Public School Finance and its Effect on the Quality of Education

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Abstract

This paper examines the discrepancies in the finance of public education across the United States in order to determine how particular funding schemes affect the quality and efficiency of education. Local governments have been the principal provider of funds for education in the past, but debate over equitable schooling for all students has led to several changes in the structure of education finance. In order to construct an encompassing measure of educational quality, a model based on Morgan and Morgan (2006) is used to assign each state a quality rating. Regression analysis helps establish the effect of various monetary variables on educational quality. There are clear patterns in the data which suggest that both the total amount of funds provided and the proportion of funds provided by each level of the government influence the quality of education. In addition, personal income and the percent of the population living below the poverty line prove to be key determinants of educational quality. It is my hope that this paper contributes to the work on the finance of public education and the work that aims to improve the quality of education in the United States.

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1. Introduction

The finance of public education in the United States has been consistently surrounded by controversy, which has resulted in various legislative measures. Because the federal Constitution fails to include education as a power assigned to the federal government, school finance is left to the discretion of each individual state. This clearly leads to a significant disparity in how education is funded across states. The fact that local property taxes have typically been the major source of funding also leads to great differences across school districts within states. Many scholars have argued that the funds available for education should not be determined by relative property value and personal income. This argument has held up in court and led to significant changes in the portions of federal, state, and local funding over the past 30 years.

Serrano v. Priest (1976) was a landmark case, in which the California Supreme Court ruled the existing system of school finance unconstitutional because it violated the state's equal protection clause. The underlying premise was that children in poorer school districts should not be penalized due to the fact that their school's ability to raise funds is dependent upon the wealth of the children's parents and neighbors. Since this ruling, 22 other state supreme courts have called for a change to their state's current system of funding education. Equity of school finance has become the responsibility of state governments, which have devised an array of grant schemes and formulas designed to distribute funds in a more equitable manner. Clearly, equity is a major concern and a more equitable academic experience is something that everyone would support. However, similar to many areas of economics, there is most likely an equity-efficiency trade-off when it comes to school finance. I will seek to shed some light on just how severe this

trade-off is and whether the benefits of a more equitable distribution of funds are significantly crowded out by a loss of quality.

This has been an area of intense debate. Some argue that the gains from increased equity are substantial and have led to narrower gaps in student achievement. Conversely, others have made the case that attempts to increase equity have resulted in lower growth in student achievement or a reduction in local revenues, which offset potential gains. Equality of funding may not be desirable if it is achieved by school districts spending relatively little on education. In fact, lower revenue states tend to have a more equal distribution of resources. However, it is also the case that states which provide a higher proportion of revenues through the state government show a more equitable distribution of funds (Moser and Rubenstein, 2002). Therefore, greater equity may be attainable through alterations to the proportions of revenues provided by each level of government. But as discussed previously, it will be important to consider the potential sacrifice in quality that may result in the attempt to achieve greater equity.

I will be attempting to determine how the distribution of funds across states affects the quality of education. There are two potentially significant factors to consider. One is the total amount of funds provided for education. It will make the most sense to consider per pupil revenues, which allows for easy comparison across states. The other factor has already been discussed in considerable detail, which is the proportion of funds provided by each level of the government. It is believed that states which provide a more substantial amount of funds locally enjoy a higher quality of education, although this may be at the expense of equality. Both of these factors should have a significant effect on the amount of educational resources available. Something to be aware of is a possible

correlation between these two variables. It may be the case that states which finance a greater portion of education locally tend to be states that provide more funds per student. For example, New York tends to be one of the lowest ranking states in terms of equity, but districts that receive the lowest levels of revenue in New York still receive an actual dollar amount that is more than the median amount per pupil in 45 of the 50 states (Marshak, 1999). Furthermore, the data suggests that there may be some correlation between personal income and educational quality. Per capital disposable personal income and the percent of the population living below the poverty line are other factors that will be examined.

