, urban schools were more efficient in producing proficient students in Reading, Mathematics and Language subjects. One conclusion that could be drawn from these results was that a student performance gap still exists between rural-urban schools. Although policy makers, educators and legislators were consistently trying to minimize the student achievement gap, this problem was still an issue, and school location could be a reason. There were substantial differences in the concentration of wealth and political power between rural and urban areas. Collins (1995) described this difference to be due to *uneven development* in these locations. This theory raised issues of economic and political equity that directly affect education. For instance, public schools in rural areas were often underfunded and located in poor locations. Hence, the affect of economic turbulence would be much worse on rural schools than urban ones. Therefore, it was important to create awareness about the effect of improving school communities in rural areas, rather than reforming school curriculum or governing school budget. It will not be

[12] Source: State Health Facts.Org. Retrieved on April 13, 2010, from http://statehealthfactsonline.org/profileind.jsp?ind=14&cat=1&rgn=26&cmprgn=1

easy to implement these changes. However, making a better school is possible through building a better community.

The social capital index was significant in some models for Primary Schools with the expected sign, but insignificant for High Schools and K-12 Schools. There were three possible reasons for these volatile results. First, Primary Schools generally had less inside social capital than High or K-12 Schools. Therefore, outside social capital stock was more important for Primary Schools than High or K-12 Schools. Second, parents' networks through social capital work better for children than they do for teens. School choice decisions by parents made Primary Schools more competitive than High or K-12 Schools. Third, community social capital stock tends to be location-specific (Glaeser, Laibson and Sacerdote, 2001). A school located in a community with less social capital stock tended to be less efficient at producing proficient students. Unfortunately, High and K-12 Schools were often located in such communities (please compare the values of the social capital index in Table 4.1 and 4.2). Therefore, instead of increasing school funding, local policy makers and administrators should increase investment in the school community itself to improve school quality.

The levels of competitive behavior varied a great deal between schools. For example, religious or non-religious private schools provided competition for Primary Schools, but not to High or K-12 Schools in Mississippi. Hence, the empirical results provided mixed support to the hypothesis that private school competition improves public school efficiency. On one hand, this result was in support of Marlow (2000), Borland and Howson (1993) and Hoxby's (2001) papers which found that the presence of private schools improved the performance of Primary Schools. However, this result did not support Arum (1996) and Marlow's (1997) papers that found competition from private

schools increased student academic outcomes in High Schools or K-12 Schools. Hence, the effect of competition was volatile and depended on school type. The number of private Primary and K-12 Schools was much higher than private High or K-12 Schools in Mississippi, which provided more competition to Primary Public Schools than High or K-12 Public Schools (Table 4.1 and 4.2). As expected, a higher number of competitors provided more competition than other wise.

Generally, Primary Schools were smaller in size which brought the opportunity to oversee the effectiveness of all programs more precisely than in a bigger school, such as High Schools or K-12 Schools. An effective school would be a better competitor than otherwise. Importantly, the curriculum in Primary Schools was relatively more flexible and often differed from school to school. The curriculum in High Schools and K-12 Schools, however, was directed and guided by the Mississippi Department of Education's graduation requirements. Additionally, High Schools were required to meet a certain graduation rate. Hence, inflexibility in the curriculum and mandated graduation requirements made High Schools and K-12 Schools less competitive than Primary Schools in Mississippi.

Competitions from religious private schools also had a significant impact on Primary Schools' efficiency, but not on High or K-12 Schools' efficiency. Religious affiliation and practice was important to many parents. Attending a religious school was even more important for these parents since they preferred to educate their children in a religious environment. The southern states are often called the "*Bible Belt*" because of the relatively high density of Christian people. Therefore, there were a higher number of religious private schools in this part of the country than the rest of the United States. Also, instilling religious beliefs was easier during childhood than older ages (Cohen-Zada

and Sander, 2007). Hence, the results that Primary Schools were more competitive with religious private primary schools were driven by these religious preferences.

7.3 Policy Issues

This dissertation added additional empirical weight to the results of earlier studies of competition in school markets. As stated earlier, market-based reforms had mixed effects on the efficiency of public schools. In this study, the effect of competition from private schools was significant for Primary Schools, but insignificant for High and K-12 Schools. Therefore, proponents of market based reforms should be aware that allowing more private schools, or even voucher programs, may not increase students' performance in public schools. Thus, to increase overall public school education quality they have to come up with new solutions.

Ranking Mississippi public schools based upon estimated technical efficiency allows for even deeper analysis of potential education market reforms. State and Local policy makers should carry out local policy programs instead of a common policy for all schools across the state. These customized local school policies will ultimately help increase individual school quality. Furthermore, this research provides a clear picture to local taxpayers and policymakers about the difference in learning outcomes in rural and urban public schools. Policy makers should minimize the educational outcome gap by developing programs targeting rural communities in Mississippi. Examining the affects of social capital on public school efficiency informs policymakers that future funding for community development is required.

7.4 Limitations

The sample did not include information on private school student test scores due to the unavailability of private school data. However, such data would not useful because the goal of this dissertation was to examine the effects of competition from private schools on public school performance. This analysis utilized NCES data to supplement state-specific data provided by the Mississippi Department of Education. Another limitation of this study was that it focused only on one state. Currently, it was impossible to conduct a similar analysis on the national level. This was because a GIS-enabled data set of school locations does not exist at the national level currently. A GIS database including the geographic location for every school building in the state of Mississippi was constructed for use in this dissertation. It was necessary to define the geographic market in which each school operates in order to construct the competition index employed in this analysis. The time costs of doing this for all fifty states were well beyond the scope of resources and time available for this dissertation. But it will be helpful for future researchers to construct and maintain such a database. *However, the value of the GIS approach is great, and this dissertation may be considered as a case study to the potential of using GIS tools to address educational reform issues.* The potential benefits of GIS analysis for educational policy research are vast, and this study should provide an example for future researchers to build upon and follow.

7.5 Future Research

Understanding a market is difficult and analyzing the effect from competition is even more complicated. An ideal market definition should consist of three market structure components: the number of competitors, the size of each competitors and the distance from each competitor. Market characteristics are also important to know before

evaluating the effect of competition in a market. Every market is different in its structure and characteristics. Without acknowledging these differences, market analysis will provide illusory results. Hence, understanding an education market from these two major aspects is the major contribution of this dissertation. Developing this methodology should help future researchers from other fields in their research. Further development of this dissertation could come in several ways, such as including private schools students' scores in different examinations, and including information about private school teachers, staff, principal and curriculum.

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APPENDIX A

STOCHASTIC FRONTIER ANALYSIS FOR PRIMARY SCHOOLS

Table A.1 Results from Stochastic Frontier Analysis for Primary Schools (Grade 8th)

Variables /Dependent Variable	Log MCT Reading	Log MCT Mathematics
Constant	2.47***	3.03***
	(0.45)	(0.45)
Log of Building Area per Student	0.27*	0.13
	(0.14)	(0.11)
Log of General Expenditures per Student	0.23*	0.20
	(0.14)	(0.13)
Log of Textbook Expenditures per Student	0.02	-0.05
	(0.05)	(0.06)
Log of Number of Teachers and Staff per Student	-0.07	-0.06
	(0.24)	(0.25)
Log likelihood function	-11.81	-12.15
Technical Efficiency		
Mean	0.74	0.73
Min	0.16	0.24
Max	0.97	0.98

N = 90, only 8th graders are included in the sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively. Standard errors are in parenthesis

Table A.2 Results from Stochastic Frontier Analysis for Primary Schools (6th Grade)

Variables /Dependent Variable	Log MCT Overall	Log MCT Reading	Log MCT Mathematics
Constant	3.26***	3.39***	3.28***
	(0.34)	(0.29)	(0.40)
Log of Building Area per Student	0.14	0.18*	0.09
	(0.11)	(0.10)	(0.13)
Log of General Expenditures per Student	0.05	-0.02	0.14
	(0.08)	(0.07)	(0.09)
Log of Textbook Expenditures per Student	-0.01	0.02	-0.01
	(0.04)	(0.04)	(0.04)
Log of Number of Teachers and Staff per Student	-0.06	0.00	-0.03
	(0.17)	(0.15)	(0.20)
Log likelihood function	37.46	50.37	18.88
Technical Efficiency			
Mean	0.85	0.87	0.81
Min	0.50	0.51	0.36
Max	0.97	0.97	0.96

N =111, only 6th graders are included in the sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

Table A.3 Results from Stochastic Frontier Analysis for Graduating Grade Pooled Model

Variables /Dependent Variable	**Log MCT Overall**	**Log MCT Reading**	**Log MCT Mathematics**
Constant	4.18***	3.98***	4.37***
	(0.20)	(0.14)	(0.18)
Log of Building Area per Student	-0.08	-0.04	-0.11**
	(0.06)	(0.04)	(0.05)
Log of General Expenditures per Student	-0.04	0.01	-0.02
	(0.04)	(0.03)	(0.04)
Log of Textbook Expenditures per Student	-0.02	0.01	-0.00
	(0.02)	(0.02)	(0.02)
Log of Number of Teachers and Staff per Student	0.08	0.04	0.22**
	(0.11)	(0.07)	(0.09)
Log likelihood function	34.63	57.71	17.06
Technical Efficiency			
Mean	0.78	0.78	0.75
Min	0.23	0.14	0.18
Max	0.97	0.98	0.99

N = 344, only non combined schools included in this sample. Frontier estimation results for Language will be available upon request. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Standard errors are in parenthesis

Table A.4 Rank Correlations: Primary Schools

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
GEORGE ELEMENTARY SCHOOL	0.9764	1	0.9885	1	0.9846	1	0.9682	1	0.1851	0.1851	0.1877
ENTERPRISE ELEMENTARY SCHOOL	0.9731	2	0.9705	29	0.9844	2	0.9642	2	0.0000	0.0029	0.0350
RANKIN ELEMENTARY SCHOOL	0.9729	3	0.9826	10	0.9831	3	0.9632	3	3.4784	3.4784	3.4789
EAST CENTRAL LOWER ELEMENTARY SCHOOL	0.9723	4	0.9842	6	0.9786	7	0.9610	6	0.0000	0.0051	0.0655
EAST CORINTH ELEMENTARY SCHOOL	0.9705	5	0.9872	3	0.9768	10	0.9601	8	0.0000	0.0002	0.0002
ELLISVILLE LOWER ELEMENTARY SCHOOL	0.9703	6	0.9792	15	0.9805	6	0.9611	5	0.0000	0.0285	0.0350
BEAUVOIR ELEMENTARY SCHOOL	0.9701	7	0.9701	30	0.9756	13	0.9595	9	136.6373	136.8053	136.8125
ANNISTON AVENUE ELEMENTARY SCHOOL	0.9688	8	0.9798	12	0.9569	41	0.9605	7	1.8954	1.9507	1.9838
JOYNER ELEMENTARY SCHOOL	0.9676	9	0.9655	36	0.9779	8	0.9569	12	0.3171	0.3171	0.3171
RAYMOND ELEMENTARY SCHOOL	0.9675	10	0.9817	11	0.9713	20	0.9567	13	0.1049	0.1517	0.1867
WAYNESBORO ELEMENTARY SCHOOL	0.9674	11	0.9836	7	0.9711	21	0.9554	15	0.0176	0.0176	0.0180
THOMAS L REEVES ELEMENTARY SCHOOL	0.9664	12	0.9737	23	0.9641	31	0.9573	11	0.1948	0.3154	0.3227
DIBERVILLE ELEMENTARY SCHOOL	0.9662	13	0.9693	31	0.9618	34	0.9581	10	0.4905	0.5780	0.5792
DELISLE ELEMENTARY SCHOOL	0.9655	14	0.9719	25	0.9710	22	0.9417	35	0.0800	0.2672	0.2825
BAYOU VIEW ELEMENTARY SCHOOL	0.9643	15	0.9835	8	0.9581	38	0.9534	17	21.5655	21.6678	21.6831
AGRICOLA ELEMENTARY SCHOOL	0.9642	16	0.9833	9	0.9550	45	0.9559	14	0.0000	0.0021	0.0237
ANDERSON ELEMENTARY SCHOOL	0.9642	17	0.9774	16	0.9658	30	0.9554	16	0.0000	0.0000	0.0015
COLUMBIA PRIMARY SCHOOL	0.9639	18	0.9798	14	0.9715	19	0.9481	28	0.0000	0.0002	0.0009
GRENADA ELEMENTARY SCHOOL	0.9635	19	0.9671	32	0.9764	12	0.9523	19	0.2555	0.2556	0.2560
WALTON ELEMENTARY SCHOOL	0.9631	20	0.9846	5	0.9072	81	0.9627	4	1.9636	2.0146	2.2838
JOE COOK ELEMENTARY SCHOOL	0.9627	21	0.9650	38	0.9671	29	0.9517	21	1.3220	1.3450	1.3479
D T COX ELEMENTARY SCHOOL	0.9612	22	0.9641	40	0.9698	24	0.9497	24	0.0000	0.0056	0.0070
CARVER LOWER ELEMENTARY SCHOOL	0.9609	23	0.9659	34	0.9565	43	0.9479	29	0.0000	1.1115	1.1186

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
NETTLETON PRIMARY SCHOOL	0.9602	24	0.9504	56	0.9821	4	0.9381	42	0.0000	0.0051	0.0076
SHARON ELEMENTARY SCHOOL	0.9599	25	0.9105	96	0.9674	26	0.9486	26	0.0000	0.0877	0.0877
BROOKHAVEN ELEMENTARY SCHOOL	0.9595	26	0.9750	21	0.9705	23	0.9375	43	0.3507	0.3507	0.3567
ARTHUR W WATSON JR ELEMENTARY SCHOOL	0.9593	27	0.9798	13	0.9567	42	0.9491	25	0.0395	0.0395	0.0403
OAK GROVE LOWER ELEMENTARY SCHOOL	0.9589	28	0.9729	24	0.9624	33	0.9517	20	0.0029	0.0097	0.0111
IUKA ELEMENTARY SCHOOL	0.9583	29	0.9617	44	0.9673	27	0.9434	32	0.0000	0.0001	0.0019
HERNANDO ELEMENTARY SCHOOL	0.9579	30	0.9739	22	0.9616	35	0.9375	44	0.0000	0.0222	0.0657
KOSCIUSKO UPPER ELEMENTARY SCHOOL	0.9575	31	0.9709	28	0.9363	62	0.9482	27	0.3210	0.3210	0.3234
GARY ROAD ELEMENTARY SCHOOL	0.9571	32	0.9621	42	0.9765	11	0.9446	30	0.0019	0.0419	0.0543
PETAL ELEMENTARY SCHOOL	0.9556	33	0.9620	43	0.9723	17	0.9344	51	0.0000	0.0052	0.0079
ROUSE ELEMENTARY SCHOOL	0.9552	34	0.9512	53	0.9729	15	0.9398	40	0.0000	0.0719	0.0753
MADISON STATION ELEMENTARY SCHOOL	0.9550	35	0.9654	37	0.9499	48	0.9401	39	1.0764	1.1560	1.1648
GARY ROAD INTERMEDIATE SCHOOL	0.9546	36	0.9667	33	0.9413	57	0.9498	23	0.0018	0.0407	0.0528
NORTH PIKE ELEMENTARY SCHOOL	0.9541	37	0.9763	18	0.9450	52	0.9336	53	0.0562	0.0562	0.0655
SHADOW OAKS ELEMENTARY SCHOOL	0.9532	38	0.9501	57	0.9517	46	0.9405	37	0.0273	0.1443	0.1791
T Y FLEMING SCHOOL	0.9527	39	0.9714	26	0.9506	47	0.9184	66	0.0000	0.0173	0.0466
PEARMAN ELEMENTARY SCHOOL	0.9527	40	0.9773	17	0.9817	5	0.8633	131	4.3005	4.3057	4.3093
PONTOTOC ELEMENTARY SCHOOL	0.9521	41	0.9236	83	0.9579	39	0.9403	38	0.0000	0.0026	0.0032
CHURCH HILL ELEMENTARY SCHOOL	0.9517	42	0.9548	48	0.9573	40	0.9413	36	0.2895	0.2993	0.3043
POPLARVILLE LOWER ELEMENTARY SCHOOL	0.9516	43	0.9504	55	0.9737	14	0.9086	82	0.0000	0.0000	0.0039
DAVIS MAGNET SCHOOL	0.9515	44	0.9870	4	0.8094	153	0.9533	18	6.5249	6.6035	6.6159
WEST AMORY SCHOOL	0.9503	45	0.9383	67	0.9772	9	0.9206	63	0.1497	0.1497	0.1506
VANCLEAVE UPPER ELEMENTARY SCHOOL	0.9501	46	0.9426	61	0.9396	60	0.9368	46	0.0000	0.0211	0.0541
HORN LAKE ELEMENTARY SCHOOL	0.9495	47	0.9373	68	0.9725	16	0.9202	65	0.0724	0.1739	0.1918
RIVERSIDE ELEMENTARY SCHOOL	0.9490	48	0.9019	106	0.9563	44	0.9363	47	0.0199	0.0423	0.0453
SENATOBIA ELEMENTARY SCHOOL	0.9489	49	0.9203	87	0.9616	36	0.9387	41	0.1132	0.1141	0.1201

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
WEST CLAY ELEMENTARY SCHOOL	0.9483	50	0.9448	60	0.9720	18	0.8866	112	0.0000	0.0146	0.0367
HARRISON CENTRAL ELEMENTARY SCHOOL	0.9480	51	0.9336	72	0.9202	71	0.9434	31	0.1139	0.1557	0.1639
NEWTON ELEMENTARY SCHOOL	0.9469	52	0.9649	39	0.9690	25	0.9124	77	0.0000	0.0049	0.0095
W L SMITH	0.9465	53	0.9599	46	0.9294	67	0.9325	54	0.1253	0.1285	0.1299
PINEVILLE ELEMENTARY SCHOOL	0.9442	54	0.9036	103	0.9359	63	0.9238	60	0.7938	0.9849	1.0104
LAWHON ELEMENTARY SCHOOL	0.9441	55	0.9064	100	0.9469	50	0.9349	49	0.4328	0.4645	0.4649
BOWMAR AVENUE SCHOOL	0.9394	56	0.9709	27	0.9473	49	0.8952	102	0.8564	0.8564	0.8581
NORTHWEST ELEMENTARY SCHOOL	0.9392	57	0.9754	20	0.9071	82	0.9130	74	0.0629	0.1963	0.2023
WEDDINGTON ELEMENTARY SCHOOL	0.9386	58	0.9509	54	0.9342	65	0.9102	80	0.9990	1.0172	1.0189
MC LEOD ELEMENTARY SCHOOL	0.9383	59	0.9757	19	0.8828	104	0.9230	61	2.3279	2.4691	2.5403
LYMAN ELEMENTARY SCHOOL	0.9354	60	0.9162	92	0.9342	64	0.8962	98	0.0000	0.1207	0.1329
BATESVILLE INTERMEDIATE SCHOOL	0.9348	61	0.9057	102	0.9101	76	0.9426	34	0.0517	0.0517	0.0561
FRANKLIN ACADEMY	0.9345	62	0.9658	35	0.8933	96	0.9128	76	1.0933	1.1228	1.1271
CARVER MIDDLE SCHOOL	0.9337	63	0.9335	73	0.9133	75	0.9078	84	0.1193	0.1797	0.2655
ALCORN CENTRAL ELEMENTARY SCHOOL	0.9333	64	0.9608	45	0.8945	94	0.9202	64	0.0133	0.0133	0.0133
NEWTON COUNTY ELEMENTARY SCHOOL	0.9325	65	0.9634	41	0.9003	86	0.8990	94	0.2141	0.2141	0.2192
LOVETT ELEMENTARY SCHOOL	0.9324	66	0.9491	58	0.9439	53	0.9079	83	0.1046	0.2714	0.2744
STERN ELEMENTARY SCHOOL	0.9320	67	0.9256	82	0.8988	88	0.9111	78	4.2405	4.2564	4.2587
A W JAMES ELEMENTARY SCHOOL	0.9319	68	0.8951	113	0.9086	79	0.9218	62	0.0999	0.1093	0.1114
WOOLMARKET ELEMENTARY SCHOOL	0.9305	69	0.9264	78	0.9672	28	0.8305	154	0.0621	0.1357	0.3379
NORA DAVIS MAGNET SCHOOL	0.9301	70	0.9386	65	0.9434	54	0.8807	118	1.7797	1.7822	1.7843
WALLS ELEMENTARY SCHOOL	0.9296	71	0.9526	50	0.8811	105	0.9164	70	0.0091	0.0250	0.0718
FLOWOOD ELEMENTARY SCHOOL	0.9290	72	0.9451	59	0.9215	70	0.8937	103	0.0437	0.3108	0.3306
CHARLESTON ELEMENTARY SCHOOL	0.9271	73	0.8473	142	0.8873	99	0.9353	48	0.0000	0.0020	0.0064
OSYKA ELEMENTARY SCHOOL	0.9271	74	0.9426	62	0.8015	161	0.9434	33	0.0000	0.0000	0.0184
FRIARS POINT ELEMENTARY SCHOOL	0.9263	75	0.8223	159	0.9603	37	0.9088	81	0.0000	0.0248	0.0275
HILLS CHAPEL SCHOOL	0.9255	76	0.7959	187	0.9458	51	0.9343	52	0.0000	0.0000	0.0034

