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An Analysis of Intradistrict Funding Equity in Rural and Urban School Districts

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By

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ABSTRACT

After a long process of judicial action, states have revised the education funding distribution systems to meet the legal requirement of providing both horizontal and vertical funding equity between districts (interdistrict) in the state. A major part of the judicially required reforms was a shift to weighted student funding or funding which provides differential amounts of education funding dependent on the estimated needs of students based on their individual characteristics. However, little research has been done to examine the equity of the funding distribution systems between schools within districts (intradistrict).

Intradistrict funding inequities are likely to persist in districts today for numerous reasons. Primary among these is the ubiquitous use of step and lane salary schedules in US public schools and the historical use of full-time equivalency systems to assign faculty positions to schools. Under full-time equivalency systems, school districts assigned teaching positions to schools based on the number of students enrolled and then estimated the amount of funding per school based on the average cost for employing a teacher. The full-time equivalency system ignored both differences in the salaries of the teachers assigned to the schools and the characteristics of the students enrolled in the schools. Often under this method, schools with the least needy students ended up with the highest paid teachers as experienced and more expensive teachers tend to opt out of these schools. This was especially true in New York City (Lankford, Loeb, and Wychoff, 2002). Thus categorical funds provided by the state to fund additional services for students with exceptional needs ended up being spent on student without special needs while schools with high number of exceptional needs students actually had lower than average per pupil expenditures.

While concerns over these types of unintended funding transfers have a great influence on intradistrict funding equity and have existed for many years, only recently has school-level spending data become available. With this improved spending data, this analysis will evaluate the level of funding inequities which exists within rural districts in Arkansas and also within a large urban district specifically New York City. Further, these differences have a great influence on intradistrict funding equity.

This dissertation is approved for recommendation
to the Graduate Council.

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DEDICATION

This dissertation is dedicated to the memory of my mother Judy Woodworth. Throughout my life, my mother always pushed me to be the best I could be. She taught me drive, determination, and a strong work ethic. I am sorry she did not live long enough to see my latest goal accomplished as she always wanted me to be a doctor. While this is not the kind of doctor she meant, I know she would have been proud.

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CHAPTER ONE: INTRODUCTION

Since the 1970's, there have been lawsuits filed in 45 states over education funding. These lawsuits have questioned the equity or adequacy of state funding schemas based on shortcomings in the states' methods of disbursing education funds and on the schooling outcomes for children in various types of districts. The earliest court cases (Serrano v. Priest, 1971) focused on equity of educational inputs. In more recent cases, the complaints have turned towards adequacy of educational inputs (Lake View v. Huckabee, 2002). In response to and sometimes in anticipation of these lawsuits, state legislatures have revised state funding systems to address issues of both horizontal and vertical equity as well as basic adequacy. Overall, in the last 40 years or so, there has been a great deal of activity aimed at enhancing the equity and adequacy of funding to school *districts* in states across the nation. For example, Arkansas has reduced the funding gap between rich and poor districts down to $158 (Liu, 2006). However, students are educated in school buildings and not district offices and it is not at all clear how funds are distributed to schools within districts. Over the past decade or so, some school finance scholars have begun to examine equity of school funding within districts. Indeed, there is a growing body of literature which indicates within district distributional practices may be not only nullifying the equity benefits and but also hiding between-school inequities which are larger than the between-district inequities which the courts have already found rose to the level of unconstitutionality (Roza & Hill, 2004; Miller, 2009).

The study of intradistrict equity has been greatly hampered by a lack of data. Researchers have had no way of tracking school-level expenditures. This is one reason why equity lawsuits have not progressed from *interdistrict* equity to *intradistrict* equity. With recent improvements of state data systems and reporting requirements, there is no legitimate reason this data should not be available. As a first step, the American Recovery and Reinvestment Act (ARRA) requires

districts receiving Title I funds to report school-level expenditures from local and state funds. This data set, Study of School-Level Expenditure (SSLE) Data, 2008-09, is used in this analysis. Every state legislature should require school-level funding and expenditure data be made available to researchers and the public.

As researchers have not been able to have accurate measures of school-level funding and expenditures, it is impossible to know with certainty if school-level funding is equitable or adequate. It has be hypothesized (Roza and Hill, 2004; Iatarola and Stiefel, 2003) that district-level distribution policies are providing inequitable levels of funding to students based on the school they attend (i.e. based on where they reside). This could violate the court defined definitions of constitutional education funding.

This discussion of intradistrict equity will begin by defining the various aspects of equity and adequacy. It will also discuss funding schema, both the most commonly used method, full-time equivalency (FTE) funding, and an alternative method, weighted student funding (WSF). After a review of the previous research on measuring intradistrict equity, there will be a definition of the data and research methods and discussion of the implications of these findings.

A. EQUITY

School finance scholars are concerned with three types of equity: horizontal equity, vertical equity, and fiscal neutrality.

Horizontal equity.

Horizontal equity is defined as equal treatment among equals. Thus, the funding system has achieved horizontal equity if general education students from one location to the next receive the same level of funding. This concept of equity was reflected in the outcome of Serrano v. Priest where the funding plan produced by the California Legislature brought per-pupil spending

in 93% of California schools to within $100 of each other (National Education Access Network, n.d.).

In most state funding systems, horizontal equity is represented by the base per pupil funding amount. The base or foundation funding amount in a state funding formula represents the average cost to educate the average student in an average school in a state. Under most formulas, this is the amount which every district receives for each student enrolled in that district. If districts in different parts of the state are receiving equal per pupil funding, horizontal equity can be said to have been achieved.

Vertical equity.

Horizontal equity is a simple and obvious concept, but many believe that it falls short of true equality when applied to educational opportunity. More important in educational funding is the concept of vertical equity, which implies that unequal treatment should be given to those with unequal needs. Rodriguez (2004) stated in order for vertical equity to exist, systems should direct greater resources towards students with greater needs.

The New Jersey Supreme Court upheld the concept of vertical equity in *Abbott v Burke* (1994) when it required the legislature to provide additional funding to 31 urban school districts serving economically disadvantaged students. The court ordered the additional resources because it found the state's funding system failed to meet the state's legal requirement to "provide to all children in New Jersey, regardless of socioeconomic status or geographic location, the educational opportunity which will prepare them to function politically, economically and socially in a democratic society." (Abbott v. Burke, 1985). As part of its opinion, the Abbott court cited the previous opinion of Robinson v Cahill (1976) in which the court stated, "The

configuration of educational services 'that will produce a sufficiently fine educational opportunity in one district, will inevitably be different from that required in others'." (p. 9)

The additional funds ordered by the New Jersey Supreme Court were thus meant to supplement the basic per pupil funding New Jersey was already providing to every district. In effect, the court revealed its concern that vertical equity had not been achieved because the foundation funding was not sufficient to meet the exceptional needs of the students in the Abbott districts. Like New Jersey's approach to the Abbott case, the approach in most states has been to provide additional resources to specific districts to address vertical equity concerns. Berne and Stiefel found "School finance legislation in the states has addressed vertical equity by weighting students according to needs or costs (37 states in 1993-94), by funding special needs programs categorically, or both." (1999, p 21). Unequal funding of students with unequal circumstances has become the common approach to achieving vertical equity.

Unequal funding to achieve vertical equity had typically taken one of two forms: weights or categorical block funding. Some states add increased weights or multipliers to the foundation funding for students in a specific demographic category such as low SES or special education. In other states, the funding formula requires additional dollar amounts be added to the districts' disbursements based on the number of students in each demographic category. In practice, the two methods have the same effect. Both methods lead to districts receiving additional funding based on the exceptional needs of its non-average students to ensure the principle of differently situated students receiving differentiated funding to ensure equity (Berne & Stiefel, 1999).

The major issue with these methods of providing vertical equity is determining the appropriate weight to assign to each category of student. As education in America is a function of the states and the right to an education is established by each state's constitution, there are 50

different student funding weighting systems (or 51 if we consider Washington DC schools). The debate of appropriate weights for each category of extraordinary needs is beyond the scope of this study. It is enough for the purposes of this study simply to establish that most states have set weights which are distributed in a consistent manner to the districts within that state.

Fiscal neutrality.

The final type of equity which has commonly been defined in discussions of public school funding is fiscal neutrality. Fiscal neutrality can be thought of as equal opportunities for all students. The concept of fiscal neutrality focuses on "freeing the tie between level of expenditures and district property wealth." (Thro, 1994). While the concept of fiscal neutrality can apply to equality of inputs or outcomes, it is far more powerful when applied to educational outcomes. When applied to educational outcomes, fiscal neutrality requires an educational experience which provides equal life opportunities to all students regardless of their background or origin (Ladd, 2008). Under Ladd's concept, fiscal neutrality becomes closely tied to the concept of adequacy as well as that of equity.

B. ADEQUACY

Many state level funding decisions have of late been concerned with not just the three types of equity, but also with adequacy. Adequacy is a critical concept in education funding. Like both horizontal and vertical equity, the concept of adequacy can be applied to either inputs or outcomes. Ladd (2008) points out that without including adequacy, equity may be meaningless. If states provided equal but inadequate funding to districts, students would not have received the level of education they needed as everyone would have been equally underfunded. Therefore, it is contingent that any discussion of equality must first include a requirement of adequacy.

When discussing inputs, adequacy can be defined as providing a minimum threshold of resources required to meet the state's constitutional education mandate. Some proponents of adequacy merely focus on meeting the determined minimum and show little concern for inequality once the minimums have been met. However, adequacy of outputs subsumes fiscal neutrality and requires equal outcomes as a foundation of an adequate education (Satz, 2008). Under this definition just providing a minimum amount of money or even a minimum level of education does not necessarily denote an adequate education.

While the above definitions of equity and adequacy give just a brief overview of the concepts, it is enough for this study to note that the definitions used by each state are currently passing legal muster in their jurisdictions and are applied uniformly to all districts within the state. The purpose of this study is to examine the difference of the application of these policies at the school level. Thus it will not delve further into the appropriateness on all 50 state policies, but will instead discuss equality and adequacy as they exist within the individual states and districts.

The results of the litigation driven revision processes have led most states to employ a funding system which disburses funds to the district based on a foundation funding amount for each student enrolled in the district. The foundation amount is then supplemented by additional funding for students with exceptional needs. The foundation amount the district receives per student is a function of education policies and politics in each state and thus varies from state to state and is influence by the individual court rulings for that state. In some states, districts also receive funding based on district characteristics such as declining or growing enrollment; however, legislatures base the majority of non-foundation funding on individual student

demographic characteristics such as low SES, English language learner status, gifted and talented status, or alternative learning environment status.

C. DISBURSEMENT PROCEEDURES

Full time equivalency funding.

Most states disburse education funds from the state to the districts which then disburse the funds to schools. Districts disburse funds to schools primarily based on teacher positions referred to as full-time equivalences (FTE). Because the districts use average teacher salaries to compute the value of the FTEs, it is not only possible but likely that schools with equivalent FTEs will not have equivalent spending on teacher salaries and benefits. This is because more experienced and thereby higher paid teachers tend to migrate to schools with wealthier, easier to educate students (Warner-King & Smith-Casem, 2005; Clotfelter, Ladd, & Vigdor, 2006). Hanushek, Kain, O'Brien & Rivken (2005) found that minority students are more likely to be taught by novice teachers. Hanuskek et al. also find that students of novice teachers also have growth which is .12 - .16 standard deviations lower than students taught by non-novice teachers. Because of these characteristics, FTE funding breaks the link between categorical funding from the state and the students for whom that funding is provided. Without requirements that districts pass through to schools categorical funding received from the state specifically to provide additional services to students with higher needs, there is no way to ensure those needs are being met.

Roza and Hill (2004) find repeatedly in multiple states that schools in wealthier neighborhoods typically receive far more applications for jobs than schools in poor neighborhoods. This is critical because as Roza and Hill state, "Our research shows that schools with the most applicants employ higher-salaried teachers. Those with much smaller applicant pools have fewer hiring choices and end up with lower-salaried teachers." (p 206). Thus, by using FTE funding, districts are likely transferring categorical funds from schools serving more

exceptional needs students for whom the categorical funds were intended to schools serving wealthier students who do not qualify for those funds. Given that teacher salaries and benefits consume a significant, in some districts in excess of 80%, of the district's budget, it is critical the funds for teachers be distributed in a manner which exhibits vertical equity.

Even funds from federal sources can be affected by the use of FTE teacher assignment policies. Originally, federal policies such as the Elementary and Secondary Education Act's (ESEA) Title I provisions which were designed to support low SES students required districts to distribute money equitably before distributing federal funds. High poverty schools were supposed to get at least an equal share of local and state funds and then supplement that funding with federal dollars. The concept of supplementing rather than supplanting is referred to as comparability.

The comparability and non-supplanting provisions within ESEA were amended in the 1980s to allow districts to use average teacher salaries in computing disbursements. According to the US Department of Education (USDOE), "current Title I statute specifically prohibits them [districts] from taking into account the higher salaries paid to more experienced teachers." (USDOE, 2011). This policy likely creates significant reallocations of even Title I funds from poor students to rich students (Roza & Hill, 2004). The USDOE acknowledged this problem in a recent policy brief on funding by stating that when comparability is defined in terms of services rather than actual expenditures there is likely a strong downward bias on spending in schools with high numbers of low SES students (USDOE, 2011).

Weighted student funding.

