EQUITY MEASURES OF THE MISSOURI SB 287 SCHOOL FUNDING FORMULA

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Doctor of Education

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by
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The undersigned, appointed by Dean of the Graduate School, have examined the dissertation entitled

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Presented by Kari Monsees

A candidate for the degree of Doctor of Education

And hereby certify that in their opinion it is worthy of acceptance.

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DEDICATION

To my loving parents Virginia and Philip Monsees, whose quiet and steady support encouraged me to make all my dreams come true. While Mom was unable to complete this journey with me in the flesh, she remains my biggest fan in heaven and smiles down upon this accomplishment. To my Dad, no better man can serve as a role model to a son on how to live life with love, dignity, compassion, and faith.

To my loving wife Laura, your love and support make all things possible. I am blessed to share this life with you and I could not have completed this journey without you. Finding you was the best thing that ever happened to me.

To my family, friends, and colleagues who have supported all my endeavors large and small. I continue to find your encouragement a source of strength as I continue my travels down the road of enlightenment.

To the students of our great public schools, may your experience provide the same knowledge and motivation as mine to pursue education to the fullest extent possible.

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Finally, I would like to thank my family and friends for their love and support throughout my life and career. I thank especially my wife Laura, who by her mere presence has encouraged me to be a better person every day. I could not have completed this journey without her.

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ABSTRACT

The purpose of this study was to compare horizontal equity measures in Missouri school funding through the fifth year of implementation of the Senate Bill 287 (SB 287) funding formula with the final year of the previous Senate Bill 380 formula. In addition, vertical equity funding components under the new formula were correlated with student achievement measures to determine if the intended goal of providing additional resources to districts with high need students was being met. This study replicated the methodology of a study by Ogle (2007) to provide comparisons between the current and previous formula on horizontal equity statistics of coefficient of variation, federal range ratio, and the McLoone Index. These measures were applied to the data for all districts and to the data for non-hold harmless district on a revenue per pupil basis.

When considering all districts in the state, horizontal equity has not improved under the SB 287 formula, with each measure far from target values. However, for non-hold harmless districts the equity values have improved and, in some cases, are approaching equity target values. The hold harmless provision in the formula continues to limit overall horizontal equity. The impact on equity of prorating the funding distribution equally for all districts during recent state budget shortfalls has been minimal. Correlation calculations indicate the SB 287 formula has been successful at distributing more funds to districts with populations of students with higher needs, as determined by student achievement outcomes.

CHAPTER ONE

INTRODUCTION TO THE STUDY

Background

The allocation of scarce resources has been a primary function of public policy

makers in a variety of settings. One area of resource allocation that garners significant

combined attention at the local, state, and federal levels is the appropriate funding of

public schools. This debate focuses on the necessary level of financial support as well as

the appropriate distribution of such support. While distribution mechanisms are

developed in the political realm, an evaluation of their effectiveness can be addressed

through an academic approach. The purpose of this study was to evaluate the

effectiveness of Missouri's most recent approach to apportion school funding, as

compared to its predecessor, in terms of the equitable distribution of financial resources.

In many states, school funding policy has evolved through a cycle of litigation by

school districts against the state, followed by the development and implementation of a

new funding mechanism. Missouri experienced such a policy cycle in 1993 and again in

2005. In 1993, Senate Bill 380 (SB 380) was passed in response to a successful lawsuit

initiated by numerous school districts collectively called the Committee for Educational

Equality (*Committee for Educational Equality v. Missouri,* 1993). The ruling in this case

indicated students did not have an equal opportunity to access education due to the lack

of an equitable distribution system. The funding formula created in SB 380 was based on

equal opportunity, providing equivalent funding to schools with equivalent local tax

rates. The formula evolved during its lifespan, but remained largely intact until it was

replaced after 2005-2006. Ogle (2007) evaluated this formula over time against various

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equity measures and determined that while it performed better than its predecessor, the formula was becoming less effective over time at providing equity. This loss of effectiveness was at least in part due to the formula being less than fully funded.

In 2005, the Missouri Legislature passed Senate Bill 287 (SB 287) as a response to both the high cost of the existing formula and a lawsuit filed by the reformulated Committee for Educational Equality (*Committee for Educational Equality v. Missouri,* 2004). In addition to challenges based on equity, this suit maintained the funding formula established in SB 380 did not provide for adequate funding levels. While the state ultimately prevailed in the courts, a new formula based on student needs has replaced the previous tax rate driven approach. The SB 287 formula utilized the successful schools approach to determine the proper level of funding per student (Podgursky & Springer, 2005). This amount is adjusted by student population characteristics such as percentages of at-risk, special education, and English language learners. Local funding sources are also considered in determining the state responsibility for funding each district. A notable provision of the SB 287 formula was the seven year phase-in process that began in 2006-2007. In 2006-2007, districts received state formula revenues based 15% on the new SB 287 formula calculation and 85% of their 2005-2006 SB 380 formula calculation. In 2007-2008, the ratio was 30% new formula and 70% old formula. The new formula phase-in portion has been scheduled to increase 14% per year until the SB 287 formula is 100% of the calculation in 2012-2013. More detail of the SB 287 formula is provided in Chapter Two.

Conceptual Underpinnings for the Study

Access to a thorough and efficient educational system is foundational in a democratic society. Funding such a thorough and efficient system is done in part through legislative action in context with other societal needs and priorities. Decisions regarding the allocation of scarce resources can often be viewed through a political frame (Bolman & Deal, 2003). This view underscores the political process required to establish a school funding mechanism at the state level. Legislators represent parochial interests in the legislative process, ultimately leading to policy provisions that work against true equity in educational funding. An example of such a provision in the SB 287 formula is the hold harmless protection given to many school districts, ensuring they will receive no less funding under the new formula even though the distribution calculation dictates otherwise. Such a provision limits the ability of an equity based formula to meet equity goals. Public education has the responsibility to educate all students to a high level and the funding mechanisms established through the political process should reflect and support this societal need. As such, Missouri has adopted a student need school funding formula designed to provide adequate funding for districts to bring all students up to a desired performance level (Podgursky & Springer, 2005).

Equal educational opportunity is terminology that can be defined in a variety of educational contexts. In school finance, fiscal neutrality is the term most often used to denote this concept (Odden & Picus, 2008). Fiscal neutrality would indicate access to educational opportunity should not vary based on local property values or household income. The extent to which a particular school funding model addresses this concept is of importance in our democratic society.

Key school funding terms to be addressed in this study include horizontal equity, vertical equity, and adequacy. Berne and Stiefel (1984) defined horizontal equity as the equal treatment of equals, which has been the traditional definition of equity in a school funding distribution formula. They defined vertical equity as the justifiable unequal treatment of unequals, recognizing that some students are disadvantaged by factors such as poverty or disability. Under the vertical equity concept, students with higher needs are justifiably supported with additional resources. According to King, Swanson, and Sweetland (2005), adequacy refers to the provision of adequate resources to meet a specified performance outcome. To the extent adequate resources are available to educate students to a defined level of competence, adequacy can be described as "the ideal state of vertical equity" (p. 3). This connection between adequacy and vertical equity was assumed in this study. While school funding equity was the overall theme of this study, the component parts of horizontal and vertical equity were differentiated throughout this study.

Statement of the Problem

School funding formulas represent policy decisions on how resources should be distributed to various schools throughout the state. The trend in Missouri and many other states has been for legal action by school districts against the state to precede legislative remedies to address real or perceived inequities. The creation of such formula remedies has often come with political compromises through the legislative process. As a result of these compromises, equity and adequacy goals have often been mitigated through particular formula attributes that serve certain interests. As Missouri transitioned from one funding formula to another, the need remained to evaluate the extent to which the

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new formula structure has improved on equity goals over its predecessor. Further analysis would be beneficial to those who seek to improve funding matters through policy decisions.

Purpose of the Study

The purpose of this study was to compare horizontal equity measures in Missouri between the funding formula created in 2005 under SB 287 and the formula created in 1993 under SB 380. In addition, vertical equity funding components were correlated with student achievement measures to determine if the intended goal of providing additional resources to high need students is being met. Welker (2006) previously conducted an evaluation of general equity between the new and old formulas in Missouri. However, his study did not differentiate between horizontal and vertical equity components, two components of equity that work against one another. In addition, the study used projected revenues for the new formula which have shown to be far different than actual revenues to date. This study replicated the methodology of a study by Ogle (2007) to provide comparisons between the current formula and the previous formula on horizontal equity measures, with an additional element added related to vertical equity. The researcher sought to enhance the overall understanding on the impact of the SB 287 formula on the distribution of resources to schools in Missouri through the first five years of implementation.

Research Questions

To evaluate Missouri funding mechanisms found in SB 287, the following questions were studied:

1. Has the horizontal revenue equity of the foundation formula created in SB 287 improved through five years of implementation over the horizontal revenue equity of the SB 380 formula it replaced?

2. Has the legislative decision to guarantee a minimum (hold harmless) payment per student impacted horizontal revenue equity in the SB 287 foundation formula?

3. Did the proration of the SB 287 funding formula in the 2010-2011 school year due to insufficient funding impact horizontal revenue equity?

4. Does a relationship exist between the revenues driven by vertical equity components of the SB 287 formula and student educational needs as measured by the Composite MAP Index?

This research considered revenue per student to determine if horizontal equity has improved during the first five years of implementation of the SB 287 formula. Students are represented by Average Daily Attendance (ADA). The research design utilized three common measures of horizontal equity to address the first three questions: the coefficient of variation, the federal range ratio, and the McLoone Index consistent with the Ogle study in 2007. For the fourth question, revenue targeting vertical equity was derived by isolating the formula revenue associated with additional weightings based on student characteristics. Composite MAP Index scores were utilized as the student outcome measure representing educational need.

Data for the 2008-2009, 2009-2010, and 2010-2011 school years were selected for analysis in this study. This represented the third, fourth, and fifth years of the seven year implementation of the SB 287 formula. The SB 287 formula was fully funded as designed from 2006-2007 school year through the 2008-2009 school year, but was

funded at 98.27% and 96.64% during the 2009-2010 and 2010-2011 years respectively.

The 2008-2009 year was also significant in that the use of the Dollar Value Modifier

(DVM) was fully implemented in the formula calculations. The DVM provides

additional funding to districts in areas with higher than median wage rates according to

Department of Labor statistics. Districts received up to 10.4% additional funding due to

local economic factors.

Hypotheses

This study utilized Annual Secretary of the Board Report (ASBR) financial data

and student achievement data from the Missouri Department of Elementary and

Secondary Education (DESE) database in conjunction with model generated revenue

calculations to test the following hypotheses:

H_O1: The foundation formula created in SB 287 provides no measurable
improvement in horizontal equity as compared to the SB 380 formula it
replaced, as measured by the federal range ratio.

H_O2: The foundation formula created in SB 287 provides no measurable
improvement in horizontal equity as compared to the SB 380 formula it
replaced, as measured by the coefficient of variation.

H_O3: The foundation formula created in SB 287 provides no measurable
improvement in horizontal equity as compared to the SB 380 formula it
replaced, as measured by the McLoone Index.

H_O4: The hold harmless provision found in SB 287 has no greater impact on
horizontal equity between non-hold harmless districts when compared to all

districts than the SB 380 formula it replaced, as measured by the federal range

ratio.

$H_O 5$: The hold harmless provision found in SB 287 has no greater impact on

horizontal equity between non-hold harmless districts when compared to all

districts than the SB 380 formula it replaced, as measured by the coefficient of

variation.

$H_O 6$: The hold harmless provision found in SB 287 has no greater impact on

horizontal equity between non-hold harmless districts when compared to all

districts than the SB 380 formula it replaced, as measured by the McLoone

Index.

$H_O 7$: The proration of the formula in 2010-2011 had no impact on horizontal equity

in the SB 287 formula distribution, as measured by the federal range ratio.

$H_O 8$: The proration of the formula in 2010-2011 had no impact on horizontal equity

in the SB 287 formula distribution, as measured by the coefficient of

variation.

$H_O 9$: The proration of the formula in 2010-2011 had no impact on horizontal equity

in the SB 287 formula distribution, as measured by the McLoone Index.

$H_O 10$: There is not a significant correlation between district revenue per

student based on additional weightings in the SB 287 foundation formula and

Composite MAP Index scores for the district.

Research Question One was addressed by evaluating hypotheses one through

three. Research Question Two was addressed by evaluating hypotheses four through six,

comparing the statistics of all districts to the statistics of non-hold harmless districts.

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Research Question Three was addressed by evaluating hypotheses seven through nine, comparing the statistics of all districts as funded to the statistics of those same districts if no proration existed in 2010-2011. Research Question Four was addressed by evaluating hypothesis ten.

Assumptions

The following assumptions have been made regarding this research study:

1. The data retrieved from DESE are accurate. Data are submitted to DESE by district personnel. Independent auditors perform tests on these data to ensure some level of reliability, but are unable, due to their limited scope, to ensure perfect compliance with reporting procedures.

2. The results of the Ogle (2007) study are accurate for the purpose of comparison to the results of this study.

3. The adjustments by the researcher to the state formula calculation tool were accurate in ascertaining revenue amounts for vertical equity components.

Limitations of the Study

The following limitations have been identified to guide the interpretation of this study:

1. This study included only Missouri public school districts and the student performance and financial data reported by those districts to DESE.

2. This study included only revenue associated with the state funding formula and the local sources accounted for within that formula. Categorical funds were excluded from the analysis, as were all federal funds except for impact aid and federal funds used to support the state formula.

3. Adjustments for district-specific needs related to size and local economic factors were included within the horizontal equity calculations despite their tendency to work against equity. Examples include the Dollar Value Modifier (DVM) and Small Schools Grant. They were not considered to be vertical equity components of the SB 287 formula.

4. Expenditures of school districts were not analyzed in the study. Only specific state and local revenues were included.

5. This study did not address the appropriateness of the current state adequacy target, nor did it address efficiency issues related to the appropriate use of available funding.

6. The Composite MAP Index scores for each district were generated and used as the sole indicator of funding needs based on student characteristics in the vertical equity correlations.

7. The researcher played a significant role in the development of the SB 287 state formula funding tool used by school districts to predict state revenue.

8. The researcher is an employee of a non-hold harmless school district.

Definition of Key Terms

The following key terms were defined to provide the context for their use throughout this study:

Adequacy. The level of resources necessary to achieve a desired educational outcome.

Annual Secretary of the Board Report (ASBR). A uniform financial report submitted by school districts to DESE at the end of each fiscal year summarizing all revenues and expenditures.

Annual Performance Report (APR). A scoring mechanism issued by DESE that indicates overall performance of a district based on a variety of performance indicators.

Assessed Valuation. Value of property determined by the county assessor based on classification of residential, commercial, agricultural, or personal.

Average Daily Attendance (ADA). The sum of total student attendance hours during the regular school year divided by the number of hours in session plus the number of summer school attendance hours divided by 1,044.

Capital Projects Fund. A specific fund within a district budget to support capital improvements and replacements for facilities and major equipment.

Categorical Revenue. Funding from state sources for targeted programs or populations (e.g. transportation, at-risk students, and exceptional pupils).

Classroom Trust Fund Revenue. The portion of state foundation formula funds supported by casino revenue, which can be placed in any district fund at the discretion of the local board of education.

Coefficient of Variation. The standard deviation divided by the mean expressed in either decimal or percent form (Oden & Picus, 2008).

Composite MAP Index. A composite score of all students in a district on the annual Missouri Assessment Program test of academic skills in the areas of Communication Arts, Mathematics, and Science.

Core Data. Data submitted by Missouri school districts to DESE. Data used in this study include property tax and attendance data.

Current Tax Revenue. Amounts derived from taxing real and personal property within the district for the current year.