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
OVERSTREET ELEMENTARY SCHOOL	0.9254	77	0.8628	128	0.9626	32	0.8954	101	2.2377	2.2510	2.2583
SALE ELEMENTARY SCHOOL	0.9251	78	0.8773	122	0.9094	77	0.9254	58	1.4852	1.4852	1.4930
LOPEZ ELEMENTARY SCHOOL	0.9248	79	0.9065	99	0.8679	115	0.9026	92	1.7632	2.0767	2.0945
OLIVE BRANCH INTERMEDIATE SCHOOL	0.9247	80	0.9519	51	0.8972	91	0.8895	106	1.0121	1.2509	1.2743
LUCEDALE INTERMEDIATE SCHOOL	0.9244	81	0.9180	91	0.8371	133	0.9145	72	0.0078	0.0078	0.0088
POPLARVILLE UPPER ELEMENTARY SCHOOL	0.9232	82	0.9409	63	0.8658	116	0.9031	90	0.0000	0.0000	0.0043
ROCKY CREEK ELEMENTARY SCHOOL	0.9222	83	0.9385	66	0.8955	92	0.8795	120	0.0000	0.0007	0.0025
IDA GREENE LOWER ELEMENTARY SCHOOL	0.9222	84	0.8781	121	0.8765	108	0.9184	67	2.2520	2.2535	2.2604
OXFORD ELEMENTARY SCHOOL	0.9197	85	0.9262	79	0.9063	84	0.8855	114	0.0170	0.0170	0.0170
EVA GORDON ELEMENTARY SCHOOL	0.9189	86	0.8926	117	0.8473	124	0.9240	59	0.0000	0.0682	0.0735
JEFF DAVIS ELEMENTARY SCHOOL	0.9184	87	0.9007	108	0.8212	145	0.9303	55	1.0813	1.2176	1.2264
BRANDON ELEMENTARY SCHOOL	0.9178	88	0.9364	69	0.8844	102	0.9043	89	0.0000	0.0515	0.0528
CALEDONIA ELEMENTARY SCHOOL	0.9174	89	0.9208	86	0.9063	83	0.8880	109	0.0000	0.0067	0.0091
ORANGE LAKE ELEMENTARY SCHOOL	0.9174	90	0.9882	2	0.8092	154	0.7809	186	0.0000	0.0678	0.4621
BEAT FOUR ELEMENTARY SCHOOL	0.9155	91	0.7987	184	0.9405	59	0.9182	68	0.0000	0.0011	0.0088
FAIR ELEMENTARY SCHOOL	0.9154	92	0.8830	119	0.9386	61	0.8643	129	0.1827	0.1827	0.1827
MAMIE MARTIN ELEMENTARY SCHOOL	0.9153	93	0.8898	118	0.9338	66	0.8783	121	0.1930	0.1930	0.1961
MORTON ELEMENTARY SCHOOL	0.9142	94	0.8932	116	0.9174	74	0.8918	105	0.0000	0.0170	0.0183
SENATOBIA MIDDLE SCHOOL	0.9121	95	0.8624	130	0.8892	97	0.9134	73	0.1204	0.1219	0.1299
DANA ROAD ELEMENTARY SCHOOL	0.9107	96	0.8627	129	0.9026	85	0.9069	85	0.1223	0.1571	0.1584
SALTILLO ELEMENTARY SCHOOL	0.9092	97	0.9261	80	0.8383	130	0.8932	104	0.0000	0.0177	0.0177
OLDE TOWNE MIDDLE SCHOOL	0.9075	98	0.8618	132	0.8843	103	0.9128	75	0.7774	0.9180	0.9530
STOKES BEARD ELEMENTARY SCHOOL	0.9072	99	0.8771	123	0.8046	157	0.9265	57	1.1808	1.1808	1.1923
BALDWYN ELEMENTARY SCHOOL	0.9058	100	0.9062	101	0.8527	121	0.8994	93	0.0000	0.0000	0.0068

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
WEST JONES ELEMENTARY SCHOOL	0.9053	101	0.8976	110	0.7981	165	0.9347	50	0.0000	0.0209	0.0230
SUMRALL ELEMENTARY SCHOOL	0.9012	102	0.9582	47	0.7828	175	0.9062	87	0.0000	0.0019	0.0064
COLLEGE PARK ELEMENTARY SCHOOL	0.9009	103	0.9225	84	0.8033	159	0.8978	95	0.0000	0.0858	0.1882
KOSSUTH ELEMENTARY SCHOOL	0.8989	104	0.9159	94	0.8225	139	0.9063	86	0.0000	0.0001	0.0001
GREENLEE ATTENDANCE CENTER	0.8984	105	0.7583	209	0.8874	98	0.9374	45	0.0000	0.0000	0.0116
AMORY ELEMENTARY SCHOOL	0.8980	106	0.9346	71	0.8502	123	0.8649	128	0.1851	0.1851	0.1862
CARTHAGE ELEMENTARY SCHOOL	0.8957	107	0.9260	81	0.8796	106	0.8495	139	0.0000	0.0057	0.0086
LAFAYETTE ELEMENTARY SCHOOL	0.8941	108	0.9072	97	0.8395	129	0.8881	107	0.0701	0.0701	0.0701
EARL NASH ELEMENTARY SCHOOL	0.8926	109	0.8802	120	0.7521	194	0.9280	56	0.0320	0.0320	0.0359
HORN LAKE INTERMEDIATE SCHOOL	0.8910	110	0.9270	77	0.8116	152	0.8838	115	0.0813	0.1934	0.2130
GRENADA UPPER ELEMENTARY SCHOOL	0.8909	111	0.9152	95	0.7887	171	0.9060	88	0.5436	0.5437	0.5445
ARLINGTON HEIGHTS ELEMENTARY SCHOOL	0.8900	112	0.8997	109	0.7700	183	0.9146	71	0.3465	0.3465	0.4538
FLORENCE ELEMENTARY SCHOOL	0.8871	113	0.9159	93	0.8381	131	0.8602	132	0.0000	0.0788	0.0998
HAZLEHURST ELEMENTARY SCHOOL	0.8851	114	0.9193	89	0.8378	132	0.8813	117	0.0000	0.0258	0.0277
ASHLAND ELEMENTARY SCHOOL	0.8840	115	0.9400	64	0.7462	201	0.8779	122	0.0000	0.0000	0.0075
DUNDEE ELEMENTARY SCHOOL	0.8835	116	0.7656	205	0.8697	112	0.9104	79	0.0000	0.0176	0.0255
EAST HANCOCK ELEMENTARY SCHOOL	0.8828	117	0.9305	75	0.8137	150	0.8473	143	0.0000	0.0283	0.0389
TYLERTOWN PRIMARY SCHOOL	0.8824	118	0.8624	131	0.8990	87	0.8025	171	0.0000	0.0000	0.0080
MENDENHALL ELEMENTARY SCHOOL	0.8818	119	0.9326	74	0.8012	162	0.8680	126	0.3371	0.3403	0.3437
CARVER ELEMENTARY SCHOOL(Tupelo)	0.8807	120	0.8575	136	0.8225	140	0.9031	91	1.2558	1.2623	1.2704
WEST MARION PRIMARY SCHOOL	0.8802	121	0.8193	164	0.8689	114	0.8964	97	0.0000	0.0000	0.0001
HANCOCK NORTH CENTRAL ELEMENTARY SCHOOL	0.8802	122	0.9347	70	0.8722	109	0.7826	185	0.0000	0.0034	0.0150
ROSELAND PARK ELEMENTARY SCHOOL	0.8795	123	0.9018	107	0.8607	118	0.8413	148	0.0784	0.0785	0.0905
SOUTH SIDE LOWER ELEMENTARY SCHOOL	0.8783	124	0.8973	112	0.8856	100	0.7967	180	0.0149	0.0165	0.0599
CHALYBEATE ELEMENTARY SCHOOL	0.8766	125	0.8203	161	0.7991	164	0.9171	69	0.0000	0.0000	0.0031
MOSELLE ELEMENTARY SCHOOL	0.8762	126	0.8935	115	0.8198	147	0.8554	136	0.0000	0.0091	0.0171

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
SUDDUTH ELEMENTARY SCHOOL	0.8761	127	0.8507	140	0.9084	80	0.8098	166	0.1913	0.1958	0.1980
FAIRVIEW ELEMENTARY SCHOOL	0.8748	128	0.9518	52	0.7168	212	0.8833	116	15.4763	15.4763	15.4864
CHARLOTTE HYATT SCHOOL	0.8739	129	0.7087	246	0.9410	58	0.8535	137	0.2827	0.3077	2.2455
HATHORN ELEMENTARY SCHOOL	0.8729	130	0.9222	85	0.5751	279	0.9502	22	0.0000	0.0316	0.0427
ACKERMAN ELEMENTARY SCHOOL	0.8727	131	0.9537	49	0.6923	227	0.8866	111	0.0000	0.0000	0.0109
MARY REID SCHOOL	0.8703	132	0.8081	178	0.8947	93	0.8309	153	0.0000	0.0154	0.0164
CRYSTAL SPRINGS ELEMENTARY SCHOOL	0.8693	133	0.8153	170	0.8595	119	0.8562	135	0.0496	0.0524	0.0579
MYRTLE HALL IV ELEMENTARY SCHOOL	0.8686	134	0.8943	114	0.7464	200	0.8807	119	6.9184	6.9184	6.9213
MAGEE ELEMENTARY SCHOOL	0.8676	135	0.9072	98	0.7978	166	0.8502	138	0.2091	0.2321	0.2321
ENTERPRISE MIDDLE SCHOOL	0.8665	136	0.7608	207	0.9417	56	0.8388	151	0.0000	0.0080	0.0279
WINONA ELEMENTARY SCHOOL	0.8662	137	0.8608	134	0.8425	126	0.8226	159	0.5785	0.6008	0.6029
PURVIS ELEMENTARY SCHOOL	0.8655	138	0.8582	135	0.7991	163	0.8695	125	0.6492	0.6569	0.6570
NESHOBA CENTRAL ELEMENTARY SCHOOL	0.8641	139	0.9023	104	0.7884	172	0.8635	130	0.0000	0.0000	0.0022
VARDAMAN ELEMENTARY SCHOOL	0.8637	140	0.7832	193	0.8716	110	0.8655	127	0.0000	0.0041	0.0041
EAST KEMPER ATTENDANCE CENTER	0.8625	141	0.8712	126	0.7150	213	0.8957	100	0.0000	0.0000	0.0031
ESCATAWPA SCHOOL	0.8594	142	0.7509	211	0.9190	72	0.7881	183	0.0635	0.0988	3.0287
W C WILLIAMS ELEMENTARY SCHOOL	0.8594	143	0.8129	174	0.8933	95	0.7970	179	0.9196	0.9215	0.9258
FALKNER ELEMENTARY SCHOOL	0.8559	144	0.8268	154	0.8396	128	0.8121	164	0.0000	0.0000	0.0020
PEARL UPPER ELEMENTARY SCHOOL	0.8558	145	0.8445	144	0.8223	141	0.8451	144	0.0601	0.2967	0.3290
ABERDEEN MIDDLE SCHOOL	0.8548	146	0.9183	90	0.6795	238	0.8744	123	0.0000	0.0026	0.0124
PORT GIBSON MIDDLE SCHOOL	0.8516	147	0.7134	241	0.9179	73	0.8697	124	0.1371	0.1371	0.1388
RIENZI ELEMENTARY SCHOOL	0.8512	148	0.8123	175	0.9223	69	0.7360	215	0.0000	0.0004	0.0004
BENTONIA GIBBS SCHOOL	0.8496	149	0.8308	151	0.8283	136	0.8247	157	0.0000	0.0084	0.0248
CHEROKEE ELEMENTARY SCHOOL	0.8493	150	0.8766	124	0.7614	187	0.8478	142	1.6698	1.8322	1.8662
BROOKS ELEMENTARY SCHOOL	0.8489	151	0.6879	258	0.9422	55	0.7971	178	0.0000	0.0092	0.0146
GULFVIEW ELEMENTARY SCHOOL	0.8485	152	0.9020	105	0.7139	214	0.8390	150	0.0600	0.0929	0.1054

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
SINGING RIVER ELEMENTARY SCHOOL	0.8484	153	0.8973	111	0.7075	220	0.8440	146	0.0000	0.0697	0.1507
PHILADELPHIA ELEMENTARY SCHOOL	0.8473	154	0.7934	190	0.8981	89	0.7740	192	0.0000	0.0000	0.0052
EAST JONES ELEMENTARY SCHOOL	0.8473	155	0.8609	133	0.8279	137	0.7892	182	0.0475	0.0489	0.0498
CYPRESS PARK ELEMENTARY SCHOOL	0.8448	156	0.8079	179	0.7589	190	0.8967	96	0.3249	0.3304	0.3340
PARKS ELEMENTARY SCHOOL	0.8360	157	0.8110	176	0.8274	138	0.8015	174	10.7240	10.7274	10.7300
REED ATTENDANCE CENTER	0.8357	158	0.7449	218	0.8700	111	0.7607	199	0.0000	0.0020	0.0047
HOPE SULLIVAN ELEMENTARY SCHOOL	0.8353	159	0.8538	138	0.7814	177	0.8027	170	0.1300	0.2311	0.2370
GASTON POINT ELEMENTARY SCHOOL	0.8352	160	0.7658	204	0.7532	193	0.8872	110	1.3791	1.6510	1.6716
IUKA MIDDLE SCHOOL	0.8328	161	0.7675	203	0.8199	146	0.8447	145	0.0000	0.0001	0.0025
POPPS FERRY ELEMENTARY SCHOOL	0.8315	162	0.7934	191	0.7703	182	0.8600	133	3.0800	3.1519	3.1616
COLUMBIA ELEMENTARY SCHOOL	0.8299	163	0.9194	88	0.6982	223	0.8192	162	0.0000	0.0004	0.0021
LIZANA ELEMENTARY SCHOOL	0.8296	164	0.8087	177	0.8594	120	0.7464	206	0.0000	0.0276	0.0444
SOUTHAVEN ELEMENTARY SCHOOL	0.8294	165	0.9275	76	0.6942	225	0.8001	175	0.2007	0.3731	0.3771
CLARA ELEMENTARY SCHOOL	0.8263	166	0.7330	226	0.8334	134	0.8391	149	0.0000	0.0016	0.0016
MARIETTA ELEMENTARY SCHOOL	0.8251	167	0.7608	208	0.8189	148	0.8204	161	0.0000	0.0068	0.0105
SOUTH JONES ELEMENTARY SCHOOL	0.8247	168	0.8244	156	0.8217	142	0.7758	190	0.0000	0.0418	0.0514
RALEIGH ELEMENTARY SCHOOL	0.8245	169	0.8200	162	0.7476	198	0.8418	147	0.0000	0.0000	0.0055
BEL AIRE ELEMENTARY SCHOOL	0.8228	170	0.8042	182	0.7464	199	0.8208	160	0.3156	0.3708	0.3837
BECKER ELEMENTARY SCHOOL	0.8222	171	0.8540	137	0.6746	243	0.8597	134	0.0355	0.0355	0.0445
EAST SUNFLOWER SCHOOL	0.8210	172	0.8374	148	0.7944	169	0.7625	198	0.0000	0.0251	0.0431
HOLLY SPRINGS PRIMARY SCHOOL	0.8198	173	0.7395	219	0.7971	167	0.8265	156	1.3770	1.3773	1.3787
CORINTH JR HIGH SCHOOL	0.8181	174	0.6972	254	0.9092	78	0.7780	189	0.0000	0.0003	0.0003
NORTHWEST RANKIN MIDDLE SCHOOL	0.8180	175	0.7814	194	0.8214	144	0.8093	167	0.0295	0.0919	0.0949
PISGAH ELEMENTARY SCHOOL	0.8157	176	0.7964	186	0.8413	127	0.7417	210	0.0000	0.0335	0.0620
PONTOTOC JUNIOR HIGH SCHOOL	0.8156	177	0.7172	238	0.8974	90	0.7730	193	0.0000	0.0079	0.0084
LINWOOD ELEMENTARY SCHOOL	0.8154	178	0.8069	180	0.7612	188	0.8099	165	0.0000	0.0412	0.0629

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
WILKINSON COUNTY ELEMENTARY SCHOOL	0.8148	179	0.8239	158	0.7595	189	0.8154	163	0.2981	0.5481	0.5504
BATESVILLE MIDDLE SCHOOL	0.8139	180	0.8456	143	0.7306	207	0.8229	158	0.0389	0.0389	0.0434
NEW HOPE ELEMENTARY SCHOOL	0.8120	181	0.8750	125	0.7130	215	0.8062	169	0.0116	0.0253	0.0268
GAUTIER ELEMENTARY SCHOOL	0.8066	182	0.8069	181	0.6188	268	0.8959	99	0.0794	0.1822	0.4600
SAUCIER ELEMENTARY SCHOOL	0.8042	183	0.7369	222	0.8459	125	0.7533	203	0.0000	0.0158	0.0383
LIPSEY SCHOOL	0.8033	184	0.8401	147	0.7323	204	0.7658	197	0.9519	0.9519	0.9578
EAST WEBSTER ELEMENTARY SCHOOL	0.8009	185	0.7953	189	0.7966	168	0.7504	204	0.0000	0.0050	0.0109
SOUTH SIDE ELEMENTARY SCHOOL	0.8005	186	0.8280	153	0.7810	178	0.7430	208	0.0125	0.1068	0.1501
EAST CENTRAL MIDDLE SCHOOL	0.7996	187	0.7506	212	0.8690	113	0.6987	237	0.0000	0.0043	0.0555
CRESTWOOD ELEMENTARY SCHOOL	0.7966	188	0.8630	127	0.7491	197	0.7418	209	0.7209	0.8121	0.8128
SHANNON ELEMENTARY SCHOOL	0.7961	189	0.8185	166	0.7302	208	0.7788	187	0.0000	0.0115	0.0121
MCLAURIN ELEMENTARY SCHOOL	0.7959	190	0.8134	173	0.8055	156	0.7037	233	0.0000	0.0062	0.0438
WATKINS ELEMENTARY SCHOOL	0.7937	191	0.8486	141	0.6355	262	0.8494	140	2.1947	2.2599	3.6178
CALHOUN CITY ELEMENTARY SCHOOL	0.7920	192	0.7386	221	0.6676	246	0.8881	108	0.4286	0.4286	0.4286
MARSHALL ELEMENTARY SCHOOL	0.7914	193	0.8186	165	0.6538	251	0.8382	152	0.6827	0.9542	1.4207
UNION ACADEMY	0.7890	194	0.8141	172	0.7432	202	0.7202	224	0.0407	0.0536	3.4567
BAYOU VIEW MIDDLE SCHOOL	0.7889	195	0.7709	199	0.7740	179	0.7400	212	3.2095	3.2867	3.2984
VERONA SCHOOL	0.7889	196	0.8259	155	0.6766	241	0.7688	196	0.0254	0.0505	0.0510
O'BANNON ELEMENTARY SCHOOL	0.7888	197	0.7499	213	0.7850	173	0.7716	194	0.4711	0.5408	0.5474
MARGARET GREEN JUNIOR HIGH SCHOOL	0.7878	198	0.7467	216	0.8320	135	0.7274	220	11.0369	11.0404	11.0430
POINDEXTER ELEMENTARY SCHOOL	0.7830	199	0.8177	168	0.6920	229	0.7957	181	0.0000	0.0038	0.0048
FLORENCE MIDDLE SCHOOL	0.7826	200	0.7992	183	0.6890	233	0.7976	177	0.0000	0.0164	0.0674
LUTHER BRANSON SCHOOL	0.7784	201	0.8513	139	0.6921	228	0.7305	218	0.0000	0.0444	0.0560
KOSCIUSKO JUNIOR HIGH SCHOOL	0.7780	202	0.7144	240	0.8136	151	0.7401	211	0.2097	0.2097	0.2113
VAN WINKLE ELEMENTARY SCHOOL	0.7778	203	0.7653	206	0.5942	275	0.8858	113	0.0000	0.0234	0.0575