There is still much debate over the actual effect of higher spending on education. Many scholars are of the belief that more dollars for education does not necessarily translate to a higher quality of education. There are several critics who argue that increased school funding only leads to increases in teacher's and administrator's salaries, and does not improve student performance. There are others who claim that additional funds can be beneficial as long as they are used in effective ways. Unfortunately, it is often the case that certain educational measures proven to be effective, such as early childhood education and effective teacher training and mentoring programs, entail very high costs. It is true that many empirical studies have shown little correlation between school spending and student performance. On the other hand, several studies find a direct link between school funding and student performance. Much of the discrepancy and debate surrounding these findings is due to the absence of a clear and agreed upon definition of a quality education.[1]

[1] It is likely that the way in which the variation in purchasing power across states and within states is accounted for also has a significant effect on the inconsistency of results. How each study defines

I have developed a model for educational quality using various factors that I feel most accurately reflect an efficient education. The model assigns a ranking to each state to facilitate the attempt to determine the effect of each state's funding scheme on the quality of education. Variables to be incorporated will be explored in sufficient detail later on and will include data on school facilities, staff, and student achievement. The model is crucial in analyzing how disparities in the finance of education translate to differences in the quality of education.

To review, there are essentially three main hypotheses to be tested. First, I would like to determine the effect that the overall amount of funding has on quality. Considering the scope of this issue and the debate surrounding it, it will be important to see if the amount of money spent on education should be the primary focus. So much is put in terms of dollars today that sometimes we are blind to what truly lies at the heart of the issue. If it turns out that additional funds do not have a significant effect on the quality of education, then states may be able to divert their attention to other educational issues that may not be getting the proper attention. Second, I wish to test how the proportion of funds provided by each level of government affects school quality. Evidence to date seems to suggest that states which provide most of their funds locally experience a less equitable distribution of funds. It will be important to determine if any of this inequality can be justified by a higher level of educational quality. If the proportion of funds provided locally does not appear to have a significant effect on the quality of education, then states should certainly seek greater equity by providing a larger share of funds at the state level and limiting the role of local governments. Lastly, I will explore the possible

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expenditures will certainly lead to a difference in results. However, I choose to leave this issue aside and focus on what it means for an education to be of greater quality.

effects of income and poverty. As discussed previously, educators and scholars seek to minimize the role of income and wealth as a determinant of educational quality. However, if their effect is still substantial then this provides further evidence that educational quality is largely tied to monetary mechanisms. The tests of these hypotheses will rely on the model for educational quality, which uses several variables in order to rank states according to quality of education.

2. Prior Approaches

There has been a substantial amount of work concerning the issue of education finance. But as discussed previously, there is no consensus among scholars when it comes to the most ideal way to finance public education. This is one of the main reasons why this issue receives so much attention and why state and local governments consistently face opposition to their current funding scheme. One area to focus on that has not been significantly examined is the model for what determines a quality education. Most of the related work tends to use various measures of student achievement, usually 4^{th} and 8^{th} grade test scores, or in some cases the SAT. However, this data alone can be incredibly insufficient if one's goal is to determine the effect of funding on the efficiency and quality of education in a broader sense.

There is one existing model that I build upon in developing my own model. Morgan Quitno Press's *Education State Rankings* has developed a model that assigns a "smartest state" ranking to each of the 50 states (Morgan and Morgan, 2006). My model uses very similar methodology, however I use some different factors. Their model assigns rates for each of the 21 factors included, based on a formula that determines how a state

compares to the national average. The formula accounts for factors that have either positive or negative effects on education and each factor is equally weighted. A summation of the weighted scores produces a state's final score. Some of the main factors include expenditures for instruction, pupil-teacher ratios, graduation rates, and test scores. There are certain factors that I choose not to include and there are others that Morgan Quitno neglects that I feel should be taken into account. More detail on the inclusion of certain factors will be discussed later on. The biggest difference between Morgan Quitno's model and mine is that their model assumes a direct effect of revenues and expenditures on the quality of education. The Morgan Quinto model assumes a positive effect of both revenue per $1,000 personal income and the percent of current expenditures used for instruction. Therefore, states that provide more revenue and use more of their funds for instruction receive a higher rating. One of the goals of this study is to test this assumption, so these factors cannot be included in the model for quality. It will be initially assumed that the quality of education is independent of revenue and expenditures. Regression analysis will determine if these variables do in fact have any significant effect on school quality.