One proposed solution to the potential misappropriation of categorical funds would be to shift school-level funding from the widely-used FTE funding method to weighted student

funding (WSF). Under WSF, districts would disburse monies to schools in a manner similar to that used by states to disburse monies to districts. In WSF, the district would provide to each school a foundation dollar amount from state and local sources for each student enrolled in that school (Ouchi, 2009). The foundation amount would be equal to the average amount considered adequate to educate the average student in the average school to the constitutionally required level. This would achieve horizontal equity. Districts would then provide schools with additional funding from local, state, and federal sources. The additional funding would be the amount necessary to provide the constitutionally required level of education to students with extraordinary needs. This would achieve vertical adequacy, fiscal neutrality, and adequacy.

Using WSF would ensure a positive correlation between the percentage of exceptional needs students in a district which attend a school and the percentage of the districts funds which the school receives (Carr et al., 2007; Hill, 2009). Further, faculty salaries, which are not only the largest single budget item in most schools but also the cause of the majority of the distribution inequality, would be constrained by the actual distribution of funds rather than the distribution of teaching positions (Ladd, 2008; Roza, 2010).

It is possible the combination of fiscal distribution systems and teacher sorting characteristics lead to intradistrict funding inequities. To determine the extent to which these inequities impact students, this study will use statistical analyses to evaluate the newly available funding data. The analyses will include comparing the average differences in expenditures between students grouped by the percentage of FRL eligible students, and ELL eligible students in New York City, to determine if these characteristics result in inequitable distribution of funds to schools. In addition to looking at simple differences in spending, the study will use spending indices to allow the evaluation of expenditures based on expected funding in a student weighted

system. Finally, multiple regression will be used to determine if any deviations in expenditure identified by the previously mentioned analyses are systematic in nature. These analyses will be able to establish if in fact there are systematic differences in funding distributions from the district to the school-level.

CHAPTER TWO: PREVIOUS RESEARCH INTRADISTRICT EQUITY

A. RESEARCH METHODS

This chapter will review previous research on school funding and the measurement of intradistrict equity. The purpose of this review is to gain an understanding of:

1. the concepts of equity including horizontal equity, vertical equity, and fiscal neutrality
2. the development of current funding practices
3. if the current practices lead to equitable educational opportunities for all students.

The method used to identify related research involved the performing of keyword searches using EBSCO, ERIC, and ProQuest. The process also included a review of research done by the National Bureau of Economic Research (NBER), Rand, and Mathematica Policy Research. Finally, hand searches of *Journal of Education Finance* for the last 10 years and *Education Finance and Policy* since its inception in 2006 were conducted.

In the studies reviewed which included empirical analyses; the researchers applied three primary techniques to quantify the extent to which FTE funding diverted supplemental funds from exceptional needs children to typical students and the extent to which WSF performed differently from FTE funding. The first step of this literature review will focus on these methods and then discuss the study results.

One method used to study intradistrict funding equity was a comparison of average per pupil spending conducted for the USDOE (Heuer & Stullich, 2011). In that study, Heuer and Stullich compared average per pupil expenditures based on school-level personnel cost and school-level personnel costs plus non-personnel costs. The Heuer and Stullich used an array of comparisons which included comparing average per pupil expenditures for Title I eligible schools to average per pupil expenditures for non-Title I schools within the same district. These

comparisons were made using both an aggregate of all Title I schools as well as comparing per pupil expenditure for each Title I school individually to the average of non-Title I schools. One critical element of this analysis was that the data on which it was based did not include any federal funds. This allowed Heuer and Stullich to focus specifically the state and local contributions only thus removing concerns about supplantation of state and local funds by federal funds.

A second method used to study intradistrict funding equity consisted of using multiple regression techniques to compute weights for categorical student characteristics (Iatarola & Stiefel, 2003; Ajwad, 2006; Roza, Guin, & Davis, 2007; Arbuckle, 2011). Under this method of analysis, the researchers compared the average expenditures for students with various characteristics to determine implicit weights for said characteristics. By running regressions with various average measures of resources, usually school-level per pupil funding, as the dependent variable and various categorical student characteristics as independent variables, the researchers were able to compute the implied weights that each district assigned to the student characteristics. The interpretation of these analyses was such that the coefficient on the independent variable represented the weight which the district placed on the characteristic. By comparing these weights, the researchers determined both the amount of funding the district provided for each characteristic as well as the relative importance of the characteristic in disbursing resources from the district to the schools.

A third method of analysis was the use of a student-weighted index (SWI) to compare the equity of the intradistrict distribution of funds (Roza & Hill, 2004; Miles & Roza, 2006; Carr et al., 2007). Miles and Roza define their SWI as, "the ratio between two dollar amounts: the actual expenditures at a given school and the expected expenditures, which are computed using district-

weighted average expenditures for each type of student." (p. 48). The computation of the two components of the SWI will vary depending on the funding formula for each jurisdiction.

Because of the variety of funding systems and weighting schema which accompany them, the composition of the SWI will vary from state to state; however, because it is a ratio measure, the SWI can be used for cross-state comparisons. This gives the SWI a definite advantage over the regression method which will produce different measures of equity based on the state chosen for the analysis as each state has a different weight for each categorical need. Likewise, the SWI is superior to USDOE method of simply comparing the average per pupil spending between groups as comparison of averages does not provide any information as to what differences between groups should be expected.

B. RESULTS OF PREVIOUS RESEARCH

Regardless of the method being used, previous research has found that some districts distributed resources to schools in an inequitable manner. Roza and Hill; Miles and Roza; Iatarola and Stiefel; Roza, Guin, and Davis; Carr et al.; Arbuckle; and Heuer and Stullich all agreed that districts consistently provided unequal resources to schools with higher percentages of exceptional needs students. Carr et al. went so far as to state, "equity created by the state [Ohio] funding formula is contravened by severe inequity in how districts then allocate resources to their individual schools." (p. 49-50).

Heuer and Stullich (2011) found that nation-wide, 43% of all Title I schools had per pupil personnel expenditures more than 4% below the average per pupil personnel expenditures when comparing each Title I school to the average of all non-Title I schools in the district. Additionally, when comparing average per pupil personnel expenditures for all Title I schools within a district to the average of all non-Title I schools within the same district, in 57% of all

districts the Title I schools received more than 4% less (45% more than 10% less) than the non-Title I schools. This would indicate that the majority of districts in America are not meeting the comparability and non-supplanting requirements of ESEA. Further, these findings represent a systematic bias in educational funding against low SES students. Heuer and Stullich found these results even though most state funding formulae provide additional funding for low SES students. Heuer and Stullich's data suggest a large portion of the bias is being driven by teacher salaries.

In their regression analyses to measure vertical equity, Iatarola and Stiefel (2003) conducted a series of regressions on New York state data using percent of students eligible for free or reduced lunch (FRL), limited English proficiency (LEP), percent immigrant status (IMM), percent highly mobile (MOB), and percent special education (SE) as independent variables. The results of the New York state regressions can be seen in Table 1.

Table 1:

Iatarola and Stiefel Regression Results: New York State Elementary Schools (pupil weighted)

Dependent Variable	Operating funds per GE student: direct service	All funds per GE student direct service	Pupil/teacher ratio (%)	Teacher salary	Percent certified (%)
	1	2	3	4	5
Intercept	5219.64	4867.18	21.23	48928.31	102.26
	(59.19)*	(32.69)*	(83.16)*	(87.83)*	(70.84)*
%FRL	-8.18	2.81	-0.03	-73.89	-0.21
	(6.88)*	(1.59)	(9.18)*	(11.20)*	(12.59)*
%LEP	4.95	14.30	-0.04	-15.27	-0.37
	(2.26)	(4.41)*	(6.74)*	(1.26)	(11.78)*
%IMM	-19.83	-20.37	0.05	149.42	0.94
	(4.42)*	(2.92)*	(4.22)*	(5.72)*	(13.92)*
%MOB	24.61	16.37	-0.03	-98.36	-0.11
	(3.30)*	(1.47)	(1.55)	(2.37)*	(1.00)
%SE		167.15	-0.21	-30.70	0.04
		(29.11)*	(21.61)*	(1.43)	(0.76)
R^2	.09	.62	.57	.31	.50

* Significant at the 5% or lower level.
(absolute value of t in parentheses)

In column 1, which represents funds meant to be provided equitably to all students, there are significant and negative coefficients for FRL students, and IMM students. This would indicate that before any supplemental funds are applied, there is a negative bias in spending for these students. These biases are somewhat offset by supplemental funds as shown in column 2; however, this would indicate that the supplemental funds are supplanting local funds instead of supplementing them. Further, even with the supplemental funds, spending on FRL students is not significantly higher than spending on non-exceptional needs students. The study had an N of 658 schools and should thereby have sufficient power to provide a reliable measure of funding disparity. The large t value for FRL in column 4, teacher salaries, suggests that much of the discrepancy was in fact being driven by differences in teacher salaries between schools serving low SES students and schools serving higher SES students. This is also reinforced by column 5 which shows FRL and LEP students were more likely to be taught by uncertified teachers than general population students.

The other studies reviewed found similar results which strengthened the argument that district policies systematically redirected resources from exceptional needs students for whom they were intended to general students who did not qualify for such support.

The one exception to these findings was Ajwad (2006) who characterizes his findings of higher spending in neighborhoods with lower family incomes and higher percentages of minority students, especially black students, as evidence of proper intradistrict disbursement practices. It should be noted however that the magnitude of the biases found by Ajwad were very small "with a one-standard change in any neighborhood characteristic variable never leading to more than a $75 change in total spending per pupil" (p. 563). Further, Ajwad's data included federal funding for Title I and special education spending both of which should have resulted in much larger

changes than the $75 changes found. The small magnitude of Ajwad's findings supports an argument that federal dollars were used to supplant local dollars rather than supplement them as intended. Thus, one might argue that Ajwad's conclusions were perfectly in line with those of most other researchers.

The many funding equity lawsuits and legislative changes which have resulted show that America has had a legacy of interdistrict inequities in student funding due to historical fiscal distribution policies. One of the major shortcomings of these failed distribution policies was failing to account for vertical equity by providing differential funding for students with different needs. While these problems have been eliminated at the interdistrict level, the distributional policies used to manage intradistrict funding practices are still lacking in proper support for horizontal equity.

The studies to date on intradistrict funding have been based primarily on district average funding data as school level data has been difficult to obtain. Even using data aggregated at the district level has suggested that school-level funding has not been differentiated enough to provide true equity for students with exceptional needs. This analysis will rely on newly available school-level expenditure data to provide a more accurate measure of intradistrict funding practices. By using predicted funding levels based on student weighted funding distribution methods, this study is able to determine not only differences in amounts of salary funding which schools receive but also is able to compare these funding levels to the funding which the schools are supposed to receive based on the estimated needs of the students attending those school. Thereby, unlike those studies before it which simply detected differences in funding, this study will determine not only if funding within districts is unequal, but also if those

inequalities are systematic in such a way as to enhance or deter educational equity for all students.

While this study could have featured several different states, it focuses specifically on Arkansas and New York City. This choice was made because both locations have had a history of funding inequities: *Lake View vs Huckabee* in Arkansas and historic inequities which led to Fair Student Funding in New York. Additionally, between the two a majority of funding settings in the country are represented. Arkansas is typical of the many rural areas across the country, and New York City is the paragon of urban life.

CHAPTER THREE: METHODS

The purpose of this study is to determine if districts are distributing funds in a manner that promotes vertical and horizontal equity as well as fiscal neutrality. In order to evaluate the level of funding equity within districts, the analyses for this study focus around three primary questions:

1) To what extent do *salary* expenditures vary between schools within districts?
2) Given that high poverty students bring additional funds into districts, do the schools that serve larger numbers of high-poverty students have relatively higher levels of *salary* spending per student?
3) Finally, to what extent do schools receive *salary* expenditure per pupil consistent with what would be expected based on the number of students in the relevant categories that qualify for additional categorical funding (FRL and ELL) under funding systems which weight school funding by student characteristics?

The analyses for these questions rely greatly on the socio-economic distribution and population density of students within each district. This is because under weighted student funding, districts distribute funds to schools in an equitable manner based on the characteristics of the students. Most districts in America are suburban or rural and have schools which serve multiple neighborhoods. This means that students in a particular school come from a wide variety of socio-economic backgrounds. On the other hand, the majority of students in America attend schools in urban school district. The higher population density in urban districts means that it is not uncommon to have one or more schools serving each neighborhood. Thereby, urban districts tend to be more socio-economically homogenous in their student populations that the suburban and rural counterparts. It is likely that the results of the analyses will be impacted by the differences in socio-economic distribution and population density which exist between urban

districts and other types of districts. For this reason, the study will be conducted in two sections. The first section will examine fiscal distributional equity in rural and suburban districts using data from Arkansas. The second section will focus on the urban environment using data from New York City.

RURAL AND SUBURBAN LOCALES: ARKANSAS DISTRICTS

In this analysis, intradistrict school funding equity for schools in relatively large districts in Arkansas were examined. It is fortunate that school-level funding data from 2008-09 is available and can thus test if perverse incentives related to teacher assignment result in more education resources being distributed to schools serving more advantaged students. This analysis focuses on three research questions below which have been specified to relate to the rural and suburban districts of Arkansas.