Debt Service Fund. A specific fund within the district budget established to retire debt issued through general obligation bonds for capital improvements.

Delinquent Tax Revenue. Local property tax proceeds that are paid and remitted to the district after the normal tax payment deadline.

Department of Elementary and Secondary Education (DESE). The state organization responsible for oversight and implementation of state educational programs and services.

Dollar Value Modifier (DVM). Formula modification factor designed to account for regional wage differences that influence the cost of providing educational services.

Equalized Operating Levy. The combined levy found in the Teachers and Incidental funds.

Equity. The fair distribution of financial resources across districts (Oden & Picus, 2008).

Federal Range Ratio. This measure is the difference between the per-student data at the 95th and 5th percentiles of students, when the data are arranged in ascending order of per-student values, divided by the per-student value at the 5th percentile of students (Berne & Stiefel, 1984).

Financial Institution Tax Revenue. Taxes levied on the intangible assets of financial institutions such as banks or savings and loan associations.

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Fines and Forfeitures Revenue. Revenue received from the county for collected fines and property forfeitures.

Fiscal Neutrality. A funding formula characteristic that intends to provide equal resources per student regardless of the amount of local tax base supporting each student.

Foundation Formula. The primary mechanism used by the State of Missouri to fund school districts.

Free and Reduced Lunch Eligible Students. A count of the students eligible to participate in the National School Lunch Program based on family income.

Hold Harmless. A provision in the formula calculation designed to prevent a district from receiving less per student under a new formula than the district received from the previous formula.

Horizontal Equity. Equal treatment of equals such that students who are alike should receive equal shares of some resource (Berne & Stiefel, 1984).

Impact Aid Revenue. Amounts received from federal funds by schools having increased enrollments due to federal activities.

In Lieu of Tax Revenue. Amounts received for property taken off the tax rolls.

Incidental Fund. The general fund of the district for operations not specifically established through another fund.

Levy. The tax rate imposed on local property at their assessed values.

Limited English Proficient (LEP). Students being educated whose primary language is not English.

Local Effort. Revenue received by a school district from its property tax rate and other dedicated sources such as fines revenue from the county government.

Missouri Assessment Program (MAP). The state level testing program to measure student performance on an annual basis beginning in grade three.

MAP Index. A composite score of all students in a grade level or grade span on the annual Missouri Assessment Program test of academic skills.

McLoone Index. The ratio of the sum of the values of all observations below the median to the sum of these observations if they had the value of the median (Odden & Picus, 2008).

Operating Levy. The combined total of tax rates in the Incidental and Teachers Funds used for general school operations.

Per Pupil Expenditures. General operating expenditures of the district for grades K-12 divided by the ADA calculation for that given year.

Performance District. A district meeting all performance requirements in the state annual district assessment program.

Performance Levy. The average operating levy of the Performance Districts as established in 2005 as $3.43 per hundred dollars of assessed valuation.

Property Tax. The revenue received by the district from the tax rate set per one hundred dollars of assessed valuation of real and personal property.

Proposition C Revenue. The revenue received by the district from the one percent state sales tax passed in Missouri in 1982 for elementary and secondary education.

Proration Factor. A percentage adjustment made to the state formula calculation to match distributed funds with available appropriations.

Revenue per Student. The sum of selected revenue sources divided by the district ADA.

Senate Bill 287 (SB 287). Missouri legislation passed in 2005 that established the new foundation formula to be implemented in 2006-2007 with a seven year phase-in provision.

Senate Bill 380 (SB 380). Missouri legislation passed in 1993, known as the Outstanding Schools Act, which contained a new basic state aid funding formula for public school districts.

Small Schools Grant Revenue. Amounts received from the state for school districts with less than 350 students in average daily attendance per state statute.

State Adequacy Target (SAT). Amount of certain state and local funds needed per student to provide an adequate education. Calculated to be $6,117 for 2006-2007 and recalculated every subsequent two years.

State Assessed Railroad and Utility Revenue. Amount derived from county average levy for school purposes, capital project purposes, and other purposes (debt service) on the assessed valuation of railroad and utility properties as assessed by the state.

Tax Rate. Also referred to as levy. Number of cents approved by voters to be applied to each one hundred dollars of assessed value to generate revenue.

Teachers Fund. A specific fund within the district budget to support expenditures for certified staff and tuition payments to other school districts.

Vertical Equity. The unequal treatment of unequals because of legitimate differences (Berne & Stiefel, 1984). An example would be an appropriate level of additional funding for a district with a high concentration of students from poverty.

Weighted Average Daily Attendance (WADA). The average daily attendance of a district (ADA) modified by the specific weightings associated with student counts above prescribed thresholds for certain disadvantaged categories such as free and reduced lunch eligibility, disability requiring special education, and limited English proficiency.

Summary

The allocation of scarce resources to public schools in Missouri is a policy decision warranting questions of equity and fairness. The formula established in SB 287 had been implemented for five years and this study served as a progress report on equity as has been previously defined in Missouri school funding. In addition, the intention of additional funding based on student needs to support student outcomes was evaluated.

An overview of the current funding formula of schools in the State of Missouri was presented in this chapter along with research questions to be answered. Assumptions and limitations of this study were presented and key terms were defined. The related literature of equity in school funding both historically at the national level and specifically as it relates to Missouri will be addressed in Chapter Two. The methods used in this study to answer the research questions will be outlined in Chapter Three. The results of this study will be summarized in Chapter Four and a discussion regarding the results and potential future research will be provided in Chapter Five.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

One of the most often studied areas of public policy for public education is the equitable distribution of financial resources. Cubberley (1920) identified the combination of local property taxes and additional state funding as the standard method for funding schools throughout the states by as early as 1820. Cubberley was also the first to identify funding disparities among schools in the early part of the 20th century, and identified what funding levels might produce adequate resources for basic educational services at the time (Ramirez, 2003). Equitable distribution of resources has been a matter of policy development, research analysis, legislation, and legal action throughout the past century.

Adding complication to the equity discussion is the fact that not all students need the same level of support to achieve the desired outcome. The seminal work of Coleman et al. (1966) identified the influence of socioeconomic, personal, and family dynamics on the success of students in school, recognizing that certain students come to school in need of additional supports. Since the publication of *A Nation at Risk* (National Commission on Excellence in Education, 1983), policy makers and the courts have generally recognized that an equal distribution of resources will not close the achievement gaps among various subgroups (King, Swanson, & Sweetland, 2005). This assumption drives the concepts of vertical equity and adequacy in school funding policy discussions.

Keys terms and related research to be discussed in this chapter include fiscal neutrality, horizontal equity, vertical equity, and adequacy. After reviewing literature on these matters, the discussion will turn to litigation surrounding school funding

distribution, both on a national level and in Missouri. Finally, a review of recent studies conducted specifically on Missouri school funding formulas will be discussed.

Fiscal Neutrality

Fiscal neutrality dictates that educational resources should not vary with local fiscal capacity, such as property value per pupil or household income (Odden & Picus, 2008). This concept contends the relative opportunity for a student to receive a quality education should not be a function of location or family income. With this in mind, many states established funding formulas that guaranteed an equivalent tax base for all students throughout the state. Local funds are supplemented with the necessary state funds to achieve equal funding per penny of tax rate among districts. This approach was generally considered to be fair to students and taxpayers.

Fiscal neutrality can be measured in at least two different ways (Odden & Picus, 2008). One approach is to calculate the correlation coefficient and elasticity between per pupil revenues (or expenditures) and local property wealth per pupil. The weaker the relationship is between total available resources and local wealth, the more equitable the formula. Another approach is to apply the horizontal equity measures described later on a per penny of tax rate basis to determine if local taxpayers are rewarded equally for their efforts through the state formula.

Formulas that equally distribute funds at a given level of tax rate allow local districts to determine the ultimate level of support for education. While this approach encourages local control over the level to which local schools are funded, the end result does not always lead to equity. Odden and Picus (2008) identified several states with equity challenges related to tax base guarantee formulas. As one might expect, high

property wealth districts also tend to value education to a greater extent through higher tax rates, while low property wealth districts tend to have lower tax rates. This result creates a large challenge from a true equity perspective. Ogle (2007) found this to be true in Missouri as well. Her study indicated a much higher level of equity on a per penny of tax rate basis than in terms of total revenue. A funding formula may rate highly in terms of fiscal neutrality and still not provide equity in resources due to the wide range of local choices in property tax rates. While fiscal neutrality measures are valuable in the overall discussion of equity, more specific equity goals are seldom met when considering fiscal neutrality alone.

<center>Horizontal Equity</center>

Horizontal equity is generally characterized by the equal treatment of equal students in terms of educational resources (Berne & Stiefel, 1984). Most formulas generally intend to distribute resources in a manner that balances available local funds with additional state funds, providing total resources within a narrow range among students and districts. The execution of such intent is a function of complex policy making, including a variety of overlay provisions, such as hold harmless mechanisms and local wage rate adjustments (Toutkoushian & Michael, 2008), that work against equity but are established for a variety of economic and political reasons.

Methods to evaluate horizontal equity were summarized in great detail in the seminal work of Berne and Stiefel (1984) and have more recently been outlined by Odden and Picus (2008), among others. Most horizontal equity statistics are descriptive in nature, describing the spread in the distribution of resources on a per student basis within a state. Common measures include mean, median, range, and restricted range.

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While these are considered of interest and are regularly reported, inflation issues make them less useful when making comparisons across multiple years (Odden & Picus, 2008). Ratio statistics such as the federal range ratio, the coefficient of variation, and the McLoone Index are immune to inflation issues and, as such, are favored in the literature. A summary of these equity indexes are discussed in the following paragraphs.

The federal range ratio is defined as the restricted range, which is the difference between the 95th and 5th percentile of revenues per pupil, divided by the observation at the 5th percentile (Odden & Picus, 2008). The restricted range element is useful since potential outliers are excluded. By dividing restricted range by the value at the 5th percentile, a ratio is generated that allows for comparison across years, controlling for the impact of resource inflation (Hirth & Eiler, 2005; Odden & Picus, 2008). A smaller federal range ratio indicates better horizontal equity. Federal Impact Aid requires the federal range ratio to be equal to or less than 0.25 for a state school finance system to be considered equitable enough to allow Impact Aid to count in equalization formula calculations (Missouri Department of Elementary and Secondary Education, 1999).

The coefficient of variation is simply the standard deviation of revenues per pupil divided by the mean (Thompson, Wood, & Honeyman, 1994). The calculation produces a value between zero and one, with smaller values indicating greater equity. This value reveals the percentage of districts falling within a standard deviation of the mean with regards to revenue per pupil. A target value of .10 is a generally accepted standard (Odden & Picus, 2008), though difficult to achieve. Given a normal distribution, this value would indicate that roughly two-thirds of schools are within one standard deviation of the mean.

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The McLoone Index, unique to school finance, "is the ratio of the sum of observations below the median to the sum of all observations that would be required if all observations below the median were brought up to the median level" (Thompson, Wood, & Honeyman, 1994, p. 250). In a particular study, revenues of all districts below the median would be compared to revenues of those same districts if they equaled the median. The closer the McLoone Index value is to one, the greater the equality. The target value for equity on the McLoone Index is 0.95 (Oden & Picus, 2008).

A sampling of research studies applying these horizontal equity calculations in various states yielded a wide range of results. In a study of Indiana's funding equity through 2001, Hirth and Eiler (2005) found favorable equity measures despite the establishment of a reward for effort formula in 1993. The federal range ratio value was just below the 0.25 mark, the coefficient of variation was 0.11, and the McLoone Index was above 0.97. These values were in sharp contrast to the findings of Ogle (2007) in evaluating the Missouri reward for effort formula through 2006. At that point in time, Missouri demonstrated a federal range ratio above 0.81, a coefficient of variation above 0.20, and a McLoone Index of 0.85. Missouri was among the worst states reviewed on these standard equity measures.

A study of the funding of public schools in Virginia through 2005 (Driscoll & Salmon, 2008) found marked improvement in horizontal equity over a period of 30 years. Despite the improvement, the state remains some distance away from meeting the standard equity targets. In fact, during the last few years of the analysis the equity, values regressed, as some local districts chose to offset increased funding by the state with lower local tax rates. Another state showing horizontal equity improvement over

time is Michigan (Addonizio, 2003). Michigan moved from a guaranteed tax base formula in 1994 to an equalized foundation plan and by 2001 all equity measures had improved dramatically. During that span of time the federal range ratio declined from 0.83 to 0.38 and the coefficient of variation declined from 0.20 to 0.14. The McLoone Index improved enough to meet the 0.95 benchmark, indicating the lower half of the distribution was fairly uniform.

Studies of North Carolina (Rolle, Houck, & McColl, 2008) and Tennessee (Rolle & Liu, 2007) funding mechanisms for horizontal equity demonstrated that even with the influx of additional funds, funding formulas have struggled to make real improvements in standard equity measures. Despite formula changes that resulted from litigation, Tennessee still struggles to meet equity benchmarks. Taken collectively, this sample of horizontal equity studies demonstrates that achieving the benchmarks found in finance textbooks (Berne & Stiefel, 1984; Odden & Picus, 2008) is difficult but not impossible. As mentioned previously, Missouri has struggled more than most states to achieve horizontal equity.

Vertical Equity

The concept of vertical equity was defined in the seminal work of Berne and Stiefel (1984) as the "appropriate unequal treatment of unequals" (p. 13). While horizontal measures of equity focus on equal treatment of students, vertical equity measures recognize that not all students come to the educational system as equals. Some students require additional resources to achieve the same educational outcome. Students from low socioeconomic backgrounds, those with disabilities, and those with limited English proficiency are generally considered in need of additional educational resources

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(Odden & Picus, 2008). In addition, some state funding mechanisms treat districts differently based on variables such as school district size, geographic area, and input costs (Baker, 2005; Baker & Duncombe, 2004). The focus of the current study was limited to variations due to student characteristics.

State funding mechanisms typically support vertical equity for student need characteristics through one of two methods: (a) the use of pupil weights and (b) the use of targeted or categorical funding (Rodriquez, 2004). Pupil weighting allows for the adjustment of pupil counts by providing additional weighting in the funding formula. For example, a special education student on average might cost twice as much to educate as a typically developing peer and, as such, would receive the funding equivalent of two students. The categories of students and their specific weightings can vary dramatically from state to state. Categorical funding is another approach to funding based on student needs. Rather than weighting the student count, categorical funds are targeted to specific students and programs based on census counts or particular program goals. Missouri recently switched from a categorical approach to a pupil weighting approach with the implementation of the school funding formula in SB 287 (Podgursky & Springer, 2005).

The appropriate weighting of students is an area of research interest not within the general scope of the current study. However, a recent survey of state funding systems indicates a great deal of variety in terms of how special populations of students are funded and the weighting values used in pupil weighted formulas (Verstegen & Jordan, 2009). Approximately 20 states use some type of student weighting system for special education. In some states, special education students have different weightings based on their level of disability. In Missouri, special education students are weighted at 0.75, but

only to the extent the population of special education students in a district exceeds the population percentage in the identified Performance Districts used to establish the State Adequacy Target (Podgursky & Springer, 2005). As a result, special education student counts above the threshold are funded at 1.75 times other students in the formula distribution. A more detailed description of Performance Districts is found later in this chapter.

Low income students are most generally weighted at 0.25 (Verstegen & Jordan, 2009), but values range as high as 1.0 for free lunch eligible students in Minnesota. Missouri uses the 0.25 weighting, but only for the number of free and reduced lunch eligible students exceeding the Performance District threshold discussed previously (Podgursky & Springer, 2005). English Language Learners are supported at varying levels as well, with most formulas weighting identified students between 0.20 and 0.60, with Missouri being at the 0.60 level for student counts above the Performance District threshold (Verstegen & Jordan, 2009).