There is certainly no shortage when it comes to data and work related to the redistribution of education funds, the effect of increased spending on education, and the equality of funding across and within states. Marshak (1999) examines disparities in per-pupil revenues both across and within states. Even cost- and need-adjusted figures result in great differences in actual revenues. However, Marshak notes the concerns related to inter-state equity may not be as relatively important as those related to intra-state equity. He observes that New York is one of the lowest ranking states in terms of intra-state

equity, but students at the lowest levels of revenue in New York receive an actual dollar amount that is more than the median amount per student in 45 of the 50 states. Marshak suggests that students in low revenue, high equity states are most likely worse off in terms of educational resources available than students in high revenue, low equity states. In drawing his conclusions he examines variations in total revenues within a state expressed in the 5th, 25th, 50th, 75th, and 95th percentiles. Marshak's results are then based on the use of some dispersion measures, which include the federal range ratio[a], coefficient of variation[b], McLoone Index[c], and Gini coefficient[d]. Marshak concludes that little equity exists both across and within states, even with the use of cost- and need-adjusted figures. Marshak does not correlate his findings to any measure of the quality of education. The examination of the equality of the distribution of funds is certainly important, but it will become more important in the context of an equity-efficiency trade-off.

Moser and Rubenstein (2002) analyze the equity issue further by examining the proportions of revenues provided by state and local governments. Their method begins with the same dispersion measures (federal range ratio, McLoone Index, Gini coefficient, coefficient of variation) as Marshak. They created indexed values of these measures and calculated a single summary statistic for each state by averaging the four. The mean index allows for easy comparisons of each state's equity relative to other states. Moser and Rubenstein continue by using factors that can be controlled by policy makers, such as the number of school districts and the percent of funding provided by the state. They are able to postulate that a more equitable distribution of funds is achieved in states with fewer districts relative to students and in states with a higher proportion of revenues

provided by the state government. Moser and Rubenstein also address a potential downfall of equality. If it is achieved because of reduced spending on education then it most likely results in a lower quality of education and would not be desirable. However, similar to Marshak, they do not perform any quantitative analysis on the correlation between funding and quality.

Extensive work has been done on the equity-efficiency trade-off in school finance. Many of these models incorporate the concept of sorting and the Tiebout model. The Tiebout model examines a region that offers a basket of goods (i.e. education, other government services) at different prices (i.e. tax rates, etc.). Tiebout assumes that individuals have different preferences and will move from one community to another in order to find the one that maximizes their utility or satisfaction. Hoxby (1995) and Fernández (2001) analyze the equity-efficiency trade-off in the context of the Tiebout model. Hoxby develops a model of schooling costs per pupil in order to demonstrate that states which provide a greater share of revenues at the state level weaken the Tiebout mechanism and have higher schooling costs. Hoxby also shows that the growth of educational attainment falls. Hoxby's model clearly finds the traditional method of school finance, where most of the revenue for schools is provided by local property taxes, to be a more effective funding scheme. In terms of the trade-off, the model predicts lower costs for any given level of school quality in states where a greater share of school funding is determined locally.

Fernández (2001) also uses the Tiebout model to justify the system of local finance as more efficient than a system of predominately state finance. Both Hoxby and Fernández are really more concerned with efficiency in the sense of consumer

satisfaction than they are with efficiency in the sense of quality of schooling. Their models are directly tied to preferences that people of different income have concerning education. They would define an efficient world as one in which the finance of education at the local level allows families to sort themselves into communities that allows them to obtain the quality of education that maximizes their utility. This does not necessarily mean that a system where education is locally financed produces higher quality schools across the board. It will most likely mean high quality schooling for higher income individuals, but there is no evidence that it results in an improvement in school quality in general.

Many of the mandated equalization schemes that states have undertaken aim to increase state aid to local school districts. However, Baicker and Gordon (2004) point out that these measures may be accompanied by parallel decreases in funds provided by local governments. So while state aid may increase equality, offsetting losses due to a crowding out effect may be detrimental to the total amount of funds allotted to education and to the quality of education. Baicker and Gordon analyze data to examine how states respond to mandated equalization schemes, how local governments react to changes in state education aid, and how changes in state aid affect spending on education. Their work supports the findings of Murray, Evans, and Schwab (1998) that court-ordered equalization schemes reduced inequality in education spending within states. In the case of California, the *Serrano* decision eventually led to the property tax limitation of Proposition 13 and to declines in spending on education. Baicker and Gordon discovered that local governments tend to respond to increases in the level of state funding by reducing their own revenue-raising and their own spending on education. If increases in

state funding are offset by decreases in other spending, then any potential gains in student achievement will most likely be undermined.