1) To what extent do *salary* expenditures vary between schools within larger districts in Arkansas?
2) Given that high poverty students bring additional funds into districts, do the schools that serve larger numbers of high-poverty students have relatively high levels of *salary* spending per student?
3) Finally, to what extent do schools receive *salary* funding per pupil commensurate with what would be expected based on the number of students in the relevant categories that qualify for additional categorical funding (FRL) under Arkansas' state funding formula?[1]

[1] Due to the rarity of ELL students in many Arkansas districts and the high correlation between ELL and FRL in Arkansas, it was not possible to evaluate the impact of ELL status on funding in Arkansas.

A. SAMPLE

This analysis employs a comprehensive database (described below) of instructional salaries for all personnel in Arkansas schools for the 2008-09 academic year. The focus of this study is primarily on elementary schools and middle schools as the need to study multiple schools within districts limits the usable data available in Arkansas. Additionally the choice was made to limit the dataset to districts with at least four schools at a given grade level, so that there will be at least some expected variability among them.

Thus, the dataset includes 229 schools (199 elementary, 18 middle, and 12 senior high) in 22 school districts serving nearly 118,000 students across the state.

B. DATA

Actual Expenditure Data.

For this analysis, the primary data source was the USDOE Study of School-Level Expenditure (SSLE) Data, 2008-09. This data set was constructed based on data collected from states under requirements of the American Recovery and Reinvestment Act of 2009 (ARRA). The data set contains data for the 2008-09 school year for all districts that received Title I Part A funds under ARRA. The data set contains: total personnel salaries for all school-level instructional and support staff, salaries for instructional staff, salaries for teachers, and non-personnel expenditures. The SLLE also contains data on student enrollment, percent of FRL eligible students, and percent of minority students.

State officials were asked to report all school-level expenditures from state and local funds only and to exclude expenditures for special education, adult education, school nutrition programs, summer school, preschool, and employee benefits. Due to divergence from the

required specifications and differences in definitions of expenditure categories between states and districts, the data set may not be appropriate for cross-state comparisons. It is, however, suitable for comparisons of schools and districts within the same state.

Predicted Salary Funding.

Predicted salary expenditure information for each school was based on funding formula found in Arkansas code. As a result of *Lake View v. Huckabee,* the state uses a codified funding formula which includes a foundation amount per pupil as well as categorical funding based on student characteristics. In this analysis, the foundation funding is defined as the sum of the per student funding that does not vary based on student characteristics. In 2008-09, the total of foundation funding including enhanced funding and professional development funding was $5,926 per pupil. Categorical funding for English-language learners was $293 dollars for each identified English-language learner. High poverty categorical funding in Arkansas includes three funding levels that depend on the overall fraction of free or reduced lunch (FRL) eligible students served in each district. Districts with FRL rates of: 90% or more received $1,486 dollars for each FRL eligible student, 70% to 90% received $992 dollars, and below 70% received $496.

Table 2 shows the 2008-09 foundation and categorical funding rates for Arkansas school districts.

Table 2

Arkansas Foundation and Categorical Funding Rates, 2008-09

Category	Foundation	Enhanced	PD	ELL	FRL Rate	Funding
Rate	$5,789	$85	$50	$293	90%+	$1,488
					70-90%	$992
					<70%	$496

For this analysis, the estimate of predicted salary expenditures in each school included only student-level funding categories such as high-poverty and English language learner.

Categorical funding for alternative learning environment (ALE) students was also excluded as ALE schools were not included in the intra-district analyses.

In the typical education funding system, operating funds are provided by the state to the districts. The districts then spend part of the funds on district-level operations and spend the remainder on school-level operations. This concept is known as pass-through. Because districts have different pass-through rates and these rates differ within district by school levels (elementary, middle, and high schools), it was necessary to group schools into grade-level clusters within each district (that is, elementary schools in district A, middle schools in district A, and high schools in district A). Therefore, the variability in salary spending (per pupil) among schools in this study was examined within grade-level clusters.

The first step in this process was to compute the percentage of funds received by the district which were then passed on to schools in a given grade-level cluster. To do this, the total amount of actual expenditures on behalf of the schools in each cluster was divided by the total predicted funding for all the schools in the cluster. The percentage of funds passed through to the schools in a cluster is defined as the deflation value. Since not all the funds provided to the district are spent at the school level, it is necessary to "deflate" the predicted formula funding by an appropriate ratio (something between 0 and 1) that will lead to a reasonable estimate of the expenditures that should be expected to occur at the school level of expenditures.

As this study focuses specifically on salary expenditure, the total salary expenditures as reported in the SSLE data for all schools within a grade-level cluster in a district were used to create the deflation index. The deflation value for this analysis was computed by dividing the sum of the school-level total salary expenditures in a cluster by the sum of the predicted formula

funding in the cluster. The formula below shows how the different funding elements and student enrollment were used to determine the proper predicted salary expenditure for each school.

$$\text{Predicted Salary Expenditure} = \text{Deflation Value}*((\text{Foundation Funding})*N_{\text{Student Enrollment}} + \text{Poverty Funding}*N_{\text{FRL Eligible Students}} + \text{ELL Funding}*N_{\text{ELL Students}})$$

C. ANALYTIC METHODS AND MEARSURES EMPLOYED

Research Question 1.

1) "To what extent do *salary* expenditures vary between schools within larger districts in Arkansas?"

To address the first question, I presented straightforward descriptive statistics summarizing the within-district variation in large districts across the state. Here, I considered intra-district inequities in two distinct ways:

Within each district cluster, I asked whether schools within the same districts were allocated similar levels of salary funds per pupil? To address this question, district averages of the absolute value of the deviation between each school's per pupil salary spending and the districts average were computed. The closer this value was to zero, the more uniform the distribution of funds within the district. Similarly, for each school, a ratio of the school's salary funding per pupil to the same figure for the district was computed. In this case, a value of 1.00 represented a school with salary funding identical to that of the district as a whole. The concept of using this type of index to measure funding equity was borrowed from the work of Roza and others who referred to this ratio as a Student Weighted Index (SWI). However, as this term can be confusing, I instead used the term Funding Equity Index (FEI). The denominator in this first ratio was average district salary spending per student full-time equivalency teaching position. This ratio was referred to as the FEI (nominal) or the FEIN.

Research Questions 2 and 3.

2) Given that high poverty students bring additional funds into districts, do the schools that serve larger numbers of high-poverty students have relatively high levels of *salary* spending per student?
3) Finally, to what extent do schools receive *salary* funding per pupil consistent with what would be expected based on the number of students in the relevant categories that qualify for additional categorical funding (FRL) under Arkansas' state funding formula?

In question one, I evaluate the data using the FEIN which was based on the district average teacher salary. For questions two and three, there was an investigation of the extent to which the spending per pupil deviated from what was predicted by the Arkansas funding formula as defined above. That is, here I "adjusted" for student characteristics by comparing actual expenditures to predicted expenditures based on the composition of the student body and the guidelines of the Arkansas funding law. Again, this consisted of a dollar deviation figure and a ratio. Here the ratio was defined as the Funding Equity Index (adjusted) or the FEIA. The FEIA was based on predicted funding weighted by student characteristics rather than average teacher salary. The FEIA was similar to the indices used by Miles and Roza (2006) and Carr et al. (2007). Specifically, the FEIA was a ratio between the amount actually expended for school-level salaries and the predicted salary expenditures per school. A school whose actual salary expenditures were equal to the predicted salary expenditures would have had a FEIA of 1.00. Schools with actual salary expenditures greater than the predicted salary expenditures would had a FEIA >1 while schools with lower actual expenditures had a FEIA < 1.

In questions two and three, it was important to investigate whether the variability found in the above analysis were associated with variation in student poverty levels. In question 2, it

was enough to simply ask if higher poverty schools receive additional funding relative to lower-poverty schools as might expected given the categorical funding structure used in Arkansas. In question 3, the analysis was modified to further ask whether the high-poverty schools were getting as much as was predicted by the funding formula.

The analyses started with simple descriptive comparisons between schools in the top and bottom poverty quartiles. For each group of schools, the basic analysis was to compute the average deviation from the district mean as well as the average deviation from the expected level of spending. The two student weighted indices (FEIN and FEIA) were computed in a similar manner. If most districts were distributing funds such that the dollars followed the children, it would have been expected that higher poverty schools received funding levels in excess of the district averages but in line with predicted amounts based on the weighted funding formula.

For the descriptive comparisons, the analyses included all schools in Arkansas as well as schools in grade-level clusters with at least four schools. Because much of Arkansas was highly rural, in many districts there was only one school at a given grade-level. This meant that the majority of schools in Arkansas will by default have a FEI of 1. Limiting comparisons to schools in grade-level clusters with at least four schools enabled the removal from the analyses of the effect of districts which had little or no ability to inequitably distribute funds.

Finally, while there may appear to be interesting patterns by looking at the schools in the top and bottom quartile of the poverty distribution, it was thus important to test the extent to which these patterns might be systematic by conducting multiple regression analyses. In these analyses, the FEI indices for each school were estimated as a factor of the poverty rate at each school. In these regressions the school's level of poverty was represented by the percentage of FRL eligible students enrolled in the school (a variable between 0 and 1).

These regressions were conducted at multiple levels: for all schools in the state, only schools in a grade-level cluster with at least four schools, and individual grade-level clusters with at least four schools within a district. Also included were regressions for individual grade-level clusters to isolate differing district policies which might have otherwise canceled each other out at the state level of aggregation. Regressions were conducted for both FEI values computed. These regressions were then compared to each other in order to evaluate the differences in the measurements of inequity under the current FTE distribution practices when measures were based on average per pupil expenditures as the FEI denominator (FEIN) or predicted salary expenditures based on student demographics as the adjusted funding denominators (FEIA).

URBAN LOCALES: NEW YORK CITY

The analyses of Arkansas data provided insight to the circumstances which reflect the majority of school districts in America; however, according to the 2010 US Census, 44% of Americans live in urban areas with more than 1,000,000 residents. Distribution patterns of schools and population density of students likely function differently in these large urban communities than in suburban and rural areas of America. Since much of the socio-economic segregation in American schools today is based on residency patterns, it is reasonable to expect levels of socio-economic segregation between urban schools within a single district differ from levels between schools within districts in rural areas. For example in the Arkansas analyses, there were no schools which served students from just one single neighborhood. Rather, even in the largest towns each school served multiple residential areas with each area having differing socio-economic profiles; therefore, schools in suburban and rural areas have a composite socio-economic makeup which leads to reduced variance in these socio-economic measures between schools within a single district. In urban areas, the higher population density means it is much more likely for there to be increased variance in socio-economic status of students between schools within the same school district. This increased level of socio-economic variance comes about due to the existence of single schools or even multiple schools per neighborhood. As lower socio-economic families have less political capital and less time to devote to applying political pressure to ensure equal funding of schools in poorer neighborhoods, there is much greater potential for intradistrict funding inequities to exist in large urban school districts.

Figure 1 shows the racial distribution and population density of New York City (Fischer, 2011). This figure is based on block data from the 2010 US Census. Each dot represents 25 people. The color coding is based on the race and ethnicity information. Red represents white

residents, blue for black residents, orange for Hispanic residents, and green for Asian residents. Since socio-economic status is highly correlated with race, neighborhoods segregated by race are also likely to be segregated by socio-economic status. As can be seen in Figure 1, while New York City has great racial diversity, individuals tend to settle in neighborhoods with individuals of similar race and socio-economic status.

These residential patterns in New York City amount to de facto segregation. New York has a high dissimilarity index and a moderate isolation index (Glaeser & Vigdor, 2012). The dissimilarity index is a common measure of segregation. The dissimilarity index is a measure which represents the extent to which two groups are equally represented in all neighborhoods within a community. The dissimilarity index for New York City is 64.7. This means that 64.7 percent of minority individuals would have to migrate to white neighborhoods to achieve an integration pattern which is homogenous across all of the area.

Another measure in the Glaeser and Vigdor study is the isolation index. Isolation is another important factor in measuring segregation. The isolation index measures the percentage of individuals in a community who live in census blocks within which the share of the population of the individual's race is above the citywide mean of the individual's race. New York City's isolation index in 2010 was 42.4. Even though segregation levels in New York City have dropped since 1970, the levels of dissimilarity and isolation in New York City still amount to racial inequality. Further, this racial inequality serves to generate a de facto segregation in educational environment which contributes to highly segregated school communities with the potential for differential funding patterns among schools. The NYCDE essentially acknowledged the inequities in 2005 when they began development of the Fair Student Funding (FSF) policies to replace the previous NYC funding distribution system.