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
TUNICA ELEMENTARY SCHOOL	0.7698	204	0.8427	145	0.6452	260	0.7704	195	0.3127	0.3127	0.3184
WEST BOLIVAR ELEMENTARY SCHOOL	0.7692	205	0.7956	188	0.6507	253	0.7785	188	0.0000	0.0000	0.0037
WARRENTON ELEMENTARY SCHOOL	0.7672	206	0.8311	150	0.6930	226	0.7338	216	0.0253	0.0604	0.0622
LONG CREEK ATTENDANCE CENTER	0.7670	207	0.6690	267	0.7314	205	0.8487	141	0.0000	0.0129	0.0181
STRAYHORN ELEMENTARY SCHOOL	0.7663	208	0.7352	225	0.8034	158	0.7326	217	0.0000	0.0120	0.0136
RUNNELSTOWN ELEMENTARY SCHOOL	0.7657	209	0.7368	223	0.7706	181	0.7175	225	0.0000	0.0105	0.0163
TWENTY EIGHTH ST ELEMENTARY SCHOOL	0.7644	210	0.8282	152	0.5416	293	0.8297	155	29.6692	29.8803	29.9182
SHADY GROVE ELEMENTARY SCHOOL	0.7642	211	0.7555	210	0.6799	237	0.7835	184	0.1234	0.1253	0.1272
SOUTH LEAKE ELEMENTARY SCHOOL	0.7638	212	0.7681	201	0.8152	149	0.6401	261	0.0000	0.0188	0.0212
EUPORA ELEMENTARY SCHOOL	0.7615	213	0.7275	229	0.7664	185	0.7484	205	0.0000	0.0000	0.0019
OXFORD MIDDLE SCHOOL	0.7606	214	0.7490	214	0.7621	186	0.7100	231	0.0701	0.0701	0.0701
BELL ELEMENTARY SCHOOL	0.7561	215	0.6912	256	0.9256	68	0.5738	291	0.0700	0.0734	0.0786
MC BRIDE ELEMENTARY SCHOOL	0.7546	216	0.8194	163	0.5908	276	0.7598	200	1.4455	1.4755	1.4805
GLENDALE ELEMENTARY SCHOOL	0.7531	217	0.8241	157	0.6629	247	0.7283	219	0.0395	0.0395	0.0395
SANDERS ELEMENTARY SCHOOL	0.7502	218	0.7680	202	0.7498	196	0.6391	262	0.0000	0.0108	0.0232
MIDDLE SCHOOL OF POPLARVILLE	0.7501	219	0.6718	266	0.8062	155	0.7021	234	0.0000	0.0000	0.0040
QUITMAN COUNTY ELEMENTARY SCHOOL	0.7497	220	0.6405	284	0.8512	122	0.6838	242	0.0000	0.0045	0.0116
GRACE CHRISTIAN ELEMENTARY SCHOOL	0.7491	221	0.7190	236	0.8021	160	0.6662	250	0.2731	0.2767	0.2769
DARLING ELEMENTARY SCHOOL	0.7483	222	0.7109	244	0.6713	244	0.8084	168	1.7212	1.7423	1.7455
WILSON ELEMENTARY SCHOOL	0.7480	223	0.7472	215	0.6914	230	0.7147	227	0.0000	0.0005	0.0132
SHERARD ELEMENTARY SCHOOL	0.7454	224	0.7198	233	0.8855	101	0.5427	299	0.0000	0.0854	0.0899
VANCLEAVE MIDDLE SCHOOL	0.7436	225	0.6938	255	0.7929	170	0.6805	244	0.0000	0.0237	0.0576
TRIGG ELEMENTARY SCHOOL	0.7416	226	0.7902	192	0.6483	255	0.7135	228	0.2222	0.2284	0.2343
PETAL MIDDLE SCHOOL	0.7393	227	0.7216	231	0.7123	217	0.7376	214	0.0173	0.0207	0.0232
SOUTHEAST MIDDLE SCHOOL	0.7380	228	0.6110	293	0.7572	191	0.8025	172	0.0000	0.0562	0.0573
LAKE MIDDLE SCHOOL	0.7373	229	0.6677	269	0.7129	216	0.8024	173	0.0000	0.0002	0.0014

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
HERNANDO MIDDLE SCHOOL	0.7350	230	0.7237	230	0.7350	203	0.6962	239	0.0000	0.0209	0.0618
BOOKER T WASHINGTON SCHOOL	0.7338	231	0.8418	146	0.5289	300	0.7755	191	7.5940	7.5940	7.5972
BALDWYN MIDDLE SCHOOL	0.7320	232	0.6110	292	0.8773	107	0.6558	255	0.0000	0.0000	0.0079
WEBB ELEMENTARY SCHOOL	0.7312	233	0.7204	232	0.7828	176	0.6011	282	3.2156	3.2327	3.2351
WEST MARION ELEMENTARY SCHOOL	0.7296	234	0.8168	169	0.6781	240	0.6703	249	0.0000	0.0002	0.0002
JEFFERSON CO ELEMENTARY SCHOOL	0.7263	235	0.7389	220	0.6483	254	0.7230	222	0.0000	0.0000	0.0052
OAK FOREST ELEMENTARY SCHOOL	0.7241	236	0.7759	196	0.6471	256	0.6972	238	0.2979	0.4167	0.4472
I T MONTGOMERY ELEMENTARY SCHOOL	0.7226	237	0.6631	271	0.7310	206	0.7203	223	0.0000	0.0112	0.0145
CENTRAL SCHOOL	0.7215	238	0.7099	245	0.7707	180	0.6525	256	1.6234	1.6344	1.6405
BENNDALE ELEMENTARY SCHOOL	0.7209	239	0.8180	167	0.6584	250	0.6226	272	0.0000	0.0007	0.0007
LELAND ELEMENTARY SCHOOL	0.7192	240	0.7062	249	0.7216	210	0.6811	243	0.0000	0.0823	0.0859
BAXTERVILLE SCHOOL	0.7176	241	0.6733	265	0.8216	143	0.5830	288	0.0000	0.0105	0.0168
BYRAM MIDDLE SCHOOL	0.7152	242	0.6883	257	0.7116	218	0.7005	235	0.0000	0.0349	0.0460
GALLOWAY ELEMENTARY SCHOOL	0.7134	243	0.7980	185	0.5518	288	0.7377	213	3.6024	3.6515	3.6851
BRANDON MIDDLE SCHOOL	0.7113	244	0.6779	260	0.7093	219	0.7166	226	0.0000	0.0565	0.0580
MITCHELL MEMORIAL ELEMENTARY SCHOOL	0.7035	245	0.8205	160	0.5186	304	0.7095	232	1.1929	1.1929	1.2222
WEST WORTHAM ELEMENTARY AND MIDDLE SCHOOL	0.7024	246	0.6753	263	0.7507	195	0.6248	270	0.0000	0.0090	0.0170
JOHNSON ELEMENTARY SCHOOL	0.7023	247	0.7193	235	0.6342	265	0.7114	230	2.2320	2.2818	2.3897
PEARL JUNIOR HIGH SCHOOL	0.7002	248	0.6546	277	0.7694	184	0.6226	273	0.0389	0.1915	0.2126
WITHERSPOON ELEMENTARY SCHOOL	0.6993	249	0.7322	227	0.6524	252	0.6339	266	0.7802	1.3578	1.3579
CANTON ELEMENTARY SCHOOL	0.6987	250	0.7067	247	0.6240	267	0.7233	221	0.5769	0.5882	0.6115
MAGNOLIA ELEMENTARY SCHOOL	0.6987	251	0.6879	259	0.7282	209	0.6206	274	0.0000	0.0687	0.0739
PASS ROAD ELEMENTARY SCHOOL	0.6983	252	0.7741	198	0.5528	286	0.6937	241	2.5614	2.7632	2.7931
JAMES ROSSER ELEMENTARY SCHOOL	0.6951	253	0.8146	171	0.6049	272	0.5810	289	0.0000	0.0242	0.0405
COLLINS ELEMENTARY SCHOOL	0.6947	254	0.7753	197	0.5858	277	0.6758	247	0.0000	0.0002	0.0055
HORN LAKE MIDDLE SCHOOL	0.6913	255	0.6614	273	0.7172	211	0.6608	253	0.0155	0.0734	0.0908

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
LYON ELEMENTARY SCHOOL	0.6907	256	0.8343	149	0.3911	332	0.7982	176	0.0008	0.0459	0.0477
CENTRAL ELEMENTARY SCHOOL	0.6906	257	0.7466	217	0.5476	292	0.7547	201	0.1108	0.1398	8.1572
STAINTON ELEMENTARY SCHOOL	0.6881	258	0.6350	286	0.7549	192	0.6141	277	0.9766	0.9766	0.9804
HEIDELBERG SCHOOL	0.6872	259	0.7151	239	0.5360	295	0.7539	202	6.9827	6.9827	6.9856
GUNTOWN SCHOOL	0.6817	260	0.6529	278	0.7055	222	0.6459	258	0.0000	0.0053	0.0053
EAST TATE ELEMENTARY SCHOOL	0.6798	261	0.7188	237	0.6470	257	0.6428	259	0.0000	0.0082	0.0133
ALCORN CENTRAL MIDDLE SCHOOL	0.6787	262	0.6984	253	0.6873	235	0.5933	285	0.0010	0.0010	0.0010
SIMPSON CENTRAL SCHOOL	0.6742	263	0.7123	242	0.5962	273	0.6637	251	0.0000	0.0193	0.0208
GEORGE COUNTY MIDDLE SCHOOL	0.6713	264	0.6574	276	0.6455	259	0.6764	246	0.0010	0.0010	0.0012
HANCOCK MIDDLE SCHOOL	0.6692	265	0.6688	268	0.6782	239	0.6203	275	0.0000	0.0217	0.0291
HENDERSON INTERMEDIATE SCHOOL	0.6685	266	0.7012	251	0.6350	264	0.6263	269	1.5732	1.5894	1.5955
GRENADA MIDDLE SCHOOL	0.6637	267	0.6122	290	0.6890	232	0.6620	252	0.3077	0.3077	0.3082
EAST PARK ELEMENTARY SCHOOL	0.6583	268	0.7306	228	0.4885	313	0.6419	260	0.2062	0.2195	0.8535
PRAIRIE ELEMENTARY SCHOOL	0.6579	269	0.6760	262	0.5738	280	0.6568	254	0.0000	0.0347	0.0549
TUPELO MIDDLE SCHOOL	0.6559	270	0.5906	297	0.6808	236	0.6471	257	0.1625	0.1625	0.1627
WEST HILLS ELEMENTARY SCHOOL	0.6546	271	0.7698	200	0.4919	312	0.6779	245	0.7709	0.7709	0.7710
CRENSHAW ELEMENTARY SCHOOL	0.6543	272	0.6637	270	0.7072	221	0.5189	309	0.0000	0.0176	0.0300
MANNING ELEMENTARY SCHOOL	0.6532	273	0.6516	279	0.5342	298	0.7439	207	0.7095	0.7174	0.7238
MOORHEAD MIDDLE SCHOOL	0.6525	274	0.6743	264	0.5254	302	0.7002	236	0.1625	0.1788	0.1979
MASON ELEMENTARY SCHOOL	0.6497	275	0.6449	280	0.6593	249	0.5987	283	1.0361	1.0380	1.0398
BOYD ELEMENTARY SCHOOL	0.6494	276	0.6257	288	0.6753	242	0.6059	279	5.9764	5.9868	5.9928
O M MC NAIR UPPER ELEMENTARY SCHOOL	0.6479	277	0.6598	275	0.6889	234	0.5345	302	2.8756	2.8776	2.8865
NORTH JACKSON ELEMENTARY SCHOOL	0.6476	278	0.7354	224	0.4966	311	0.6710	248	2.0756	2.2045	2.7745
ARMSTRONG ELEMENTARY SCHOOL	0.6462	279	0.6439	282	0.5959	274	0.6366	264	1.7231	1.7402	1.7429
AKIN ELEMENTARY SCHOOL	0.6418	280	0.7805	195	0.5149	306	0.5906	286	1.0637	1.0771	1.0785

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
NICHOLSON ELEMENTARY SCHOOL	0.6407	281	0.7197	234	0.5733	281	0.5761	290	0.0029	0.0134	0.0390
NORTH PIKE MIDDLE SCHOOL	0.6383	282	0.6032	295	0.6617	248	0.6054	280	0.0033	0.0170	0.0203
LOUISVILLE ELEMENTARY SCHOOL	0.6360	283	0.7121	243	0.5523	287	0.5971	284	0.2549	0.2549	0.2549
RULEVILLE MIDDLE SCHOOL	0.6350	284	0.5182	313	0.6260	266	0.7119	229	0.0610	0.0709	0.0814
JONESTOWN ELEMENTARY SCHOOL	0.6344	285	0.5430	305	0.8632	117	0.4363	326	0.0000	0.0178	0.0199
LUMBERTON ELEMENTARY SCHOOL	0.6330	286	0.5238	312	0.7848	174	0.5459	298	0.0000	0.0050	0.0071
NEW HEBRON ATTENDANCE CENTER	0.6281	287	0.5293	308	0.6896	231	0.6244	271	0.0000	0.0058	0.0141
WILLIAM M COLMER MIDDLE SCHOOL	0.6264	288	0.5768	301	0.6676	245	0.5667	294	0.4037	0.6386	0.6406
GAUTIER MIDDLE SCHOOL	0.6213	289	0.6121	291	0.5497	290	0.6375	263	0.0000	0.0381	0.0836
SHELBY SCHOOL	0.6213	290	0.5412	306	0.6460	258	0.6025	281	0.0000	0.0060	0.0151
MCCOMB MIDDLE SCHOOL	0.6204	291	0.6411	283	0.6136	269	0.5510	296	0.5773	0.5773	0.7443
GOODMAN PICKENS ELEMENTARY SCHOOL	0.6176	292	0.6608	274	0.5623	285	0.5832	287	0.0015	0.0090	0.0184
JEFFERSON MIDDLE SCHOOL	0.6144	293	0.6079	294	0.6056	271	0.6107	278	0.0000	0.0003	0.0014
CALEDONIA MIDDLE SCHOOL	0.6135	294	0.6624	272	0.5702	282	0.5683	292	0.0000	0.0125	0.0169
LAKE ELEMENTARY SCHOOL	0.6126	295	0.6987	252	0.5249	303	0.5674	293	0.0016	0.0300	0.7631
LAFAYETTE MIDDLE SCHOOL	0.6032	296	0.5612	303	0.5835	278	0.6325	268	0.0723	0.0723	0.0723
GREENHILL ELEMENTARY SCHOOL	0.6006	297	0.5692	302	0.5677	283	0.6353	265	0.0000	0.0201	0.0210
COLDWATER ELEMENTARY SCHOOL	0.5981	298	0.7036	250	0.5283	301	0.5199	307	0.0297	0.0590	0.0739
KIRKPATRICK SCHOOL	0.5929	299	0.6766	261	0.3656	335	0.6938	240	7.3948	7.3948	7.3979
MENDENHALL JUNIOR HIGH SCHOOL	0.5911	300	0.6309	287	0.6081	270	0.4978	314	7.3210	7.3250	7.3272
FULWILER ELEMENTARY SCHOOL	0.5897	301	0.7064	248	0.4630	320	0.5358	301	0.9586	0.9703	0.9798
WILLIAM J BERRY ELEMENTARY SCHOOL	0.5754	302	0.5255	311	0.5387	294	0.6159	276	0.2417	0.2485	0.2504
NESHOBA CENTRAL MIDDLE SCHOOL	0.5718	303	0.5940	296	0.5345	297	0.5599	295	0.0000	0.0000	0.0044
CARTHAGE JUNIOR HIGH SCHOOL	0.5661	304	0.6215	289	0.5048	308	0.5305	303	0.0000	0.0106	0.0174

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
BURNSVILLE ELEMENTARY SCHOOL	0.5579	305	0.5137	314	0.6970	224	0.4016	332	0.0008	0.0008	0.0022
CARVER ELEMENTARY SCHOOL (Jeff. Davis. Co)	0.5545	306	0.5781	300	0.6354	263	0.3955	333	0.8909	0.8955	0.9012
EAST MARION ELEMENTARY SCHOOL	0.5535	307	0.6448	281	0.4816	314	0.5132	310	0.0000	0.0004	0.0024
BATESVILLE JUNIOR HIGH SCHOOL	0.5529	308	0.4556	323	0.6405	261	0.5250	305	0.0370	0.0370	0.0396
LEFLORE COUNTY ELEMENTARY SCHOOL	0.5343	309	0.6395	285	0.4683	317	0.4680	317	0.0000	0.0117	0.0161
CHARLESTON MIDDLE SCHOOL	0.5306	310	0.4815	317	0.5636	284	0.5116	312	0.0000	0.0013	0.0043
OKOLONA ELEMENTARY SCHOOL	0.5204	311	0.5825	299	0.4633	319	0.4569	323	0.0000	0.0000	0.0042
CRYSTAL SPRINGS MIDDLE SCHOOL	0.5118	312	0.4742	319	0.5514	289	0.4760	315	0.0355	0.0374	0.0413
WEST KEMPER ELEMENTARY SCHOOL	0.5068	313	0.5276	310	0.4574	322	0.5022	313	0.3690	0.3690	0.3817
MAGEE MIDDLE SCHOOL	0.5060	314	0.4891	316	0.5294	299	0.4755	316	0.7507	0.7776	0.7776
WAYNESBORO MIDDLE SCHOOL	0.5026	315	0.4686	321	0.5359	296	0.4617	320	0.0993	0.0993	0.0997
AMANDA ELZY ELEMENTARY SCHOOL	0.4981	316	0.5900	298	0.3450	339	0.5384	300	2.2121	2.2133	2.2161
BAY SPRINGS MIDDLE SCHOOL	0.4949	317	0.5481	304	0.3814	333	0.5272	304	0.9006	0.9006	0.9106
S. D. LEE MIDDLE SCHOOL	0.4916	318	0.4736	320	0.5032	309	0.4610	321	0.5735	0.5772	0.5791
COFFEEVILLE ELEMENTARY SCHOOL	0.4901	319	0.4026	330	0.4075	327	0.6328	267	0.0000	0.0001	0.0045
MCEVANS SCHOOL	0.4888	320	0.4201	327	0.4978	310	0.5117	311	0.0000	0.0143	0.0239
EILAND MIDDLE SCHOOL	0.4868	321	0.4101	329	0.4769	316	0.5468	297	0.2329	0.2329	0.2329
NAILOR ELEMENTARY SCHOOL	0.4807	322	0.4962	315	0.5479	291	0.3397	337	13.0846	13.0887	13.0919
BUCKATUNNA ELEMENTARY SCHOOL	0.4751	323	0.5292	309	0.4805	315	0.3744	334	0.0000	0.0006	0.0006
CHASTAIN MIDDLE SCHOOL	0.4682	324	0.4485	324	0.4227	325	0.5192	308	10.7769	10.8239	10.9091
R H BEARDEN ELEMENTARY SCHOOL	0.4666	325	0.4358	325	0.5095	307	0.4020	331	0.0000	0.0045	0.0088
DENMAN JUNIOR HIGH SCHOOL	0.4623	326	0.4323	326	0.4659	318	0.4588	322	2.5202	2.5202	3.0001
HOLLY SPRINGS INTERMEDIATE SCHOOL	0.4476	327	0.5346	307	0.3262	340	0.4277	328	1.5198	1.5200	1.5213
SHIVERS JUNIOR HIGH SCHOOL	0.4422	328	0.4778	318	0.3540	338	0.4552	324	0.0000	0.0028	0.0132
CHAMBERS MIDDLE SCHOOL	0.4372	329	0.3342	337	0.5176	305	0.4175	329	1.1509	1.2315	1.2505

A.4 (continued)

School Name	TE Overall	Rank Overall	TE Reading	Rank Reading	TE Math.	Rank Math.	TE Lang.	Rank Lang.	SCI5	SCI15	SCI25
POWELL MIDDLE SCHOOL	0.4337	330	0.4019	331	0.4150	326	0.4624	319	0.9705	1.0024	1.4213
COLLINS MIDDLE SCHOOL	0.4319	331	0.4598	322	0.3688	334	0.4400	325	0.0000	0.0002	0.0066
LIBERTY ELEMENTARY SCHOOL	0.4146	332	0.3876	332	0.3924	331	0.4342	327	0.0000	0.0000	0.0090
JEFFERSON COUNTY MIDDLE SCHOOL	0.4037	333	0.4185	328	0.4004	328	0.3556	336	0.0000	0.0000	0.0059
SOUTH DELTA MIDDLE SCHOOL	0.3841	334	0.3164	338	0.4279	323	0.3672	335	0.0000	0.0000	0.0084
GALENA ELEMENTARY SCHOOL	0.3690	335	0.1984	342	0.3653	336	0.5213	306	0.0000	0.0231	0.0292
B F LIDDELL MIDDLE SCHOOL	0.3648	336	0.3466	335	0.3939	330	0.3151	340	0.0281	0.0281	0.0315
INVERNESS SCHOOL	0.3611	337	0.1358	344	0.4624	321	0.4672	318	1.8326	1.8787	1.8855
WEST BOLIVAR DISTRICT MIDDLE SCHOOL	0.3555	338	0.2642	340	0.3557	337	0.4165	330	0.0000	0.0000	0.0040
ROBERT L MERRITT MIDDLE SCHOOL	0.3452	339	0.2871	339	0.3960	329	0.3174	339	1.2943	1.2991	1.3040
PLANTERSVILLE SCHOOL	0.3366	340	0.3617	334	0.3249	341	0.2842	341	0.0000	0.0279	0.0288
GLOSTER ELEMENTARY SCHOOL	0.3045	341	0.3460	336	0.2694	342	0.2718	342	0.0580	0.0662	0.0675
EAST ELEMENTARY SCHOOL	0.2930	342	0.3637	333	0.1759	344	0.3307	338	1.0090	1.0107	1.0149
HUNTER MIDDLE SCHOOL	0.2774	343	0.1847	343	0.4257	324	0.1839	344	0.0918	0.1018	0.1048
NICHOLS MIDDLE SCHOOL	0.2281	344	0.2193	341	0.2462	343	0.2028	343	0.1383	0.1442	0.1613

Please note: TE Overall: Technical efficiency in proficiency rate in Overall MCT examinations; TE Math.: Technical efficiency in proficiency rate in MCT Mathematics examination; TE Reading: Technical efficiency in proficiency rate in MCT Reading examination; TE Lang.: Technical efficiency in proficiency rate in MCT Language examination; SCI – School Competition Index for different size of market.