In addition to all of the work on the equitable distribution of funds and the equity-efficiency trade-off, there has been a moderate amount of work on the connection between school funds and student achievement. Guryan (2001) tackles the issue of whether increased educational funding results in an improvement in the quality of schooling. Guryan's regression-discontinuity estimates suggest that money does indeed matter. His results imply that a one standard deviation increase in per pupil spending leads to about a half of a standard deviation increase in 4th grade test scores. Although, the results for 8th grade test scores showed little evidence of an effect of spending on the mean score. This implies that education is a cumulative process and that the effects on 8th graders may be less significant because they have already received a good portion of their education in schools that were not as well funded. From further investigation of the distribution of test scores, Guryan observes that increased spending results in fewer students scoring at both tails of the distribution. This holds for both 4th and 8th graders, implying reduced inequality of student achievement. A shortcoming that Guryan himself notes is that these results are controversial because the correlation between spending and student achievement is partially dependent on variation in school and district characteristics other than spending. I hope to capture some of this "other" variation with the methodology that I use. My model for the quality of schooling examines much more than test scores alone and will hopefully capture many of the other variables that determine a quality education. Accordingly, regression analysis will provide information

on correlations between the funding of education and the quality of education as I define it.

Card and Payne (1998) did some work on the distribution of school spending and the distribution of SAT scores. Their work is more focused on the gap in test scores across richer and poorer districts. They find that test scores of children of less-educated parents are higher in states which have a more equal distribution of funds between richer and poorer districts. Additionally, Card and Payne note a significant widening of test score outcomes in states with a higher income gradient of per capital school expenditures, which means less of total state spending is spent in districts with a high proportion of low-income families. Card and Payne neglect to draw any conclusions pertaining to any overall trends in test scores relative to a more equitable distribution of funds. Similar to Guryan, they also limit their definition of student achievement to a test score, in this case the SAT. Although the SAT is a standardized test and data is readily available, Card and Payne are aware of its disadvantages. The biggest issue is that participation rates vary greatly across states. Test takers in states with lower participation rates are often from wealthier families and rank in the upper portion of their high school classes. Therefore, there is a strong correlation between participation rates and SAT scores, namely that the mean SAT score is higher in states with lower participation rates. For this reason SAT scores will not be included in the model for the quality of education, as it does not adequately represent a measure of student achievement that translates across states. The biggest difference in my approach is the use of a model that is intended to rank states according to various factors that constitute a quality education rather than simply examining test scores. This should shed some light on the effect of both total spending

and the proportion of spending provided by various levels of the government on a broader measure of school quality.

3. Data

There is an abundance of data on educational information pertaining to finance as well as facilities, student achievement, students, and teachers. Three main sources are used to obtain the data required to test the hypotheses. The first is *Education State Rankings 2006-2007: PreK-12 Education in the 50 United States* (Morgan and Morgan, 2006). This is where the data necessary to develop the model for the quality of education is obtained. This source has over 400 tables comparing states in student achievement, school finance, teachers' salaries, test scores, graduation rates, and more. Data for the factors in the model is listed in both alphabetical and rank order (by state) and the national average is also provided. The model also requires the standard deviation of each factor, which I calculate on my own.

The data related to school funds, revenues, and expenditures is from primarily two sources. The first is the U.S. Census Bureau's *Public Education Finances 2005* report. The report was issued in April of 2007 and provides data on Public Elementary and Secondary Education finances by state. There are also some relational statistics and state rankings pertaining to education finances. Data from the National Center for Education Statistics (NCES) is also drawn upon. An enormous variety of data related to education is available, but of particular use is the financial information on the percent distribution of revenues and per pupil revenues by state. Due to the amount of material and the focus on this topic by scholars, obtaining the proper data does not pose a problem.