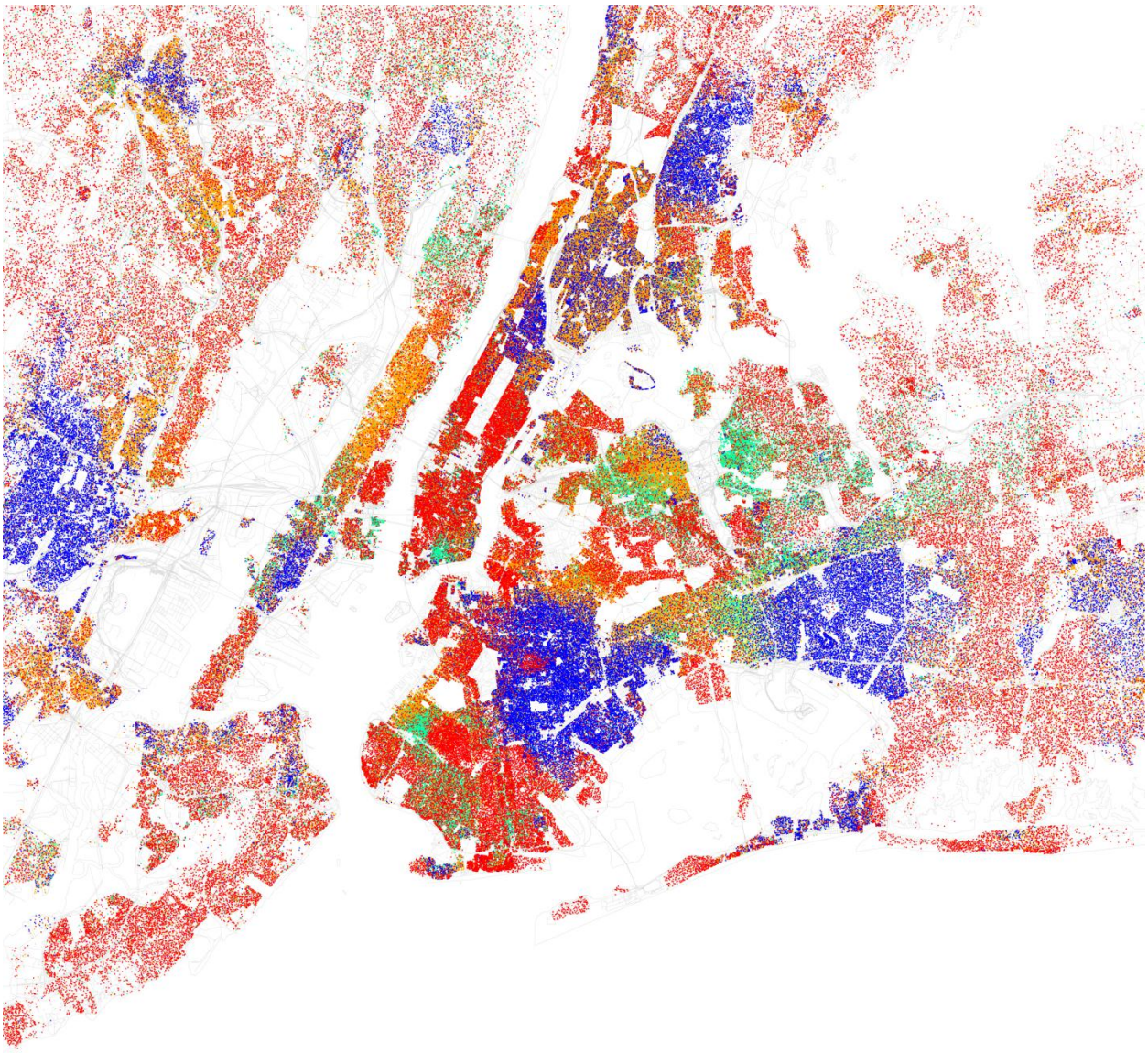

Figure 1: Race and Ethnicity 2010: New York City

The New York City Department of Education (NYCDE) provides data on school funding. This data provided the means to conduct an investigation into the funding distribution patterns for New York City schools similar to those conducted for Arkansas schools in the previous chapter. To this purpose, the New York analyses will tailor the research questions as follows:

1) To what extent do *salary* expenditures vary between schools within New York City?

2) Given that high poverty students bring additional funds into districts, do the schools that serve larger numbers of high-poverty students have relatively high levels of *salary* spending per student?
3) Finally, to what extent do schools receive *salary* funding per pupil commensurate with what would be expected based on the number of students in the relevant categories that qualify for additional categorical funding (FRL and ELL) under New York City's Fair Student Funding?

A. SAMPLE

This analysis employs a comprehensive database (described below) of instructional salaries for all personnel in New York City schools for the 2008-09 academic year. Because New York City is such a large district, this analysis can focus not only on elementary schools and middle schools but also high schools as there are multiple schools at every level within the district. The dataset includes 1,460 schools (747 elementary, 305 middle, and 408 senior high) in the five boroughs serving nearly 968,716 students across the state.

B. DATA

Actual Expenditure Data.

For this analysis, the primary data source was the USDOE Study of School-Level Expenditure (SSLE) Data, 2008-09. This data set was constructed based on data collected from states under requirements of the American Recovery and Reinvestment Act of 2009 (ARRA). The data set contains data for the 2008-09 school year for all districts that received Title I Part A funds under ARRA. The data set contains: total personnel salaries for all school-level instructional and support staff, salaries for instructional staff, salaries for teachers, and non-

personnel expenditures. The SSLE also contains data on student enrollment, percent of FRL eligible students, and percent of minority students.

State officials were asked to report all school-level expenditures from state and local funds only and to exclude expenditures for special education, adult education, school nutrition programs, summer school, preschool, and employee benefits. Due to divergence from the required specifications and differences in definitions of expenditure categories between states and districts, the data set may not be appropriate for cross-state comparisons. It is, however, suitable for comparisons of schools and districts within the same state.

Predicted Salary Funding.

Predicted salary expenditure information for each school was obtained from the New York City Department of Education (NYCDE). Beginning in 2007, New York City implemented Fair Student Funding (FSF). The purpose of FSF was to address acknowledged disparities in the distribution of funds to New York City schools (NYC Independent Budget Office, 2007). New York City distributed $5.5 billion through the FSF program. This amounted to two-thirds of the funding which was distributed to schools in 2009.

FSF uses a student weighted formula to determine the amount of funding for each school. Being defined as student weighted means that the funding amount is determined by the characteristics of the students. The primary considerations in the FSF formula are the student's grade and special needs. The formula provides weights for each student characteristic. Additional weights are provided for students attending special schools such as Career and Technical Education (CTE). The weights for each student are added and this number is multiplied by $3,788 to determine the funding provided by NYCDE to each school. Table 3 shows the weights assigned to student characteristics under FSF.

Table 3

Grade and Needs-Based Weights for Fair Student Funding

Base Weight	Weight	Dollars
Grade K-5	1.00	$3,788
Grade 6-8	1.08	$4,091
Grade 9-12	1.03	$3,902
Poverty Before 4th Grade	.24	$909
4th to 5th Grade		
Below Standards	.25	$947
Well Below Standards	.40	$1,515
6th to 8th Grade		
Below Standards	.35	$1,326
Well Below Standards	.50	$1,894
9th to 12 Grade		
Below Standards	.25	$947
Well Below Standards	.40	$1,515
ELL K-5	.40	$1,515
ELL 6-12	.50	$1,894
NCLB Transfer	.53	$2,000
Special Education <20%	.56	$2,121
Special Education 20%-60%	.68	$2,576
Special Education >60%	1.23	$4,659
Self Contained K-8		
Special Education >60%	.73	$2,765
Self Contained 9-12		
Special Education >60%	2.28	$8,637
Inclusion K-8		
Special Education >60%	2.52	$9,546
Inclusion 9-12		
Specialized Academic School	.25	$947
Specialized Audition School	.35	$1,326
Nursing CTE	.26	$967
Health Trade Technical CTE	.17	$629
Business CTE	.12	$451
Home Ec, Arts CTE	.05	$193
Transfer	.40	$1,515

FSF was designed to address inequities in school funding due to differences in teacher salaries. Prior to FSF the NYCDE allocated teaching positions based on student enrollment and grade level. Since this distribution method did not take into account the actual salaries paid for each position, there were high levels of inequity in NYC school funding. While FSF was meat to

resolve these inequities, it has not been fully implemented. One of the primary reasons for the delay in full implementation of FSF is the disruptions which would be caused to school teacher staffs if those schools which were previously over funded were to suddenly lose funding. In order to provide more stability, NYCDE chose to phase in FSF. As part of the phase in plan, schools with FSF amounts less than pre-FSF funding will receive supplemental funding referred to as legacy funding. The legacy funding amount will be the difference between FSF amounts and the amount received in the previous year. Schools with FSF amounts higher than the previous funding amount would receive the previous amount plus 55% of the difference between FSF and the previous amount. The delay in implementation has left inequities in funding within the NYC public school system.

The legacy spending inequities could come about due to the tendency of more experienced teachers to migrate to schools with more white students, fewer students in poverty, and fewer ELL students (Hanushek, Kain, O'Brien & Rivken, 2005). Additionally, the same processes of teacher sorting would tend to place newer teachers and therefore lower per pupil salary expenditures in schools that serve more minority students. Since minority students have higher rates of poverty and the FSF provides more funding for poverty students, it is more likely those schools are being underfunded. Thus, the important question is whether these inequities are systematic.

Since the addition of legacy funding means that actual expenditures were greater than the FSF total, it was necessary to deflate the actual salary expenditures to match the FSF estimates. As with the Arkansas analysis the total salary expenditure at each grade level was divided by the total of expenditures to determine the percent of expenditures which were assigned to salaries. This figure was then used to determine the deflation rate required to match total expenditures to

total salaries. The total expenditures for each school were then multiplied by this deflation rate to enable this analysis.

Predicted Salary Expenditure * Deflation Value = FSF

C. ANALYTIC METHODS AND MEARSURES EMPLOYED

Research Question 1.

To address the first question, I presented straightforward descriptive statistics summarizing the within-district variation across NYC. As with the Arkansas analysis, there were two distinct types of intradistrict variation which needed to be considered. Again, the first analysis undertaken was to determine whether salary expenditures in NYC schools are consistent across the district.

To complete this analysis, I first examined the absolute value differences between salary expenditures for each school and the average salary expenditures for all NYC schools by grade level. The average per pupil salary expenditure was the FTE expenditure. The ratio of actual per pupil salary expenditures to NYC average per pupil salary expenditures was the FEIN.

Research Questions 2 and 3.

Next I examined the extent to which the spending per pupil deviated from the predicted amount as defined by the FSF estimates provided by NYCDE. Since FSF was a weighted funding system based on student characteristics, this ratio was defined as the FEIA and was comparable to the FEIA figure used in the Arkansas analysis. A school with deflated salary expenditures equal to the FSF amount had an FEIA of 1.00. Deflated expenditures greater than the FSF had a FEIA >1 while schools with lower deflated expenditures had a FEIA <1.

As with the previous analyses of Arkansas data, the next step was to determine if differences in variability were associated with levels of student poverty or ELL enrollment. To do this, the schools were split into quartiles based on the percent of students in the school who qualified as eligible for free and reduced lunches (FRL). Additionally, due to the higher number of ELL students in New York City schools, a separate analysis was included to evaluate the differences by ELL quartile as well.

If FSF had eliminated discrepancies in funding, schools which enrolled more FRL eligible students should have had higher per pupil expenditures than schools with lower FRL eligible enrollment. Likewise, since FSF included supplemental funding for ELL students, there should also have been a positive correlation between percent of ELL students enrolled and per pupil funding.

The critical determination was not just whether differences in funding exist, but whether those differences were systematic. To determine if these differences were systematic required the use of multiple regression analysis. For these analyses, the FEI indices for each school were estimated as a factor of the poverty rate at each school (see model 1) and then as a factor of the ELL rate at each school (see model 2). In these regressions the school's level of poverty or ELL students was represented by the percentage of students enrolled in the school (a variable between 0 and 1).

$$\text{Model 1: } FEI=\beta_0 + \beta_1 FRL + \varepsilon$$

$$\text{Model 2: } FEI= \beta_0 + \beta_1 ELL + \varepsilon$$

A significant coefficient on β_1 in the model indicated that spending was significantly different based on FRL or ELL respectively. In the models above, I could not control for percent minority within the schools as it was highly correlated with FRL rates and ELL rates in schools

in some grade-district clusters, but not in others. This created inconsistent results from analysis to analysis.

I also conducted one additional model for New York City schools. In New York, it was possible to examine equity across the district by borough. Model 3 was an additional analysis which included dummy variables to identify the borough in which a school was located.

Model 3: $FEI=\beta_0 + \beta_1 FRL + \beta 3 Brooklyn + \beta_4 Manhattan + \beta_5 Queens + \beta_6 StatenIsland + \varepsilon$

In model 3, the omitted borough was The Bronx. The Bronx was selected as the omitted case as it had average FEIs closest to the district average FEI.

CHAPTER FOUR: RESULTS

RURAL AND SUBURBAN LOCALES: ARKANSAS DISTRICTS

Research question one for the Arkansas analysis was "To what extent do *salary* expenditures vary between schools within larger districts in Arkansas?" To address this question, FEIN measures of intradistrict equity were computed. The FEIN is an index of school equity computed by dividing the per-pupil expenditure at a school by the average per-pupil expenditure within a district. The absolute value of the difference between the expected FEIN value of 1 and the actual FEIN value is called the ratio of variation. Previous researchers (Iatarola & Stiefel, 2003; Miles & Roza, 2006) have used a ratio of variation greater than 0.1 to demark a school with inequitable funding. Using this standard, 77 of 1,020 Arkansas schools were found to have FEINs which were above 1.10 and 38 below 0.90 when measured based on the average spending per pupil model. This meant 11% of schools had ratios of variation greater than 0.1. This number somewhat underestimates the level of inequity in Arkansas as many of the 1,020 schools are in districts with only one school per level. These schools will by default have a FEIN of 1.00. To address this limitation, I also conducted an analysis using only schools in grade-level clusters with more than four schools. Among grade-level clusters with at least four schools, there were 45 schools with FEIN values above 1.10 and 21 schools below 0.90. This amounted to 29% of the 229 schools in grade-level clusters with at least four schools. In Table 4, there is presented a breakdown of the number of schools with ratios of variation greater than 0.1 in each grade-level cluster as well as the minimum and maximum FEIN values within that cluster.