Measuring vertical equity is problematic at best. Berne and Stiefel (1984) identified two general approaches to the measurement of vertical equity. One approach is to apply a pupil need weight to all students who need extra services and then conduct a horizontal equity analysis using the weighted pupil count as opposed to the un-weighted count. To the extent equity measures approach zero after controlling for student needs through weightings, the funding mechanism is considered to provide vertical equity. Berne and Stiefel (1984) acknowledge the inherent issue with establishing appropriate weights for various categories of student needs, which will ultimately influence the equity calculations. A second approach is to conduct a regression analysis between per

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pupil expenditures (or revenues) and various student need characteristics. Vertical equity would be determined by the extent to which positive relationships exist between funding and student needs or characteristics. However, no specific targets have been established for the desired strength of such relationships. Toutkoushian and Michael (2007) have recently defined an expanded regression model that incorporates both student and district level characteristics in analyzing vertical and horizontal equity with the intent of providing a more comprehensive view of both vertical and horizontal equity.

The vertical equity measurement approaches suggested by Berne and Stiefel (1984) can yield data on how well funding for vertical equity factors meet the intended purpose of providing additional funding based on student need. However, as others have pointed out (e.g. Toutkoushian & Michael, 2007), the results only indicate the extent to which additional funds based on student needs exist, not if the level is appropriate to generate a specific outcome. Despite the inherent challenges, such measures can provide trend information on progress towards vertical equity when applied across several years for a given funding system. It should be noted the vertical equity measurements identified in the research for this project had a common element – vertical equity funding was compared to various input measures of student and district attributes. The current study deviated by comparing vertical equity funding components to student outcomes in hopes of overcoming the need to properly define appropriate input weightings.

<center>Adequacy</center>

While the equitable distribution of financial resources has been studied for some time, a more recent area of study revolves around the adequacy of a given funding mechanism. Adequacy connects inputs and outputs as described by Odden and Picus

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(2008) such that "adequacy involves the provision of a set of strategies, programs, curriculum, and instruction, with appropriate adjustments for special-needs students, districts, and schools, and their full financing, that is sufficient to provide all students an equal opportunity to learn to high performance standards" (p.75). Most adequacy studies attempt to identify a minimum level of education required of the state and correlate funding to achieve that level of education. The method for defining the adequate level of funding varies from state to state, with at least four distinct strategies identified in the literature (Hoff, 2005; Odden, 2001; Taylor, Baker, & Vedlitz, 2005). A review of each strategy follows.

Professional Judgment

The strategies for determining adequacy can be described on a continuum from resource oriented on one end, to outcome oriented on the other end (Taylor et al., 2005). Professional Judgment falls on the resource oriented end of the spectrum. Under this method, practicing educational professionals are brought together to establish what resources in terms of staff, programs, and support are necessary to provide an adequate education (Hoff, 2005; Taylor et al., 2005). A dollar value is placed on the total of the prescribed resources, which becomes the minimum value at which the educational program is deemed adequate.

Evidence Based

The Evidence Based strategy for determining adequacy is another resource oriented strategy for determining adequacy. This strategy is similar to Professional Judgment, except that the practitioners are replaced with expert analysts or researchers (Hoff, 2005; Taylor et al., 2005). The experts determine resource levels based on proven

reform and improvement models that have been empirically tested over time. Smaller class sizes and various intervention strategies for disadvantaged students are often included in the model. Because this strategy is based partially on research that measures student outcomes, it falls nearer to the center of the resource to output continuum than the Professional Judgment strategy.

Cost Function

Also near the center of the continuum of adequacy strategies, but on the outcome oriented side, is the Cost Function strategy. The Cost Function strategy is a complicated statistical method used by economists to measure the relationship between actual expenditures and educational outcomes, related to a given set of district and student characteristics (Taylor et al., 2005). This method is resource oriented in one regard, in that it attempts to quantify variations of input costs for various districts.

Successful Schools

A strategy that is purely outcome based is the Successful Schools approach. The basic concept of this model is that to determine what it costs to adequately educate, one only has to look at what schools with the desired level of student achievement are spending on education (Hoff, 2005; Taylor et al., 2005). The average expenditures for a district meeting the outcome standard then becomes the adequacy threshold. This method assumes that if some schools can be effective at this level of funding, all schools have an adequate opportunity to do the same. Most versions of this approach do account for differences in student populations, but even advocates recognize the difficulty in establishing reliable adjustments for student needs (Hoff, 2005).

Reconciling the various adequacy approaches is a difficult task. Unfortunately, the various approaches have resulted in wide ranges of predicted adequacy values in terms of dollars per pupil (Taylor et al., 2005). Even using a different approach within the same state can result in significantly different values (Augenblick & Silverstein, 2004; Taylor et al., 2005). Each approach has many built in assumptions that can be challenged or lead to errors if inaccurate. Wood and Rolle (2007) advocate for using a variety of approaches in assessing adequacy, indicating that each provides valuable information based on the assumptions used. The same authors, however, rank the Successful Schools Model as the most valid and useful, as it is easily understood by the public and policy makers and targets a level of performance that currently exists in certain school districts.

Taylor et al. (2005) describe the many challenges in regards to determining the best approach. Resource oriented strategies have the advantage of being fairly easy to design and explain, but are not tied directly to student outcomes. In addition, members of the political process tend to have a cynical view of the so called experts utilized to establish adequacy levels. Output oriented strategies are tied to student achievement, but defining an adequate level of student performance is difficult and a moving target at best. In fact, little evidence can be found that desired outcomes correlate with a specific level of funding (Costrell, Hanushek & Loeb, 2008; Podgursky & Springer, 2005; Taylor et al., 2005). In other words, low performing districts tend to have similar spending patterns to those who meet the outcome standard. While legal challenges have been largely successful based on adequacy claims, defining adequacy appropriately has been a difficult task for states and courts alike (Roellke et al., 2004).

Regardless of the method chosen to determine adequate funding levels, factors other than a prescribed minimum funding level must be considered when analyzing a particular state funding formula. An adequacy level typically refers to educating an average student in an average district. Practical experience tells one that not all students and districts require the same level of resources. Adjustments to a particular adequacy level are necessary to achieve vertical equity, whereby students who have greater needs receive greater funding (Odden, 2001; Rodriquez, 2004). Local factors such as poverty levels, second language learners, special education incidences and cost of living must be considered.

<div align="center">School Funding Litigation</div>

School funding litigation has been commonplace in K-12 public education since the early 1970s (Obhof, 2004). The *Serrano v. Priest* decision of 1971 in California established that the local wealth of a district should not be the determining factor in how much is spent on a child's education. However, the Supreme Court decision of 1973 in *San Antonio Independent School District v. Rodriguez* established that the federal constitution does not consider education a property right. As a result, from that point in time forward, education funding litigation has primarily been a state issue. The only state without a constitutional provision for education is South Carolina, and 45 of the remaining states have been involved in funding litigation at one time or another (Argon, 2005).

Litigation at the state level focused initially on the equity issue identified in *Serrano v. Priest*. Progress in equalizing funding among school districts within a state was made through the implementation of foundation formulas (Ramirez, 2003). The

foundation approach attempts to equalize the playing field by having state funds supplement local funds to a greater extent in districts with fewer local resources. However, states have struggled in many cases to achieve the equity goals of their foundation formulas and, as a result, funding litigation continued. By the end of the 1970s, state supreme courts ruled in twenty states on funding equity, with only seven cases ruling in favor of school districts (Obhof, 2004). During most of the 1980s, even fewer school districts found relief through the courts.

With the focus on equity yielding only moderate results, a new wave of school funding litigation began in 1989 based on a Kentucky Supreme Court decision. In this case, the focus on equity was replaced with a determination the state was not providing funding for an adequate education (Obhof, 2004). In the years that followed, adequacy cases won in state courts in 23 of 27 instances (Kennedy, 2005). Typically, adequacy cases attempt to identify a minimum level of education required of the state, with additional funding provided to bring under-funded districts up to the desired standard. The method for defining the adequate level of funding varies from state to state, with four strategies commonly identified in the literature as discussed previously (Hoff, 2005; Odden, 2001).

A primary reason for the success of adequacy suits is the focus on student outcomes (Odden, 2001). As standards increase, the burden of the state increases to ensure the resources are provided to raise achievement to new levels. Allowing local districts to determine their own spending levels was no longer sufficient to guarantee students can achieve new performance standards. A similar debate has begun on the federal level, as some have argued that appropriate funding was not being provided by

the federal government for students to reach the standards of *No Child Left Behind* (Welner & Weitzman, 2005).

Funding Litigation in Missouri

The pattern of litigation in Missouri has followed a similar path to the nation as a whole. Equity based litigation resulted in a new foundation formula for the state in 1993 (Ogle, 2007; Podgursky & Springer, 2005). The premise of the 1993 formula established through SB 380 was that school districts with equal property tax levies would have comparable resources for students, regardless of local property value wealth. A byproduct of this formula was a built-in incentive for local districts to raise property taxes, which would result in greater funding from the state as well. For a few years, the formula was successful in narrowing the expenditure per pupil gap found throughout the state (Ogle, 2007).

Over time, however, the expenditure gap widened once again due to at least two reasons. First, patrons in many districts continued to raise their local levy, generating additional local and state funds while other districts continued to operate with the minimum local levy. Second, as the funding demand of the formula became increasingly expensive, the state was not able to fully fund the formula, resulting in a proration of state aid. This proration tended to disproportionately affect districts with low property values that rely more heavily on state aid. Combining both factors, as well as many others, resulted in a nearly three to one gap in high expenditure per pupil districts compared to low expenditure districts by 2004 (Podgursky & Springer, 2005).

As the achievement of equity has continued to elude Missouri's funding formula, the emphasis on adequacy brings a new element of evaluation. In 2003, the Missouri

School Board Association commissioned a study by Augenblick and Myers to determine the adequate level for school funding in Missouri (Podgursky & Springer, 2005). The report indicated that a large number of school districts do not have the resources required to meet student performance requirements outlined by state and federal accountability standards. Outcome based school funding is a key element in much of the literature surrounding school funding adequacy (Hoff, 2005; Obhof, 2004; Odden, 2001). The basis of this concept is that once a desired standard of student achievement is established, funding mechanisms can be developed to meet those educational needs.

In 2004, the State of Missouri was sued by 257 school districts based on inadequate and inequitable school funding. In hopes to circumvent the litigation, the Missouri legislature and governor adopted a new funding formula during the 2005 legislative session via SB 287 (Viadero, 2005). A primary component of the new formula is the establishment of a state adequacy target, which was calculated by using a version of the successful schools model found in the Augenblick and Myers study cited earlier (Podgursky & Springer, 2005). School districts receiving perfect scores on the annual performance report, known as Performance Districts, were analyzed to determine current spending levels. The adequate level of state and local funding, known as the State Adequacy Target (SAT), was established at $6,117 per pupil, with adjustments for student population characteristics and local wage rates (Podgursky & Springer, 2005). The SAT is recalculated every two years based on a revised list of Performance Districts. The formula also included a seven year phase-in provision to transition districts to their new payment levels under SB 287.

The SB 287 formula included an adjustment for local wage rates, known as the Dollar Value Modifier (DVM). The DVM identified the median wage rate county in the state and established a mechanism to calculate a multiplier for each county above the median. The counties below the median are all given a 1.0 value, while the highest DVM was calculated at 1.104. As a result, some school districts receive up to 10.4% additional funds to account for wage pressures in their geographical area. The DVM percentage increase was phased-in over the first three years of formula implementation.

Districts are funded based on their Weighted Average Daily Attendance (WADA) count. The WADA calculation is the sum of their Average Daily Attendance (ADA) and additional weighted student counts for select high need student populations above established thresholds. The thresholds for additional weighting are established as the average population percentages found in the Performance Districts and are recalculated every two years. The funding formula includes extra weighting for students in categories such as special education at 0.75, limited English proficiency at 0.60, and free or reduced lunch eligibility at 0.25 when above the Performance District's average percentage threshold. The WADA is multiplied by the SAT and the DVM, the total of which is reduced by the 2004-2005 local effort of the district to determine required state funding. The local effort calculation includes property tax receipts generated by the Performance Levy. The Performance Levy is the average operating tax levy of the Performance Districts used to establish the SAT, which was established at $3.43 per hundred dollars of assessed value. Districts are not penalized in the formula if their operating tax rate is above $3.43, nor are they supported additionally by the formula if their operating levy is below $3.43. The local effort amount is held constant in the formula unless the assessed

value of the district drops below the 2004-2005 level or fines revenue increases above the 2004-2005 level.

The SB 287 formula also included a hold harmless provision to ensure that districts do not lose money as a result of implementing the new formula. Districts with greater than 350 ADA are held harmless at the per pupil amount under the SB 380 formula received in 2005-2006, as adjusted by the DVM. Districts with less than 350 ADA are held harmless at their total state funding level in 2005-2006 as adjusted by the DVM, even if the district experiences a decline in enrollment. Another feature of the formula is the Small Schools Grant, which allocates additional resources to school districts with less than 350 ADA. The annual appropriation for the Small Schools Grant has been $15 million, which represents less than one-half of one percent of the 2010-2011 formula appropriation.

As mentioned previously, the formula was designed to be phased-in over a seven year period (Podgursky & Springer, 2005). During the phase-in period, districts are funded in a combination of the SB 287 formula calculation amount and the SB 380 formula calculation amount for the district in 2005-2006. The funding ratio for each year is referenced in Table 1.

Despite the passage of the new formula, the litigation continued with few school districts dropping from the suit. In 2007, the Cole County Circuit Court upheld the new formula on constitutional tests of adequacy and equity (*Committee for Educational Equality v. Missouri,* 2007). The ruling indicated that the state met the constitutional requirement of spending 25% of general revenues for the purpose of free public education. In addition, the ruling supported the fact that funding of education is both a

local and state effort, and that local control interests support variances in funding across the state. The decision was appealed and in 2009 the Missouri Supreme Court confirmed the lower court's ruling (*Committee for Educational Equality v. Missouri,* 2009). At both levels the rulings give great deference to the legislative branch to determine appropriate funding beyond the 25% of general revenue constitutional requirement. In addition, both rulings indicated that education was not a fundamental right under the current state constitution, limiting the scrutiny of testing under the equal protection clause. As such, the variance of spending between districts does not conflict with the constitution under the most literal of interpretations.

Table 1

SB 287 Phase-in Percentages by School Year

School Year	% SB 287 Formula	% SB 380 Formula
2006-2007	15	85
2007-2008	30	70
2008-2009	44	56
2009-2010	58	42
2010-2011	72	28
2011-2012	86	14
2012-2013	100	0

Missouri Equity Research

The Missouri school funding formula established by SB 380 in 1993 has been the subject of much review, analysis, and revision over the course of thirteen years of

implementation prior to being replaced in 2006. The Outstanding Schools Act

formulated in SB 380 included the establishment of the Commission on Performance to

advise the State Board of Education on school reform progress and the status of

improving equity through the funding formula. As a result, the Missouri Department of

Elementary and Secondary Education (DESE) conducted an equity study in 1999 to

determine the extent to which revenue equity had improved during the first five years of

the new formula.

The Missouri Department of Elementary and Secondary Education study (1999)

indicated SB 380 did improve equity on a per pupil revenue basis as well as on a per

penny of tax rate basis, as measured by the coefficient of variation and the federal range

ratio. The improvement was more dramatic on a per penny of tax rate basis, as would be

expected in a formula that equalizes through a guaranteed tax base approach that intends

to provide equal access more so than revenue equality. It should be noted that while the

equity calculations improved under the SB 380 formula, values failed to reach the equity

targets established in the literature (Odden & Picus, 2008). However, the overall

improvement was significant compared to the equity measures of the previous Missouri

distribution formula, which were reported by Ko (2006) as among the worst in the nation

in 1992-1993.