4. Methodology

My analysis is based on the model developed for the quality of education, which is derived from that of Morgan and Morgan (2006). The model is intended to capture the most important factors that comprise a quality education. The factors will consist of positive factors, where a high ranking for that factor is considered to increase quality, and negative factors, where a high ranking for that factor decreases quality. Each state is compared to the national average for each individual factor, making sure to account for the positive and negative nature of the factor. The formula used for each positive factor (F_x) is:

$$(F_{xi} - \bar{x}) \Big/ \sigma_x$$

and for each negative factor (F_x) is:

$$(\bar{x} - F_{xi}) \Big/ \sigma_x$$

where F_{xi} is the value of the x[th] factor for each state *i*, $\bar{x}$ is the mean of the x[th] factor, and σ_x is the standard deviation of the x[th] factor. The factors are equally weighted. To obtain a state's final score, the scores from each individual factor are summed and each state is assigned a ranking. The following is the list of factors considered:

Positive (+) and Negative (-) Factors Included in the Model:

1. Percent of Public Elementary Schools Offering Talented/Gifted Programs in 2000 (+)
2. Percent of Public Elementary Schools Offering Extended Day or Before or After School Daycare Programs in 2000 (+)
3. Percent of Public Secondary Schools Offering Advanced Placement (AP) Courses in 2000 (+)
4. Percent of Population Graduated from High School in 2005 (+)
5. Averaged Freshman Graduation Rate for Public High Schools in 2005 (+)
6. Estimated Public High School Graduation Rate in 2005 (+)
7. Average Daily Attendance as a Percent of Fall Enrollment in Public Elementary and Secondary Schools in 2004 (+)
8. Percent of Public School 4^{th} Graders Proficient or Better in Reading in 2005 (+)
9. Percent of Public School 8^{th} Graders Proficient or Better in Reading in 2005 (+)
10. Percent of Public School 4^{th} Graders Proficient or Better in Writing in 2002 (+)
11. Percent of Public School 8^{th} Graders Proficient or Better in Writing in 2002 (+)
12. Percent of Public School 4^{th} Graders Proficient or Better in Mathematics in 2005 (+)
13. Percent of Public School 8^{th} Graders Proficient or Better in Mathematics in 2005 (+)
14. Percent of Schools Reporting that More than Half of 4^{th} Grade Parents Participated in Parent-Teacher Conferences in 2003 (+)
15. Percent of Schools Reporting that More than Half of 8^{th} Grade Parents Participated in Parent-Teacher Conferences in 2003 (+)
16. Percent of Classes Taught by Highly Qualified Teachers in All Schools in 2005 (+)
17. Percent of Public School Districts Requiring Full State Teacher Certification in Field to be Taught in 2000 (+)
18. Public High School Drop Out Rate in 2002 (-)
19. Average Class Size in Public Elementary Schools in 2000 (-)
20. Average Class Size in Public Secondary Schools in 2000 (-)
21. Total Student-Teacher Ratio in Public Schools in 2004 (-)

Test scores are obviously one of the main factors considered. As discussed previously, scholars often focus on test scores as a measure of school quality and student achievement. I do not argue that test scores are a poor measure of quality, however they insufficiently capture all the benefits of a quality education on their own. This is why a model that incorporates other factors that contribute to education in addition to test scores is created.

The model includes services that extend beyond the typical classroom experience, such as talented and gifted programs and before or after school programs. These are the kinds of programs that show a strong dedication to the development of a school's students. Students who show exceptional abilities should be challenged by programs that offer them some more advanced materials. The before and after school programs may be even more important, especially when it comes to narrowing the achievement gap among students. The gifted programs are great, but the students who benefit from them will most

likely do very well regardless. The before and after school programs provide a safe place for children and allow them to participate in productive activities or work on their homework. These programs are often beneficial to students of lower income families, where both parents work full-time jobs and cannot afford a babysitter five days a week. AP programs are another example of a school's commitment to student progress. AP courses provide a challenge to students as well as prepare them for higher education.

Additionally, the model includes some data on parent's involvement in their child's education. This might not appear to have a direct impact on quality of education, but one can argue that it reflects a community's preference for education. If parents in a particular school district are very involved then there is likely a large emphasis on education in that district. This emphasis leads to a greater focus on the quality of schools in that district. This data is also likely to translate to the amount of attention that education is given in the student's home. Parents have the ability to be teachers as well and the one-on-one time at home may be just as important as a child's time in the classroom.

This leads to the importance of class size in our public schools. It is believed that class size and student-teacher ratios are crucial components of a quality education. Reducing class size has been a primary goal of parents, teachers, and education researchers. Smaller class sizes create an enhanced learning environment and allow teachers to spend more time and energy helping each individual child succeed. Smaller classes also help improve safety and order in the classroom, which is particularly important with children of young ages. There has also been a significant amount of

research that suggests smaller class sizes lead to increased student achievement (Finn and Gerber, 2005).