Caution should be used when interpreting the percent of schools in a grade-level cluster with ratio of variation greater than 0.1. This data should be given more weight in grade-level clusters with more schools as higher N lessened the impact of individual schools.

Table 4 also contains the average absolute value of the deviation from the average funding for schools in the district. This number provides insight into the level of variation between schools within a district. Since each district has a different percentage of funds it receives from the state which are passed through to the schools, these numbers are not fully comparable; however, the pass through rates are similar enough to make rough comparisons of equity based on funding deviations shown in Table 4.

Schools in the 22 large districts in this sample allocated an average of approximately $3,700 in salary expenditures per pupil in 2008-09. For these 229 schools in the sample, the average deviation from the district mean salary spending level was $330, or just under 10% of the spending level. In some districts, the average school deviated by $100 or fewer, while in other districts, the average school deviated from the mean by more than $600 per pupil.

Table 4

Variability in Salary Spending Within Districts in Arkansas Measured by Average Expenditures per Pupil, 2008-09

	N of Schools in Cluster	Average Absolute Value of Deviation from $Average	N of Schools with FEIN below 0.90	N of Schools with FEIN above 1.10	Percent of Schools with FEIN differences >0.10	Minimum FEIN	Maximum FEIN
Arkansas	1020	$132	38	77	11%	0.70	1.67
Clusters N>=4	**229**	**$330**	**21**	**45**	**29%**	**0.70**	**1.67**
Elem	**199**	**$315**	**17**	**38**	**28%**	**0.70**	**1.67**
MS	**18**	**$387**	**3**	**3**	**33%**	**0.83**	**1.25**
HS	**12**	**$494**	**1**	**4**	**42%**	**0.86**	**1.38**
Batesville K-6	4	$286	1	1	50%	0.86	1.12
Benton K-5	4	$100	0	0	0%	0.96	1.07
Bentonville K-4	9	$169	0	0	0%	0.91	1.09
Bryant K-5	7	$375	0	1	14%	0.90	1.59
Cabot K-4	8	$131	0	1	13%	0.92	1.11
Conway K-4	9	$228	0	1	11%	0.92	1.13
El Dorado K-4	4	$226	0	1	25%	0.92	1.16
Fayetteville K-5	8	$264	0	2	25%	0.91	1.17
Ft. Smith K-6	19	$199	1	2	16%	0.82	1.13
Ft. Smith 7-9	4	$442	1	1	50%	0.83	1.25
Harrison K-4	4	$538	1	1	50%	0.88	1.42
Hot Springs K-5	4	$351	1	1	50%	0.89	1.23
Jonesboro 1-6	4	$200	0	1	25%	0.94	1.16
Little Rock K-5	28	$604	7	7	50%	0.79	1.38
Little Rock 6-8	7	$311	0	1	14%	0.92	1.13
Little Rock	6	$690	1	3	67%	0.86	1.38

	N of Schools in Cluster	Average Absolute Value of Deviation from $Average	N of Schools with FEIN below 0.90	N of Schools with FEIN above 1.10	Percent of Schools with FEIN differences >0.10	Minimum FEIN	Maximum FEIN
9-12 N. Little Rock K-5	13	$395	2	4	46%	0.86	1.27
Pine Bluff K-5	6	$85	0	0	0%	0.95	1.06
Pulaski County K-5	23	$233	0	3	13%	0.92	1.48
Pulaski County 6-8	7	$431	2	1	43%	0.84	1.19
Pulaski County 9-12	6	$297	0	1	17%	0.91	1.19
Russellville K-4	6	$357	1	1	33%	0.82	1.18
Springdale K-5	16	$326	1	6	44%	0.70	1.15
Texarkana K-4	5	$285	1	1	40%	0.82	1.21
Van Buren K-4	6	$265	1	2	50%	0.85	1.19
West Memphis K-6	8	$475	0	2	25%	0.90	1.67
White Hall K-6	4	$158	0	0	0%	0.94	1.07

Since a major hypothesis of this analysis is that distributing funds based on FTE teacher positions allowed districts to redirect money from high needs students to non-high needs students, it was necessary to compute another FEI based on the predicted funding for schools which was the amount a district should have received on behalf of a school based on the characteristics of the students enrolled in that school (see Table 6). Funding weighted by student characteristics is called adjusted funding, and the index based on it is the fiscal equity index (adjusted) or FEIA. One hundred two schools had FEIA above 1.10 and 54 below 0.90. This

meant that 15% of schools had ratios of variation larger than 0.1. Among grade clusters with at least four schools, 48 schools had FEIA over 1.10 and 35 under 0.90. This meant that 36% of schools in clusters with large ability to have variability had inequitable funding.

Table 5:

Characteristics of Schools by FEIN Level

	FEIN <=0.9	0.9<FEIN<1.1	FEIN=>1.1
N of Schools	21	163	45
% FRL	54%	61%	71%
AVG Deviation from District Mean	-$622	-$27	$782
AVG FEIN	0.84	0.99	1.21
AVG FEIA	0.85	0.99	1.20

Table 5 shows the characteristics of schools based on the FEIN value. The three groups are those with a FEIN below 0.9, FEIN near 1.0, and FEIN above 1.1. Schools with a lower FEIN have a lower percentage of FRL students enrolled. This would be expected since schools with more poverty students generally have higher spending levels in states that distribute funding based on student characteristics such as Arkansas. These numbers do not, however, speak to the appropriate level of funding the schools should receive in order to provide the services to poverty students.

Table 6

Differences between Actual and Predicted Salary Spending Within Districts in Arkansas, 2008-09

	N of Schools in Cluster	Average Absolute Value of Deviation from $Predicted	N of Schools with FEIA below 0.90	N of Schools with FEIA above 1.10	Percent of Schools with FEIA differences >0.10	Minimum FEIA	Maximum FEIA
Arkansas	1020	$189	54	102	15%	0.56	1.67
Clusters N>=4	**229**	**$351**	**35**	**48**	**36%**	**0.56**	**1.66**
Elem	**199**	**$356**	**31**	**41**	**36%**	**0.56**	**1.66**
MS	**18**	**$361**	**3**	**4**	**39%**	**0.76**	**1.14**
HS	**12**	**$349**	**1**	**3**	**33%**	**0.88**	**1.25**
Batesville K-6	4	$185	1	0	25%	0.87	1.09
Benton K-5	4	$170	0	1	25%	0.91	1.14
Bentonville K-4	9	$189	0	1	11%	0.90	1.13
Bryant K-5	7	$370	0	1	14%	0.92	1.66
Cabot K-4	8	$196	0	1	13%	0.95	1.31
Conway K-4	9	$506	2	1	33%	0.69	1.10
El Dorado K-4	4	$201	0	1	25%	0.94	1.11
Fayetteville K-5	8	$270	0	2	25%	0.92	1.18
Ft. Smith K-6	19	$353	4	7	58%	0.78	1.19
Ft. Smith 7-9	4	$377	1	1	50%	0.90	1.14
Harrison K-4	4	$418	0	1	25%	0.93	1.31
Hot Springs K-5	4	$512	1	1	50%	0.56	1.38
Jonesboro 1-6	4	$348	1	1	50%	0.88	1.28
Little Rock K-5	28	$604	9	9	64%	0.72	1.42
Little Rock 6-8	7	$428	1	2	43%	0.76	1.14
Little Rock	6	$388	0	2	33%	0.93	1.14

	N of Schools in Cluster	Average Absolute Value of Deviation from $Predicted	N of Schools with FEIA below 0.90	N of Schools with FEIA above 1.10	Percent of Schools with FEIA differences >0.10	Minimum FEIA	Maximum FEIA
9-12 N. Little Rock K-5	13	$349	1	4	38%	0.89	1.28
Pine Bluff K-5	6	$76	0	0	0%	0.97	1.08
Pulaski County K-5	23	$475	7	4	48%	0.75	1.43
Pulaski County 6-8	7	$285	1	1	29%	0.87	1.12
Pulaski County 9-12	6	$309	1	1	33%	0.88	1.25
Russellville K-4	6	$332	1	2	50%	0.82	1.26
Springdale K-5	16	$199	1	1	13%	0.88	1.10
Texarkana K-4	5	$153	0	1	20%	0.92	1.12
Van Buren K-4	6	$227	1	1	33%	0.87	1.10
West Memphis K-6	8	$425	2	1	38%	0.88	1.44
White Hall K-6	4	$172	0	0	0%	0.94	1.07

For the 229 schools in the sample, the average deviation from the predicted salary spending per pupil was $351, or just under 10% of the spending level. In only one district, the average school deviated from predicted by less than $100; in three other districts, the average school deviated from the mean by more than $500 per pupil.

Using the predicted funding (FEIA) rather than average expenditure (FEIN) as the denominator of the index showed more schools met the 0.1 threshold for identifying inequity. Specifically, more schools appear to be over-funded using the funding measure weighted by

student characteristics than using the cluster average per pupil. Large FEIA values indicate that the given schools had higher expenditures than would be expected based on the funding the district received for the students in that school. This money had to be reallocated from other schools in the cluster. Indeed, when the analysis considers variation from predicted funding based on the formula, some districts do have large inequities in funding.

Table 7

Characteristics of Schools by FEIA Level

	FEIA <=0.9	0.9<FEIA<1.1	FEIA=>1.1
N of Schools	35	146	48
% FRL	58%	61%	66%
AVG Deviation from District Mean	-$578	-$33	$770
AVG FEIA	0.85	0.99	1.21
AVG FEIN	0.84	0.99	1.21

Table 7 shows that there are fewer poverty students in schools with lower FEIA levels as there was in schools with lower FEIN levels. There is much less variation in the FRL values for the FEIA model than the FEIN. However, simply finding variability is not interesting in and of itself; the key question with regard to equity is the extent to which this variability is systematically related to student characteristics. This is what is evaluated in the final two research questions.

Research question two asked, "Given that high poverty students bring additional funds into districts, do the schools that serve larger numbers of high-poverty (or minority) students have relatively high levels of *salary* spending per student?" To answer this question, required the computation of means weighted by student enrollment for schools in the highest and lowest quartiles by percent of FRL eligible students and percent of minority students for the 229 schools in the 22 large districts in Arkansas.

The differences found between groups were systematic and in the expected direction, but not especially large (Table 8). First of all, with respect to average district funding, the poorest schools received an average of $64 more per pupil in salary expenditures than did the average school in the district (the resulting equity index was 1.04). On the other hand, schools with the least poverty received $87 less than the district average (FEIN = 0.99).

Thus, the good news is that schools with more poor students received additional funding per pupil for personnel. But, was this amount what *should* have been given based on the characteristics of the students enrolled in these schools? That is what research question three asks, "Finally, to what extent do schools receive *salary* funding per pupil commensurate with what would be expected based on the number of students in the relevant categories that qualify for additional categorical funding (FRL and ELL) under Arkansas' state funding formula?"

To address this question, the average deviation from the predicted funding level (also shown in Table 8) must be evaluated. Schools serving higher percentages of poor students received $6 less per pupil than would be expected given the funding formula. However, for the most part, these funds were likely not being transferred to the wealthiest schools, as these schools received $22 less per pupil than would be expected given the funding formula.

Table 8

Weighted Means of Key Variables for Poverty Quartiles, 229 Schools in 22 Large Arkansas Districts, 2008-09

Variable	Quartile 4 (Highest) Poverty	Quartile 3 Poverty	Quartile 2 Poverty	Quartile 1 (Lowest) Poverty
N of Schools	61	57	55	56
Percent FRL	91%	72%	52%	30%
Average Deviation from District Mean	$66	$124	-$81	-$87
AVG FEIN	1.04	1.05	1.00	0.99
Average Deviation from Predicted	-$6	$94	-$63	-$22
AVG FEIA	1.03	1.04	1.00	1.01
Per Pupil Total Salaries	$3,742	$3,985	$3,483	$3,695

Some of the results in Table 8 may appear contradictory at first pass as three of the quartiles have negative average expenditures, but none of the FEIA is less than 1.0. This is due to the fact that the average deviation from predicted and the FEIA operate through different mechanisms. The average deviation from predicted only detects transfers of funding from one category to another. By way of example, imagine a quartile with only two students. If $200 dollars is taken from one of the students and given to the other, the average deviation from predicted spending for the quartile remains zero.[2] Since this measure is in absolute dollars, the transfer of funding would only show up if the two students were in different quartiles in Table 8. The FEIA values, however, are determined by actual funding divided by the expected funding. This means dollars in the FEIA have a relative value based on the expected funding level. Due to the relative value of dollars in the FEIA, the FEIA will change based on within quartile transfers as well as transfers between quartiles as long as the within quartile transfer is between

[2] (-$200 + $200)/2=$0

students with different expected funding levels. Given the example above, if $200 is taken from a student with an expected funding of $1,000 the student's FEIA would be 0.8. Give that same $200 to a student in the same quartile and who's expected funding was $800 and he will have a FEIA of 1.2. The quartile's average deviation from expended would remain $0, but the average FEIA would have risen to 1.1.

If the $200 dollars taken from the student in Quartile 4 with an expected funding of $1,000 is split and $100 dollars goes to a student in a Quartile 3 and $100 dollars to the student with an expected funding of $800 in Quartile 4, then the average deviation from expected for Quartile 4 becomes -$50, but the FEIA still rises to 1.01 and the FEIA of Quartile 3 would be positive as well. This difference in mechanisms explains why the average deviation from expected and the FEIA will not always be correlated.