Ko (2006) extended the 1999 DESE study to include two additional years of data

and some additional equity measures, namely the McLoone Index and Gini coefficient.

A report from the Missouri State Auditor was critical of the DESE study for not including

other widely known equity measures (Ko, 2006). In total, Ko (2006) found that equity

improved in Missouri through the first four years of the SB 380 formula, but reversed and

began declining during the 1998-2000 time frame. This trend was generally confirmed by Ogle (2007) and Podgursky and Springer (2005).

The most comprehensive analysis of the SB 380 formula was conducted by Ogle in 2007. Ogle replicated the DESE study from 1999 and included several enhancements. Calculations for the McLoone Index were added to the analysis, as were several years of data extending through the final year of the SB 380 formula in 2006. Ogle found that equity had generally stopped improving, and by most measures had declined from 1998 to 2006. However, nearly all measures remained significantly better than found under the preceding funding formula. The one exception was the McLoone Index, which had regressed by 2006 below the values found in 1993. This would indicate that districts in the lower half of the revenue distribution had not made progress towards approaching the median level of revenue support.

One important aspect of the Ogle study (2007) and the DESE study (1999) was the analysis on the impact of the hold harmless provision found in SB 380. Hold harmless is an overlay provision (Toutkoushian & Michael, 2008) that ensures no district receives less revenue per pupil as a state moves from one funding mechanism to another. As a result, some districts receive more funding than required under the equity formula. Ogle (2007) determined this provision has worked against equity improvements in Missouri and suggested a phase-out of the hold harmless provision might be one approach to further improve overall equity.

In 2005, SB 287 established a new formula designed to provide adequate resources to achieve a desired outcome based on student needs, which was to be phased in over seven years beginning with the 2006-2007 school year. Welker (2006) made an

initial attempt at determining if the new formula improved equity over the SB 380

formula it replaced. His study assumed the formula was fully implemented and funded

for the first year and applied the federal range ratio and the coefficient of variation

calculations to the data, but no other equity calculations. Welker (2006) determined that

the new formula would reduce the coefficient of variation from 0.26 to 0.20, and lower

the federal range ratio from 0.82 to 0.47. The Welker (2006) study was limited by the

fact that no attempt was made to control for student weightings and their related revenue,

which were included within the SB 287 formula but were supported through separate

categorical funds under the SB 380 formula. Controlling for these additional revenues

might have improved the equity analysis.

A review of available research yielded no additional studies on the current state of

equity under the Missouri SB 287 formula. The Welker study (2006) provided a preview

of expected results, but constant changes in various formula variables and the fact that

Missouri has struggled to fund the new formula as intended generated unanswered

questions. The current study was intended to provide further information on the impact

of the SB 287 formula on equity in Missouri.

<div align="center">Summary</div>

The funding of schools in Missouri and other states is largely a political function

of determining the distribution of scarce resources (Bolman & Deal, 2003). Equity

concerns have existed over time and a variety of measures have been used to determine

how well states distribute resources. States often face litigation from districts challenging

the constitutionality of the existing formula and often respond with a new method of

distribution. Conversations of equity have evolved into more specific terms of horizontal

and vertical equity, differentiating support based on need under modern equity paradigms. Adequacy has been added to the discussion with the hope of targeting resources to a defined, desired student outcome.

Missouri has followed the pattern of many states, with a new funding formula established as a result of litigation twice in the past generation. The SB 380 has been studied in great detail and was shown to improve equity based on a variety of measures from 1993 to 2006. However, the improvements were limited mostly to the first few years of implementation and never approached generally accepted standards for equity. The new funding formula established in SB 287 had been largely untested to this point. In the current study, the researcher sought to enhance the understanding of equity as it relates to the SB 287 formula. The following chapter will outline the methods used for this analysis.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

The Missouri legislature approved a new school funding formula in May 2005

through Senate Bill 287 (SB 287) in response to litigation by a significant portion of the

schools in the state (Podgursky & Springer, 2005). This formula is based on the

successful schools model (Hoff, 2005), which identifies the resource level needed on

average by schools meeting the state performance standards. The new outcomes based

formula replaced the tax base driven formula created in 1993 under Senate Bill 380 (SB

380), also known as the Outstanding Schools Act. The 1993 formula came after a court

ruling that found its predecessor unconstitutional. The current formula (SB 287) was

created with the hope of averting a similar ruling.

The development of a school funding formula is a political process. In order for a

new model to be developed, compromise is often necessary regardless of the potential

impact of such compromise on measures of equity and adequacy. School formulas are

commonly evaluated against a variety of standards. In general, researchers have wanted

to know if funds are equally distributed. Over time, policy makers have come to realize

that some students need more resources than others to achieve a desired outcome. As a

result, concepts of vertical equity and adequacy have evolved. This study attempted to

evaluate school funding formulas in Missouri against common measures found in the

literature.

The methods used to evaluate horizontal equity of the current school funding

formula as compared to the previous school funding formula in Missouri, as well as the

attempt to find the relationship between vertical equity funding components and student

needs, will be outlined in this chapter. An overview of the current problem is presented, followed by the purpose of the study. After a statement of the research questions and hypotheses, the sample is described and the data collection and analysis techniques are identified.

<div align="center">Problem and Purpose Overview</div>

School funding formulas represent policy decisions on how resources should be distributed to various schools throughout the state. The trend in Missouri and many other states has been for legal action by schools to precede legislative remedies to address real or perceived inequities. The creation of such formula remedies has often come with political compromises through the legislative process. As a result of these compromises, equity and adequacy goals have often been mitigated through particular formula attributes that serve certain interests. As Missouri transitioned from one funding formula to another, the need remained to evaluate the extent to which the new formula structure has improved on equity and adequacy goals over its predecessor. Further analysis would be beneficial to those who seek to improve funding matters through policy decisions.

The purpose of this study was to compare horizontal equity measures in Missouri between the funding formula created in 2005 under SB 287, and the formula created in 1993 under SB 380. In addition, vertical equity funding components were correlated with student achievement measures to determine if the intended goal of providing additional resources to high need students is being met. Welker (2006) previously conducted an evaluation on general equity between the new SB 287 formula and the previous SB 380 formula in Missouri. However, his study did not differentiate between horizontal and vertical equity components, a key distinction in terms of adequacy. In

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addition, the Welker study (2006) used projected revenues for the new formula which have shown to be far less than actual revenues to date. The current study replicated the general structure of a study by Ogle (2007) to provide comparisons between the current formula and the previous formula on horizontal equity measures, with an additional element added related to vertical equity. The current study sought to enhance the overall understanding on the impact of the SB 287 formula on the distribution of resources to schools in Missouri through the first five years of implementation.

<div align="center">Research Questions</div>

To evaluate Missouri funding mechanisms found in SB 287, the following questions were studied:

1. Has the horizontal revenue equity of the foundation formula created in SB 287 improved through five years of implementation over the horizontal revenue equity of the SB 380 formula it replaced?

2. Has the legislative decision to guarantee a minimum (hold harmless) payment per student impacted horizontal revenue equity in the SB 287 formula?

3. Did the proration of the SB 287 funding formula in the 2010-2011 school year due to insufficient funding impact horizontal revenue equity?

4. Does a relationship exist between the revenues driven by vertical equity components of the SB 287 formula and student educational needs as measured by the Composite MAP Index?

This research considered revenue per student to determine if horizontal equity has improved during the first five years of implementation of the SB 287 formula. Students are represented by average daily attendance (ADA). The research design utilized three

common measures of horizontal equity to address the first three research questions: the coefficient of variation, the federal range ratio, and the McLoone Index, consistent with the Ogle study in 2007. For the fourth research question, revenue targeting vertical equity was derived by isolating the formula revenue associated with additional weightings based on student characteristics. Composite MAP Index scores were utilized as the student outcome measure representing educational need.

Data for the 2008-2009, 2009-2010, and 2010-2011 school years were selected for analysis in this study. This represented the third, fourth, and fifth years of implementation of the SB 287 formula. The SB 287 formula was fully funded as designed during the 2008-2009 school year, but was funded at 98.27% and 96.64% during the 2009-2010 and 2010-2011 years respectively. The 2008-2009 year was also significant in that the use of the Dollar Value Modifier (DVM) was fully implemented in the formula calculations. The DVM provides additional funding to districts in areas with higher than the median wage rates according to Department of Labor statistics.

<center>Hypotheses</center>

This study utilized Annual Secretary of the Board Report (ASBR) financial data and student achievement data from the Missouri Department of Elementary and Secondary Education (DESE) database in conjunction with model generated revenue calculations to test the following hypotheses:

H_O1: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the federal range ratio.

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H$_O$2: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the coefficient of variation.

H$_O$3: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the McLoone Index.

H$_O$4: The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the federal range ratio.

H$_O$5: The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the coefficient of variation.

H$_O$6: The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the McLoone Index.

H$_O$7: The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the federal range ratio.

H$_O$8: The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the coefficient of variation.

H_O9:   The proration of the formula in 2010-2011 had no impact on horizontal equity

in the SB 287 formula distribution, as measured by the McLoone Index.

H_O10:   There is not a significant correlation between district revenue per

student based on additional weightings in the SB 287 foundation formula and

Composite MAP Index scores for the district.

Research Question One was addressed by evaluating hypotheses one through

three. Research Question Two was addressed by evaluating hypotheses four through six,

comparing the statistics of all districts to the statistics of non-hold harmless districts.

Research Question Three was addressed by evaluating hypotheses seven through nine,

comparing the statistics of all districts as funded to the statistics of those same districts if

no proration existed in 2010-2011. Research Question Four was addressed by evaluating

hypothesis ten.

<div align="center">Rationale for a Quantitative Research Approach</div>

The selection of a particular mode of research must be guided by the nature of the

research questions at hand. A quantitative approach is often utilized to develop models

explaining the relationship between variables. Studies of this sort seek to answer

questions of how much or how many, with an interest in prediction (Merriam, 1998). On

the other hand, qualitative research poses questions that seek to reveal the nature of

things through observation and inductive methods. Merriam (1998) suggested that

quantitative research tends to test theory, while qualitative research seeks to build theory

when lacking in the current knowledge base. This study focused on evaluating the level

of equity in the distribution of public school funding in Missouri, attempting to answer

the how much question with a quantitative approach. Funding formulas are quite

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technical in nature and only a few researchers, educational leaders, and policy makers truly understand the intricacies of a given formula choice. Evaluations of such formulas appear best suited to be addressed through quantitative measures that can provide direct information for each school district impacted by a particular formula.

After a generation of litigation surrounding equity in school funding, a transition has occurred in more recent times to a focus on providing an *adequate* level of education funding (Obhof, 2004; Roellke, Green, & Zielewski, 2004). This approach attempts to tie resource inputs to a desired level of educational outcome. Outcomes in this case are quantified data identified through the Missouri school accountability system, as reported on the Annual Performance Report (APR). The method for defining the adequate level of funding varies from state to state, with at least four distinct strategies identified in the literature (Hoff, 2005; Odden, 2001). Missouri has operationalized adequate funding with the successful schools approach, which attempts to identify schools already meeting the desired performance outcome and deems their level of expenditures to be adequate. Under this paradigm, the Missouri Legislature approved a new school funding formula in 2005, which took effect in the 2006-2007 school year (Podgursky & Springer, 2005). Included in the new formula is a seven year phase-in, which intends to provide a gradual transition from one formula to another. The purpose of the new formula is to provide a baseline level of adequate funding, while also distributing funds in an equitable manner based on student needs.

The advantages of selecting a quantitative approach in the study of school funding formulas in Missouri are supported by the potential utilization of the research findings. Policy makers in this arena, namely those in the state legislative and executive

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government branches, tend to focus on objective measures of inputs and outputs in their decision making process (Marshall & Gerstl-Pepin, 2005). A quantitative approach seeks to avoid the subjective nature of educational professionals attempting to define through qualitative methods an effective school funding formula. The perception of self interest related to a qualitative design can undermine the credibility of such an approach in the eyes of some policy makers.

A second advantage of the quantitative approach is the ease in which the study can be replicated in subsequent years. The nature of schools' ever changing local conditions and the potential impact of phase-in provisions create an environment where equity considerations are far from static. Regardless of the approach used to determine equitable distribution of funding, the dynamics of the systems involved will require constant recalculation as standards increase along with inflationary pressure on inputs. Given the large number of Missouri school districts, a rich descriptive qualitative design involving a relatively small sample does not lend itself to informing statewide policy regarding a school funding formula.

The primary limitation of using quantitative methods to determine equitable funding distribution for education is the inability to inform on how to utilize funds appropriately. As Marshall and Gerstl-Pepin (2005) stated, "Quantitative research can be used to determine if a policy is effective, but it cannot necessarily explain why" (p. 60). Even if a school funding formula is found to provide equity in the distribution of funds, the evaluation of such would not likely indicate how efficient or effective the schools are at using such funds. While effective and efficient use of available funds are important

areas of research, the primary question of equity of school funding distribution for Missouri schools remains unresolved under the recently adopted SB 287 funding formula.

Population and Sample

The population in this study included 518 of the 523 school districts in the State of Missouri for the 2008-2009 and 2009-2010 school years. Only 517 districts were included in the 2010-2011 school year due to a consolidation. Certain entities were excluded because of unique parameters that provide funding for these districts through state and federal programs. The excluded entities included three school districts with federal military lands and two special school districts for the education of special needs children. The Division of Youth Services schools, the St. Louis Career Education District, and the Voluntary Interdistrict Choice Corporation (VICC) were also excluded. VICC is a nonprofit corporation created by legislation to facilitate the voluntary student transfer program as part of the federal desegregation agreement. Charter schools within the Kansas City and St. Louis City school districts are treated as subsets of the host district and their revenue calculations are all inclusive. The sample was consistent with the Ogle (2007) study with the exception of one less district due to consolidation. To provide a complete and accurate analysis of the research questions, 518 school districts were included in the overall sample, representing 99% of the districts in Missouri. The inclusion of nearly all districts presented a universe of data rather than a limited sample and provided the opportunity for summative totals for the entire state.

The samples for each year of the study largely mirror the data for the 2005-2006 school year compiled by Ogle (2007). As reflected in Table 2, the total number of districts had decreased by one prior to 2008-2009 due to a consolidation, and by 2010-

2011 another district had consolidated. The number of students was represented by

Average Daily Attendance (ADA). The total ADA in 2010-2011 dropped by

approximately 13,000 students due to modifications many districts made in their 2010

summer school offerings over fears of reduced state funding for summer school

attendance hours. Of note is the increase in mean operating levy from $3.61 in 2005-

2006 to $3.74 in 2010-2011.

Table 2

School District Statistics – All Missouri School Districts

	Fiscal Year			
Variable	2005-2006	2008-2009	2009-2010	2010-2011
Number of Districts	519	518	518	517
Number of Students (ADA)	837,040	832,435	837,848	824,879
Mean Operating Levy	$3.61	$3.60	$3.66	$3.74

Note: The mean operating levy was calculated by multiplying the tax rate by the ADA
for each district, summing those products, and then dividing by total ADA. 2005-2006
data as reported by Ogle (2007).

Table 3 includes summary information on the non-hold harmless districts in the

sample for each year. In 2005-2006 there were 58 hold harmless districts within the total

sample (Ogle, 2007). Under SB 287 the number increased to 155 in 2010-2011, despite

similar ADA totals in the remaining non-hold harmless districts as compared to 2005-

2006. A large number of districts became hold harmless for the first time under the new

SB 287 formula due in large part to their high local property tax rates, encouraged by the

reward for effort provisions of the SB 380 formula. Many of these districts are small

districts in the northern third of the state, but some can be found throughout the state.