APPENDIX B

STOCHASTIC FRONTIER ANALYSIS FOR HIGH SCHOOLS & K-12 SSCHOOLS

Table B.1 Results from Stochastic Frontier Analysis for High Schools

Variables /Dependent Variable	**Log SATP Algebra**	**Log SATP History**	**Log SATP English**
Constant	2.02	4.25***	5.21***
	(1.42)	(0.55)	(0.84)
Log of Building Area per Student	0.01	0.03	0.35***
	(0.12)	(0.06)	(0.09)
Log of General Expenditures per Student	0.23**	0.05	0.04
	(0.08)	(0.051)	(0.06)
Log of Textbook Expenditures per Student	0.03	-0.01	0.17***
	(0.05)	(0.03)	(0.04)
Log of Number of Teachers and Staff per Student	-0.35	0.10	0.22
	(0.36)	(0.11)	(0.19)
Log likelihood function	-60.23	-11.79	-40.07
Technical Efficiency			
Mean	0.62	0.74	0.68
Min	0.06	0.25	0.11
Max	0.93	0.96	0.95

N = 87, only non-combined schools included in this sample. Biology didn't converge
***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

Table B.2 Results from Stochastic Frontier Analysis for K-12 Schools

Variables /Dependent Variable		**Log SATP Algebra**
Constant		1.935*
		(1.107)
Log of Building Area per Student		0.147
		(0.099)
Log of General Expenditures per Student		0.056
		(0.083)
Log of Textbook Expenditures per Student		0.059
		(0.082)
Log of Number of Teachers and Staff per Student		-0.513***
		(0.216)
Log likelihood function		-36.384
Technical Efficiency		
	Mean	0.634
	Min	0.065
	Max	0.972

N = 64, only combined schools included in this sample. Biology, English and History didn't converge, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

Table B.3 Results from Stochastic Frontier Analysis for Pooled Schools Model

Variables /Dependent Variable	**Log SATP Overall**	**Log SATP Algebra**	**Log SATP History**	**Log SATP English**
Constant	3.731***	2.505***	4.251***	4.939***
	(0.412)	(0.797)	(0.433)	(0.679)
Log of Building Area per Student	-0.039	-0.004	-0.027	-0.287***
	(0.040)	(0.081)	(0.046)	(0.083)
Log of General Expenditures per Student	0.085***	0.192***	0.044	0.028
	(0.036)	(0.066)	(0.037)	(0.055)
Log of Textbook Expenditures per Student	0.028	0.054	0.112	0.148***
	(0.021)	(0.039)	(0.021)	(0.038)
Log of Number of Teachers and Staff per Student	-0.076	-0.226	0.005	0.154
	(0.096)	(0.177)	(0.093)	(0.150)
Log likelihood function	- 13.705	-99.185	-29.442	-86.491
Technical Efficiency				
Mean	0.778	0.632	0.729	0.658
Min	0.698	0.066	0.195	0.105
Max	0.971	0.938	0.963	0.939

N = 151, combined and non-combined schools included in this sample. Biology didn't converge, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in parenthesis

Table B.4 Rank Correlations: High Schools and K-12Schools

School Name	TE Overall	Rank Overall	TE Algebra	Rank Algebra	TE History	Rank His	TE English	Rank English	Combined	SCI5	SCI15	SCI25
SOUTHEAST ATTENDANCE CENTER	0.9714	1	0.9383	1	0.9036	32	0.9307	5	1	0.0000	0.0314	0.0325
PETAL HIGH SCHOOL	0.9706	2	0.9107	8	0.9580	3	0.9331	3	0	0.0000	0.0008	0.0013
SENATOBIA JR SR HIGH SCHOOL	0.9682	3	0.9202	5	0.9229	21	0.9006	16	1	0.0569	0.0577	0.0614
WEST LINCOLN SCHOOL	0.9661	4	0.9338	3	0.9524	6	0.8704	27	1	0.0000	0.0086	0.0120
NEW SITE HIGH SCHOOL	0.9609	5	0.9357	2	0.8817	47	0.8965	18	0	0.0000	0.0102	0.0102
WINONA SECONDARY SCHOOL	0.9523	6	0.9107	9	0.9509	7	0.9080	13	1	0.1048	0.1054	0.1082
WALNUT ATTENDANCE CENTER	0.9485	7	0.9070	10	0.8928	41	0.8532	32	1	0.0000	0.0000	0.0019
BALDWYN HIGH SCHOOL	0.9474	8	0.8973	15	0.8903	44	0.9067	14	0	0.0000	0.0000	0.0047
PORT GIBSON HIGH SCHOOL	0.9382	9	0.8469	39	0.9585	2	0.8318	41	0	0.3642	0.3642	0.3663
EAST CENTRAL HIGH SCHOOL	0.9363	10	0.8497	36	0.9483	10	0.8783	24	0	0.0000	0.0017	0.0155
ACKERMAN HIGH SCHOOL	0.9357	11	0.9069	11	0.7277	84	0.9174	8	1	0.0000	0.0034	0.0140
TUPELO HIGH SCHOOL	0.9287	12	0.7583	56	0.9167	25	0.9144	10	0	0.0033	0.0047	0.0047
CLEVELAND HIGH SCHOOL	0.9246	13	0.8525	35	0.8750	49	0.8851	21	0	0.3778	0.3801	0.3818
WESSON ATTENDANCE CENTER	0.9231	14	0.8686	29	0.9318	16	0.8037	55	1	0.0000	0.0054	0.0081
LELAND HIGH SCHOOL	0.9224	15	0.8899	18	0.9493	8	0.7701	65	0	0.0000	0.0806	0.0822
UNION HIGH SCHOOL	0.9223	16	0.8681	30	0.9486	9	0.8264	44	1	0.0000	0.0030	0.0078
BILOXI HIGH SCHOOL	0.9213	17	0.7832	51	0.8928	42	0.9219	7	0	0.0925	0.1070	0.1080
ITAWAMBA AGRICULTURAL HIGH SCHOOL	0.9213	18	0.9005	14	0.8500	55	0.8485	36	0	0.0000	0.0000	0.0025
STRINGER ATTENDANCE CENTER	0.9172	19	0.9131	7	0.7783	69	0.9315	4	1	0.0000	0.0075	0.0086
OCEAN SPRINGS HIGH SCHOOL	0.9172	20	0.7642	53	0.9216	22	0.8960	19	0	0.0545	0.0562	0.0572
HANCOCK HIGH SCHOOL	0.9170	21	0.9245	4	0.7295	83	0.8788	22	0	0.0000	0.0077	0.0102
GULFPORT HIGH SCHOOL	0.9160	22	0.8486	37	0.9398	13	0.8716	26	0	0.1412	0.1440	0.1473
ST MARTIN HIGH SCHOOL	0.9126	23	0.8789	22	0.8825	46	0.7746	61	1	0.1491	0.1565	0.1581
HERNANDO HIGH SCHOOL	0.9119	24	0.8242	41	0.9339	15	0.9053	15	0	0.0000	0.0105	0.0346

B.4 (continued)

School Name	TE Overall	Rank Overall	TE Algebra	Rank Algebra	TE History	Rank History	TE English	Rank English	Combined	SCI5	SCI15	SCI25
VANCLEAVE HIGH SCHOOL	0.9097	25	0.8912	17	0.9029	33	0.8487	35	0	0.0000	0.0165	0.0215
PISGAH HIGH SCHOOL	0.9061	26	0.8564	34	0.9008	34	0.6694	88	1	0.0000	0.0365	0.0737
EAST UNION ATTENDANCE CENTER	0.9038	27	0.8084	47	0.6459	110	0.9388	1	1	0.0000	0.0000	0.0007
KOSCIUSKO SENIOR HIGH SCHOOL	0.9026	28	0.8790	21	0.8015	65	0.8871	20	0	0.1824	0.1824	0.1843
PEARL HIGH SCHOOL	0.9017	29	0.8193	43	0.8947	38	0.8651	29	0	0.0000	0.0913	0.0953
POPLARVILLE JR SR HIGH SCHOOL	0.8978	30	0.8836	20	0.7426	80	0.8365	40	0	0.0000	0.0000	0.0025
NANIH WAIYA ATTENDANCE CENTER	0.8965	31	0.9067	12	0.9565	5	0.6486	94	1	0.0000	0.0145	0.0154
TISHOMINGO COUNTY HIGH SCHOOL	0.8905	32	0.6259	87	0.9450	11	0.8785	23	0	0.0000	0.0000	0.0017
FALKNER HIGH SCHOOL	0.8850	33	0.5488	101	0.8918	43	0.9080	12	1	0.0000	0.0000	0.0022
SUMRALL MIDDLE & HIGH SCHOOL	0.8842	34	0.7496	60	0.8707	50	0.9223	6	1	0.0000	0.0014	0.0038
PELAHATCHIE ATTENDANCE CENTER	0.8822	35	0.8570	32	0.9240	20	0.7318	75	1	2.1593	2.1593	2.1932
SMITHVILLE HIGH SCHOOL	0.8821	36	0.8710	26	0.7481	77	0.9148	9	1	0.0000	0.0035	0.0040
PONTOTOC HIGH SCHOOL	0.8751	37	0.8063	48	0.9278	17	0.7221	79	0	0.0000	0.0000	0.0008
MONTGOMERY COUNTY HIGH SCHOOL	0.8730	38	0.8885	19	0.4881	131	0.8521	33	1	0.0000	0.0141	0.0161
HATLEY HIGH SCHOOL	0.8694	39	0.8270	40	0.8593	53	0.7523	67	1	0.0534	0.0534	0.0537
AMORY HIGH SCHOOL	0.8613	40	0.8705	27	0.8040	64	0.8718	25	0	0.1373	0.1373	0.1379
ENTERPRISE HIGH SCHOOL	0.8598	41	0.8568	33	0.9172	24	0.7333	74	0	0.0000	0.0032	0.0222
ENTERPRISE SCHOOL	0.8555	42	0.7453	61	0.7945	66	0.8181	47	1	0.0000	0.0067	0.0102
EAST WEBSTER HIGH SCHOOL	0.8458	43	0.8918	16	0.7136	87	0.8635	30	1	0.0000	0.0000	0.0220
MIZE ATTENDANCE CENTER	0.8435	44	0.8112	45	0.9627	1	0.7952	58	1	0.0000	0.0032	0.0069
MADISON CENTRAL HIGH SCHOOL	0.8432	45	0.4774	113	0.9063	30	0.9381	2	0	0.1117	0.1606	0.1626
STARKVILLE HIGH SCHOOL	0.8412	46	0.8580	31	0.8366	59	0.8270	43	0	4.0971	4.0985	4.1019
BRANDON HIGH SCHOOL	0.8402	47	0.7035	71	0.8931	40	0.9137	11	0	0.0000	0.0299	0.0318
FLORENCE HIGH SCHOOL	0.8378	48	0.7123	68	0.8391	58	0.8509	34	0	0.0209	0.0583	0.0730
EUPORA HIGH SCHOOL	0.8364	49	0.8776	24	0.5248	125	0.8235	45	1	0.0000	0.0018	0.0044

B.4 (continued)

School Name	TE Overall	Rank Overall	TE Algebra	Rank Algebra	TE History	Rank His	TE English	Rank English	Combined	SCI5	SCI15	SCI25
SEMINARY ATTENDANCE CENTER	0.8260	50	0.6677	76	0.9272	18	0.7243	77	1	0.0000	0.0000	0.0005
VARDAMAN HIGH SCHOOL	0.8213	51	0.7298	63	0.7855	68	0.8167	48	1	0.0000	0.0061	0.0061
NEWTON COUNTY HIGH SCHOOL	0.8200	52	0.6298	84	0.8608	51	0.8537	31	1	0.2045	0.2045	0.2087
TAYLORSVILLE HIGH SCHOOL	0.8121	53	0.8783	23	0.8528	54	0.8058	53	1	0.0000	0.0017	0.0027
MCLAURIN ATTENDANCE CENTER	0.8102	54	0.6408	81	0.9163	26	0.5379	106	1	0.0000	0.0105	0.0486
NORTH PIKE SENIOR HIGH SCHOOL	0.8050	55	0.7191	65	0.8282	60	0.8295	42	0	0.0755	0.0755	0.0777
OLIVE BRANCH HIGH SCHOOL	0.8000	56	0.7334	62	0.8224	61	0.8366	39	0	1.2394	1.2774	1.2804
LAKE ATTENDANCE CENTER	0.7997	57	0.9041	13	0.7732	70	0.8062	52	0	0.0000	0.0020	0.0036
TERRY HIGH SCHOOL	0.7962	58	0.4937	112	0.8952	37	0.8042	54	0	0.0000	0.0076	0.0191
CLINTON HIGH SCHOOL	0.7949	59	0.2967	136	0.9208	23	0.9002	17	0	0.0383	0.1019	0.1026
COLUMBIA HIGH SCHOOL	0.7915	60	0.7600	55	0.9114	29	0.7797	60	0	0.0000	0.0003	0.0012
WEST POINT HIGH SCHOOL	0.7813	61	0.7094	69	0.8167	62	0.8697	28	0	0.0349	0.0382	0.0410
RICHLAND HIGH SCHOOL	0.7786	62	0.7046	70	0.7922	67	0.8092	51	1	0.0000	0.0658	0.0757
CALEDONIA HIGH SCHOOL	0.7774	63	0.5454	102	0.7730	71	0.8132	49	0	0.0000	0.0064	0.0103
SEBASTOPOL ATTENDANCE CENTER	0.7679	64	0.6409	80	0.9440	12	0.7273	76	1	0.0000	0.0094	0.0107
NESHOBA CENTRAL HIGH SCHOOL	0.7666	65	0.5398	103	0.8804	48	0.7964	57	0	0.0000	0.0000	0.0039
RIVERSIDE HIGH SCHOOL	0.7662	66	0.6587	77	0.8897	45	0.7421	69	1	0.0216	0.0399	0.0399
LUMBERTON HIGH SCHOOL	0.7624	67	0.2372	141	0.9580	4	0.4648	117	0	0.0000	0.0258	0.0274
LOYD STAR SCHOOL	0.7530	68	0.5659	99	0.9141	28	0.7744	62	1	0.0453	0.0453	0.0463
CARTHAGE HIGH SCHOOL	0.7494	69	0.8113	44	0.6451	111	0.7465	68	0	0.0000	0.0123	0.0156
BRUCE HIGH SCHOOL	0.7388	70	0.5204	108	0.9358	14	0.7403	70	1	0.0000	0.0025	0.0025
DREW HIGH SCHOOL	0.7338	71	0.6287	85	0.7024	93	0.6494	93	0	0.0930	0.0998	0.1023
FRANKLIN HIGH SCHOOL	0.7311	72	0.3120	131	0.8967	35	0.8369	38	0	0.0000	0.0000	0.0002
BROOKHAVEN HIGH SCHOOL	0.7251	73	0.8766	25	0.5668	121	0.7061	83	0	0.1121	0.1121	0.1149
PEARL RIVER CENTRAL HIGH SCHOOL	0.7239	74	0.6123	90	0.6612	109	0.8107	50	0	0.0021	0.0025	0.0036
PICAYUNE MEMORIAL HIGH SCHOOL	0.7184	75	0.7628	54	0.6957	97	0.6818	87	0	0.0071	0.0075	0.0122
PUCKETT ATTENDANCE CENTER	0.7161	76	0.5301	105	0.6891	100	0.7240	78	1	0.0000	0.0289	0.0564

NETTLETON HIGH SCHOOL	0.7141	77	0.7240	64	0.8485	56	0.6527	91	0	0.0000	0.0049	0.0049

B.4 (continued)

School Name	TE Overall	Rank Overall	TE Algebra	Rank Algebra	TE History	Rank History	TE English	Rank English	Combined	SCI5	SCI15	SCI25
BAY SPRINGS HIGH SCHOOL	0.7069	78	0.6706	74	0.7624	74	0.7585	66	0	0.9525	0.9525	0.9549
RULEVILLE CENTRAL HIGH SCHOOL	0.7002	79	0.5779	95	0.6892	99	0.6007	97	0	0.0538	0.0584	0.0659
MAGEE HIGH SCHOOL	0.7001	80	0.8700	28	0.6201	116	0.5474	104	0	0.9477	0.9773	0.9773
ABERDEEN HIGH SCHOOL	0.6988	81	0.3401	128	0.5053	129	0.4743	116	0	0.0000	0.0014	0.0068
AMANDA ELZY HIGH SCHOOL	0.6988	82	0.6928	73	0.2585	148	0.3440	132	1	1.1867	1.1873	1.1888
AMITE COUNTY HIGH SCHOOL	0.6988	83	0.3638	126	0.5087	128	0.4991	111	0	0.0000	0.0003	0.0109
BAILEY MAGNET SCHOOL	0.6988	84	0.2455	140	0.3978	140	0.3637	130	0	3.8633	3.8982	3.9063
BASSFIELD HIGH SCHOOL	0.6988	85	0.5383	104	0.7312	82	0.5927	99	1	0.0000	0.0003	0.0007
BAY HIGH SCHOOL	0.6988	86	0.3346	129	0.6264	115	0.7370	73	0	0.4513	0.4513	0.4563
BROAD STREET HIGH SCHOOL	0.6988	87	0.4514	117	0.8962	36	0.3358	133	1	0.0000	0.0035	0.0053
BYHALIA HIGH SCHOOL	0.6988	88	0.5289	106	0.3200	146	0.3979	127	0	0.0026	0.0242	0.0725
CALHOUN CITY HIGH SCHOOL	0.6988	89	0.8469	38	0.5964	120	0.6616	89	1	0.4662	0.4662	0.4662
CANTON PUBLIC HIGH SCHOOL	0.6988	90	0.9157	6	0.5316	124	0.2858	141	0	0.4212	0.4266	0.4409
CLARKSDALE HIGH SCHOOL	0.6988	91	0.3926	123	0.9270	19	0.4504	119	0	0.0007	0.0007	0.0020
COAHOMA AGRICULTURAL HIGH SCHOOL	0.6988	92	0.0760	149	0.9055	31	0.2750	144	1	0.0000	0.0001	0.0073
COFFEEVILLE HIGH SCHOOL	0.6988	93	0.6330	83	0.7094	91	0.7706	64	1	0.0175	0.0432	0.0537
COLDWATER HIGH SCHOOL	0.6988	94	0.2738	138	0.6657	107	0.1166	149	0	0.0000	0.0000	0.0033
COLUMBUS HIGH SCHOOL	0.6988	95	0.2279	142	0.6763	105	0.6938	85	0	0.0421	0.0421	0.0436
CRYSTAL SPRINGS HIGH SCHOOL	0.6988	96	0.2263	144	0.4556	136	0.5422	105	0	0.0640	0.0675	0.0723
DEXTER HIGH SCHOOL	0.6988	97	0.2244	145	0.1947	151	0.1052	151	1	0.0000	0.0000	0.0058
EAST SIDE HIGH SCHOOL	0.6988	98	0.5493	100	0.4515	137	0.2727	145	0	0.4258	0.4283	0.4303
EDINBURG ATTENDANCE CENTER	0.6988	99	0.2973	135	0.5097	127	0.5612	100	1	0.0000	0.0114	0.0145

B.4 (continued)