Based on these results, the answer to question two was: yes, schools with more poor students did receive higher levels of salary expenditure funding than did schools with lower percentages of FRL eligible students when groups are divided into two groups. It is worth noting that Quartile 4, which had the highest percentage of FRL eligible students, did not have higher expenditures than Quartile 3. Likewise, Quartile 1 has higher per-pupil expenditures than Quartile 2. In question three, the examination moves to whether the differences are large enough based on the percentage of students served in the poor schools. These first analyses suggest that traditional FTE funding measures may have been reallocating money from high needs students to non-high needs students and the simple equity measures based on FTE funding were disguising intradistrict funding inequity between schools.

Figure 2 shows the distribution of FEIN for the schools in clusters with at least four schools per cluster. Figure 3 shows the distribution of FEIA for the same schools.

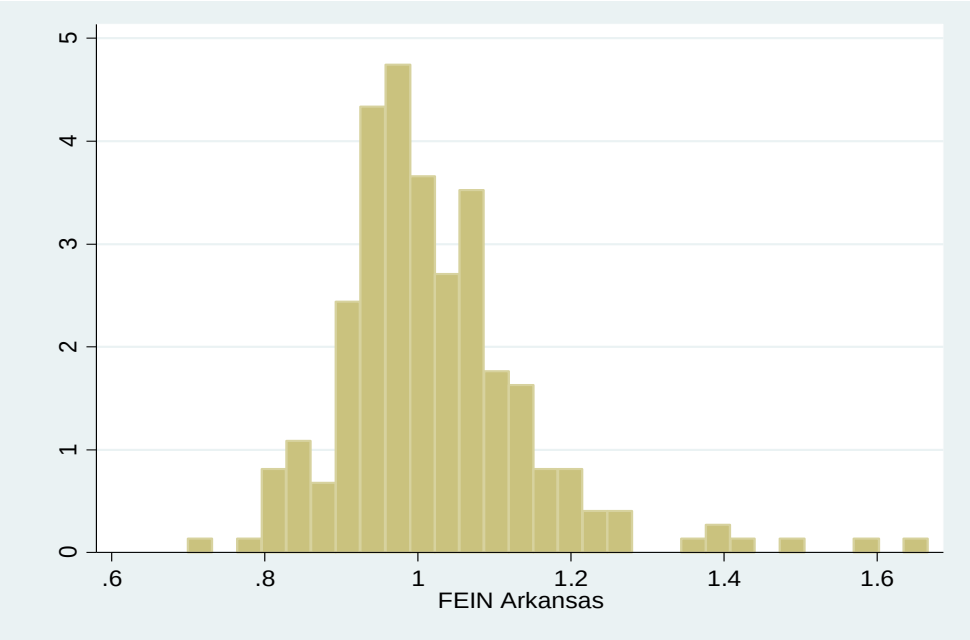

Figure 2: Histogram of FEIN for Arkansas Schools in Grade-Level Clusters with at least Four Schools

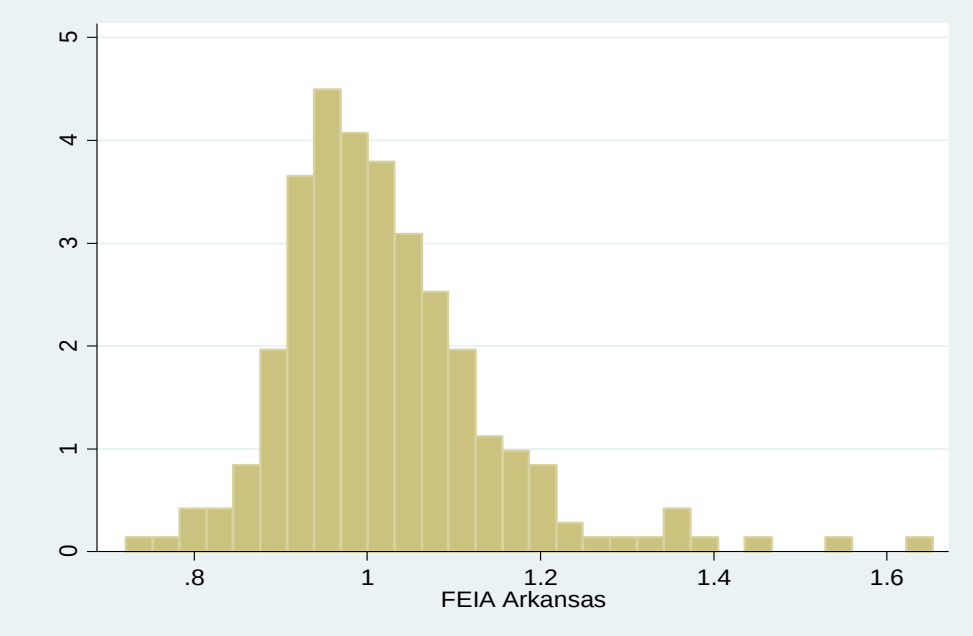

Figure 3: Histogram of FEIA for Arkansas Schools in Grade-Level Clusters with at least Four Schools

In the FEIA model, the per-pupil expenditure at each school varies based on the characteristics of the students. This means that the positive skew could be the result of funds

being transferred from schools with higher expected spending to those with lower expected spending. For example, a school with expected per pupil expenditure of $3,000 would have only a .05 FEIA decrease from lowering expenditures by $150 per pupil. If the receiving school had expected spending of $2,500 per pupil, the addition of the same $150 per pupil would result in a .06 increase in FEIA.

The above table and figures based on summary statistics for schools by FRL eligible students quartiles and do reveal some trends, but cannot explain the mechanism of those trends. To systematically assess the extent to which these trends hold across all schools in the 22 large districts, two simple regressions were run of FEI on FRL rates. The first regression was for the FEI based on average per pupil expenditures (FEIN) and the second was on the FEI based on predicted values from the funding formula (FEIA).

The first regression was with the FEI which represents horizontal equity used average per pupil funding practices in the denominator (FEIN) as the dependent variable and percent FRL eligible students as the independent variable. For the percent FRL eligible students variable, the value used was between 0 and 1. This made interpretation of the coefficient simple. The coefficient for the FRL variable would be the difference in the FEI between a school with no FRL eligible students and a school with all students FRL eligible. The same measure was used in a similar regression which measured vertical equity. This would be one with the FEI based on predicted salary expenditures as determined by weighted student funding (FEIA) as the dependent variable. These models were first estimated for all schools in the sample, then the restricted sample of only schools in grade-level clusters with at least four schools, and then for each of the 27 individual district-level school clusters. Results from both FEI regressions (FEIN and FEIA) are shown in Table 9.

Table 9

FRL Coefficients: Fiscal Equity Indices Regressed on Percent FRL Eligible

	N of Schools in Cluster	FRL Coef. FEIN	FRL Coef. FEIA
Arkansas	1020	0.047	0.015
Clusters N>=4	**229**	**0.080***	**-0.047**
Batesville K-6	4	0.749	-0.095
Benton K-5	4	-0.138	0.111
Bentonville K-4	9	0.218	0.212
Bryant K-5	7	1.447	1.894*
Cabot K-4	8	-0.078	0.119
Conway K-4	9	-0.187	0.268
El Dorado K-4	4	0.665	0.487
Fayetteville K-5	8	0.210	0.162
Ft. Smith K-6	19	-0.105	-0.385**
Ft. Smith 7-9	4	0.367	-0.091
Harrison K-4	4	0.932	0.684
Hot Springs K-5	4	-0.384	-0.592
Jonesboro 1-6	4	-0.570*	-1.005***
Little Rock K-5	28	0.092	-0.173
Little Rock 6-8	7	-0.009	-0.470
Little Rock 9-12	6	0.378	0.040
N. Little Rock K-5	13	0.312*	0.143
Pine Bluff K-5	6	-0.375	-0.423*
Pulaski County K-5	23	0.044	-0.025
Pulaski County 6-8	7	0.788	0.034
Pulaski County 9-12	6	0.643	0.507
Russellville K-4	6	-0.095	-0.312
Springdale K-5	16	0.201	-0.111
Texarkana K-4	5	0.651*	-0.245
Van Buren K-4	6	0.411	0.244
West Memphis K-6	8	0.077	-0.180
White Hall K-6	4	-1.758	-1.496

*Significant at the .05 level, ** Significant at the .01 level, *** Significant at the .001 level.

While some of the coefficients were large, it should be remembered that it would be unlikely for a grade-level cluster within a district to actually contain two schools one of which had no FRL eligible students and the other having all students FRL eligible. Further, clusters which had little variation in FRL rates could end up with large but not significant regression

coefficients even with moderate index differences. For example, Table 10 shows the FRL rates and FEIN rates for the White Hall K-6 cluster. The limited range of the FRL variable amplified the size but not the significance of the regression coefficient.

Table 10

White Hall K-6 Cluster Schools

School	Percent FRL	FEIN
Hardin Elementary	.3808	.9689
Taylor Elementary	.3956	.9396
Gandy Elementary	.4009	1.0132
Moody Elementary	.3458	1.0749

When measured using the FEIN, two clusters and the overall group had a positive and significant coefficient while one cluster had a negative and significant coefficient. The coefficient on the FRL variable was not significant for most clusters. These results showed which districts appeared to systematically provide more or less funding to schools of high-poverty students.

A few points are clear. First of all, across the large districts in the state, poverty level was positively related to the FEIN ratio (coefficient=.08). Thus, poorer schools did receive additional funds as Table 8 showed earlier. N. Little Rock and Texarkana are two districts that are systematically allocating more dollars to poorer schools, while Jonesboro is doing the opposite.

However, as we noted earlier, perhaps the more important question is whether the appropriate (or predicted) level of funding is being distributed to poor schools. To address this question, the FEIA is the relevant indicator. The overall coefficient for the large districts in the sample is statistically insignificant (-.047), suggesting that there is no relationship between FRL rates and the deviation from predicted funding level. This is good news overall, although different stories emerge in a few districts. In Jonesboro, Pine Bluff, and Fort Smith (K-5),

schools with greater poverty receive less funding than expected. Bryant school district, on the other hand, provides greater than expected funding to poorer schools.

Table 11 shows information on the characteristics of the schools in the clusters with significant negative coefficients in the FEIN model. Shown is the number of schools in the cluster, the cluster FEI based on average per pupil expenditure, and the weighted average per pupil expenditures for the upper and lower halves of schools within the cluster by FRL eligibility.

Table 11

Characteristics of Clusters with Significant Negative Coefficients on FRL, FEIN Model

	N Schools	Cluster Average FEIN	High Poverty %FRL	Low Poverty % FRL	$ Per Pupil High Poverty	$ Per Pupil Low Poverty
Jonesboro 1-6	4	-0.570	87%	63%	$2,693	$3,003
N Little Rock K-5	13	0.312	92%	51%	$4,265	$3,568
Texarkana K-4	5	0.651	85%	56%	$3,112	$2,659

Results differed from the regression of the FEI based on WSF on percent of FRL students (see Table 9). In the FEIA model, only one cluster was both positive and significant whereas, three clusters had negative and significant coefficients. Further all three of the FEI indices which appeared positive and significant in the FEIN model became insignificant in the FEIA model. For the majority of grade-level clusters, poor students appeared to receive less funding when using the FEIA rather than the FEIN. Across all clusters, the weighted average coefficient for percent students FRL eligible measuring equity using FEIN was 0.152 as compared to -0.027 using the FEIA. Using the FTE based measure made it appear as if schools serving poor students had higher than expected salary expenditures, but the WSF based measure showed schools serving poorer students on average actually had slightly lower than expected salary expenditures.

Thus the answer to question three is no, schools which served students who *qualify for* more categorical funding did not reap a proportionately large level of resources.

URBAN LOCALES: NEW YORK CITY

These analyses were conducted at two levels: for all schools in NYC and by borough. Analyses were conducted for both FEI values computed. The results of the analyses were then compared to each other in order to evaluate the differences in the measurements of average expenditures, FEIN model, and predicted expenditures based on New York City's fair student funding (FSF) allocation method, FEIA model. As in the previous section of this chapter, the standard used to determine inequity was an absolute value FEI variation greater than 0.1. Under this standard, 578 schools out of 1,460 in NYC have FEIN of less than .9. A further 339 schools out of 1,460 have FEIN greater than 1.1. By this measure, 63% of schools in NYC met the standard for inequitable funding. It is clear there is a large amount of variance in per pupil funding levels in NYC schools. Table 12 shows the variance in intradistrict spending based on FTE funding for NYC schools.

Table 12:

Variability in Teacher Salary Spending Within NYC by Full Time Equivalency Distribution, 2009-2010

	N of Schools in Cluster	Average Per-Pupil Expend-iture by FTE	Average Absolute Value of Deviation from $Average	N of Schools with FEIN below 0.90	N of Schools with FEIN above 1.10	Percent of Schools with FEIN differences >0.10	Minimum FEIN	Maximum FEIN
New York City	1460	$19,002	$3,329	578	337	63%	0.21	4.93
Brooklyn	456	$19,155	$3,520	168	123	64%	0.49	4.93
Manhat-tan	286	$19,563	$4,047	100	74	61%	0.21	3.88
Queens	302	$17,247	$3,463	179	25	68%	0.47	4.57
Staten Island	65	$18,608	$2,407	21	13	52%	0.63	1.39
The Bronx	351	$19,806	$3,752	110	102	60%	0.52	3.93

Table 13 shows the average characteristics of schools by the FEIN level. The schools are grouped by those with FEIN below 0.9, those with FEIN values near 1.0, and those with values above 1.1. The differences between the FEIN and FEIA averages for the three groups indicate much more variation in funding that was seen in Arkansas. Even though there are large differences in average deviation from district mean and FEIA, the differences in FRL rates between the three different categories are small. Further, all three categories have identical rates of ELL students. This suggests that FRL has only a small relationship with spending rates and ELL has no impact.