With some limitation, the SB 380 formula directed more state aid to districts willing to

tax local property at a higher rate. In many of these districts the combined local and state

effort exceeded the State Adequacy Target, resulting in hold harmless status under the

new SB 287 formula. The average operating levy for the non-hold harmless districts was

23 cents higher in 2010-2011 than in the 2008-2009 sample.

Table 3

School District Statistics – Missouri Non-Hold Harmless School Districts

	Fiscal Year			
Variable	2005-2006	2008-2009	2009-2010	2010-2011
Number of Districts	461	357	370	362
Number of Students (ADA)	620,309	537,831	604,193	619,780
Mean Operating Levy	$3.65	$3.41	$3.54	$3.64

Note: The mean operating levy was calculated by multiplying the tax rate by the ADA
for each district, summing those products, and then dividing by total ADA. 2005-2006
data as reported by Ogle (2007).

Data Collection and Instrumentation

Primary data on the population for the 2008-2009, 2009-2010, and 2010-2011

school years were collected from existing Missouri DESE databases, referenced on the

web at http://dese.mo.gov. The three years of data represent SB 287 formula phase-in

percentages of 44%, 58%, and 72% respectively. The Dollar Value Modifier (DVM) was

also fully phased-in beginning in 2008-2009. Average daily attendance (ADA) was

recorded to allow for revenues to be quantified in per pupil terms. Weighted average

daily attendance (WADA) was collected for use in isolating revenues driven by student characteristics of districts. Tax rate data and MAP Index data for each district were also collected from DESE sources.

The WADA counts included weightings for free or reduced lunch eligible, special education, and limited English proficient students above certain thresholds. The difference between WADA and ADA represents additional student counts applied to the formula to provide increased revenue to support students with high needs. State revenue totals for each district were separated into funds driven by ADA and additional funds driven by student weightings. No instruments were designed for this study, but equations in the formula calculation tool found on the DESE website were used to separate formula revenue into the component parts. It should be noted that the researcher assisted in the development of the formula calculation tool in 2005 used by school districts to project formula revenue. The procedure used to divide the revenue between the ADA and WADA components was verified for accuracy with retired DESE Deputy Commissioner Dr. Gerri Ogle (personal communication, March 23, 2012).

For non-hold harmless districts, revenue splits were figured by simply calculating state aid using the corresponding ADA associated with the payment WADA for a given year. This difference between the ADA driven total and the actual payment total driven by WADA was considered to be student need driven revenue. Hold harmless districts were treated differently depending upon whether or not their total ADA was above 350 or not. The SB 287 formula included a provision that guaranteed districts at or below 350 ADA would receive no less total state funding than the higher of their total in 2004-2005 or 2005-2006. Under this provision, the funding level of a hold harmless district at or

below 350 ADA was not impacted by student weights in the WADA totals, so student weight driven revenue was considered zero.

For districts above 350 ADA, the SB 287 hold harmless provision dictated they receive no less state funding than their 2005-2006 amount per WADA modified by the DVM. For those districts the baseline state revenue figure was generated by dividing the 2005-2006 state aid by the 2005-2006 ADA, and then multiplying the result by the DVM and the corresponding proration factor. This product was subtracted from the actual state funding for each sample year to determine the formula revenue driven by student weights. In each sample year studied, a small number of districts (six or fewer) yielded negative student weight driven revenue totals using this approach. This appeared to be due to the interplay between actual ADA and payment ADA for a given district, as well as the relative weights of summer school ADA and student weightings in the total WADA figures between 2005-2006 and a given sample year. The magnitude of the negative values was a total of 0.003% of total state aid for all districts and was considered negligible. For such districts the student weight driven revenue was held at zero.

To address the question of vertical equity, funding designated to support high need students was totaled and divided by the district ADA to generate a dollar per pupil average of additional funds. MAP Index data for required tests in communication arts, mathematics, and science were utilized to generate a Composite MAP Index score for each district. The calculation approach was similar to DESE's individual grade level MAP Index calculation in that Below Basic student percentages were given a weighting of six, Basic student percentages were given a weighting of seven, Proficient student percentages were given a weighting of eight, and Advanced student percentages were

given a weighting of nine. This approach generated a range of possible MAP Index

scores of 600 to 900. This student outcome measure was selected for analysis because

nearly every student in the state participates in this assessment process.

District Annual Performance Report (APR) scores are generally considered a

more representative measure of performance for a district due to inclusion of a variety of

performance measures in addition to test scores. However, since more than half of the

school districts receive perfect or near perfect APR scores, the lack of discernment limits

usefulness for data analysis. The relationship between student need based funding and

school performance was implied during the development of the SB 287 formula, based on

the use of the successful schools approach. Successful schools were identified as those

with perfect APR scores. Since the APR includes MAP index results scores as the

biggest portion of the scoring rubric, those scores were considered representative of

district performance in terms of student outcomes.

Revenue data were collected from the ASBR financial reports submitted by each

district, subject to audit by independent auditors. Only revenues placed in the Incidental

and Teachers Funds were considered, generally referred to as the operating funds of the

district. Revenues placed in the Capital Projects Fund and Debt Service Fund were not

included. They are for specific purposes and are not supported directly by state aid.

Revenue data were chosen over expenditure data as a representation of access to funding.

Operating expenditures can be influenced by district decisions regarding transfers for

capital projects and fund balance fluctuations, to name a few examples. The following

data points were gathered from DESE databases for each school district, with the

accounting code number for revenues included in parenthesis:

1. School district code identifier

2. Name of school district

3. Average daily attendance (ADA) for the district for 2008-2009, 2009-2010, and 2010-2011.

4. Weighted average daily attendance (WADA) for the district for 2008-2009, 2009-2010, and 2010-2011.

5. Equalized operating levy for the district for the district for 2008-2009, 2009-2010, and 2010-2011.

6. Current tax revenue (5111) for the district for 2008-2009, 2009-2010, and 2010-2011.

7. Delinquent tax revenue (5112) for the district for 2008-2009, 2009-2010, and 2010-2011.

8. Proposition C revenue (5113) for the district for 2008-2009, 2009-2010, and 2010-2011.

9. Financial institution tax revenue (5114) for the district for 2008-2009, 2009-2010, and 2010-2011.

10. Merchants & Manufacturers' surtax revenue (5115) for the district for 2008-2009, 2009-2010, and 2010-2011.

11. In lieu of tax revenue (5116) for the district for 2008-2009, 2009-2010, and 2010-2011.

12. Fines and forfeitures revenue (5211) for the district for 2008-2009, 2009-2010, and 2010-2011.

13. State Assessed Railroad and Utility revenue (5221) for the district for 2008-2009, 2009-2010, and 2010-2011.

14. Other county revenue (5222, 5230-37) for the district for 2008-2009, 2009-2010, and 2010-2011.

15. Foundation formula revenue (5311) for the district for 2008-2009, 2009-2010, and 2010-2011.

16. Classroom Trust Fund revenue (5319) for the district for 2008-2009, 2009-2010, and 2010-2011.

17. Hold harmless or formula status for the district for 2008-2009, 2009-2010, and 2010-2011.

18. Small Schools Grant revenue (5325) for the district for 2008-2009, 2009-2010, and 2010-2011.

19. Impact Aid federal revenue (5411) for the district for 2008-2009, 2009-2010, and 2010-2011.

20. Basic Formula Stabilization Fund revenue (5422, 5424) for the district for 2008-2009, 2009-2010, and 2010-2011.

21. Federal Education Jobs Fund revenue (5425, 5428, 5429) for the district for 2008-2009, 2009-2010, and 2010-2011.

22. MAP index scores for mathematics for grades 3-8, and Algebra I and II end of course exams for the district for 2008-2009, 2009-2010, and 2010-2011.

23. MAP index scores for communication arts for grades 3-8, and English I and II end of course exams for the district for 2008-2009, 2009-2010, and 2010-2011.

24. MAP index scores for science for grades 5 and 8, and Biology I end of course

exam for the district for 2008-2009, 2009-2010, and 2010-2011.

Informed consent was not necessary for this study because the data were publicly available.

Data Analysis

The researcher analyzed collected data with SPSS statistical software and Microsoft Excel spreadsheets. Descriptive statistics of mean, median, standard deviation, minimum, and maximum were calculated for key variables. For the question of horizontal equity, three calculations were performed as described in various equity studies: federal range ratio, coefficient of variation, and McLoone Index (Hirth & Eiler, 2005; Ko, 2006; Ogle, 2007; Thompson, Wood, & Honeyman, 1994). The calculation of the federal range ratio required the determination of the 5th and 95th percentile of the data set on a student level basis. The results of these calculations were compared to the results found by Ogle (2007) on the analysis of the last year of the previous formula under SB 380, which was 2005-2006.

The federal range ratio is defined as the restricted range, which is the difference between the 95th and 5th percentile of revenues per pupil, divided by the observation at the 5th percentile. The restricted range element is useful since potential outliers are excluded. By dividing restricted range by the value at the 5th percentile, a ratio is generated that allows for comparison across years, controlling for the impact of resource inflation (Hirth & Eiler, 2005; Odden & Picus, 2008). A smaller federal range ratio indicates better horizontal equity. Federal Impact Aid requires the federal range ratio to be equal to or less than 0.25 for a state school finance system to be considered equitable

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enough to allow Impact Aid to count in equalization formula calculations (Missouri Department of Elementary and Secondary Education, 1999). The federal range ratio calculation was used to evaluate hypotheses one, four, and seven.

The coefficient of variation is simply the standard deviation of revenues per pupil divided by the mean (Thompson, Wood, & Honeyman, 1994). The calculation produces a value between zero and one, with smaller values indicating greater equity. This value reveals the percentage of districts falling within a standard deviation of the mean with regards to revenue per pupil. A target value of .10 is a generally accepted standard (Odden & Picus, 2008), though difficult to achieve. Given a normal distribution, this value would indicate that roughly two-thirds of schools are within one standard deviation of the mean. The coefficient of variation was used to evaluate hypotheses two, five, and eight.

The McLoone Index, unique to school finance, "is the ratio of the sum of observations below the median to the sum of all observations that would be required if all observations below the median were brought up to the median level" (Thompson, Wood, & Honeyman, 1994, p. 250). In the current study, revenues of all districts below the median were compared to revenues of those same districts if they equaled the median. The closer the McLoone Index value is to one, the greater the equality. The target value for equity on the McLoone Index is 0.95 (Oden & Picus, 2008). The McLoone Index was used to evaluate hypotheses three, six, and nine.

Each horizontal equity calculation was performed on two sets of data, one for all schools in the sample and one excluding hold harmless districts from the sample. All revenues were evaluated on a per student basis rather than on a district basis to account

for large variations in student enrollment from district to district. Each horizontal equity calculation was also conducted on the 2010-2011 revenue data assuming no proration existed for that year to determine the impact of the funding shortfall.

For the question of vertical equity, student need driven revenues on a per pupil basis were correlated with Composite MAP Index scores for students in each district. The assumption in this comparison is that additional resources should be directed to schools with higher student needs in terms of performance outcomes. This calculation was conducted on the entire sample on a per district basis. The Pearson correlation coefficient was utilized, which produces values from -1 to +1 (Thompson, Wood, & Honeyman, 1994). Negative values are indicative of greater resources going to districts with higher student needs based on academic achievement outcomes. The correlation calculation was used to evaluate hypothesis ten.

<div align="center">Summary</div>

With several years of implementation of a new school funding formula in Missouri completed, a comparison to the previous formula was in order to determine its impact on various measures of equity. The purpose of this study was to determine if the new formula improved equity measures as intended by policy makers. All school districts in the state, with the exception of three federal land districts and two special school districts, were included in the study to provide a comprehensive view of the state as a whole. The SB 287 formula was evaluated based on all districts and with hold harmless districts excluded. These results were compared to a previous study (Ogle, 2007) to determine if equity has improved since the last year of the SB 380 formula that

was replaced. Funding to support high need students was also evaluated to determine if additional resources were being provided to districts with the lowest performance results.

The methods used to implement this study were explained in this chapter. The findings generated from these methods will be presented in Chapter Four. An interpretation of the findings and a discussion of how those findings connect to relevant literature and future study will be provided in Chapter Five.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

The purpose of this study was to compare horizontal equity measures in Missouri between the funding formula created in 2005 under SB 287 and the formula created in 1993 under SB 380. In addition, vertical equity funding components were correlated with student achievement measures to determine if the intended goal of providing additional resources to high need students is being met. This study replicated the methodology of a study by Ogle (2007) to provide comparisons between the current formula and the previous formula on horizontal equity measures, with an additional element added related to vertical equity. The researcher sought to enhance the overall understanding on the impact of the SB 287 formula on the distribution of resources to schools in Missouri through the first five years of implementation.

This chapter provides an explanation of how the data were analyzed. It includes descriptive characteristics of the school districts included in the study along with research questions and hypotheses. It also includes an analysis of the data collected. The data for the first three research questions were analyzed using common school finance equity calculations including the Federal Range Ratio, Coefficient of Variation, and the McLoone Index. The data for the fourth research question were analyzed using Pearson Product Moment correlations. To evaluate Missouri funding mechanisms found in SB 287, the following questions were studied:

1. Has the horizontal revenue equity of the foundation formula created in SB 287 improved through five years of implementation over the horizontal revenue equity of the SB 380 formula it replaced?

2. Has the legislative decision to guarantee a minimum (hold harmless) payment per student impacted horizontal revenue equity in the SB 287 foundation formula?

3. Did the proration of the SB 287 funding formula in the 2010-2011 school year due to insufficient funding impact horizontal revenue equity?

4. Does a relationship exist between the revenues driven by vertical equity components of the SB 287 formula and student educational needs as measured by the Composite MAP Index?

This study utilized Annual Secretary of the Board Report (ASBR) financial data and student achievement data from the Missouri Department of Elementary and Secondary Education (DESE) database in conjunction with model generated revenue calculations to test the following hypotheses:

H_O1: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the federal range ratio.

H_O2: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the coefficient of variation.

H_O3: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the McLoone Index.

H_O4: The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all

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districts than the SB 380 formula it replaced, as measured by the federal range ratio.

H_O5:   The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the coefficient of variation.

H_O6:   The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the McLoone Index.

H_O7:   The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the federal range ratio.

H_O8:   The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the coefficient of variation.

H_O9:   The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the McLoone Index.

H_O10: There is not a significant correlation between district revenue per student based on additional weightings in the SB 287 foundation formula and Composite MAP Index scores for the district.

Review of Research Design

The researcher analyzed collected data with SPSS statistical software (version 19.0) and Microsoft Excel spreadsheets. Descriptive statistics of mean, median, standard

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deviation, minimum, and maximum were calculated for key variables. For the question

of horizontal equity, three calculations were performed as described in various equity

studies: federal range ratio, coefficient of variation, and McLoone Index (Hirth & Eiler,

2005; Ko, 2006; Ogle, 2007; Thompson, Wood, & Honeyman, 1994). The calculation of

the federal range ratio required the determination of the 5th and 95th percentile of the data

set on a student level basis. The results of these calculations were compared to the results

found by Ogle (2007) on the analysis of the last year of the previous formula under SB

380, which was 2005-2006.

Each horizontal equity calculation was performed on two population sets, one for

all schools in the sample and one excluding hold harmless districts from the sample. For

2009-2010 and 2010-2011, the samples excluding hold harmless districts were also

analyzed with a nominal number of outlier districts removed (two districts and one

district respectively). Each outlier district was more than five standard deviations higher

in revenues per pupil than the remaining districts in the sample as a result of unique

characteristics to be described later in this chapter. All revenues were evaluated on a per

student basis rather than on a district basis to account for large variations in student

enrollment from district to district. Each horizontal equity calculation was also

conducted on the 2010-2011 revenue data assuming no proration existed for that year to

determine the impact of the funding shortfall. Once again, outliers were removed for

calculations on samples excluding hold harmless districts.