School Name	TE Overall	Rank Overall	TE Algebra	Rank Algebra	TE History	Rank History	TE English	Rank English	Combined	SCI5	SCI15	SCI25
GENTRY HIGH SCHOOL	0.6988	100	0.4598	116	0.4058	139	0.4207	123	0	0.3949	0.3985	0.4028
HAMILTON HIGH SCHOOL	0.6988	101	0.3623	127	0.2120	150	0.8195	46	1	0.0000	0.0000	0.0067
HARRISON CENTRAL HIGH SCHOOL	0.6988	102	0.4719	115	0.6874	102	0.7075	81	0	0.0000	0.0068	0.0087
HAZLEHURST HIGH SCHOOL	0.6988	103	0.5080	110	0.7450	78	0.3580	131	0	0.0000	0.0410	0.0444
HEIDELBERG HIGH SCHOOL	0.6988	104	0.6372	82	0.6386	113	0.3297	134	1	0.2865	0.2865	0.2887
HINDS COUNTY AGRICULTURAL HIGH SCHOOL	0.6988	105	0.8240	42	0.6883	101	0.6373	95	0	0.0000	0.0000	0.0256
INDEPENDENCE HIGH SCHOOL	0.6988	106	0.5884	93	0.4806	134	0.4889	113	1	0.0000	0.0056	0.0142
J J MC CLAIN HIGH SCHOOL	0.6988	107	0.2589	139	0.3233	145	0.3045	139	1	0.2417	0.2436	0.2460
J Z GEORGE HIGH SCHOOL	0.6988	108	0.5685	98	0.3479	143	0.3274	135	1	0.0203	0.0232	0.0341
JEFFERSON CO HIGH SCHOOL	0.6988	109	0.4102	121	0.3124	147	0.4862	114	0	0.0000	0.0000	0.0078
JIM HILL HIGH SCHOOL	0.6988	110	0.3646	125	0.7646	73	0.6295	96	0	0.0596	0.1447	0.1454
KEMPER COUNTY HIGH SCHOOL	0.6988	111	0.3831	124	0.4629	135	0.3267	136	0	0.3288	0.3288	0.3361
LEFLORE COUNTY HIGH SCHOOL	0.6988	112	0.7834	50	0.6066	117	0.2797	142	1	0.0000	0.0137	0.0192
LOUISVILLE HIGH SCHOOL	0.6988	113	0.6571	78	0.4845	133	0.7068	82	0	0.1657	0.1657	0.1666
M. S. PALMER HIGH SCHOOL	0.6988	114	0.7149	67	0.6427	112	0.4121	124	1	0.2500	0.2500	0.2524
MCCOMB HIGH SCHOOL	0.6988	115	0.2109	147	0.8064	63	0.7377	72	0	0.8532	0.8532	0.8542
MERIDIAN HIGH SCHOOL	0.6988	116	0.6272	86	0.4893	130	0.6893	86	0	0.1256	0.1256	0.1262
MORTON HIGH SCHOOL	0.6988	117	0.5281	107	0.7015	95	0.6534	90	0	0.0000	0.0253	0.0253
NEW HOPE HIGH SCHOOL	0.6988	118	0.4356	120	0.7247	85	0.8464	37	0	0.0190	0.0236	0.0260
NEWTON HIGH SCHOOL	0.6988	119	0.2212	146	0.5348	123	0.4033	126	0	0.0000	0.0094	0.0179
NORTH PANOLA HIGH SCHOOL	0.6988	120	0.7650	52	0.3447	144	0.2231	146	0	0.0000	0.0220	0.0226
NORTHEAST JONES HIGH SCHOOL	0.6988	121	0.3996	122	0.6969	96	0.7967	56	1	0.0000	0.0010	0.0017
NOXAPATER ATTENDANCE CENTER	0.6988	122	0.7015	72	0.8945	39	0.6523	92	1	0.0000	0.0251	0.0251
NOXUBEE COUNTY HIGH SCHOOL	0.6988	123	0.7884	49	0.6324	114	0.4036	125	0	0.0250	0.0250	0.0280
O'BANNON HIGH SCHOOL	0.6988	124	0.6004	91	0.6766	104	0.2769	143	1	0.4378	0.4867	0.4889
OKOLONA HIGH SCHOOL	0.6988	125	0.8088	46	0.7111	88	0.3075	138	1	0.0000	0.0000	0.0024
PHILADELPHIA HIGH SCHOOL	0.6988	126	0.6678	75	0.7510	76	0.7040	84	0	0.0000	0.0000	0.0122
POTTS CAMP ATTENDANCE CENTER	0.6988	127	0.6409	79	0.3840	141	0.5191	109	1	0.0000	0.0086	0.0087

B.4 (continued)

School Name	TE Overall	Rank Overall	TE Algebra	Rank Algebra	TE History	Rank His	TE English	Rank English	Combined	SCI5	SCI15	SCI25
PROVINE HIGH SCHOOL	0.6988	128	0.3179	130	0.6920	98	0.4264	122	0	0.1208	0.1707	0.1715
RALEIGH HIGH SCHOOL	0.6988	129	0.5943	92	0.7698	72	0.5575	101	1	0.0000	0.0000	0.0067
RAYMOND HIGH SCHOOL	0.6988	130	0.4488	118	0.7101	89	0.5270	108	0	0.0450	0.0489	0.0794
ROSA FORT HIGH SCHOOL	0.6988	131	0.0668	151	0.8605	52	0.4398	120	0	0.2764	0.2764	0.2814
S V MARSHALL HIGH SCHOOL	0.6988	132	0.1073	148	0.7020	94	0.2037	147	1	0.0000	0.0084	0.0107
SCOTT CENTRAL ATTENDANCE CENTER	0.6988	133	0.4721	114	0.6781	103	0.5143	110	1	0.0000	0.0000	0.0038
SHANNON HIGH SCHOOL	0.6988	134	0.7560	58	0.7557	75	0.4805	115	1	0.0000	0.0022	0.0025
SHAW HIGH SCHOOL	0.6988	135	0.5835	94	0.6644	108	0.4900	112	1	0.0000	0.0201	0.0335
SIMMONS HIGH SCHOOL	0.6988	136	0.5723	96	0.6709	106	0.7401	71	0	0.0000	0.0214	0.0410
SOUTH LEAKE HIGH SCHOOL	0.6988	137	0.6238	88	0.7098	90	0.3035	140	1	0.0000	0.0244	0.0258
SOUTH PANOLA HIGH SCHOOL	0.6988	138	0.5158	109	0.7245	86	0.7865	59	0	0.0259	0.0259	0.0276
SOUTH PIKE SENIOR HIGH SCHOOL	0.6988	139	0.7565	57	0.8437	57	0.3145	137	0	0.0000	0.0420	0.0420
TYLERTOWN HIGH SCHOOL	0.6988	140	0.7168	66	0.5574	122	0.5505	103	1	0.0000	0.0000	0.0038
VELMA JACKSON HIGH SCHOOL	0.6988	141	0.5028	111	0.7076	92	0.5343	107	0	0.0000	0.0048	0.0064
VICKSBURG HIGH SCHOOL	0.6988	142	0.2857	137	0.5205	126	0.5557	102	0	1.2017	1.2017	1.2025
WAYNE COUNTY HIGH SCHOOL	0.6988	143	0.7536	59	0.6039	118	0.7720	63	0	0.0078	0.0078	0.0078
WEIR ATTENDANCE CENTER	0.6988	144	0.3051	132	0.6025	119	0.5967	98	1	0.0000	0.0052	0.0135
WEST BOLIVAR DIST HIGH SCHOOL	0.6988	145	0.0687	150	0.7392	81	0.4630	118	0	0.0000	0.0000	0.0029
WEST MARION HIGH SCHOOL	0.6988	146	0.4478	119	0.2471	149	0.7108	80	0	0.0000	0.0002	0.0002
WEST TALLAHATCHIE HIGH SCHOOL	0.6988	147	0.3016	133	0.3490	142	0.1132	150	1	0.0000	0.0090	0.0107
WILKINSON COUNTY HIGH SCHOOL	0.6988	148	0.2272	143	0.9151	27	0.4278	121	0	0.6285	0.6285	0.6310
WILLIAMS SULLIVAN HIGH SCHOOL	0.6988	149	0.3011	134	0.7439	79	0.1383	148	1	0.3940	0.3940	0.4008
WINGFIELD HIGH SCHOOL	0.6988	150	0.6143	89	0.4369	138	0.3840	129	0	0.0352	0.1266	0.1273
YAZOO COUNTY HIGH SCHOOL	0.6988	151	0.5721	97	0.4880	132	0.3925	128	0	0.0000	0.0194	0.0228

Please note: TE Overall – Technical efficiency in proficiency rate in Overall SATP examinations, TE Algebra - Technical efficiency in proficiency rate in Algebra SATP examination, TE His.- Technical efficiency in proficiency rate in History SATP examination, TE English - Technical efficiency in proficiency rate in English SATP examination, Combined – K-12 School (1) or High School (0), SCI – School Competition Index for different size of market.

APPENDIX C

PRIMARY SCHOOLS - EIGTH GRADE

Table C.1 Determinants Analysis: Primary Schools - 8th Grade (MCT Overall Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error
Dependent variable				
Inefficiency Score in Proficient Rate in MCT Overall Examinations				
Independent variables				
Constant	0.133	0.358	0.096	0.381
Black Principal	0.096**	0.043	0.043	0.032
Female Principal	0.028	0.027	0.026	0.028
Experience Principal	-0.006	0.007	0.002	0.007
Square Experience Principal	0.000	0.000	-0.000	0.000
Percent of Black Staff	-0.211	0.139	-0.023	0.139
Percent of Female Staff	0.045	0.129	-0.032	0.114
Experience Staff	-0.009	0.025	0.004	0.029
Square Experience Staff	0.000	0.001	-0.000	0.001
Percent of Black Teachers	0.321*	0.173	0.247	0.160
Percent of Female Teachers	-0.321	0.229	-0.340*	0.188
Percent of Master Teachers	-0.138	0.132	-0.281**	0.125
Experience Teachers	0.009	0.041	0.024	0.043
Square Experience Teachers	0.000	0.002	-0.000	0.002
Percent of Black Students	0.484***	0.085	0.458***	0.084
Percent of Free Lunch Students	0.202***	0.064	0.169**	0.072
Small-city/rural	0.066*	0.034	-0.018	0.033
School Competition Index	-0.033***	0.008	-0.035***	0.001
Social Capital Index	-0.000	0.000	-0.000*	0.000
Percent of Religious Enrollment	0.016	0.023	-0.019	0.026
R-square	0.931		0.936	
Adj-R-square	0.913		0.919	

Sample Size (N) = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively
Heteroskedasticty corrected model

Table C.2 Determinants Analysis: Primary Schools - 8th Grade (MCT Reading Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Reading Examination						
Independent variables						
Constant	0.153	0.378	-0.267	0.375	-0.205	0.435
Black Principal	0.070	0.059	0.085	0.058	0.141**	0.069
Female Principal	-0.019	0.028	0.000	0.025	-0.012	0.031
Experience Principal	0.003	0.009	-0.004	0.008	-0.001	0.009
Square Experience Principal	-0.000	0.000	0.000	0.000	0.000	0.000
Percent of Black Staff	0.393***	0.144	0.674***	0.117	0.438***	0.160
Percent of Female Staff	0.016	0.114	-0.135	0.112	-0.123	0.141
Experience Staff	-0.039	0.033	-0.021	0.031	-0.034	0.034
Square Experience Staff	0.002	0.001	0.001	0.001	0.001	0.001
Percent of Black teachers	-0.109	0.182	-0.152	0.165	-0.082	0.207
Percent of Female teachers	-0.104	0.217	0.058	0.217	0.161	0.248
Percent of Master teachers	-0.126	0.131	-0.240*	0.126	-0.137	0.143
Experience Teachers	0.000	0.050	0.103*	0.053	0.077	0.052
Square Experience Teachers	0.000	0.002	-0.004*	0.002	-0.003	0.002
Percent of Black Students	0.283***	0.088	0.101	0.096	0.221**	0.106
Percent of Free Lunch Students	0.198***	0.060	0.121*	0.071	0.132	0.083
Small-city/rural	0.104***	0.036	-0.013	0.042	0.005	0.028
School Competition Index	-0.029**	0.012	-0.022*	0.013	-0.026**	0.012
Social Capital Index	0.000	0.000	-0.001**	0.000	-0.000***	0.000
Percent of Religious Enrollment	0.049*	0.025	-0.023	0.022	-0.034	0.042
R-square	0.890		0.951		0.845	
Adj-R-square	0.860		0.937		0.804	

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table C.3 Determinants Analysis: Primary Schools - 8th Grade (MCT Mathematics Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency score in proficient rate in MCT Mathematics						
Independent variables						
Constant	0.286	0.452	0.383	0.466	0.332	0.537
Black Principal	0.074	0.050	0.011	0.038	0.047	0.055
Female Principal	-0.039	0.040	-0.011	0.039	0.024	0.042
Experience Principal	0.026**	0.010	0.021**	0.009	0.018	0.011
Square Experience Principal	-0.001**	0.000	-0.000**	0.000	-0.000	0.000
Percent of Black Staff	-0.269	0.205	-0.104	0.192	-0.163	0.230
Percent of Female Staff	0.105	0.187	0.126	0.151	0.181	0.187
Experience Staff	-0.021	0.041	-0.018	0.039	-0.039	0.046
Square Experience Staff	0.001	0.002	0.001	0.002	0.002	0.002
Percent of Black Teachers	0.224	0.238	0.208	0.208	0.118	0.234
Percent of Female Teachers	-0.416	0.312	-0.556*	0.291	-0.583*	0.324
Percent of Master Teachers	-0.095	0.183	0.052	0.174	0.088	0.195
Experience Teachers	-0.067	0.041	-0.065	0.048	-0.057	0.056
Square Experience Teachers	0.003*	0.002	0.003	0.002	0.003	0.002
Percent of Black students	0.561***	0.113	0.539***	0.121	0.627***	0.138
Percent of Free Lunch students	0.348***	0.096	0.334***	0.800	0.368***	0.116
Small-city/rural	0.108***	0.041	0.005	0.025	0.046	0.044
School Competition Index	-0.026**	0.012	-0.029*	0.015	-0.032*	0.016
Social Capital Index	0.001	0.000	-0.000	0.000	0.000	0.000
Percent of Religious Enrollment	0.048	0.034	0.029	0.037	0.014	0.060
R-square	0.902		0.877		0.822	
Adj-R-square	0.876		0.844		0.774	

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively
Heteroskedasticty corrected model

Table C.4 Determinants Analysis: Primary Schools - 8th Grade (MCT Language Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Language						
Independent variables						
Constant	0.122	0.416	-0.263	0.426	0.351	0.435
Black Principal	-0.033	0.030	-0.012	0.032	-0.000	0.032
Female Principal	-0.014	0.031	-0.037	0.032	-0.012	0.033
Experience Principal	-0.013	0.008	-0.015	0.009	-0.011	0.008
Square Experience Principal	0.000*	0.000	0.000	0.000	0.000	0.000
Percent of Black Staff	0.014	0.164	0.202	0.178	-0.009	0.171
Percent of Female Staff	-0.124	0.152	-0.072	0.144	-0.101	0.164
Experience Staff	-0.013	0.043	0.005	0.043	-0.012	0.048
Square Experience Staff	0.000	0.002	-0.000	0.002	0.000	0.002
Percent of Black Teachers	0.275*	0.164	0.149	0.168	0.316*	0.174
Percent of Female Teachers	-0.314	0.297	-0.068	0.267	-0.339	0.304
Percent of Master Teachers	-0.172	0.142	-0.232	0.146	-0.107	0.159
Experience Teachers	0.055*	0.032	0.078**	0.035	0.022	0.035
Square Experience Teachers	-0.002	0.001	-0.003*	0.001	-0.000	0.001
Percent of Black Students	0.281***	0.094	0.254***	0.093	0.271**	0.108
Percent of Free Lunch Students	0.311***	0.071	0.252***	0.080	0.271***	0.087
Small-city/rural	0.048	0.032	-0.014	0.047	0.008	0.040
School Competition Index	-0.022***	0.006	-0.018**	0.007	-0.025***	0.008
Social Capital Index	-0.001	0.000	-0.000*	0.000	-0.000	0.000
Percent of Religious Enrollment	0.043	0.027	0.035	0.031	-0.019	0.043
R-square	0.873		0.837		0.794	
Adj-R-square	0.838		0.793		0.738	

N=90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

APPENDIX D

PRIMARY SCHOOLS - SIXTH GRADE

Table D.1 Determinants Analysis: Primary Schools - 6th Grade (MCT Overall Examinations)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Overall						
Independent variables						
Constant	0.073	0.190	0.164	0.193	-0.003	0.199
Black Principal	0.047*	0.028	0.029	0.018	0.044*	0.024
Female Principal	0.013	0.018	0.009	0.016	0.021	0.017
Experience Principal	0.004	0.003	0.005	0.005	0.006	0.004
Square Experience Principal	-0.000	0.000	-0.000	0.000	-0.000*	0.000
Percent of Black Staff	-0.158**	0.077	-0.128**	0.057	-0.116*	0.069
Percent of Female Staff	-0.293**	0.129	-0.323***	0.122	-0.359***	0.135
Experience Staff	-0.000	0.017	0.002	0.018	-0.007	0.018
Square Experience Staff	0.000	0.001	0.000	0.001	0.000	0.001
Percent of Black Teachers	0.114	0.086	0.131	0.091	0.078	0.085
Percent of Female Teachers	0.159	0.148	0.007	0.160	0.141	0.151
Percent of Master Teachers	-0.020	0.072	-0.001	0.074	0.000	0.080
Experience Teachers	0.006	0.018	0.015	0.018	0.019	0.016
Square Experience Teachers	-0.000	0.001	-0.001	0.001	-0.001	0.001
Percent of Black Students	0.141**	0.069	0.127**	0.055	0.154**	0.068
Percent of Free Lunch Students	0.056	0.061	0.074	0.059	0.063	0.055
Small-city/rural	0.045	0.028	0.007	0.019	0.053**	0.022
School Competition Index	-0.000	0.001	-0.000	0.000	0.000	0.000
Social Capital Index	-0.003	0.002	-0.000	0.000	-0.000	0.000
Percent of Religious Enrollment	0.020	0.018	-0.024	0.022	0.064**	0.029
R-square	0.494		0.733		0.478	
Adj-R-square	0.387		0.677		0.369	

N = 111, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table D.2 Determinants Analysis: Primary Schools - 6th Grade (MCT Reading Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Reading						
Independent variables						
Constant	0.150	0.143	0.367**	0.177	0.051	0.145
Black Principal	0.062***	0.022	0.059***	0.019	0.046**	0.019
Female Principal	0.027*	0.014	0.015	0.015	0.028**	0.012
Experience Principal	-0.001	0.004	-0.002	0.004	-0.001	0.003
Square Experience Principal	0.000	0.000	0.000	0.000	0.000	0.000
Percent of Black Staff	-0.089	0.062	-0.067	0.055	-0.040	0.049
Percent of Female Staff	-0.245***	0.092	-0.262***	0.087	-0.283***	0.097
Experience Staff	0.011	0.013	0.009	0.014	0.023	0.016
Square Experience Staff	-0.000	0.001	-0.000	0.001	-0.001	0.001
Percent of Black Teachers	-0.043	0.065	-0.018	0.068	0.014	0.065
Percent of Female Teachers	-0.060	0.109	-0.209	0.131	-0.085	0.117
Percent of Master Teachers	-0.046	0.055	-0.087	0.055	-0.027	0.062
Experience Teachers	0.017	0.014	0.016	0.016	0.018	0.012
Square Experience Teachers	-0.001	0.001	-0.001	0.001	-0.001	0.000
Percent of Black Students	0.144**	0.058	0.096*	0.051	0.085**	0.042
Percent of Free Lunch Students	0.064	0.049	0.093*	0.053	0.061	0.043
Small-city/rural	0.019	0.019	-0.015	0.018	0.024*	0.013
School Competition Index	0.000	0.000	-0.000	0.000	-0.000	0.000
Social Capital Index	-0.003	0.002	-0.000	0.000	-0.000**	0.000
Percent of Religious Enrollment	-0.013	0.013	-0.029*	0.017	0.063	0.025
R-square	0.522		0.807		0.823	
Adj-R-square	0.422		0.767		0.786	

N = 111, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table D.3 Determinants Analysis: Primary Schools - 6th Grade (MCT Mathematics Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Mathematics						
Independent variables						
Constant	0.049	0.318	0.012	0.386	0.278	0.385
Black Principal	0.009	0.042	0.069**	0.028	0.065**	0.032
Female Principal	-0.024	0.027	-0.009	0.025	-0.037	0.026
Experience Principal	0.008	0.007	0.012*	0.007	0.008	0.007
Square Experience Principal	-0.000	0.000	-0.000**	0.000	-0.000	0.000
Percent of Black Staff	-0.044	0.104	-0.218**	0.093	-0.074	0.114
Percent of Female Staff	0.153	0.181	-0.072	0.222	0.000	0.165
Experience Staff	-0.027	0.029	-0.002	0.029	0.012	0.022
Square Experience Staff	0.001	0.001	0.000	0.001	-0.000	0.001
Percent of Black Teachers	0.215*	0.116	0.169	0.145	0.084	0.128
Percent of Female Teachers	-0.008	0.227	-0.172	0.268	-0.122	0.228
Percent of Master Teachers	0.175	0.115	0.133	0.107	0.069	0.106
Experience Teachers	-0.005	0.025	0.025	0.031	-0.025	0.030
Square Experience Teachers	0.000	0.001	-0.001	0.001	0.001	0.001
Percent of Black Students	0.148	0.098	0.241***	0.084	0.224**	0.098
Percent of Free Lunch Students	-0.069	0.075	0.049	0.099	-0.114	0.088
Small-city/rural	0.078*	0.045	-0.006	0.035	0.024	0.039
School Competition Index	-0.001*	0.001	-0.001	0.001	-0.000	0.001
Social Capital Index	-0.011***	0.004	-0.001**	0.000	-0.000**	0.000
Percent of Religious Enrollment	0.092***	0.028	-0.023	0.031	0.056	0.039
R-square	0.909		0.515		0.519	
Adj-R-square	0.891		0.413		0.419	