Table 13

Characteristics of New York City Schools by FEIN Level

	FEIN <=0.9	0.9<FEIN<1.1	FEIN=>1.1
N of Schools	578	544	337
% FRL	69%	79%	85%
% ELL	15%	15%	15%
AVG Deviation from District Mean	-$4,052	-$157	$5,325
AVG FEIN	0.79	0.99	1.28
AVG FEIA	0.98	1.05	1.15

Determining if the residuals of the FTE funding system in NYC are still influencing intradistrict funding equity requires computing another FEI index based on the FSF formula. The FSF formula is a weighted student funding (WSF) index which for these analyses are defined as the FEIA. Table 14 contains the salary spending variability data based on the FEIA.

Table 14

Variability in Salary Spending Within NYC by Weighted Student Funding Distribution, 2009-2010

	N of Schools in Cluster	Average Per-Pupil Expend-iture	Average Absolute Value of Deviation from $Predicted	N of Schools with FEIA below 0.90	N of Schools with FEIA above 1.10	Percent of Schools with FEIA differences >0.10	Minimum FEIA	Maximum FEIA
New York City	1460	$6,006	$779	279	462	51%	0.63	2.26
Brooklyn	456	$6,117	$820	78	173	55%	0.67	2.11
Manhat-tan	286	$6,214	$974	63	83	51%	0.63	2.04
Queens	302	$5,432	$663	63	83	48%	0.70	1.56
Staten Island	65	$5,765	$807	5	31	54%	0.86	1.51
The Bronx	351	$6,229	$766	70	92	46%	0.71	2.26

As can be seen in Table 14, the variance in spending related to predicted amounts based on the Fair Student Funding is much smaller than the variance in average spending. This means that much of the funding differences between schools found when comparing actual dollars are based on student characteristics. Differing spending based on student characteristics fits with the concept of vertical equity. The fact that there is still a large amount of variance, 51% of schools have funding more than 10% from the predicted amounts, even when adjusting for student characteristics demonstrates that NYC has not fully implemented FSF. While full implementation of FSF would be preferable, the existing discrepancies may not be of major concern as long they demonstrate fiscal neutrality, i.e. they are not systematically distributed based on the characteristics of the students enrolled in each school.

Table 15

Characteristics of New York City Schools by FEIA Level

	FEIA <=0.9	0.9<FEIA<1.1	FEIA=>1.1
N of Schools	279	720	462
% FRL	67%	78%	77%
% ELL	16%	16%	12%
AVG Deviation from District Mean	-$957	-$63	$1,274
AVG FEIA	0.84	0.99	1.24
AVG FEIN	0.94	0.94	1.12

Table 15 shows the average characteristics of schools by the FEIA level. The schools are grouped by those with FEIA below 0.9, those with FEIA values near 1.0, and those with values above 1.1. The differences in the percentage of FRL eligible students is similar across all three groups. The higher FEIA group and the FEIA near 1.0 groups are almost identical. Likewise, there are no major differences in the percentage of ELL students between groups.

Research question two asked, "Given that high poverty students bring additional funds into districts, do the schools that serve larger numbers of high-poverty (or minority) students have relatively high levels of *salary* spending per student?" To answer this question, required the computation of means weighted by student enrollment for schools in the highest and lowest quartiles by percent of FRL eligible students and percent of minority students for the 1,460 NYC schools.

Table 16:

Weighted Means of Key Variables for Poverty Quartiles, 1,460 schools in NYC, 2009-10

Variable	Quartile 4 (Highest) Poverty	Quartile 3 Poverty	Quartile 2 Poverty	Quartile 1 (Lowest) Poverty
N of Schools	364	366	364	366
Percent FRL	95%	88%	78%	49%
Percent Non-White	98%	95%	90%	68%
Percent ELL	24%	17%	11%	7%
Average Deviation from District Mean	$1,612	$727	-$338	-$1,995
AVG FEIN	1.08	1.04	0.98	0.89
Average Deviation from Predicted	$343	$99	-$127	-$204
AVG FEIA	1.06	1.02	0.98	0.97
Per Pupil Total Salaries	$16,547	$15,529	$14,442	$13,155

On first examination, it would appear that students in the highest quartile of poverty (most FRL students) have significantly higher spending than the lowest quartile. By the FEIN index, that is based on average spending (horizontal equity), the lowest quartile is being underfunded as reflected by the FEIN ratio of 0.89. Based on the same FEIN measure, students in the highest quartile have an index of 1.08 which would indicate that those schools are being overfunded. However, when vertical equity based on student characteristics is included in the computation, the apparent spending differences are not as strong with the average deviation from predicted based on WSF is only $343 and the FEIA drops to 1.06. The lowest poverty quartile which appears to be grossly underfunded based on FTE standards is actually being funded just below the level which would be expected based on the student characteristics; thus the lowest quartile has and FEIA of 0.97 and has a WSF based deviation of only -$204. Even though in actual dollars, the average per pupil expenditure on salary and benefits at highest FRL quartile schools is $3,600 more than the per pupil expenditure at lowest quartile schools, the values based

on student characteristics show that this difference is actually much less due to the differences in expected funding needed to achieve vertical equity based on the FSF formula. Since all four quartiles have a FEIA of near 1.00, this indicates that funds are being distributed in a manner consistent with vertical equity. Further, this displacement does not reach the .1 or 10% threshold required to declare the funding system inequitable.

Table 17:

*Weighted Means of Key Variables for ELL Quartiles, 1,446 schools in NYC, 2009-10**

Variable	Quartile 4 (Highest) ELL	Quartile 3 ELL	Quartile 2 ELL	Quartile 1 (Lowest) ELL
N of Schools	362	361	361	362
Percent FRL	89%	83%	75%	64%
Percent Non-White	94%	90%	88%	80%
Percent ELL	34%	14%	7%	3%
Average Deviation from District Mean	$124	$596	$156	-$746
AVG FEIN	1.01	1.03	1.01	0.96
Average Deviation from Predicted [3]	-$1	-$95	$6	$43
AVG FEIA	1.03	1.01	0.98	0.99
Per Pupil Total Salaries	$15,267	$15,563	$14,984	$13,876

* 14 NYC schools were missing ELL data and were excluded from these tables

The analysis by ELL quartiles (Table 17) shows that the current NYC funding system is much more in line with what the FSF formula predicts. The lowest FEIA index by percent ELL is 0.98 while the highest FEIA is 1.03. These indices show that the values are extremely close to the funding amounts expected under a vertical equity funding system such as FSF. Even in dollar amounts no ELL quartile has a weighted average difference more than $100 from the expected

[3] The -$95 dollars equals only 0.6% of the per pupil total salary expenditure. Since average deviation only detects transfers between quartiles, it is not unreasonable for it to vary from the FEIA. This is especially possible when the dollar amounts are such a small percentage of the expenditure.

funding. Again, every quartile has a FEIA very near 1.00 which indicates that even with legacy funding issues, FSF system is providing strong vertical equity for ELL students in New York City

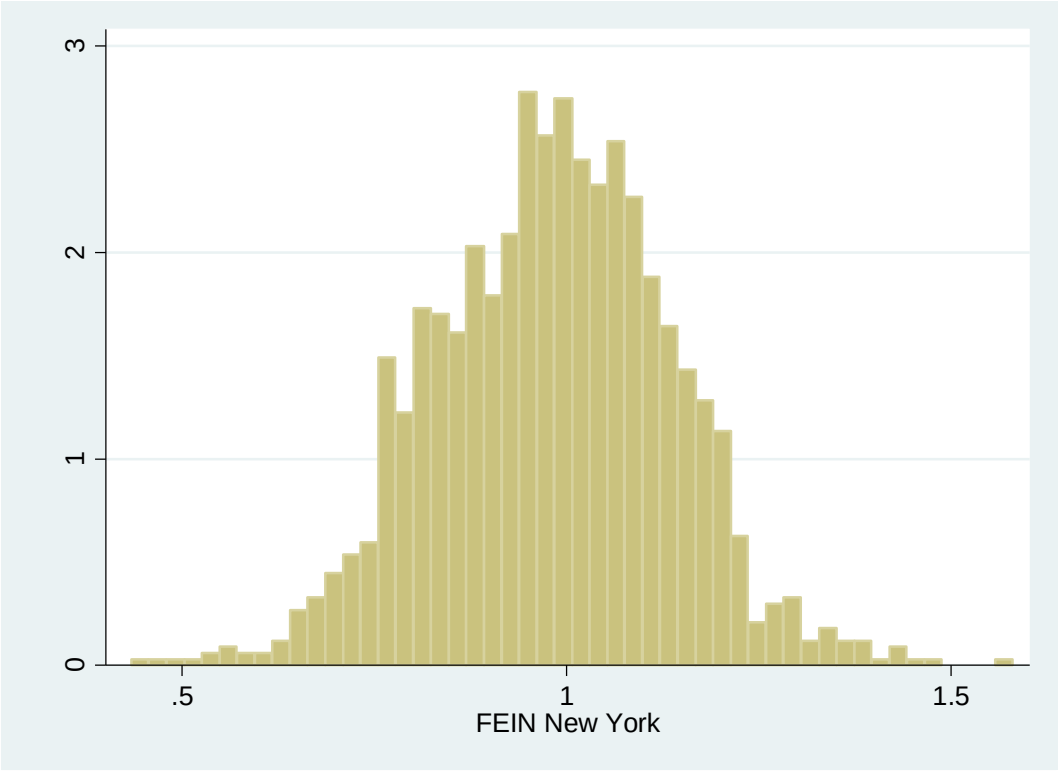

Figure 4: Histogram of FEIN for New York City Schools

Figure 4 shows the school indexes from the FEIN model are fairly normally distributed. This histogram does not provide any evidence as to the pattern of funding transfers taking place between schools in NYC. In the Arkansas analysis, the positive skew in Figure 3 suggested a direction for the transfers. Figure 4 on the other hand suggests that the funding transfers in NYC are more random.

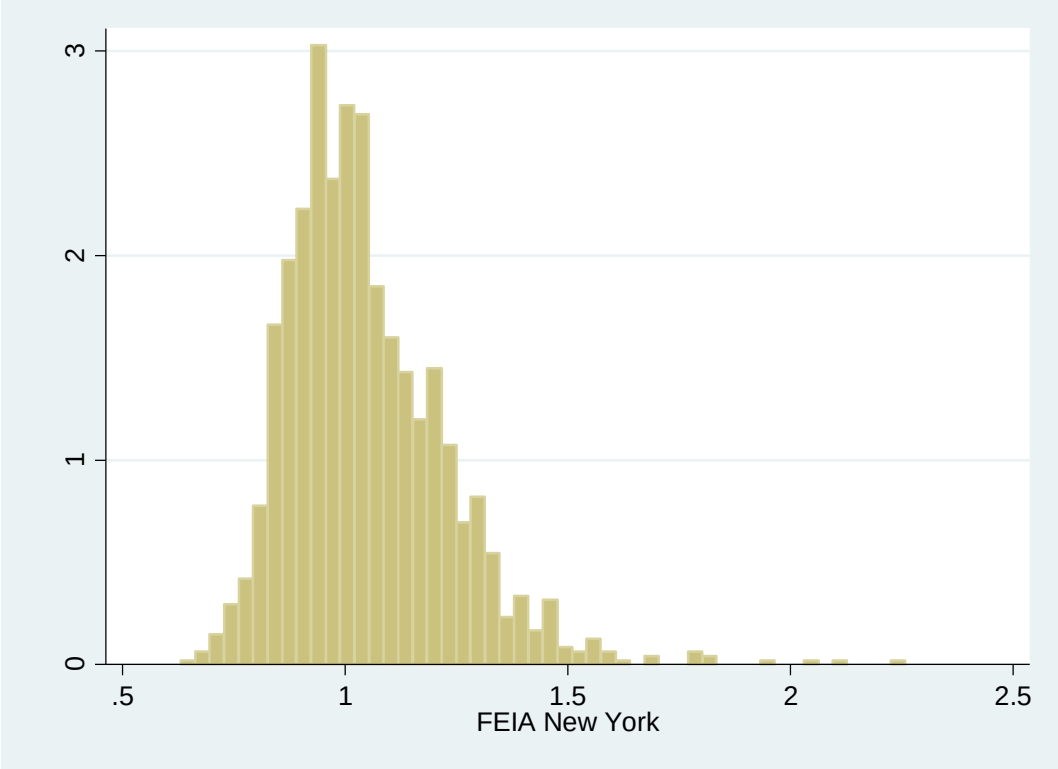

Figure 5: Histogram of FEIA for New York City Schools

Figure 5 shows a definite positive skew to the school indexes under the FEIA model. As with Arkansas, this would suggest that funds are being transferred systematically from one type of school to another type of school. As in Arkansas, this distribution could be the result of transfers from schools with higher expected per-pupil expenditures to those with lower expected per-pupil expenditures or it could also be the result of transfers from schools with more students to schools with similar expected per-pupil funding but with fewer students.