For the question of vertical equity, student need driven revenues on a per pupil

basis were correlated with Composite MAP Index scores for students in each district.

The assumption in this comparison is that additional resources should be directed to

schools with higher student needs in terms of performance outcomes. This calculation was conducted on the entire sample on a per district basis. The Pearson correlation coefficient was utilized, which produces values from -1 to +1 (Thompson, Wood, & Honeyman, 1994). Negative values are indicative of greater resources going to districts with higher student needs based on academic achievement outcomes. The correlation calculation was used to evaluate hypothesis ten.

<div align="center">Descriptive Analysis</div>

Revenue per Student for All Districts

The descriptive statistics for revenue per student in all districts are reported in Table 4. The reported values include mean revenue, the standard deviation, the minimum value, and the maximum value. The 2005-2006 data represent the last year of funding under the SB 380 formula as reported by Ogle (2007). During the three years studied under the SB 287 formula, mean revenue increased from $6,501 under the previous formula to exceed $8,000 in each year of the new formula. The peak value for mean revenue was in 2010-2011 at $8,295 per student.

The standard deviation in revenue per student for all districts was reported by Ogle (2007) to be $1,329 in 2005-2006. During the years studied under the SB 287 formula, the standard deviation in revenue for all districts increased to a peak value of $1,669 in 2008-2009. The subsequent two years had standard deviation values of $1,573 and $1,654 respectively.

The minimum revenue per student for all districts in 2005-2006 was reported by Ogle (2007) to be $4,482. During the years studied under the SB 287 formula, minimum revenue increased to a peak value of $5,920 in 2008-2009. The subsequent two years had

minimum revenue per student values of $5,896 and $5,915 respectively. Maximum

revenue per student values grew from $16,998 in 2005-2006 to a peak value of $22,984

in 2009-2010.

Table 4

Summary of Descriptive Analysis of Revenue per Student for All Districts

Year	Mean Revenue	SD	Minimum	Maximum
2005-2006	$6,501	$1,329	$4,482	$16,998
2008-2009	$8,145	$1,669	$5,920	$18,749
2009-2010	$8,079	$1,573	$5,896	$22,984
2010-2011	$8,295	$1,654	$5,915	$21,508

Note: 2005-2006 data as reported by Ogle (2007)

Revenue per Student for Non-Hold Harmless Districts

The descriptive statistics for revenue per student in non-hold harmless districts are

reported in Table 5. The reported values include mean revenue, the standard deviation,

the minimum value, and the maximum value. The 2005-2006 data represent the last year

of funding under the SB 380 formula as reported by Ogle (2007). During the three years

studied under the SB 287 formula, mean revenue increased from $6,197 under the

previous formula to exceed $7,300 in each year of the new formula. The peak value for

mean revenue was in 2010-2011 at $7,681 per student. For the years 2009-2010 and

2010-2011, a small number of outlier districts were removed from the analysis and

revised calculations were reported. The removal of outlier districts did not have a large

effect on mean revenue per pupil due to the relatively small number of students in the outlier districts.

The standard deviation in revenue for non-hold harmless districts was reported by Ogle (2007) to be $984 in 2005-2006. During the years studied under the SB 287 formula, the standard deviation in revenue for such districts increased to a peak value of $1,102 in 2010-2011. Removal of an outlier district lowered the standard deviation in that year to $1,076. The standard deviation value in 2008-2009 was $975, and with outliers removed was $986 in 2009-2010.

The minimum revenue per student for non-hold harmless districts in 2005-2006 was reported by Ogle (2007) to be $4,482. During the years studied under the SB 287 formula, minimum revenue increased to a peak value of $5,920 in 2008-2009. The subsequent two years had minimum revenue per student values of $5,896 and $5,915 respectively. Maximum revenue per student values grew from $16,998 in 2005-2006 to a peak value of $20,302 in 2010-2011. However, with the removal of a nominal number of outlier districts, maximum values are more reasonably described as peaking at $12,059 per student in 2008-2009. The values for the subsequent two years with outliers removed were $10,060 and $11,974 respectively.

The two outlier districts among those on the SB 287 formula in 2009-2010 were Lesterville R-IV and West Platte County R-IV. Lesterville was also considered an outlier in 2010-2011. Lesterville's status as an outlier appears to have been influenced by a large settlement received as an influx of local money to the district from a utility company after the Taum Sauk Dam failure in 2005. The influx of additional local funds was not offset in any way by the SB 287 formula. West Platte County was a hold

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harmless district in each year studied with the exception of 2009-2010. The district had a

relatively high per pupil revenue amount and resided near the boundary of being on the

formula or hold harmless in each year.

Table 5

Summary of Descriptive Analysis of Revenue per Student for Non-Hold Harmless Districts

Year	Mean Revenue	SD	Minimum	Maximum
2005-2006	$6,197	$984	$4,482	$10,296
2008-2009	$7,339	$975	$5,920	$12,059
2009-2010	$7,438	$1,070	$5,896	$19,226
2009-2010*	$7,423	$986	$5,896	$10,060
2010-2011	$7,681	$1,102	$5,915	$20,302
2010-2011**	$7,676	$1,076	$5,915	$11,974

Note: 2005-2006 data as reported by Ogle (2007)
* West Platte County R-IV and Lesterville R-IV removed as outliers
** Lesterville R-IV removed as an outlier

Horizontal Equity Analysis

Revenue per Student – Federal Range Ratio

The federal range ratio measure was applied to a total of eight sets of data. The

set of all school districts was tested for the years 2008-2009 through 2010-2011. The

calculation was applied to the same three years for the set of non-hold harmless districts.

In addition, the calculation was figured on two sets of non-hold harmless districts that

excluded certain outliers identified previously. The federal range ratio calculation

required the identification of the 95th and the 5th percentile of revenues per pupil, the

difference of which was divided by the 5th percentile. A lower value represents better horizontal equity, with a value of 0.25 or less considered equitable (Odden & Picus, 2008). The federal range ratio was used to test hypotheses one and four and the results are reported in Table 6.

H_O1:   The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the federal range ratio.

In the case of all districts, the federal range ratio was reported by Ogle (2007) to be 0.813 in 2005-2006 under the SB 380 formula. During the three years studied under the SB 287 formula, the federal range ratio showed some improvement in equity by decreasing to 0.776 in 2009-2010, but returned to a value of 0.814 by 2010-2011. Since the federal range ratio values showed no improvement over the years analyzed and remain far from the target value, the null hypothesis is not rejected.

H_O4:   The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the federal range ratio.

Among non-hold harmless districts, the federal range ratio in 2005-2006 under SB 380 was reported as 0.630 (Ogle, 2007). Under the SB 287 formula, this value had improved to 0.493 by 2008-2009. The federal range ratio value in the subsequent two years was 0.588 and 0.598 respectively. The removal of outlier districts had no impact on the calculated values. Since the federal range ratio values were consistently lower for non-hold harmless districts than all districts, the null hypothesis is rejected.

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Table 6

Summary of Equity Analysis of Revenue per Student – Federal Range Ratio

Year	All Districts	Non-Hold Harmless Districts
2005-2006	0.813	0.630
2008-2009	0.871	0.493
2009-2010 (*)	0.776	0.588 (0.588)
2010-2011 (*)	0.814	0.598 (0.598)

Note: 2005-2006 data as reported by Ogle (2007)
* Values in parentheses include removal of outliers

Revenue per Student – Coefficient of Variation

The coefficient of variation measure was applied to a total of eight sets of data.

The set of all school districts was tested for the years 2008-2009 through 2010-2011. The

calculation was applied to the same three years for the set of non-hold harmless districts.

In addition, the calculation was conducted on two sets of non-hold harmless districts that

excluded certain outliers identified previously. The coefficient of variation calculation

required the identification of the mean revenue value and the standard deviation of

revenue for each data set. The standard deviation value was divided by the mean revenue

value to generate the coefficient of variation. A lower value represents better horizontal

equity, with a value of 0.10 or less considered equitable (Odden & Picus, 2008). The

coefficient of variation was used to test hypotheses two and five and the results are

reported in Table 7.

H$_O$2:   The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the coefficient of variation.

In the case of all districts, the coefficient of variation was reported by Ogle (2007) to be 0.205 in 2005-2006 under the SB 380 formula. As of 2008-2009 under the SB 287 formula, the coefficient of variation remained at 0.205. The value improved slightly to 0.195 the following year, but retreated to 0.199 in 2010-2011. Since the coefficient of variation values showed little to no improvement over the years analyzed and remain far from the target value, the null hypothesis is not rejected.

H$_O$5:   The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the coefficient of variation.

Among non-hold harmless districts, the coefficient of variation in 2005-2006 under SB 380 was reported as 0.159 (Ogle, 2007). Under the SB 287 formula, this value had improved to 0.133 by 2008-2009. The coefficient of variation value in the subsequent two years was 0.144 and 0.143 respectively. The removal of outlier districts lowered these values to 0.133 and 0.140 respectively. Since the coefficient of variation values were consistently lower for non-hold harmless districts than all districts, the null hypothesis is rejected.

Table 7

Summary of Equity Analysis of Revenue per Student – Coefficient of Variation

Year	All Districts	Non-Hold Harmless Districts
2005-2006	0.205	0.159
2008-2009	0.205	0.133
2009-2010 (*)	0.195	0.144 (0.133)
2010-2011 (*)	0.199	0.143 (0.140)

Note: 2005-2006 data as reported by Ogle (2007)
* Values in parentheses include removal of outliers

Revenue per Student – McLoone Index

The McLoone Index calculation was applied to a total of eight sets of data. The set of all school districts was tested for the years 2008-2009 through 2010-2011. The calculation was applied to the same three years for the set of non-hold harmless districts. In addition, the calculation was figured on two sets of non-hold harmless districts that excluded certain outliers identified previously. The McLoone Index calculation required the identification of the median student revenue value and the sum of all revenues below the median value for each data set. The sum of all revenues below the median was divided by the sum of revenues assuming all students below the median were at the median value. A higher value represents better horizontal equity among the lower half of the distribution, with a value of 0.95 considered to be the desired target (Odden & Picus, 2008). The McLoone Index was used to test hypotheses two and five and the results are reported in Table 8.

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H_O3: The foundation formula created in SB 287 provides no measurable

improvement in horizontal equity as compared to the SB 380 formula it

replaced, as measured by the McLoone Index.

In the case of all districts, the McLoone Index was reported by Ogle (2007) to be

0.849 in 2005-2006 under the SB 380 formula. As of 2008-2009 under the SB 287

formula, the McLoone Index had improved to 0.867. The value improved to 0.884 the

following year, but retreated to 0.881 in 2010-2011. Since the McLoone Index values

showed marginal improvement over the years analyzed under the SB 287 formula as

compared to the final year of the SB 380 formula, hypothesis three was narrowly

rejected.

H_O6: The hold harmless provision found in SB 287 has no greater impact on

horizontal equity between non-hold harmless districts when compared to all

districts than the SB 380 formula it replaced, as measured by the McLoone

Index.

Among non-hold harmless districts, the McLoone Index in 2005-2006 under SB

380 was reported as 0.860 (Ogle, 2007). Under the SB 287 formula, this value had

improved to 0.934 by 2008-2009. The coefficient of McLoone Index value in the

subsequent two years was 0.932 and 0.922 respectively. The removal of outlier districts

lowered the 2009-2010 value to 0.930, but had no impact on the 2010-2011 value. Since

the McLoone Index values were consistently higher for non-hold harmless districts than

all districts, the null hypothesis is rejected. It was noted that the McLoone Index for non-

hold harmless districts were very near the equity target value of 0.95 (Odden & Picus,

2008) under the SB 287 formula analysis.

Table 8

Summary of Equity Analysis of Revenue per Student – McLoone Index

Year	All Districts	Non-Hold Harmless Districts
2005-2006	0.849	0.860
2008-2009	0.867	0.934
2009-2010 (*)	0.884	0.932 (0.930)
2010-2011 (*)	0.881	0.922 (0.922)

Note: 2005-2006 data as reported by Ogle (2007)
* Values in parentheses include removal of outliers

Impact of Formula Proration on Horizontal Equity

Beginning in 2009-2010, the State of Missouri failed to appropriate enough funds to fully fund the SB 287 foundation formula. As a result, DESE prorated the formula payment to all districts by the amount necessary to distribute the available appropriation. In 2009-2010, districts received 98.27% of the state funds indicated by the SB 287 funding formula. In 2010-2011, districts received 96.64% of the state funds indicated by the SB 287 funding formula. Table 9 includes comparative data for all districts on various horizontal equity measures between actual prorated funding levels versus those same measures assuming the SB 287 formula had been fully funded in 2010-2011. Table 10 includes the same comparative data on the set of non-hold harmless districts. The horizontal equity measures described previously were applied to the 2010-2011 data to address the following hypotheses:

H_O7: The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the federal range ratio.

H_O8:   The proration of the formula in 2010-2011 had no impact on horizontal equity

   in the SB 287 formula distribution, as measured by the coefficient of

   variation.

H_O9:   The proration of the formula in 2010-2011 had no impact on horizontal equity

   in the SB 287 formula distribution, as measured by the McLoone Index.

When reviewing data for all school districts in 2010-2011, each equity measure

showed nominal improvement if full funding were assumed. The federal range ratio

improved from 0.814 to 0.799, the coefficient of variation improved from 0.199 to 0.196,

and the McLoone Index improved from 0.881 to 0.888. For the non-hold harmless

school districts, the impact of full funding on the equity calculations was even less

noticeable. The federal range ratio improved from 0.598 to 0.587, the coefficient of

variation improved from 0.143 to 0.140, and the McLoone index improved from 0.922 to

0.923. Given the nominal level of differences between prorated funding and assumed full

funding in 2010-2011 regardless of equity measure, null hypotheses seven, eight, and

nine are not rejected.

Table 9

Summary of Equity Analysis of Revenue per Student – Prorated Funding Compared to Full Funding in 2010-2011 for All Missouri School Districts

Equity Measure	Prorated Funding	Full Funding
Federal Range Ratio	0.814	0.799
Coefficient of Variation	0.199	0.196
McLoone Index	0.881	0.888

Table 10

Summary of Equity Analysis of Revenue per Student – Prorated Funding Compared to Full Funding in 2010-2011 for Missouri Non-Hold Harmless School Districts

Equity Measure	Prorated Funding	Full Funding
Federal Range Ratio	0.598	0.587
Coefficient of Variation	0.143	0.140
McLoone Index	0.922	0.923

Vertical Equity Analysis

Revenues associated with extra student weightings in the formula calculation were extrapolated during the data analysis phase of the study. Such revenues were calculated by district and assigned a per pupil average. Composite MAP Index scores were also computed for each district. A Pearson correlation coefficient was used to assess the amount of linear relationship between the two variables of weighted revenue per student and Composite MAP Index score on a per district basis. Table 11 provides summary information regarding average per pupil revenues associated with extra student weightings and average Composite MAP Index scores. The average student need driven revenue increased each year of the study from $163 in 2008-2009 to $244 in 2010-2011. This would be expected as the percentage of new formula allocation increased each year during the formula implementation. In each year a small number of districts received more than $1,000 per pupil in additional revenue based on their student characteristics. Composite MAP Index scores, as calculated in this study, showed steady improvement in the years analyzed. Table 12 includes the correlation results for all Missouri districts,

while Table 13 includes the correlation results for the subset of non-hold harmless districts. The Pearson correlation coefficient was used to assess hypothesis ten.

H$_O$10: There is not a significant correlation between district revenue per

student based on additional weightings in the SB 287 foundation formula and

Composite MAP Index scores for the district.