N = 111, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table D.4 Determinants Analysis: Primary Schools - 6th Grade (MCT Language Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency score in proficient rate in MCT Language						
Independent variables						
Constant	0.295	0.230	0.265	0.253	-0.108	0.264
Black Principal	0.049	0.032	0.017	0.027	0.086***	0.030
Female Principal	0.043*	0.023	0.015	0.022	0.033	0.022
Experience Principal	0.004	0.005	-0.003	0.007	0.007	0.005
Square Experience Principal	-0.000	0.000	0.000	0.000	-0.001	0.001
Percent of Black Staff	0.029	0.096	0.040	0.079	0.041	0.096
Percent of Female Staff	-0.498***	0.136	-0.359***	0.132	-0.299**	0.126
Experience Staff	-0.017	0.024	-0.011	0.0232	-0.018	0.023
Square Experience Staff	0.001	0.001	0.001	0.001	0.001	0.001
Percent of Black Teachers	-0.071	0.108	-0.123	0.101	-0.187	0.115
Percent of Female Teachers	0.145	0.139	-0.000	0.125	0.157	0.115
Percent of Master Teachers	-0.163*	0.089	-0.093	0.095	-0.077	0.103
Experience Teachers	0.015	0.023	0.032	0.023	0.029	0.025
Square Experience Teachers	-0.001	0.001	-0.001	0.001	-0.001	0.001
Percent of Black Students	0.115	0.082	0.142*	0.076	0.192**	0.083
Percent of Free Lunch Students	0.173***	0.069	0.185***	0.062	0.125*	0.071
Small-city/rural	0.049*	0.028	0.029	0.027	0.081***	0.024
School Competition Index	0.001	0.001	0.001	0.001	0.001	0.001
Social Capital Index	-0.002	0.003	-0.000	0.000	-0.000	0.000
Percent of Religious Enrollment	-0.020	0.019	-0.038	0.027	0.073**	0.033
R-square	0.524		0.656		0.754	
Adj-R-square	0.425		0.585		0.703	

N = 111, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

APPENDIX E

PRIMARY SCHOOLS - GRADUATING GRADE

Table E.1 Determinants Analysis: Primary Schools - Graduating Grade (MCT Overall Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Overall						
Independent variables						
Constant	1.149***	0.164	1.258***	0.160	1.437***	0.182
Black Principal	-0.004	0.020	0.010	0.022	0.003	0.022
Female Principal	-0.003	0.016	0.001	0.016	-0.012	0.016
Experience Principal	0.002	0.003	0.002	0.004	0.001	0.003
Square Experience Principal	-0.00	0.000	-0.000	0.000	-0.000	0.000
Percent of Black Staff	-0.121**	0.060	-0.059	0.066	-0.046	0.070
Percent of Female Staff	-0.536***	0.110	-0.482***	0.100	-0.434***	0.100
Experience Staff	-0.006	0.014	0.001	0.014	-0.004	0.016
Square Experience Staff	0.000	0.001	-0.000	0.001	0.000	0.001
Percent of Black Teachers	0.282***	0.082	0.093	0.084	0.196**	0.090
Percent of Female Teachers	-0.399**	0.155	-0.509***	0.137	-0.601***	0.138
Percent of Master Teachers	-0.022	0.059	0.004	0.059	-0.042	0.058
Experience Teachers	-0.021	0.017	-0.028*	0.016	-0.029	0.019
Square Experience Teachers	0.001	0.001	0.001*	0.001	0.001	0.001
Percent of Black Students	0.081	0.052	0.143***	0.052	0.067	0.054
Percent of Free Lunch Students	0.088***	0.031	0.048	0.034	0.049	0.035
Small-city/rural	0.015	0.016	0.008	0.018	-0.029*	0.017
School Competition Index	-0.001***	0.000	-0.001**	0.000	-0.001***	0.000
Social Capital Index	0.001	0.001	-0.000	0.000	-0.000**	0.000
Percent of Religious Enrollment	0.023	0.015	-0.039*	0.019	-0.049*	0.028
R-square	0.367		0.391		0.401	
Adj-R-square	0.331		0.356		0.365	

N = 344, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table E.2 Determinants Analysis: Primary Schools - Graduating Grade (MCT Reading Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Reading						
Independent variables						
Constant	1.511***	0.184	1.429***	0.198	1.762***	0.207
Black Principal	-0.006	0.021	-0.019	0.025	-0.003	0.024
Female Principal	-0.007	0.017	-0.004	0.017	-0.008	0.017
Experience Principal	0.004	0.003	0.004	0.004	0.003	0.004
Square Experience Principal	-0.000*	0.000	-0.000*	0.000	-0.000	0.000
Percent of Black Staff	0.021	0.067	0.017	0.076	0.043	0.075
Percent of Female Staff	-0.715***	0.114	-0.678***	0.107	-0.655***	0.106
Experience Staff	-0.004	0.015	0.003	0.015	-0.009	0.016
Square Experience Staff	0.000	0.001	-0.000	0.001	0.000	0.001
Percent of Black Teachers	0.187**	0.086	0.177*	0.092	0.136	0.094
Percent of Female Teachers	-0.575***	0.163	-0.549***	0.148	-0.692***	0.146
Percent of Master Teachers	-0.074	0.064	-0.165**	0.065	-0.089	0.059
Experience Teachers	-0.025	0.019	-0.009	0.022	-0.033	0.022
Square Experience Teachers	0.001	0.001	0.000	0.001	0.001	0.001
Percent of Black Students	-0.012	0.053	0.024	0.054	0.006	0.056
Percent of Free Lunch Students	0.148***	0.037	0.085**	0.040	0.097**	0.039
Small-city/rural	-0.009	0.018	-0.037*	0.021	-0.023	0.019
School Competition Index	-0.001*	0.001	-0.001	0.000	-0.001	0.001
Social Capital Index	-0.000	0.001	-0.000***	0.000	-0.000***	0.000
Percent of Religious Enrollment	-0.006	0.017	-0.055	0.023	-0.067*	0.035
R-square	0.456		0.470		0.484	
Adj-R-square	0.423		0.439		0.453	

N = 344, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table E.3 Determinants Analysis: Primary Schools - Graduating Grade (MCT Mathematics Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Mathematics						
Independent variables						
Constant	0.876***	0.210	1.039***	0.216	1.097***	0.218
Black Principal	0.011	0.032	0.012	0.027	0.016	0.027
Female Principal	-0.041*	0.022	-0.026	0.021	-0.010	0.021
Experience Principal	0.004	0.005	0.003	0.004	0.003	0.004
Square Experience Principal	-0.000	0.000	-0.000	0.000	-0.000	0.000
Percent of Black Staff	-0.171*	0.102	-0.129	0.093	-0.114	0.095
Percent of Female Staff	-0.287**	0.137	-0.311**	0.129	-0.367***	0.127
Experience Staff	0.024	0.018	0.010	0.015	0.014	0.017
Square Experience Staff	-0.001	0.001	-0.000	0.001	-0.001	0.001
Percent of Black Teachers	0.492***	0.121	0.307***	0.111	0.327***	0.111
Percent of Female Teachers	-0.461**	0.183	-0.473***	0.176	-0.463***	0.173
Percent of Master Teachers	-0.136	0.090	-0.004	0.086	-0.024	0.088
Experience Teachers	-0.014	0.024	-0.026	0.026	-0.031	0.025
Square Experience Teachers	0.001	0.001	0.001	0.001	0.001	0.001
Percent of Black Students	0.067	0.071	0.173**	0.069	0.149**	0.067
Percent of Free Lunch Students	0.067	0.049	0.028	0.054	0.038	0.051
Small-city/rural	-0.048**	0.024	-0.037	0.024	-0.029	0.023
School Competition Index	-0.002	0.002	-0.002	0.002	-0.001	0.002
Social Capital Index	-0.000	0.001	-0.000*	0.000	-0.000	0.000
Percent of Religious Enrollment	0.034	0.022	-0.023	0.026	-0.023	0.038
R-square	0.327		0.333		0.377	
Adj-R-square	0.288		0.293		0.341	

N = 344, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table E.4 Determinants Analysis: Primary Schools - Graduating Grade (MCT Language Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in MCT Language						
Independent variables						
Constant	1.662***	0.177	1.571***	0.178	1.627***	0.196
Black Principal	0.008	0.025	0.022	0.025	0.029	0.023
Female Principal	0.003	0.019	-0.004	0.018	-0.024	0.019
Experience Principal	-0.005	0.004	-0.008**	0.004	-0.001	0.003
Square Experience Principal	0.000	0.000	0.000	0.000	-0.000	0.000
Percent of Black Staff	-0.053	0.075	-0.059	0.075	0.053	0.077
Percent of Female Staff	-0.551***	0.123	-0.434***	0.118	-0.449***	0.123
Experience Staff	-0.031	0.019	-0.011	0.019	-0.022	0.017
Square Experience Staff	0.001	0.001	0.000	0.001	0.001	0.001
Percent of Black Teachers	0.171*	0.094	0.076	0.095	0.047	0.097
Percent of Female Teachers	-0.726***	0.173	-0.757***	0.159	-0.831***	0.169
Percent of Master Teachers	0.056	0.069	-0.017	0.069	0.075	0.068
Experience Teachers	-0.023	0.017	-0.019	0.016	-0.024	0.019
Square Experience Teachers	0.001	0.001	0.001	0.001	0.001	0.001
Percent of Black Students	0.035	0.062	0.104*	0.059	0.051	0.061
Percent of Free Lunch Students	0.134***	0.035	0.104***	0.038	0.123***	0.043
Small-city/rural	0.0540***	0.019	0.024	0.020	0.057***	0.019
School Competition Index	-0.001***	0.000	-0.001***	0.000	-0.001**	0.000
Social Capital Index	0.000	0.001	-0.000	0.000	-0.000	0.000
Percent of Religious Enrollment	0.045**	0.018	-0.029	0.023	-0.019	0.029
R-square	0.664		0.484		0.578	
Adj-R-square	0.644		0.454		0.553	

N = 344, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

APPENDIX F

HIGH SCHOOL

Table F.1 Determinants Analysis: High School (SATP Overall Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP Overall						
Independent variables						
Constant	3.089***	1.038	2.290**	1.013	1.979*	1.001
Black Principal	-0.078	0.056	-0.108**	0.053	-0.051	0.055
Female Principal	0.022	0.039	-0.011	0.029	-0.018	0.038
Experience Principal	-0.023**	0.009	-0.015**	0.006	-0.017**	0.007
Square Experience Principal	0.000**	0.000	0.000**	0.000	0.000**	0.000
Percent of Black Staff	-0.379**	0.179	-0.282	0.183	-0.432*	0.239
Percent of Female Staff	-0.246**	0.121	-0.292***	0.103	-0.262**	0.119
Experience Staff	0.062	0.047	0.069	0.043	0.086*	0.045
Square Experience Staff	-0.002	0.002	-0.003*	0.002	-0.003*	0.002
Percent of Black Teachers	0.385	0.233	0.331	0.232	0.482*	0.276
Percent of Female Teachers	-0.185	0.272	0.003	0.242	0.097	0.278
Percent of Master Teachers	-0.172	0.139	-0.253***	0.104	-0.327***	0.105
Experience Teachers	-0.017	0.051	-0.015	0.053	-0.033	0.052
Square Experience Teachers	0.000	0.002	0.001	0.002	0.001	0.002
Percent of Black Students	0.491***	0.113	0.503***	0.101	0.444***	0.107
Percent of Free Lunch Students	0.138	0.100	0.198**	0.089	0.092	0.085
Small-city/rural	-0.002	0.032	0.021	0.032	0.041	0.039
School Competition Index	-0.048	0.044	-0.041	0.059	0.026	0.056
Social Capital Index	0.007***	0.002	0.001**	0.000	0.000	0.000
Percent of Religious Enrollment	-0.059	0.037	-0.029	0.028	-0.103*	0.052
Primary Schools MCT Score (15 Mile)	-3.432***	1.080	-2.765**	1.079	-2.256**	1.055
R-square	0.975		0.909		0.812	
Adj-R-square	0.968		0.881		0.755	

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table F.2 Determinants Analysis: High School (SATP Algebra Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP Algebra						
Independent variables						
Constant	2.068	3.017	3.202	2.693	2.893	2.839
Black Principal	0.232	0.151	0.271*	0.146	0.100	0.181
Female Principal	0.048	0.115	0.014	0.106	0.131	0.129
Experience Principal	0.002	0.019	0.002	0.016	-0.012	0.021
Square Experience Principal	-0.000	0.000	-0.000	0.000	0.000	0.000
Percent of Black Staff	-1.704***	0.427	-1.815***	0.424	-1.653***	0.556
Percent of Female Staff	0.112	0.434	0.192	0.467	-0.092	0.534
Experience Staff	-0.059	0.148	-0.088	0.145	-0.078	0.166
Square Experience Staff	0.002	0.005	0.003	0.005	0.003	0.006
Percent of Black Teachers	1.115***	0.393	0.947**	0.388	1.291***	0.479
Percent of Female Teachers	0.933	0.585	0.693	0.617	0.384	0.715
Percent of Master Teachers	-0.431	0.494	-0.621	0.479	-0.706	0.511
Experience Teachers	-0.019	0.120	-0.017	0.116	-0.059	0.127
Square Experience Teachers	0.002	0.005	0.002	0.005	0.003	0.005
Percent of Black Students	0.732**	0.295	0.914***	0.260	0.754**	0.294
Percent of Free Lunch Students	-0.029	0.225	0.069	0.163	-0.207	0.167
Small-city/rural	0.102	0.086	0.017	0.082	0.039	0.084
School Competition Index	-0.026	0.090	-0.054	0.095	-0.007	0.116
Social Capital Index	0.012***	0.003	0.004***	0.001	0.001	0.001
Percent of Religious Enrollment	0.058	0.073	-0.046	0.083	-0.131	0.122
Primary Schools MCT Score (15 Mile)	-2.154	2.948	-3.311	2.581	-1.694	2.716
R-square	0.823		0.778		0.600	
Adj-R-square	0.773		0.710		0.479	

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table F.3 Determinants Analysis: High School (SATP History Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP History						
Independent variables						
Constant	2.769***	0.968	1.639*	0.958	2.479**	0.974
Black Principal	-0.117	0.078	-0.067	0.079	-0.139**	0.066
Female Principal	0.053	0.068	0.025	0.058	0.039	0.045
Experience Principal	-0.027***	0.008	-0.034***	0.007	-0.034***	0.007
Square Experience Principal	0.001***	0.000	0.001***	0.000	0.001***	0.000
Percent of Black Staff	-0.024	0.209	-0.050	0.215	0.054	0.204
Percent of Female Staff	-0.362***	0.130	-0.264*	0.136	-0.288**	0.138
Experience Staff	0.198***	0.039	0.112***	0.036	0.133***	0.038
Square Experience Staff	-0.007***	0.001	-0.004***	0.001	-0.005***	0.001
Percent of Black Teachers	-0.063	0.224	-0.102	0.214	-0.120	0.227
Percent of Female Teachers	-0.131	0.287	0.105	0.232	-0.032	0.269
Percent of Master Teachers	0.066	0.172	-0.034	0.127	-0.127	0.153
Experience Teachers	-0.016	0.069	0.009	0.072	-0.036	0.071
Square Experience Teachers	-0.001	0.003	-0.001	0.003	0.001	0.003
Percent of Black Students	0.378***	0.066	0.379***	0.097	0.315***	0.100
Percent of Free Lunch Students	0.236***	0.047	0.212**	0.094	0.243***	0.074
Small-city/rural	0.096*	0.056	0.021	0.037	0.035	0.041
School Competition Index	-0.011	0.081	0.011	0.069	0.086	0.063
Social Capital Index	0.001	0.004	0.000	0.000	-0.000	0.000
Percent of Religious Enrollment	-0.049	0.034	-0.005	0.032	-0.066	0.065
Primary Schools MCT Score (15 Mile)	-4.109***	1.014	-2.327**	0.912	-3.018***	0.987
R-square	0.855		0.892		0.785	
Adj-R-square	0.811		0.859		0.721	

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table F.4 Determinants Analysis: High School (SATP English Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP English						
Independent variables						
Constant	3.187**	1.351	4.449***	1.553	4.105***	1.404
Black Principal	0.031	0.079	-0.066	0.076	-0.026	0.072
Female Principal	-0.042	0.037	-0.069*	0.038	-0.033	0.036
Experience Principal	-0.011	0.013	-0.008	0.012	-0.001	0.011
Square Experience Principal	0.000	0.000	0.000	0.000	0.000	0.000
Percent of Black Staff	-0.530*	0.272	-0.681**	0.311	-1.005***	0.299
Percent of Female Staff	-0.414**	0.189	-0.508**	0.239	-0.636***	0.228
Experience Staff	0.083	0.073	0.074	0.081	0.081	0.076
Square Experience Staff	-0.004	0.003	-0.004	0.003	-0.005	0.003
Percent of Black Teachers	0.918***	0.339	1.116***	0.354	1.311***	0.324
Percent of Female Teachers	-0.977***	0.341	-1.212***	0.381	-1.431***	0.317
Percent of Master Teachers	-0.497***	0.172	-0.642***	0.218	-0.820***	0.222
Experience Teachers	-0.085	0.088	-0.152*	0.086	-0.132	0.084
Square Experience Teachers	0.003	0.003	0.006*	0.003	0.006*	0.003
Percent of Black Students	0.326**	0.130	0.352**	0.145	0.398***	0.142
Percent of Free Lunch Students	0.131	0.159	0.218	0.150	0.294*	0.169
Small-city/rural	-0.133**	0.059	-0.145**	0.058	-0.132**	0.057
School Competition Index	0.057	0.063	-0.025	0.049	-0.039	0.048
Social Capital Index	0.002	0.004	0.001	0.001	0.001*	0.000
Percent of Religious Enrollment	-0.095**	0.042	-0.089**	0.045	-0.080	0.069
Primary Schools MCT Score (15 Mile)	-2.391*	1.337	-3.159**	1.557	-2.825*	1.501
R-square	0.841		0.824		0.859	
Adj-R-square	0.793		0.770		0.816	

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

APPENDIX G

K-12 SCHOOLS

Table G.1 Determinants Analysis: K-12 Schools (SATP Overall Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP Overall						
Independent variables						
Constant	-2.219***	0.818	-3.487***	0.987	-2.564**	1.144
Black Principal	-0.175**	0.077	-0.221**	0.085	-0.353***	0.108
Female Principal	0.052	0.073	0.095	0.085	0.203*	0.107
Experience Principal	0.026**	0.012	0.027**	0.012	0.025**	0.011
Square Experience Principal	-0.001*	0.000	-0.001**	0.000	-0.000*	0.000
Percent of Black Staff	0.040	0.257	-0.026	0.339	-0.246	0.368
Percent of Female Staff	0.637***	0.187	0.644**	0.255	0.429*	0.232
Experience Staff	0.149***	0.047	0.143***	0.045	0.196***	0.047
Square Experience Staff	-0.006***	0.002	-0.005***	0.002	-0.007***	0.002
Percent of Black Teachers	-0.046	0.275	0.272	0.328	0.536	0.344
Percent of Female Teachers	0.172	0.323	0.306	0.317	-0.031	0.368
Percent of Master Teachers	-0.235	0.223	-0.334	0.208	-0.281	0.231
Experience Teachers	0.092	0.103	0.278**	0.127	0.092	0.152
Square Experience Teachers	-0.003	0.004	-0.011**	0.005	-0.003	0.006
Percent of Black Students	0.591***	0.161	0.309*	0.167	0.305*	0.167
Percent of Free Lunch Students	0.544***	0.173	0.763***	0.191	0.934***	0.211
Small-city/rural	-0.158	0.143	-0.086	0.118	-0.062	0.182
School Competition Index	-0.021	0.072	0.059	0.094	0.005	0.106
Social Capital Index	-0.021	0.029	-0.004	0.006	0.001	0.001
Percent of Religious Enrollment	0.085*	0.048	-0.081**	0.040	-0.068	0.054
R-square	0.922		0.869		0.857	
Adj-R-square	0.888		0.812		0.795	