Answers to the previous questions have shown there is variance in education funding. These funding differences appear to benefit low socio-economic students. Question three is the final step which will determine if the funding differences are systematically biased against FRL eligible students. Determining the answer to question three "To what extent do schools receive *salary* funding per pupil commensurate with what would be expected based on the number of

students in the relevant categories that qualify for additional categorical funding (FRL and ELL) under New York City's Fair Student Funding?" requires the use of multiple regression analysis.

Table 18

Regression Results FEI Regressed on Percent FRL Eligible:

	FEIN	t-value	FEIA	t-value
% FRL	0.35**	7.99	0.04**	2.00
	(.04)		(.02)	
Elementary Level	-0.01	-0.72	0.00**	2.35
	(.02)		(.00)	
Middle Level	-0.02	-0.68	-0.00**	-5.73
	(.02)		(.00)	
Constant	0.74**	20.23	1.01**	52.42
	(.04)		(.02)	

Table 18 shows the regression results from regressing the two FEI indices on FRL rates. Based on the FEIN, New York City spends significantly more on salary and benefits for personnel in schools with higher FRL rates. The impact of FRL rate on the index is 0.35. This means that moving a school from 0% FRL eligible students to 100% FRL will increase funding by 35%. At an average per pupil spending rate of $15,000, this would amount to an additional $5,250 per pupil. Therefore, under an FTE funding system, it would appear that students serving poorer schools were receiving far more money than average.

The second analysis shown in Table 18 is a regression of FEIA on FRL rates. In this model, the percentage of FRL eligible students in a school is also significantly different from zero, but this time the coefficient is only 0.04. At the same $15,000 average salary, this would be a difference of $600 dollars in per pupil spending on salaries. To achieve the full $600 dollar per pupil spending difference, a school would have to go from 0 percent FRL eligible to 100 percent eligible. If instead, the $600 difference were linearized over the full range of 100 percent, the difference was equal to $6 additional per pupil funding for each 1 percent increase in FRL eligibility.

The proper interpretation of the two regressions on the FEIs is that NYC is providing additional funding for FRL students under both models. This is demonstrated by the results of the FEIN regression which found significant increases in the FEIN based on the percentage of FRL students enrolled in the school. The results of the regression on the weighted index showed that the FEIA also differed significantly as FRL rates changed but by a much smaller amount. This indicates that the FSF formula is providing a systematic distribution of funds to the students with expected higher education costs. This does not mean that NYC school funding strictly follows the FSF, but that any discrepancies are not harmful, and if fact slightly beneficial, in relation to student FRL rates.

Table 19

Regression Results FEI Regressed on Percent English Language Learners

	FEIN	t-value	FEIA	t-value
% ELL	0.02	0.35	-0.15**	-4.78
	(.06)		(..03)	
Elementary Level	-0.00	-0.09	0.00**	2.92
	(.020)		(.00)	
Middle Level	0.00	0.09	-0.00**	-5.64
	(.03)		(.00)	
Constant	1.00**	53.93	1.07**	150.39
	(.02)		(.01)	

The results of the regression analysis with the percent of English language learners (ELL) as the dependent variable had results opposite to those for percent FRL eligible. Under the FTE (horizontal equity) model, there was no significant difference in the funding index based on the percent ELL student in the school. However, the FEIA which includes additional funding for special needs in the index denominator has a negative coefficient, and the percent of ELL students does have a significant difference on funding. Under FEIA model, NYC provides less funds per pupil to schools with higher percentages of ELL students. This finding was not consistent with FSF and vertical equity. The difference is equivalent to $2,250 per pupil. While

this is not a small amount, achieving the full differential would require two schools in which one school had 0 percent ELL students and the other school had 100% ELL student population. Again, if the difference was linearized, this was the equivalent to a $22.50 per pupil change for each additional 1 percent of ELL student enrollment.

NYC has a single funding system that is a hybrid system. The current funding policies combine some legacy aspects of the previous funding system which the NYCDE acknowledged as inequitable and the FSF based system. The inequities of the previous system were based in part on the borough in which the school was located. As such, it is informative to repeat the analyses on the FEI values based on borough.

Table 20 includes descriptive information by borough. These results show the majority of boroughs are within the .1 boundary used to define funding inequity based on the average funding in the district (FEIN). Only Queens had a FEIN value which deviated from 1.00 by more than the .1 threshold. Equal average funding is indicative of horizontal equity. Thereby, funding across boroughs was generally equitable.

When the impact of student characteristics on funding are taken into account, i.e. vertical equity, the average FEIA index values for each borough are very close to 1.00 with the exception of Staten Island and Queens. Queens which had a FEIN value on only .90 has a FEIA index of 0.96. This means while Queens schools still receive less than adequate per pupil funding based on WSF funding and vertical equity, the funding level is more appropriate when examined through the scope of student needs by the FEIA.

Table 20

Weighted Means of Key Variables by Borough, 1,460 schools in NYC, 2009-10

Variable	Brooklyn	Manhattan	Queens	Staten Island	The Bronx
N of Schools	456	286	302	65	351
Percent FRL	81%	72%	72%	55%	87%
Percent Non-White	89%	87%	86%	48%	97%
Percent ELL	12%	16%	14%	6%	19%
Average Deviation from District Mean	$144	$716	-$1,899	-$581	$847
FEIN	1.01	1.03	0.90	0.97	1.04
Average Deviation from Predicted	$147	$-10	$-219	$237	$16
FEIA	1.03	1.00	0.96	1.06	1.01
Per Pupil Total Salaries	$15,135	$15,431	$13,541	$14,465	15,392

Table 21 gives the variable of interest, percent FRL, from these regressions. While the combined Ney York City results showed an appropriate level of funding for schools based on student needs as measured through percent FRL using the FEIA which controls for student characteristics, the breakouts by borough found larger differences in funding based on FRL which were significant for four of the five boroughs. Table 21 shows that schools located in Brooklyn and Manhattan have significantly higher funding as percent FRL eligible students increases. Whereas, Queens and Staten Island both have significantly lower funding per pupil as FRL rates increase. Brooklyn had the largest coefficient, 0.22. The interpretation of this was that a 1 percent increase in the FRL rate of a Brooklyn school led to a $33 per pupil increase in salary. Staten Island had the largest negative coefficient, -.19 which was the equivalent to a $29 shortfall in funding per pupil for each 1 percent increase in FRL students enrolled

Table 21

Regression Results FEI Regressed on Percent FRL Eligible Students by Borough

	FEIN	t-value	FEIA	t-value
% FRL Brooklyn	0.37**	3.90	0.22**	4.06
	(.09)		(.05)	
% FRL Manhattan	0.46**	5.52	0.09*	2.30
	(.08)		(.04)	
% FRL Queens	0.15	1.64	-0.14**	-3.20
	(.09)		(.04)	
% FRL Staten	0.13	1.49	-0.19*	-2.16
Island	(.09)		(.09)	
% FRL The Bronx	0.37*	2.20	0.10	1.26
	(.17)		(.07)	

The major reason for developing and implementing the FSF formulas was to address recognized inequities in funding. While FSF seems to have improved the intradistrict equity in NYC (the coefficients on the FEIA are smaller than the FEIN), the delay in fully implementing the program meant that some inequity still exists. The results in Table 22 show that Staten Island was over-funded based on the FEIA measure of vertical equity; however, Table 21 showed that the additional monies were not being directed toward schools with high percentages of FRL students. Additionally, Table 21 showed that in all the boroughs except The Bronx funding is still significantly influenced by percent FRL even though the FEIA takes into account adjustments for Fair Student Funding. It is worth noting, however, that in Brooklyn and Manhattan the funding for FRL students is actually beyond the amount expected based on FRL rates.

These results make an investigation of spending differences by borough worthwhile. A simple regression with a dummy variable for each borough would reveal if systematic funding differences still existed between boroughs. The dependent variable for this regression was the FEIA. The FEI index is based on the FSF model for school funding which included vertical

equity. If the dummy values were significant, this meant that money coming from non-FSF sources such as legacy teacher funding was causing continuing inequitable funding in NYC.

Table 22

Regression Results: Vertical Funding Index (FEIA) with Borough Dummy Variables

Variable	Coefficient	t-value
Brooklyn	0.04**	3.22
	(.01)	
Queens	-0.003	-0.24
	(.01)	
Staten	0.09**	3.81
Island	(.02)	
Manhattan	0.01	0.62
	(.01)	
Constant	1.03	108.19
	(.01)	

The results of the regression on the vertical equity index, FEIA, with dummy variables for each borough showed that there were still systematic inequities between boroughs. Schools in Staten Island on average had funding which exceeded the amounts necessary to provide vertical equity when compared to the omitted borough which in this case was The Bronx. Based on the results from the dummy variable regression and the other analyses, particular attention should be paid to funding in Staten Island schools as this borough has repeatedly been found to have higher than expected funding across multiple analyses but not in relation to FRL eligibility rates.

Analyses of funding in New York City schools showed that the FSF system had greatly increased vertical equity for poverty and ELL students. Some legacy spending from the previous system persisted, and it appeared to have some impact on intradistrict funding distributions as shown by aggregate differences and regression coefficients which were significant. The results of the New York City analyses showed that funding distribution methods could be designed and implemented which would distribute funds in a manner consistent with the goals of vertical equity.

CHAPTER FIVE: POLICY IMPLICATIONS

CONCLUSIONS

FTE intradistrict funding distribution practices, those based on distributing funds by teacher slots valued at the average salary, can cause funds to be shifted from category-qualified students to non-qualified students. As categorical funding is usually meant to aid districts in providing additional services for high-needs students, allowing this transfer not only harms the neediest students, but also may dilute the effectiveness of categorical funds.

As measured by the FEIN, the majority of clusters in Arkansas had a positive coefficient on FRL. These positive measures were likely masking the true direction of funding inequity. The mechanism by which this could have occurred was that while the per pupil expenditures in schools with more high-poverty students was higher than the average per pupil expenditures for their grade-level cluster, the amount of funds per pupil received by the district for those schools was even further above average amount received by schools in the grade-level cluster. The FEIA index measured inequity by comparing salary expenditures at a school to the predicted salary expenditures which should have been made based on the funding formula. When the predicted salary expenditures were based on the characteristics of the students, they more closely aligned with the funding received by the district on behalf of those students.

Likewise, policy makers in the NYC public school district recognized there were inequities in the funding system used to distribute funds between schools in NYC. To remedy these concerns, the NYCDE developed the FSF system for distributing funding to schools in a manner which addressed vertical equity. However, due to policy constraints the FSF program had not yet been fully implemented. These analyses showed that more funding was going to schools with higher percentages of ELL and FRL eligible students than would be expected based on purely horizontal equity funding by which every student in NYC received the same per pupil

expenditures. This does not mean that the FSF goal has been achieved. There were still legacy issues affecting the distribution of educational funds in the NYC schools. This was evident in the fact that funding transfers were still occurring as evidenced by the high FEIA rates across the various quintile breakouts. Although, NYC should be commended that none of the breakouts showed FEIA values with absolute differences in excess of the .1 threshold which was the standard for inequity in the research literature. In two boroughs Queens and Staten Island schools did not receive significantly higher funding as their percentage of FRL eligible students increased. In Manhattan and Brooklyn schools those with a higher percentage of FRL students received significantly more funding. These differences the vertical equity goals of Fair Student Funding had not yet been achieved, but the movement of NYC funding was in the correct direction.

Using the more accurate FEIA showed FTE distribution practices could create inequity among schools in the same district. By relying on the average per pupil values, FTE distribution methods ignored the student-level funding differences required to achieve vertical equity and fiscal neutrality. In some cases, FTE funding likely led to the unintended transfer of funds from high needs students to lower needs students.

Another policy implication of intradistrict inequity caused by FTE distribution systems was the dilution of the effectiveness of funding reforms meant to aid students with exceptional needs. Since districts were allowed to reallocate funds provided to the district for the purpose of aiding high needs students to average students, it should not come as a surprise that studies on the effectiveness of such policies often have had difficulty detecting any effects of such programs. This was not to say that all or even any such policies definitely had positive effects on

student achievement, but the funding inequities created by FTE distribution made accurate assessment of these programs much more difficult if not impossible.

LIMITATIONS

Some districts were missing from the SSLE data set. Unfortunately, for these districts there was no available measure of school-level expenditures. These districts were excluded from the Arkansas analyses.

While the FEI based on the WSF predicted salary expenditures provides a more accurate estimate of intradistrict equity, they are still predicted data. With current technology, it would be possible for departments of education and the districts themselves to provide complete information on school-level funding. Having more accurate information would improve the estimates of spending and thus the measures of intradistrict inequity. Therefore, a more accurate measure would be possible, although, not with the current publicly available data.

These analyses did not address the impact of intradistrict equity on student achievement. If intradistrict equity does not have an effect on student achievement, should it be a concern? This is definitely an area for additional study which will hopefully be investigated further in the future.

Using the FEI based on the WSF, the Fiscal Equity Index (Adjusted), provides a more accurate measure of intradistrict equity; however, WSF methods are only appropriate for use in states where funds are distributed to the districts based on student characteristics. For states in which funds are distributed via block grants or other methods, it may be difficult to develop more accurate measures than one based on average per pupil funding.

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