In all cases a significant negative relationship was identified. This indicated that more weighted revenue per pupil was associated to districts with lower Composite MAP Index scores, which is the intention of a student need driven formula. For the group of all Missouri school districts, the negative Pearson value was highest at -0.348 in 2009-2010, and was only slightly lower in the other two years studied. For the group of non-hold harmless school districts, the negative relationship also had a peak value in 2009-2010 at -.486, with only slightly lower values in the other two years studied. Given that the relationship in all cases is negative at a significance of $p < 0.01$, the null hypothesis is rejected.

Table 11

Student Need Driven Revenue per Pupil and Composite MAP Index Summary

	2008-2009	2009-2010	2010-2011
Average Student Need Driven Revenue per Pupil	$163	$204	$244
Average Composite MAP Index	753	758	763

Table 12

Correlations between Composite MAP Index Scores and Student Need Driven Revenue per Pupil – Students in All Missouri School Districts

	2008-2009	2009-2010	2010-2011
Pearson Correlation	-0.315*	-0.348*	-0.322*
Significance (2-tailed)	.000	.000	.000
N	518	518	517

*p < .01

Table 13

Correlations between Composite MAP Index Scores and Student Need Driven Revenue per Pupil – Students in Missouri Non-Hold Harmless School Districts

	2008-2009	2009-2010	2010-2011
Pearson Correlation	-0.453*	-0.486*	-0.453*
Significance (2-tailed)	.000	.000	.000
N	357	370	362

*p < .01

Summary

This chapter provided an overview of the findings related to each research question and the related hypotheses. Based on a variety of equity measures Research Question One was answered in the negative, as horizontal equity values for the SB 287 formula failed to reach targets established in the literature. Some progress was observed for non-hold harmless districts and McLoone Index values for those districts approached

the standard equity target. Hold harmless provisions in the SB 287 formula continue to impact horizontal equity values, resulting in an affirmative response to Research Question Two. Horizontal equity values for the group of all school districts were consistently worse than for the group of non-hold harmless school districts.

The response to Research Question Three was no, since the DESE approach to prorating all districts equally in 2010-2011 did not appear to impact horizontal equity. And finally, in response to Research Question Four it was determined that more revenues were being directed to districts with higher student needs as measured by student outcomes per the Composite MAP Index. A further examination of the findings and conclusions will be presented in Chapter Five. In addition, Chapter Five will present implications, suggestions for future research, and a summary of the study.

CHAPTER FIVE

FINDINGS, IMPLICATIONS, AND CONCLUSIONS

The purpose of this study was to compare horizontal equity measures in Missouri between the funding formula created in 2005 under SB 287 and the formula created in 1993 under SB 380. In addition, vertical equity funding components were correlated with student achievement measures to determine if the intended goal of providing additional resources to high need students is being met. Welker (2006) previously conducted an evaluation of general equity between the new and old formulas in Missouri. However, his study did not differentiate between horizontal and vertical equity components, two components of equity that work against one another. In addition, the Welker (2006) study used projected revenues for the new formula which have shown to be measurably different than actual revenues to date. This study replicated the methodology of a study by Ogle (2007) to provide comparisons between the current formula and the previous formula on horizontal equity measures, with an additional element added related to vertical equity. The researcher sought to enhance the overall understanding of the impact of the SB 287 formula on the distribution of resources to schools in Missouri through the first five years of implementation.

To evaluate Missouri funding mechanisms found in SB 287, the following questions were studied:

1. Has the horizontal revenue equity of the foundation formula created in SB 287 improved through five years of implementation over the horizontal revenue equity of the SB 380 formula it replaced?

2. Has the legislative decision to guarantee a minimum (hold harmless) payment per student impacted horizontal revenue equity in the SB 287 foundation formula?

3. Did the proration of the SB 287 funding formula in the 2010-2011 school year due to insufficient funding impact horizontal revenue equity?

4. Does a relationship exist between the revenues driven by vertical equity components of the SB 287 formula and student educational needs as measured by the Composite MAP Index?

This research considered revenue per student to determine if horizontal equity has improved during the first five years of implementation of the SB 287 formula. Students are represented by Average Daily Attendance (ADA). The research design utilized three common measures of horizontal equity to address the first three questions: the coefficient of variation, the federal range ratio, and the McLoone Index consistent with the Ogle study in 2007. For the fourth question, revenue targeting vertical equity was derived by isolating the formula revenue associated with additional weightings based on student characteristics. Composite MAP Index scores were utilized as the student outcome measure representing educational need.

Data for the 2008-2009, 2009-2010, and 2010-2011 school years were selected for analysis in this study. This represented the third, fourth, and fifth years of the seven year implementation of the SB 287 formula. The SB 287 formula was fully funded as designed from the 2006-2007 school year through the 2008-2009 school year, but was funded at 98.27% and 96.64% during the 2009-2010 and 2010-2011 years respectively. The 2008-2009 year was also significant in that the use of the Dollar Value Modifier (DVM) was fully implemented in the formula calculations. The DVM provides

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additional funding to districts in areas with higher than median wage rates according to Department of Labor statistics. Districts receive up to 10.4% additional funding due to local economic factors.

This study utilized Annual Secretary of the Board Report (ASBR) financial data and student achievement data from the Missouri Department of Elementary and Secondary Education (DESE) database in conjunction with model generated revenue calculations to test the following hypotheses:

H_O1: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the federal range ratio.

H_O2: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the coefficient of variation.

H_O3: The foundation formula created in SB 287 provides no measurable improvement in horizontal equity as compared to the SB 380 formula it replaced, as measured by the McLoone Index.

H_O4: The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the federal range ratio.

H_O5: The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all

districts than the SB 380 formula it replaced, as measured by the coefficient of variation.

H_O6: The hold harmless provision found in SB 287 has no greater impact on horizontal equity between non-hold harmless districts when compared to all districts than the SB 380 formula it replaced, as measured by the McLoone Index.

H_O7: The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the federal range ratio.

H_O8: The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the coefficient of variation.

H_O9: The proration of the formula in 2010-2011 had no impact on horizontal equity in the SB 287 formula distribution, as measured by the McLoone Index.

H_O10: There is not a significant correlation between district revenue per student based on additional weightings in the SB 287 foundation formula and Composite MAP Index scores for the district.

Research Question One was addressed by evaluating hypotheses one through three. Research Question Two was addressed by evaluating hypotheses four through six, comparing the statistics of all districts to the statistics of non-hold harmless districts. Research Question Three was addressed by evaluating hypotheses seven through nine, comparing the statistics of all districts as funded to the statistics of those same districts if no proration existed in 2010-2011. Research Question Four was addressed by evaluating hypothesis ten.

Findings and Interpretations

Research Question One Answered

To answer Research Question One, hypotheses one through three were tested

reviewing the data for all districts. The federal range ratio was calculated by dividing the

difference between the 95th percentile in per student revenue and the 5th percentile in

revenue per student by the observation at the 95th percentile. The federal range ratio

during the final year of the SB 380 formula of 2005-2006 was reported by Ogle (2007) as

0.813. The ratio was less equitable at a value of 0.871 for 2008-2009, and then improved

to 0.776 in 2009-2010, only to regress to 0.814 by 2010-2011. Each of these values was

well above the benchmark level of 0.25 identified in the literature (Odden & Picus,

2008). In total, the federal range ratio did not show improvement when considering all

districts under SB 287 through 2010-2011 as compared to all districts under SB 380 in

2005-2006. The ratio value of 0.814 indicates that districts at the 95th percentile received

81.4% more revenue per student than districts at the 5th percentile, which is more than

three times the target threshold. The continued phase-in of the SB 287 formula did not

generate improved values in the federal range ratio when considering all districts and, as

a result, hypothesis one was not rejected.

The coefficient of variation for all districts in 2005-2006 was reported by Ogle

(2007) to be 0.205 during the final year of the SB 380 formula, just as it was found to be

in 2008-2009 under the SB 287 formula. The value improved modestly to 0.195 in 2009-

2010 and then regressed slightly to 0.199 in 2010-2011. In each year the coefficient of

variation value was roughly twice the target value of 0.10 (Odden & Picus, 2008). The

target value of 0.10 would indicate that roughly two-thirds of students in the population

would be supported by a revenue amount within 10% of the mean. To illustrate, the mean revenue on a per student basis in 2010-2011 was found to be $8,295. A coefficient of variation of 0.10 would generate a range of $1,660 between plus or minus one standard deviation at values of $9,125 and $7,465. This would indicate that students at a plus one standard deviation mark receive 22% more revenue support than students at the minus one standard deviation mark for that year. By comparison, a coefficient of variation of 0.199 generated a range of $3,308 between plus or minus one standard deviation at values of $9,949 and $6,641. This indicated in 2010-2011 students at a plus one standard deviation mark received approximately 50% more revenue support than students at the minus one standard deviation mark. The continued phase-in of the SB 287 formula did not appear to generate improved values in the coefficient of variation when considering all districts and, as a result, hypothesis two was not rejected.

The McLoone Index for all districts during the final year of the SB 380 formula in 2005-2006 was reported by Ogle (2007) to be 0.849. Under the SB 287 formula the value had increased to 0.867 in 2008-2009 and 0.884 in 2009-2010 before regressing slightly to 0.881 in 2010-2011. While the calculated values are below the equity target value of 0.95 (Odden & Picus, 2008) needed to indicate substantial equity across the bottom half of the distribution, each year was marginally better than under the final year of the old formula.

To put these values in perspective, the McLoone Index of 0.881 for all districts in 2010-2011 indicated that the average revenue per pupil in the bottom half of the distribution was $7,028 as compared to the median value of $7,977. On average, a student in the bottom half of the distribution receives $949 less in revenue support than

the median student, or $550 less than the 0.95 equity target value of $7,578. By comparison, the 0.849 McLoone Index from 2005-2006 would translate into a value of $6,772, which is $1,205 less in revenue support per student than the median value or $806 less than the 0.95 equity target value of $7,578. In practical terms, the improvement in the McLoone Index value from 2005-2006 to 2010-2011 of 3.2 percentage points decreased the gap to the equity target of 0.95 by approximately one-third. Of note from the Ogle (2007) study was the trend of a declining McLoone Index value during the final years of the SB 380 formula after peaking at a value of 0.903 during 1997-1998 and holding a value of 0.893 as late as 2000-2001. The SB 287 formula has yet to achieve those levels when considering all districts, but no declining trend has clearly been established. Since the McLoone Index has remained higher under each year of the SB 287 formula studied as compared to the final year of the SB 380 formula, hypothesis three is rejected by a narrow margin.

Collectively the horizontal equity measures of federal range ratio, coefficient of variation, and the McLoone Index were used to make a comprehensive assessment of whether or not the SB 287 formula had improved horizontal equity through 2010-2011 as compared to the predecessor SB 380 formula. Since the federal range ratio and the coefficient of variation calculations showed no measureable improvements and the McLoone Index demonstrated only marginal gains, it was determined that the SB 287 formula has not improved horizontal equity over the SB 380 formula when considering all districts.

Research Question Two Answered

Hypotheses four through six were tested to answer Research Question Two by comparing results for all districts to the group of non-hold harmless districts in each year of the study. Values for the federal range ratio were consistently lower for the non-hold harmless districts as compared to the group of all districts. The difference was the most dramatic in 2008-2009, with a federal range ratio value of 0.871 for all districts versus 0.493 for non-hold harmless districts. While the 0.493 value is substantially above the equity target value of 0.25 (Odden & Picus, 2008), it represented an improvement over the 2005-2006 value of 0.630 reported by Ogle (2007) under the last year of the SB 380 formula. Further review of the Ogle (2007) findings indicate that federal range ratio values found in this study of the SB 287 formula were more equitable than in any year of the SB 380 formula studied.

During the years 2009-2010 and 2010-2011, the federal range ratio for non-hold harmless districts regressed slightly to values of 0.588 and 0.598 respectively. However, these values were clearly lower than the values for all districts in comparable years at 0.776 and 0.814 respectively. To provide context to these values, the 2010-2011 ratio of 0.814 for the group of all districts indicates the districts at the 95th percentile of the distribution received 81.4% more revenue per student than those at the 5th percentile. The real dollar difference between these values in 2010-2011 was $11,562 to $6,372, or $5,190. For the non-hold harmless districts in 2010-2011, the real dollar difference for the federal range ration value of 0.598 was $10,148 to $6,352, or $3,796, which was an improvement of $1,394 per student. By contrast, Ogle (2007) found the federal range ratio values between non-hold harmless districts to be improved over the group of all

districts in only two of the six years studied, one of which was the 2005-2006 year used as a baseline for this study. In addition, the gap in the ratio value for 2005-2006 was larger than any other year of the SB 380 study, yet was still less than each year of this SB 287 study. Because the federal range ratio values for the group of non-hold harmless districts was measurably better over the group of all districts in each year of the study, and the margin of improvement was consistently better than found under the SB 380 formula (Ogle, 2007), research hypothesis four was rejected. Based on federal range ratio values, horizontal equity in the SB 287 formula was impacted to a greater extent by the hold harmless provision in SB 287 than it was in the SB 380 formula.

Coefficient of variation values between the group of all districts and the group of non-hold harmless districts followed a very similar pattern to the federal range ratio statistics. In each year under the SB 287 formula, the coefficient of variation was markedly lower for non-hold harmless districts than the group of all districts. The largest difference was found in 2008-2009 with a value of 0.205 for all districts versus a value of 0.133 for the non-hold harmless districts. While a value of 0.133 does not meet the equity target of 0.10 (Odden & Picus, 2008), it comes closer to the target than any year under the SB 380 formula as reported by Ogle (2007). In addition, the gap in coefficient of variation values between the non-hold harmless districts and the group of all districts was larger in all years studied of the SB 287 formula than those reported for the SB 380 formula, indicating a greater impact of the hold harmless provision on horizontal equity in the SB 287 formula.

The coefficient of variation values for non-hold harmless districts regressed slightly in 2009-2010 and 2010-2011 to 0.144 and 0.143, respectively. However,

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removal of a small number of outlier districts from the samples mitigated a significant

portion of the backslide with resulting values of 0.133 and 0.140 respectively. To

provide context, the 0.140 coefficient of variation value for 2010-2011 represents a range

of $2,152 at plus or minus one standard deviation of revenue per student, as compared to

the range of $3,308 at plus or minus one standard deviation of revenue per student for the

group of all districts, a difference of $1,156 per student. Given the size of differences in

coefficient of variation values between non-hold harmless districts and the group of all

districts, and the fact that those differences are larger in each year of the SB 287 formula

studied as compared to the SB 380 formula findings, research hypothesis five was

rejected. As measured by the coefficient of variation, the hold harmless provision of the

SB 287 formula had a greater negative impact on horizontal equity than the hold harmless

provision found in the SB 380 formula.

McLoone Index values for the group of non-hold harmless districts were

consistently higher than the group of all districts. In fact, the 2008-2009 McLoone Index

value for non-hold harmless districts approached the 0.95 equity target (Odden & Picus,

2008) at a value of 0.934 and regressed only marginally the subsequent two years. At a

value of 0.934, the average revenue per student of all students below the median value of

$7,023 was calculated at $6,559. This amount was only $113 per student below the 0.95

equity target value of $6,672 for that year. By comparison, the gap between average

revenue per student and the 0.95 target value in the group of all districts was $550.

The 2010-2011 McLoone Index value for non-hold harmless districts was the

lowest of the SB 287 formula years studied at 0.922, a value that exceeded any year

reported for such districts under the SB 380 formula (Ogle, 2007). The range in

McLoone Index values between non-hold harmless districts and the group of all districts was also larger in all years of the SB 287 formula studied. Ogle (2007) reported only marginal differences between the two groups of districts on this horizontal equity measure, with the 2005-2006 value used for comparison in this study as typical. Given the consistently higher values for the McLoone Index in non-hold harmless districts compared to all districts, as well as the larger margins found in such measures under the SB 287 formula, hypothesis six was rejected. As measured by the McLoone Index, the hold harmless provision of the SB 287 formula had a greater negative impact on horizontal equity than the hold harmless provision found in the SB 380 formula.