N = 64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table G.2 Determinants Analysis: K-12 Schools (SATP Algebra Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP Algebra						
Independent variables						
Constant	-3.455*	1.996	-1.939	2.119	-2.828	2.262
Black Principal	-0.649**	0.244	-0.781***	0.248	-0.895***	0.243
Female Principal	0.055	0.181	0.262	0.209	0.410**	0.197
Experience Principal	0.027	0.022	0.056**	0.025	0.060***	0.019
Square Experience Principal	-0.000	0.001	-0.001**	0.001	-0.001**	0.000
Percent of Black Staff	-1.09	0.707	-0.477	0.642	-0.458	0.728
Percent of Female Staff	1.827***	0.418	0.392	0.509	1.348***	0.434
Experience Staff	0.146	0.103	0.205**	0.089	0.277***	0.092
Square Experience Staff	-0.006*	0.003	-0.008**	0.003	-0.011***	0.003
Percent of Black Teachers	2.014**	0.763	1.900**	0.794	1.922**	0.771
Percent of Female Teachers	1.728***	0.493	0.368	0.508	0.892*	0.529
Percent of Master Teachers	-0.237	0.494	-0.082	0.472	0.116	0.476
Experience Teachers	0.131	0.265	-0.046	0.334	-0.191	0.337
Square Experience Teachers	-0.005	0.010	0.002	0.012	0.008	0.012
Percent of Black Students	-0.114	0..371	-0.478	0.388	-0.614*	0.344
Percent of Free Lunch Students	1.243***	0.418	1.595***	0.432	1.781***	0.420
Small-city/rural	0.086	0.107	-0.002	0.121	0.127	0.114
School Competition Index	-0.182	0.117	-0.242	0.144	-0.334**	0.142
Social Capital Index	-0.083*	0.046	-0.024***	0.008	0.003**	0.001
Percent of Religious Enrollment	0.281**	0.113	-0.067	0.089	0.003	0.118
R-square	0.873		0.856		0.781	
Adj-R-square	0.818		0.795		0.686	

N = 64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

APPENDIX H

POOLED SCHOOLS (HIGH SCHOOLS AND K-12 SCHOOLS)

Table H.1 Determinants Analysis: High Schools and K-12 Schools- Pooled Schools (SATP Overall Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP Overall						
Independent variables						
Constant	0.892**	0.385	1.179***	0.357	0.969***	0.349
Black Principal	-0.012	0.022	-0.008	0.023	0.001	0.021
Female Principal	0.002	0.014	0.004	0.017	-0.005	0.014
Experience Principal	-0.005*	0.003	-0.001	0.003	-0.001	0.003
Square Experience Principal	0.000*	0.000	0.000	0.000	0.000	0.000
Percent of Black Staff	-0.295***	0.084	-0.125	0.079	-0.129	0.079
Percent of Female Staff	-0.088	0.066	-0.164***	0.061	-0.097*	0.054
Experience Staff	0.028*	0.015	0.019	0.017	0.019	0.014
Square Experience Staff	-0.001*	0.001	-0.001	0.001	-0.001	0.001
Percent of Black Teachers	0.185**	0.087	0.082	0.085	0.045	0.083
Percent of Female Teachers	0.058	0.082	-0.112	0.087	-0.070	0.088
Percent of Master Teachers	-0.059	0.049	-0.062	0.052	-0.068	0.049
Experience Teachers	-0.016	0.019	-0.023	0.017	-0.007	0.018
Square Experience Teachers	0.000	0.001	0.001	0.001	0.000	0.001
Percent of Black Students	0.261***	0.044	0.212***	0.041	0.238***	0.039
Percent of Free Lunch Students	0.063	0.052	0.032	0.049	0.057	0.051
Small-city/rural	0.028*	0.016	0.008	0.016	-0.007	0.016
School Competition Index	-0.024	0.017	-0.004	0.022	0.004	0.021
Social Capital Index	0.002***	0.001	0.000	0.000	0.000	0.000
Percent of Religious Enrollment	0.016	0.015	-0.017	0.012	-0.007	0.016
Primary Schools MCT Score (15 Mile)	-0.933**	0.357	-1.009***	0.354	-0.944***	0.354
R-square	0.746		0.713		0.699	
Adj-R-square	0.706		0.668		0.652	

N = 148, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table H.2 Determinants Analysis: High Schools and K-12 Schools- Pooled Schools (SATP Algebra Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP Algebra						
Independent variables						
Constant	-1.937	1.856	-0.799	1.851	-2.028	1.830
Black Principal	-0.033	0.110	0.046	0.103	-0.025	0.112
Female Principal	0.202*	0.104	0.169	0.103	0.219**	0.097
Experience Principal	0.000	0.013	-0.002	0.012	0.003	0.013
Square Experience Principal	-0.000	0.000	0.000	0.000	-0.000	0.000
Percent of Black Staff	-1.019***	0.357	-1.061***	0.367	-0.978**	0.380
Percent of Female Staff	0.152	0.289	0.007	0.283	-0.152	0.309
Experience Staff	-0.049	0.088	0.030	0.083	0.040	0.088
Square Experience Staff	0.002	0.003	-0.001	0.003	-0.001	0.003
Percent of Black Teachers	0.807**	0.347	0.890***	0.337	0.893**	0.361
Percent of Female Teachers	0.325	0.436	0.072	0.417	-0.067	0.460
Percent of Master Teachers	-0.205	0.278	-0.317	0.239	-0.146	0.290
Experience Teachers	-0.029	0.114	-0.084	0.112	-0.095	0.125
Square Experience Teachers	0.001	0.005	0.003	0.004	0.004	0.005
Percent of Black Students	0.904***	0.222	0.719***	0.203	0.814***	0.213
Percent of Free Lunch Students	-0.128	0.148	-0.152	0.138	-0.195	0.152
Small-city/rural	0.003	0.064	-0.013	0.070	0.006	0.069
School Competition Index	-0.062	0.062	-0.037	0.076	-0.022	0.080
Social Capital Index	0.006**	0.003	0.001	0.001	0.000	0.001
Percent of Religious Enrollment	0.085	0.060	-0.128**	0.054	-0.064	0.076
Primary Schools MCT Score (15 Mile)	3.052	1.845	1.853	1.819	3.502*	1.873
R-square	0.481		0.481		0.418	
Adj-R-square	0.398		0.398		0.327	

N = 148, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table H.3 Determinants Analysis: High Schools and K-12 Schools- Pooled Schools (SATP History Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency Score in Proficient Rate in SATP History						
Independent variables						
Constant	1.794**	0.806	1.731*	0.903	1.282	0.879
Black Principal	-0.156***	0.056	-0.173***	0.059	-0.201***	0.058
Female Principal	-0.039	0.057	-0.020	0.053	-0.010	0.055
Experience Principal	-0.021**	0.009	-0.022**	0.008	-0.022***	0.008
Square Experience Principal	0.000**	0.000	0.000**	0.000	0.000**	0.000
Percent of Black Staff	0.099	0.182	0.240	0.212	0.201	0.179
Percent of Female Staff	0.112	0.165	0.165	0.185	0.102	0.163
Experience Staff	0.107***	0.037	0.105**	0.044	0.101***	0.037
Square Experience Staff	-0.004**	0.002	-0.003*	0.002	-0.003**	0.001
Percent of Black Teachers	-0.260	0.165	-0.275	0.194	-0.255	0.185
Percent of Female Teachers	-0.188	0.247	-0.182	0.275	-0.279	0.261
Percent of Master Teachers	0.049	0.136	0.104	0.156	0.086	0.149
Experience Teachers	0.055	0.051	0.019	0.060	0.018	0.049
Square Experience Teachers	-0.003	0.002	-0.001	0.002	-0.001	0.002
Percent of Black Students	0.394***	0.127	0.374***	0.122	0.374***	0.116
Percent of Free Lunch Students	0.287***	0.096	0.204*	0.109	0.259***	0.095
Small-city/rural	0.036	0.056	0.015	0.059	0.039	0.051
School Competition Index	0.012	0.057	0.052	0.070	0.051	0.071
Social Capital Index	0.002	0.004	-0.001	0.001	-0.000	0.000
Percent of Religious Enrollment	-0.025	0.031	-0.019	0.033	-0.027	0.050
Primary Schools MCT Score (15 Mile)	-3.220***	0.833	-2.813***	0.943	-2.145**	0.997
R-square	0.582		0.503		0.554	
Adj-R-square	0.517		0.424		0.484	

N = 148, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

Table H.4 Determinants Analysis: High Schools and K-12 Schools- Pooled Schools (SATP English Examination)

Variables	5 Mile Coefficient	Std. Error	15 Mile Coefficient	Std. Error	25 Mile Coefficient	Std. Error
Dependent variable						
Inefficiency score in proficient rate in SATP English						
Independent variables						
Constant	0.475	1.095	0.536	1.171	1.365	0.957
Black Principal	-0.103*	0.057	-0.150***	0.057	-0.032	0.052
Female Principal	-0.005	0.042	-0.039	0.042	-0.057**	0.026
Experience Principal	-0.004	0.007	-0.007	0.009	0.006	0.009
Square Experience Principal	0.000	0.000	0.000	0.000	-0.000	0.000
Percent of Black Staff	-0.134	0.219	-0.163	0.224	-0.408**	0.188
Percent of Female Staff	0.109	0.159	0.129	0.181	-0.049	0.151
Experience Staff	0.151***	0.046	0.138***	0.049	0.109***	0.039
Square Experience Staff	-0.006***	0.002	-0.005***	0.002	-0.005***	0.001
Percent of Black Teachers	1.001***	0.257	0.932***	0.259	1.097***	0.216
Percent of Female Teachers	-0.046	0.238	0.089	0.274	-0.059	0.258
Percent of Master Teachers	-0.479***	0.162	-0.464**	0.180	-0.444***	0.144
Experience Teachers	0.019	0.082	0.038	0.085	-0.021	0.072
Square Experience Teachers	-0.001	0.003	-0.001	0.003	0.001	0.003
Percent of Black Students	0.119	0.112	0.215*	0.129	0.191*	0.113
Percent of Free Lunch Students	0.291***	0.098	0.296**	0.119	0.377***	0.115
Small-city/rural	-0.023	0.051	-0.006	0.068	0.008	0.047
School Competition Index	0.053	0.044	0.007	0.044	-0.007	0.043
Social Capital Index	-0.001	0.002	-0.000	0.001	0.000*	0.000
Percent of Religious Enrollment	-0.054*	0.030	-0.029	0.035	-0.022	0.039
Primary Schools MCT Score (15 Mile)	-1.503	1.024	-1.748*	1.027	-2.152**	0.943
R-square	0.717		0.673		0.796	
Adj-R-square	0.672		0.622		0.765	

N = 148, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively Heteroskedasticty corrected model

APPENDIX I

SINGLE EQUATION MODEL: EIGHTH GRADE

Table I.1 Results from Single Equation Model: Primary Schools Model - 8th Grade (MCT Overall Examination)

Dependent Variable: MCT Overall Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**
Constant	2.158*** (0.459)	2.174*** (0.520)
Log of Building Area per Student	0.556*** (0.127)	0.524*** (0.129)
Log of General Expenditures per Student	0.005 (0.142)	-0.008 (0.157)
Log of Textbook Expenditures per Student	-0.004 (0.059)	0.039 (0.068)
Log of Number of Teachers and Staff per Student	-0.149 (0.244)	0.047 (0.287)
Log Percent of Black Students	-0.051*** (0.018)	-0.064*** (0.018)
Log Percent of Free Lunch Students	-0.342*** (0.063)	-0.304*** (0.073)
Small-city/rural	-0.073 (0.061)	-0.036 (0.074)
Log School Competition Index	0.012 (0.010)	-0.010 (0.008)
Log Social Capital Index	-0.089*** (0.034)	-0.006 (0.019)
Log Percent of Religious Enrollment	0.101*** (0.043)	-0.013 (0.024)
Log likelihood function	18.222	13.318
Technical Efficiency		
Mean	0.830	0.819
Min	0.486	0.451
Max	0.963	0.959

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table I.2 Pearson Correlation Coefficients: Primary Schools Model - 8th Grade

Variable	Technical Efficiency Overall Proficiency Rate -5 Miles	Technical Efficiency Overall Proficiency Rate -15 Miles
Percent of Black Students	-0.393*** [0.000]	-0.408*** [0.000]
Percent of Free lunch Enrollment	-0.307*** [0.004]	-0.318*** [0.002]
Small-city/Rural	-0.049 [0.641]	-0.067 [0.533]
School Competition Index	0.022 [0.836]	0.073 [0.493]
Social Capital Index	0.082 [0.439]	0.129 [0.227]
Percent of Religious Enrollment	-0.064 [0.549]	0.001 [0.989]

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

Table I.3 Results from Single Equation Model: Primary Schools Model - 8th Grade (MCT Language Examination)

Dependent Variable: MCT Language Proficiency Rate	**5 Mile Coefficient**	**25 Mile Coefficient**
Constant	1.607***	1.847***
	(0.474)	(0.486)
Log of Building Area per Student	0.707***	0.671***
	(0.128)	(0.132)
Log of General Expenditures per Student	0.015	-0.050
	(0.134)	(0.139)
Log of Textbook Expenditures per Student	-0.058	-0.033
	(0.059)	(0.065)
Log of Number of Teachers and Staff per Student	-0.353	0.083
	(0.262)	(0.308)
Log Percent of Black Students	-0.056***	-0.069***
	(0.018)	(0.019)
Log Percent of Free Lunch Students	-0.351***	-0.331***
	(0.062)	(0.067)
Small-city/rural	-0.076	0.006
	(0.063)	(0.078)
Log School Competition Index	0.015	-0.015
	(0.011)	(0.011)
Log Social Capital Index	-0.081**	0.031
	(0.034)	(0.023)
Log Percent of Religious Enrollment	0.108**	-0.012
	(0.044)	(0.036)
Log likelihood function	14.214	10.235
Technical Efficiency		
Mean	0.829	0.819
Min	0.412	0.324
Max	0.957	0.964

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis, Frontier for 15 miles market didn't converge for SATP Language examination

Table I.4 Pearson Correlation Coefficients: Primary Schools Model - 8th Grade

Variable	Technical Efficiency Language Proficiency Rate - 5 Miles	Technical Efficiency Language Proficiency Rate - 25 Miles
Percent of Black Students	-0.246**	-0.234***
	[0.019]	[0.027]
Percent of Free lunch Enrollment	-0.218***	-0.189***
	[0.038]	[0.073]
Small-city/Rural	-0.064	-0.073
	[0.546]	[0.493]
School Competition Index	0.054	0.113
	[0.613]	[0.288]
Social Capital Index	0.091	0.030
	[0.393]	[0.774]
Percent of Religious Enrollment	-0.068	-0.035
	[0.526]	[0.745]

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

Table I.5 Results from Single Equation Model: Primary Schools Model - 8th Grade (MCT Mathematics Examination)

Dependent Variable: MCT Mathematics Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	2.657***	2.699***	2.657***
	(0.633)	(0.569)	(0.633)
Log of Building Area per Student	0.499***	0.521***	0.499***
	(0.168)	(0.153)	(0.168)
Log of General Expenditures per Student	-0.135	-0.098	-0.135
	(0.161)	(0.149)	(0.161)
Log of Textbook Expenditures per Student	-0.038	-0.038	-0.038
	(0.084)	(0.076)	(0.084)
Log of Number of Teachers and Staff per Student	0.095	-0.032	0.095
	(0.327)	(0.289)	(0.327)
Log Percent of Black Students	-0.067***	-0.054**	-0.067**
	(0.021)	(0.021)	(0.021)
Log Percent of Free Lunch Students	-0.328***	-0.353***	-0.328***
	(0.079)	(0.071)	(0.079)
Small-city/rural	-0.023	-0.072	-0.023
	(0.084)	(0.070)	(0.084)
Log School Competition Index	-0.009	0.011	-0.009
	(0.012)	(0.013)	(0.012)
Log Social Capital Index	0.009	-0.095**	0.009
	(0.025)	(0.041)	(0.025)
Log Percent of Religious Enrollment	0.007	0.077	0.007
	(0.042)	(0.046)	(0.042)
Log likelihood function	3.961	7.861	3.961
Technical Efficiency			
Mean	0.831	0.839	0.846
Min	0.486	0.451	0.443
Max	0.963	0.955	0.953

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table I.6 Pearson Correlation Coefficients: Primary Schools Model -8th Grade

Variable	Technical Efficiency Mathematics Proficiency Rate -5 Miles	Technical Efficiency Mathematics Proficiency Rate -15 Miles	Technical Efficiency Mathematics Proficiency Rate -25 Miles
Percent of Black Students	-0.376*** [0.000]	-0.367*** [0.000]	-0.378*** [0.000]
Percent of Free lunch Enrollment	-0.255** [0.015]	-0.256*** [0.015]	-0.256** [0.015]
Small-city/Rural	-0.021 [0.842]	-0.008 [0.939]	-0.000 [0.998]
School Competition Index	-0.032 [0.763]	0.039 [0.712]	0.017 [0.870]
Social Capital Index	0.061 [0.569]	0.084 [0.428]	-0.011 [0.921]
Percent of Religious Enrollment	-0.029 [0.779]	-0.022 [0.833]	-0.042 [0.694]

N = 90, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

APPENDIX J.

SINGLE EQUATION MODEL: GRADUATING GRADE PRIMARY SCHOOLS

Table J.1 Results from Single Equation Model: Primary Schools Model - Graduating Grade (MCT Overall Examination)

Dependent Variable: MCT Overall Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	4.113***	4.163***	4.217***
	(0.207)	(0.210)	(0.209)
Log of Building Area per Student	-0.030	0.038	-0.050
	(0.057)	(0.059)	(0.058)
Log of General Expenditures per Student	-0.064	-0.066	-0.067*
	(0.041)	(0.041)	(0.040)
Log of Textbook Expenditures per Student	-0.014	-0.018	-0.013
	(0.026)	(0.026)	(0.025)
Log of Number of Teachers and Staff per Student	0.126	0.129	0.109
	(0.111)	(0.112)	(0.109)
Log Percent of Black Students	-0.027***	-0.028**	-0.027**
	(0.009)	(0.009)	(0.010)
Log Percent of Free Lunch Students	-0.022	-0.022	-0.023
	(0.015)	(0.016)	(0.16)
Small-city/rural	-0.025	-0.016	-0.019
	(0.019)	(0.024)	(0.024)
Log School Competition Index	-0.001	0.004	0.007*
	(0.005)	(0.004)	(0.004)
Log Social Capital Index	0.018	0.002	-0.008
	(0.014)	(0.008)	(0.010)
Log Percent of Religious Enrollment	-0.006	0.001	0.010
	(0.016)	(0.010)	(0.015)
Log likelihood function	44.553	44.400	45.292
Technical Efficiency			
Mean	0.78	0.79	0.79
Min	0.23	0.24	0.24
Max	0.97	0.97	0.98

N = 344, non-combined schools included in this sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table J.2 Pearson Correlation Coefficients: Primary Schools Model -Graduating Grade (MCT Overall Examination)

Variable	Technical Efficiency Overall Proficiency Rate -5 Miles	Technical Efficiency Overall Proficiency Rate -15 Miles	Technical Efficiency Overall Proficiency Rate -25 Miles
Percent of Black Students	-0.314*** [0.000]	-0.313*** [0.000]	-0.313*** [0.000]
Percent of Free lunch Enrollment	-0.254** [0.001]	-0.253*** [0.015]	-0.254** [0.015]
Small-city/Rural	-0.041 [0.453]	-0.048 [0.494]	-0.048 [0.377]
School Competition Index	0.044 [0.409]	0.038 [0.480]	0.032 [0.559]
Social Capital Index	-0.063 [0.239]	0.076 [0.161]	0.086 [0.109]
Percent of Religious Enrollment	0.075 [0.165]	0.152*** [0.005]	0.100 [0.063]

N = 344, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

Table J.3 Results from Single Equation Model: Primary Schools Model- Graduating Grade (MCT Reading Examination)

Dependent Variable: MCT Reading Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	3.997***	4.053***	4.071***
	(0.151)	(0.157)	(0.152)
Log of Building Area per Student	-0.012	-0.023	-0.033
	(0.040)	(0.044)	(0.042)
Log of General Expenditures per Student	-0.032	-0.037	-0.032
	(0.034)	(0.035)	(0.035)
Log of Textbook Expenditures per Student	-0.005	-0.008	-0.005
	(0.021)	(0.021)	(0.021)
Log of Number of Teachers and Staff per Student	0.054	0.064	0.042
	(0.084)	(0.086)	(0.084)
Log Percent of Black Students	-0.018***	-0.019***	-0.017**
	(0.007)	(0.007)	(0.008)
Log Percent of Free Lunch Students	-0.013	-0.010	-0.009
	(0.013)	(0.012)	(0.012)
Small-city/rural	-0.022	-0.011	-0.013
	(0.015)	(0.018)	(0.018)
Log School Competition Index	0.002	0.003	0.005*
	(0.003)	(0.003)	(0.003)
Log Social Capital Index	0.011	0.003	-0.003
	(0.010)	(0.006)	(0.008)
Log Percent of Religious Enrollment	-0.010	0.006	0.014
	(0.012)	(0.008)	(0.012)
Log likelihood function	65.318	64.795	65.678
Technical Efficiency			
Mean	0.78	0.78	0.78
Min	0.14	0.14	0.14
Max	0.98	0.98	0.98

N = 344, non-combined schools included in this sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table J.4 Pearson Correlation Coefficients: Primary Schools Model- Graduating Grade (MCT Reading Examination)

Variable	Technical Efficiency Reading Proficiency Rate -5 Miles	Technical Efficiency Reading Proficiency Rate -15 Miles	Technical Efficiency Reading Proficiency Rate -25 Miles
Percent of Black Students	-0.309*** [0.000]	-0.307*** [0.000]	-0.312*** [0.000]
Percent of Free lunch Enrollment	-0.263** [0.001]	-0.263*** [0.001]	-0.267*** [0.000]
Small-city/Rural	-0.065 [0.228]	-0.074 [0.172]	-0.071 [0.186]
School Competition Index	0.052 [0.336]	0.052 [0.340]	0.045 [0.401]
Social Capital Index	-0.032 [0.560]	0.113** [0.035]	0.118** [0.029]
Percent of Religious Enrollment	0.133** [0.013]	0.138** [0.011]	0.137** [0.011]

N = 344, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

Table J.5 Results from Single Equation Model: Primary Schools Model - Graduating Grade (MCT Mathematics Examination)

Dependent Variable: MCT Mathematics Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	4.334***	4.339***	4.41***
	(0.190)	(0.193)	(0.183)
Log of Building Area per Student	-0.084	-0.084	-0.103**
	(0.053)	(0.053)	(0.051)
Log of General Expenditures per Student	-0.039	-0.038	-0.041
	(0.038)	(0.037)	(0.036)
Log of Textbook Expenditures per Student	-0.002	-0.001	-0.001
	(0.024)	(0.024)	(0.024)
Log of Number of Teachers and Staff per Student	0.249***	0.249***	0.235***
	(0.098)	(0.097)	(0.093)
Log Percent of Black Students	-0.018**	-0.017**	-0.018**
	(0.009)	(0.009)	(0.009)
Log Percent of Free Lunch Students	-0.010	-0.009	-0.011
	(0.014)	(0.013)	(0.013)
Small-city/rural	-0.000	0.001	0.001
	(0.017)	(0.019)	(0.019)
Log School Competition Index	-0.000	-0.000	0.004
	(0.004)	(0.003)	(0.003)
Log Social Capital Index	0.006	0.001	-0.007
	(0.014)	(0.007)	(0.008)
Log Percent of Religious Enrollment	-0.001	-0.000	0.016
	(0.013)	(0.009)	(0.013)
Log likelihood function	20.894	20.795	21.975
Technical Efficiency			
Mean	0.76	0.76	0.76
Min	0.18	0.18	0.18
Max	0.98	0.98	0.99

N = 344, non-combined schools included in this sample, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table J.6 Pearson Correlation Coefficients: Primary Schools - Graduating Grade (MCT Mathematics Examination)

Variable	Technical Efficiency Mathematics Proficiency Rate -5 Miles	Technical Efficiency Mathematics Proficiency Rate -15 Miles	Technical Efficiency Mathematics Proficiency Rate -25 Miles
Percent of Black Students	-0.374*** [0.000]	-0.374*** [0.000]	-0.369*** [0.000]
Percent of Free lunch Enrollment	-0.299*** [0.000]	-0.301*** [0.000]	-0.297** [0.000]
Small-city/Rural	-0.021 [0.695]	-0.025 [0.647]	-0.023 [0.662]
School Competition Index	0.029 [0.587]	0.031 [0.567]	0.022 [0.689]
Social Capital Index	-0.081 [0.133]	0.065 [0.232]	0.075 [0.163]
Percent of Religious Enrollment	0.012 [0.825]	0.113** [0.036]	0.050 [0.352]

N = 344, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

APPENDIX K

SINGLE EQUATION MODEL: HIGH SCHOOLS

Table K.1 Results from Single Equation Model: High Schools (SATP Overall Examination)

Dependent Variable: SATP Overall Proficiency Rate		**5 Mile Coefficient**	**15 Mile Coefficient**
Constant		4.193***	4.113***
		(0.738)	(0.634)
Log of Building Area per Student		0.006*	0.061
		(0.079)	(0.068)
Log of General Expenditures per Student		0.064	0.069*
		(0.047)	(0.042)
Log of Textbook Expenditures per Student		-0.022	-0.041
		(0.029)	(0.026)
Log of Number of Teachers and Staff per Student		-0.067	-0.001
		(0.127)	(0.119)
Log Percent of Black Students		-0.084**	-0.095***
		(0.033)	(0.029)
Log Percent of Free Lunch Students		-0.201***	-0.159***
		(0.055)	(0.048)
Small-city/rural		-0.031	-0.050
		(0.068)	(0.074)
Log School Competition Index		-0.000	0.006
		(0.013)	(0.010)
Log Social Capital Index		-0.096**	-0.004
		(0.047)	(0.031)
Log Percent of Religious Enrollment		-0.014	0.106
		(0.072)	(0.093)
Log Primary Schools MCT Score		2.907**	3.073***
		(1.158)	(1.046)
Log likelihood function		16.513	15.217
Technical Efficiency			
	Mean	0.875	0.816
	Min	0.589	0.421
	Max	0.956	0.968

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis, SATP Overall didn't converge for 25 Miles market

Table K.2 Pearson Correlation Coefficients: High Schools

Variable	Technical Efficiency Overall Proficiency Rate -5 Miles
Percent of Black Students	-0.299*** [0.004]
Percent of Free lunch Enrollment	-0.200** [0.063]
Small-city/Rural	0.062 [0.565]
School Competition Index	-0.042 [0.699]
Social Capital Index	-0.083 [0.447]
Percent of Religious Enrollment	0.085 [0.433]
Primary Schools MCT Score	0.008 [0.939]

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

Table K.3 Results from Single Equation Model: High Schools (SATP History Examination)

Dependent Variable: SATP History Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	5.022***	4.937***	4.729***
	(0.739)	(0.738)	(0.744)
Log of Building Area per Student	0.044	0.064	0.069
	(0.079)	(0.078)	(0.077)
Log of General Expenditures per Student	0.040	0.033	0.035
	(0.056)	(0.055)	(0.051)
Log of Textbook Expenditures per Student	-0.085***	-0.096***	-0.081***
	(0.031)	(0.030)	(0.028)
Log of Number of Teachers and Staff per Student	0.114	0.180	0.097
	(0.121)	(0.120)	(0.118)
Log Percent of Black Students	-0.048	-0.062*	-0.049
	(0.036)	(0.034)	(0.035)
Log Percent of Free Lunch Students	-0.154***	-0.141**	-0.130*
	(0.065)	(0.071)	(0.067)
Small-city/rural	-0.092	-0.066	-0.067
	(0.068)	(0.074)	(0.067)
Log School Competition Index	-0.005	-0.010	-0.004
	(0.014)	(0.011)	(0.012)
Log Social Capital Index	-0.080	0.034	-0.001
	(0.051)	(0.037)	(0.029)
Log Percent of Religious Enrollment	-0.057	0.201	0.064
	(0.073)	(0.122)	(0.040)
Log Primary Schools MCT Score	2.622*	2.789**	2.518*
	(1.375)	(1.375)	(1.374)
Log likelihood function	3.043	3.684	3.089
Technical Efficiency			
Mean	0.818	0.821	0.810
Min	0.315	0.299	0.286
Max	0.957	0.959	0.963

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table K.4 Pearson Correlation Coefficients: High Schools

Variable	Technical Efficiency History Proficiency Rate -5 Miles	Technical Efficiency History Proficiency Rate -15 Miles	Technical Efficiency History Proficiency Rate -25 Miles
Percent of Black Students	-0.251***	-0.245**	-0.275***
	[0.019]	[0.022]	[0.010]
Percent of Free lunch Enrollment	-0.197**	-0.192*	-0.208**
	[0.067]	[0.075]	[0.053]
Small-city/Rural	-0.025	0.017	-0.029
	[0.812]	[0.873]	[0.789]
School Competition Index	-0.052	-0.075	-0.099
	[0.633]	[0.490]	[0.364]
Social Capital Index	-0.070	0.019	-0.007
	[0.519]	[0.854]	[0.946]
Percent of Religious Enrollment	-0.001	0.025	0.052
	[0.993]	[0.818]	[0.629]
Primary Schools MCT Score	0.130	0.081	0.095
	[0.229]	[0.457]	[0.381]

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

Table K.5 Results from Single Equation Model: High Schools (SATP Algebra Examination)

Dependent Variable: SATP Algebra Proficiency Rate		**15 Mile Coefficient**	**25 Mile Coefficient**
Constant		2.714**	3.213**
		(1.361)	(1.487)
Log of Building Area per Student		0.042	0.035
		(0.146)	(0.154)
Log of General Expenditures per Student		0.182**	0.167*
		(0.086)	(0.090)
Log of Textbook Expenditures per Student		-0.041	-0.045
		(0.053)	(0.045)
Log of Number of Teachers and Staff per Student		-0.641**	-0.585**
		(0.273)	(0.295)
Log Percent of Black Students		-0.097*	-0.139**
		(0.051)	(0.063)
Log Percent of Free Lunch Students		-0.081	-0.036
		(0.095)	(0.099)
Small-city/rural		0.037	0.131
		(0.114)	(0.101)
Log School Competition Index		0.013	0.033
		(0.016)	(0.023)
Log Social Capital Index		-0.106*	-0.088**
		(0.064)	(0.045)
Log Percent of Religious Enrollment		-0.117	0.003
		(0.213)	(0.087)
Log Primary Schools MCT Score		4.380**	5.474***
		(1.884)	(1.895)
Log likelihood function		-50.480	-50.066
Technical Efficiency			
	Mean	0.658	0.663
	Min	0.049	0.052
	Max	0.947	0.952

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis, SATP Algebra didn't converge for 5 Miles market

Table K.6 Pearson Correlation Coefficients: High Schools

Variable	Technical Efficiency Algebra Proficiency Rate - 15 Miles	Technical Efficiency Algebra Proficiency Rate - 25 Miles
Percent of Black Students	-0.266**	-0.227**
	[0.013]	[0.035]
Percent of Free lunch Enrollment	-0.152	-0.126
	[0.157]	[0.234]
Small-city/Rural	0.009	-0.001
	[0.933]	[0.987]
School Competition Index	-0.043	-0.078
	[0.687]	[0.472]
Social Capital Index	-0.066	-0.001
	[0.539]	[0.992]
Percent of Religious Enrollment	0.099	-0.060
	[0.361]	[0.576]
Primary Schools MCT Score	0.026	-0.029
	[0.808]	[0.786]

N = 87, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

APPENDIX L

SINGLE EQUATION MODEL: K-12 SCHOOLS

Table L.1 Results from Single Equation Model: K-12 Schools (SATP English Examination)

Dependent Variable: SATP English Proficiency Rate		**15 Mile Coefficient**
Constant		3.874***
		(1.081)
Log of Building Area per Student		-0.104
		(0.137)
Log of General Expenditures per Student		0.116
		(0.103)
Log of Textbook Expenditures per Student		0.013
		(0.056)
Log of Number of Teachers and Staff per Student		0.298
		(0.212)
Log Percent of Black Students		-0.170**
		(0.065)
Log Percent of Free Lunch Students		-0.717***
		(0.151)
Small-city/rural		0.044
		(0.231)
Log School Competition Index		0.012
		(0.024)
Log Social Capital Index		-0.066
		(0.054)
Log Percent of Religious Enrollment		0.069
		(0.046)
Log likelihood function		-15.686
Technical Efficiency		
	Mean	0.774
	Min	0.180
	Max	0.950

N = 64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table L.2 Pearson Correlation Coefficients: K-12 Schools

Variable	Technical Efficiency English Proficiency Rate -15 Miles
Percent of Black Students	-0.254** [0.043]
Percent of Free lunch Enrollment	-0.171 [0.174]
Small-city/Rural	0.038 [0.764]
School Competition Index	0.022 [0.864]
Social Capital Index	0.019 [0.883]
Percent of Religious Enrollment	-0.009 [0.938]

N = 64, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

APPENDIX M

SINGLE EQUATION MODEL: POOLED SCHOOLS (HIGH & K-12 SCHOOLS)

Table M.1 Results from Single Equation Model: Pooled Schools (SATP Overall Examination)

Dependent Variable: SATP Overall Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	3.986*** (0.515)	3.845*** (0.524)	4.160*** (0.562)
Log of Building Area per Student	0.022 (0.054)	0.030 (0.054)	0.015 (0.051)
Log of General Expenditures per Student	0.063* (0.037)	0.063* (0.036)	0.066* (0.035)
Log of Textbook Expenditures per Student	-0.001 (0.021)	0.001 (0.021)	-0.002 (0.019)
Log of Number of Teachers and Staff per Student	-0.024 (0.091)	-0.017 (0.092)	0.009 (0.088)
Log Percent of Black Students	-0.095*** (0.026)	-0.109*** (0.026)	-0.109*** (0.026)
Log Percent of Free Lunch Students	-0.204*** (0.046)	-0.182*** (0.047)	-0.182*** (0.043)
Small-city/rural	-0.046 (0.057)	-0.026 (0.063)	-0.047 (0.059)
Log School Competition Index	0.000 (0.011)	-0.004 (0.007)	0.012 (0.010)
Log Social Capital Index	-0.066 (0.046)	-0.008 (0.021)	-0.030 (0.021)
Log Percent of Religious Enrollment	0.018 (0.066)	-0.017 (0.036)	0.031 (0.022)
Log Primary Schools MCT Score	2.295*** (0.743)	2.324*** (0.765)	2.378*** (0.754)
Log likelihood function	26.134	24.733	27.022
Technical Efficiency			
Mean	0.85	0.85	0.84
Min	0.36	0.36	0.36
Max	0.95	0.95	0.96

N = 148, non-combined schools included in this sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table M.2 Pearson Correlation Coefficients: Pooled Schools (SATP Overall Examination)

Variable	Technical Efficiency Overall Proficiency Rate -5 Miles	Technical Efficiency Overall Proficiency Rate -15 Miles	Technical Efficiency Overall Proficiency Rate -25 Miles
Percent of Black Students	-0.224***	-0.242***	-0.246***
	[0.006]	[0.003]	[0.002]
Percent of Free lunch Enrollment	-0.147*	-0.146*	-0.155**
	[0.073]	[0.075]	[0.059]
Small-city/Rural	0.084	0.109	0.131
	[0.310]	[0.188]	[0.113]
School Competition Index	-0.042	-0.075	-0.126
	[0.616]	[0.358]	[0.128]
Social Capital Index	-0.109	-0.091	-0.003
	[0.185]	[0.273]	[0.968]
Percent of Religious Enrollment	0.052	0.138*	0.037
	[0.529]	[0.094]	[0.652]
Primary Schools MCT Score	0.04578	0.02540	0.002
	[0.5806]	[0.7593]	[0.980]

N = 148, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket

Table M.3 Results from Single Equation Model: Pooled Schools (SATP Algebra Examination)

Dependent Variable: SATP Algebra Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	3.493***	3.294***	3.280***
	(0.838)	(0.852)	(0.968)
Log of Building Area per Student	-0.007	0.036	0.032
	(0.099)	(0.107)	(0.090)
Log of General Expenditures per Student	0.105	0.096	0.117
	(0.066)	(0.077)	(0.077)
Log of Textbook Expenditures per Student	0.014	0.019	0.032
	(0.029)	(0.031)	(0.034)
Log of Number of Teachers and Staff per Student	-0.356***	-0.276*	-0.237
	(0.133)	(0.145)	(0.155)
Log Percent of Black Students	-0.026	-0.053	-0.081*
	(0.033)	(0.036)	(0.046)
Log Percent of Free Lunch Students	-0.164***	-0.152**	-0.143*
	(0.062)	(0.078)	(0.086)
Small-city/rural	-0.008	0.097	0.038
	(0.078)	(0.083)	(0.085)
Log School Competition Index	0.042***	-0.001	0.019
	(0.017)	(0.011)	(0.017)
Log Social Capital Index	-0.059	-0.023	-0.049
	(0.065)	(0.047)	(0.040)
Log Percent of Religious Enrollment	0.270***	-0.065	0.058
	(0.077)	(0.043)	(0.039)
Log Primary Schools MCT Score	2.827***	2.910***	2.252*
	(0.969)	(1.010)	(1.180)
Log likelihood function	-78.357	-83.036	-82.279
Technical Efficiency			
Mean	0.64	0.64	0.66
Min	0.06	0.06	0.07
Max	0.95	0.95	0.95

N = 148, non-combined schools included in this sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table M.4 Pearson Correlation Coefficients: Pooled Schools (SATP Algebra Examination)

Variable	Technical Efficiency Algebra Proficiency Rate -5 Miles	Technical Efficiency Algebra Proficiency Rate -15 Miles	Technical Efficiency Algebra Proficiency Rate -25 Miles
Percent of Black Students	-0.202** [0.014]	-0.230*** [0.005]	-0.201** [0.014]
Percent of Free lunch Enrollment	-0.097 [0.239]	-0.088 [0.286]	-0.078 [0.341]
Small-city/Rural	0.016 [0.850]	0.007 [0.934]	0.031 [0.701]
School Competition Index	-0.022 [0.786]	-0.002 [0.983]	-0.048 [0.564]
Social Capital Index	-0.114 [0.168]	-0.146 [0.078]	-0.061 [0.458]
Percent of Religious Enrollment	0.042 [0.609]	0.119 [0.147]	0.032 [0.702]
Primary Schools MCT Score	-0.040 [0.626]	-0.026 [0.753]	-0.042 [0.615]

N = 148, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10percent respectively, P-values are in the bracket

Table M.5 Results from Single Equation Model: Pooled Schools Model (SATP English Examination)

Dependent Variable: SATP English Proficiency Rate	**5 Mile Coefficient**	**15 Mile Coefficient**	**25 Mile Coefficient**
Constant	4.437***	4.393***	4.783***
	(0.712)	(0.731)	(0.611)
Log of Building Area per Student	-0.056	-0.055	-0.082
	(0.075)	(0.075)	(0.063)
Log of General Expenditures per Student	-0.005	-0.004	-0.007
	(0.046)	(0.045)	(0.042)
Log of Textbook Expenditures per Student	0.057**	0.053*	0.051*
	(0.029)	(0.029)	(0.026)
Log of Number of Teachers and Staff per Student	0.155	0.133	0.111
	(0.110)	(0.119)	(0.105)
Log Percent of Black Students	-0.153***	-0.153***	-0.144***
	(0.042)	(0.039)	(0.034)
Log Percent of Free Lunch Students	-0.407***	-0.405***	-0.403***
	(0.063)	(0.064)	(0.054)
Small-city/rural	-0.137*	-0.112	-0.167**
	(0.077)	(0.084)	(0.012)
Log School Competition Index	-0.015	-0.003	0.014
	(0.014)	(0.009)	(0.012)
Log Social Capital Index	0.005	-0.001	-0.057**
	(0.059)	(0.031)	(0.027)
Log Percent of Religious Enrollment	0.060	-0.017	0.053**
	(0.081)	(0.038)	(0.026)
Log Primary Schools MCT Score	2.726***	2.805***	2.571***
	(0.889)	(0.946)	(0.841)
Log likelihood function	-28.298	-29.091	-24.547
Technical Efficiency			
Mean	0.75	0.76	0.76
Min	0.16	0.16	0.17
Max	0.95	0.95	0.96

N = 148, non-combined schools included in this sample. ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, Standard errors are in the parenthesis

Table M.6 Pearson Correlation Coefficients: Pooled Schools (SATP English Examination)

Variable	Technical Efficiency English Proficiency Rate -5 Miles	Technical Efficiency English Proficiency Rate -15 Miles	Technical Efficiency English Proficiency Rate -25 Miles
Percent of Black Students	-0.322***	-0.322***	-0.334***
	[0.000]	[0.000]	[0.000]
Percent of Free lunch Enrollment	-0.216***	-0.218***	-0.249***
	[0.0083]	[0.007]	[0.002]
Small-city/Rural	0.136	0.131	0.148*
	[0.100]	[0.112]	[0.072]
School Competition Index	-0.017	-0.001	-0.058
	[0.837]	[0.983]	[0.483]
Social Capital Index	-0.098	0.064	0.003
	[0.234]	[0.439]	[0.971]
Percent of Religious Enrollment	0.068	0.119	0.049
	[0.413]	[0.148]	[0.547]
Primary Schools MCT Score	0.018	-0.026	0.043
	[0.831]	[0.753]	[0.598]

N = 148, ***, **, and * indicate statistical significance at 1 percent, 5 percent and 10 percent respectively, P-values are in the bracket