Collectively the horizontal equity measures of federal range ratio, coefficient of variation, and the McLoone Index were used to make a comprehensive assessment of whether or not horizontal equity in the SB 287 formula was impacted by a hold harmless provision to a greater extent than the hold harmless provision in the SB 380 formula. Since the federal range ratio, the coefficient of variation, and McLoone Index calculations all indicated better horizontal equity for non-hold harmless districts, and the margin of difference was consistently higher under the SB 287 formula than the SB 380 formula, it was determined that the SB 287 formula was impacted by a hold harmless provision to a greater extent than the SB 380 formula it replaced.

Research Question Three Answered

A response to Research Question Three required the testing of hypotheses seven through nine. For the 2010-2011 school year data were analyzed under two conditions. Horizontal equity calculations were conducted based on actual revenue per student received, then again with the assumption that the SB 287 funding formula was funded at

100% for the year rather than the prorated value of 96.64%. When reviewing data for all school districts, each equity measure showed nominal improvement if full funding were assumed. The federal range ratio improved from 0.814 to 0.799, the coefficient of variation improved from 0.199 to 0.196, and the McLoone Index improved from 0.881 to 0.888. For the non-hold harmless school districts, the impact of full funding on the equity calculations was even less noticeable. The federal range ratio improved from 0.598 to 0.587, the coefficient of variation improved from 0.143 to 0.140, and the McLoone index improved from 0.922 to 0.923. Given the nominal level of differences between prorated funding and assumed full funding in 2010-2011 regardless of equity measure, null hypotheses seven, eight, and nine were not rejected.

While full funding of the SB 287 formula in 2010-2011 would have resulted in nominal improvements in overall horizontal equity, the choice by DESE to prorate all districts equally did not demonstrate an adverse impact on one particular set of districts based on typical equity measures. Had DESE chosen to prorate hold harmless and non-hold harmless districts differently, the equity measures would have most certainly diverged mathematically. Under the SB 380 formula, hold harmless districts were exempt from any further proration once they dropped to their hold harmless level. Data reported by Ogle (2007) indicated that as the SB 380 formula was prorated in the last few years of existence, the gap on equity measures between all districts and non-hold harmless districts grew. Prior to that time the horizontal equity statistics were much more comparative between the groups. Such a trend has not been recognized through 2010-2011 as a result of prorating the SB 287 formula equally for all districts.

Research Question Four Answered

Research Question Four was addressed by testing hypothesis ten. Revenues associated with extra student weightings in the formula calculation were extrapolated during the data analysis phase of the study. Such revenues were calculated by district and assigned a per pupil average. Composite MAP Index scores were also computed for each district. A Pearson correlation coefficient was used to assess the amount of linear relationship between the two variables of weighted revenue per student and Composite MAP Index score on a per district basis. In each year a significant inverse relationship was found between student need driven revenue and Composite MAP Index scores. This relationship was true regardless of considering all districts or just the group all non-hold harmless districts, as higher student need driven revenues for a district were related to lower Composite MAP Index scores.

For the group of all districts, the Pearson values ranged from -0.315 to -0.348 with all years significant at $p<.01$. For the group of non-hold harmless districts, the Pearson values ranged from -0.452 to -.486 with all years significant at $p<.01$. This data indicates a significant relationship in all cases between additional revenue generated by student characteristics and the outcome measure of Composite MAP Index and, as a result, hypothesis ten was rejected. The findings would indicate the SB 287 formula is directing more revenue to districts with students of higher needs based on criteria such as free and reduced lunch eligibility, special education status, or English Language Learner status.

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Discussion

The allocation of state funding resources to public schools in Missouri is accomplished through the foundation formula established in SB 287. Enactment of such policy measures warrant questions of equity and fairness. This study served as a progress report on equity as has been previously defined in Missouri school funding. In addition, the intention of additional funding based on student needs to support student outcomes was evaluated.

When considering all districts in the state, the SB 287 funding formula has not improved horizontal equity over the SB 380 formula it replaced, based on the measurements of the federal range ratio or coefficient of variation. Values on these measures far exceeded the target thresholds established in the literature (Berne & Stiefel, 1984; Odden & Picus, 2008). The McLoone Index, which considers the lower half of districts in the funding distribution, showed only marginal improvement and also failed to reach target thresholds. For each horizontal equity variable, the data trend during the three years analyzed in this study did not indicate improvement over time as the SB 287 was being phased-in each year. The SB 287 funding formula was not achieving the broad goal of providing equitable funding to all students.

A possible explanation to the lack of overall equity improvement was generated through investigation of the second research question regarding the impact of the hold harmless provision in SB 287. Ogle (2007) identified the hold harmless provision in the SB 380 formula as an impediment to overall equity. The results of this study would indicate the hold harmless provision in the subsequent SB 287 formula has also impacted horizontal equity in a negative fashion. Toutkoushian and Michael (2008) referred to a

hold harmless accommodation as an overlay provision driven by political necessity rather than equity goals. Policy makers commonly make political accommodations as they determine the allocation of scarce resources (Bolman & Deal, 2003).

By analyzing data for the subset of non-hold harmless districts and comparing to the group of all districts, it was apparent that the SB 287 formula is making progress on horizontal equity measures for non-hold harmless districts. For this group of districts, federal range ratio, coefficient of variation, and McLoone Index values all showed marked improvement over the values reported by Ogle (2007) under the SB 380 formula. In fact, the McLoone Index values for non-hold harmless districts were close to the target value of 0.95 (Odden & Picus, 2008). The SB 287 formula has been relatively effective in leveling up the lower half of the revenue distribution. The remaining differences in revenue among such districts were likely associated with local property tax rate choices and the Dollar Value Modifier adjustment in the formula based on regional wage rates.

In total, non-hold harmless districts have seen an improvement in horizontal equity under the SB 287 formula. The horizontal equity measures for the non-hold harmless districts in this study were similar to those predicted by Welker (2006) for all districts in his analysis of the SB 287 formula that assumed full funding in the first year with no changes in other revenue sources. However, since the SB 287 formula does not include an offset for increasing local property values, many hold harmless and other high revenue formula districts have seen significant increases in total revenues due to changes in local property tax receipts. The Dollar Value Modifier also tends to favor high wealth districts, making it difficult to improve horizontal equity measures among the group of all districts. By using the State Adequacy Target approach to fund schools, districts in the

lower end of the revenue distribution are brought up to a certain level, while some districts above the target continue to receive significantly higher amounts of total revenue. This characteristic of the SB 287 formula mitigates the opportunity to achieve horizontal equity among all districts.

Beginning in 2009-2010, DESE began prorating the distribution of formula funds due to insufficient appropriations to fully fund the SB 287 formula. By 2010-2011, the proration level was at 96.64% of the calculated payment. Research Question Three addressed DESE's choice to prorate the formula equally among all districts, given that no proration method was established in law. This study determined horizontal equity was not impacted by the choice to equally prorate all districts. Ogle (2007) reported that under the SB 380 formula, horizontal equity measures got worse during the years the formula was underfunded. Under SB 380, hold harmless districts were not prorated any further after they dropped to their hold harmless level, as a result the remaining formula districts absorbed the remaining shortfall. The approach of prorating all districts equally on the SB 287 formula in 2010-2011 indicated no impact to horizontal equity measures.

Finally, Research Question Four evaluated the goal of directing more financial resources to districts with high need students in relation to academic outcomes. This concept of vertical equity implies that some students require more resources to achieve a desired performance level (Berne & Stiefel, 1984). Correlations in this study indicated that higher student need driven revenues were significantly associated with lower student achievement scores as measured by the Composite MAP Index. This would imply that the SB 287 formula is sending additional resources to districts with higher student needs as demonstrated by lower academic performance. The study did not address the

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appropriateness of the amount of student need driven funds or the effectiveness of their use by districts.

These results, taken in total, would indicate that the goal of fiscal neutrality (Odden & Picus, 2008) remained unmet through five years of implementation of SB 287. Local property wealth still has a major impact on the availability of resources to students in a particular district. When considering all districts, the equal treatment of equals concept of horizontal equity (Berne & Stiefel, 1984) has not yet been accomplished through SB 287 in Missouri. Some progress has been made on horizontal equity when considering only non-hold harmless districts. However, the overlay provision (Toutkoushian & Michael, 2008) of hold harmless status continued to pose a challenge to achieving horizontal equity. The SB 287 formula has shown promise of addressing vertical equity demands through justifiable unequal treatment of unequals (Berne & Stiefel, 1984), demonstrated by additional revenues being directed to districts with lower student outcome measures.

Implications for Practice

This research yields some noted implications for practice. The hold harmless provision within the SB 287 formula limits the ability to achieve horizontal equity for resource allocation among students within the state. While such a provision may be necessary for political reasons, the equity impact is substantial. Policy makers should consider phasing-out this provision gradually over time, thus allowing the formula to distribute more funds based on equity and adequacy. A gradual phase-out during a period of time when total resources for hold harmless districts are increasing would be the most practical way to implement such a change. The recommendation to phase-out

the hold harmless provision was made by Ogle (2007) in regards to the SB 380 formula and remains valid under the SB 287 formula.

Further complicating equity under the SB 287 formula are the special provisions for school districts with an average daily attendance of 350 students or less. Such districts divide $15 million annually through the Small Schools Grant in addition to their regular formula allocation. Small school districts are also held harmless based on their total funding under the previous formula, rather than on the per pupil basis used for other districts. As a result, many small districts receive the same formula funds each year despite declining enrollments. Together these provisions have certainly stabilized or enhanced funding of small districts. On the other hand, such provisions have limited the need for consolidation discussions even when they might be appropriate in certain circumstances. Overlay provisions (Toutkoushian & Michael, 2008) such as these are often necessary in the political realm of funding formula development, but generally impact horizontal equity in a negative fashion. This reality should be considered by policy makers as they continue to explore ways to efficiently and effectively implement educational programming.

At the other end of the spectrum, the SB 287 formula does not account for the increases in local property tax revenues experienced by many districts since the local effort baseline was established using 2004-2005 data. High revenue districts have generally continued to see larger percentage gains in local effort than many of their low revenue peers, offsetting many of the gains the SB 287 formula generated to bring low revenue districts up to the adequacy target. While the SB 287 formula has been effective at bringing up revenues in the bottom half of the distribution, nothing in the formula

provides an offset for significant revenue growth in the high revenue districts. An adjustment in the local effort calculation, at least on a per pupil basis, may be necessary for horizontal equity goals to be met in addition to adequacy goals. The technical implementation of this adjustment would be straightforward.

DESE's choice to prorate all districts equally appears to have had minimal impact on equity values. Given the negative impact on equity of prorating only formula districts under the SB 380 formula as quantified by Ogle (2007), revisions to the SB 287 formula legislation regarding proration methodology to reflect this proration approach is justified. If hold harmless provisions are phased out over time as described previously, the need to modify the proration methodology would be minimized.

On a more global level, the dependence on local property tax revenue to fund schools in Missouri continues to be a challenge to equity. So long as dramatic differences in assessed value per student exist among districts in the state, and so long as the local property tax base provides more resources to schools than state sources, it will be difficult to achieve true horizontal equity. Future formula revisions should consider the balance between state and local funding streams. A transfer of some additional responsibility from local effort to state effort will almost certainly be necessary if the goal is to equalize resource allocation to a greater extent. A change of this sort will admittedly be difficult in the political process.

Suggestions for Future Research

Analyzing the data for this study generated several potential areas for further research. First, the vertical equity aspect of the SB 287 formula needs further analysis. This study simply attempted to determine if more funds were available to districts with

students of higher need as demonstrated by student achievement outcome measures. Further research is needed to determine if the additional funds are sufficient or not, based on appropriate allocation criteria, or utilized effectively at the local district level to impact learning for students struggling to reach performance standards. The SB 287 formula removed several categorical funds for supporting high need students and allowed greater flexibility for use of state funds at the local district level. A review of the effectiveness of this approach is warranted.

A second area needing further research is the method of prorating funds chosen by DESE and the related impact on equity when appropriations do not provide adequate resources. For 2012-2013 and 2013-2014 the State Adequacy Target was scheduled to increase dramatically per the calculation provisions in state statute. With limited guidance in law, DESE has elected to hold the State Adequacy Target at the 2011-2012 level until fully funded. A formal review of the impact of different choices in proration approaches might benefit policy makers who might address this issue in the future.

Given that the State Adequacy Target was scheduled to increase dramatically beginning in 2012-2013, additional analysis is warranted to determine what level of equity would be achieved if the formula were funded to meet the new higher levels. Also of interest would be an analysis of how many districts hold harmless at the current State Adequacy Target would become formula districts at the new higher levels. The overall cost of the formula increases significantly with the higher State Adequacy Target, which may ultimately impact the sustainability of the current formula.

Finally, the balance between state and local funding in Missouri needs to be reviewed in context with other states to determine if a different formula approach is

needed to improve overall equity. A comprehensive review on the impact of local property values and tax rates on horizontal equity would assist in making such a determination. So long as wide disparities in local wealth per student are not mitigated in a more direct fashion through the formula, horizontal equity will be difficult to achieve. An exploration of possible methods to account for these continued disparities would assist policy makers in future debates on the proper mechanisms to allocate resources.

Summary

The purpose of this study was to compare horizontal equity measures in Missouri between the funding formula created in 2005 under SB 287 and the formula created in 1993 under SB 380. In addition, vertical equity funding components were correlated with student achievement measures to determine if the intended goal of providing additional resources to high need students was being met. School funding formulas represent policy decisions on how resources should be distributed to various school districts throughout the state. The creation of such formula remedies has often come with political compromises through the legislative process. The researcher in the current study replicated the general structure of a study by Ogle (2007) to provide comparisons between the current formula and the previous formula on horizontal equity measures, with an additional element added related to vertical equity. The researcher sought to enhance the overall understanding on the impact of the SB 287 formula on the distribution of resources to school districts in Missouri through the first five years of implementation.

When considering all districts across the state, the SB 287 formula has generated little improvement in measures of horizontal equity. Given the stated adequacy goal of

the SB 287 formula versus a pure equity approach, this finding was not completely surprising. The hold harmless provision of the SB 287 formula has impacted horizontal equity in a negative fashion, even more so than under the SB 380 formula it replaced. On a more positive note, among non-hold harmless districts equity has improved under the SB 287 formula. While standard equity targets have yet to be reached for non-hold harmless districts, the values for the federal range ratio, coefficient of variation, and McLoone Index showed marked improvement from the SB 380 formula as reported by Ogle (2007). Furthermore, the vertical equity component of the SB 287 does appear to send a significant amount of additional revenue to districts with high need students in relation to student outcome measures. More research is needed to determine if these funds are adequate, appropriately based, or utilized effectively.

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VITA

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Kari received a Masters in Education from the University of Central Missouri in 2000, with an emphasis on Secondary School Administration. He added an Education Specialist degree from the University of Central Missouri in 2001, with an emphasis on School District Administration. Kari accepted a position with the Warrensburg R-VI School District as Assistant Superintendent in 2003, where he served for five years. Since 2008 he has been the Chief Financial Officer for the Wentzville R-IV School District in Wentzville, Missouri. Kari received his Education Doctorate in Educational Leadership and Policy Analysis from the University of Missouri-Columbia in 2012. He has been married to his wife, Laura, for 11 years, and he has one stepson, Christopher, and one step-grandson, Jaxon.