Overall, the variables that have been chosen will be an effective measure of the quality of education. It is also important to note that any factors related to funding, revenues, or expenditures are not included. Morgan Quitno's model includes revenue per $1,000 personal income and current expenditures used for instruction in their model. My model determines quality while excluding any monetary variables. I assign a ranking to each state and run various regressions against data pertaining to school finance.

Given the variables in the model, there is reason to believe that money does in fact matter. The additional services that certain schools provide, such as the gifted programs, the before or after school programs, and AP courses are often costly. The factors relating to teachers are also likely to be effected by monetary forces. It only makes sense for the best teachers and the most highly qualified teachers to be more costly. It obviously costs money to hire additional teachers in order to reduce pupil-teacher ratios. Parent involvement may also correlate to funding provided to schools and probably even more so to the income level in a given area. It is possible that districts in which parent involvement is high are relatively wealthy districts. Since most of the funds for education are still provided at the local level, these districts may have greater access to revenues that are provided by property and income taxes.

There are multiple measures of school finance that can be used in the attempt to correlate the quality of education to the funding scheme in a particular state. Several of these are examined in order to determine which ones have a relatively small effect (or no effect) and which ones have a strong effect on quality. A major concern is the possible

correlation between these variables. It is obvious that data on revenues and expenditures will be highly correlated with each other and it is likely that there will be further correlation with other variables such as spending on instruction and salaries. There is also a strong chance of correlation between the data on funds provided by each level of government. In a multiple regression model this results in multicollinearity, which results in imprecise estimates of the independent variables effect on the dependent variable. Table 1 shows the correlation matrix constructed in order to avoid this issue, where high correlations between two variables are highlighted in yellow.

As discussed previously, the effect that the total amount of funds for education has on the quality of schools will be analyzed initially. To avoid multicollinearity issues two groups of variables are formed. The first consists of revenues per pupil, revenues per $1,000 income, the percent of expenditures used for instruction, and state expenditures for preschool. The second contains total expenditures per pupil, current expenditures per $1,000 income, capital expenditures per pupil, and the percent of expenditures used for salaries. Ordinary least squares (OLS) is used to regress the school quality rating on each group of variables. The exact same methodology is applied to investigate how the proportion of funds provided by each level of the government effect school quality. Again, the variables are split into two groups. The first contains revenues per pupil at each the local, state, and federal level of government. The second group consists of local revenues as a percent of total revenues and federal revenues as a percent of the total. Results from the regressions (to be discussed shortly) suggest that there may be a connection between personal income and the quality of education across states. Therefore, the same regression analysis as described above is performed, but per capita

disposable personal income and the percent of the population below the poverty line are added as an additional variables. These methods are the most straightforward and efficient way to test the hypotheses.

5. Results

Using the aforementioned formulas, each state's quality of education rating is calculated, shown in Table 2. Ratings range from 16.86 to -21.36 and the standard deviation is 8.28. The top five states are Minnesota, Massachusetts, Washington, Connecticut, and New Jersey with respective ratings of 16.86, 12.36, 12.03, 11.60, and 11.08. The five worst performing states are Louisiana, Mississippi, Alabama, New Mexico, and West Virginia with respective scores of -21.36, -19.08, -17.84, -14.62, and -12.58. It is interesting to note that the state rankings are noticeably different from those conducted by Morgan Quitno Press. My model employs some new variables, while removing any monetary variables. I feel these factors produce the most accurate and efficient measure of educational quality independent of financial resources, given the data available.

Regression analysis confirms that there is a statistically significant relationship between the quality of education and certain monetary variables. I will reiterate the fact that my measure of the quality of education is different from previous academic studies. Certain studies conclude no statistically significant relationship exists, but most of these studies utilize a narrow definition of educational quality, such as test scores. In every regression in this study there is at least one, and in most cases two statistically significant variables. This econometric analysis will help shed some light on the ensuing debate over

the role of funds in public education. There is certainly some evidence for additional funding to serve as a means to improve the education system. However, beyond a certain point the debate will transcend economic issues and have to grapple with political and social issues that are never easily resolved. First, the statistical relationship between finance and quality will be explored, which is the main focus of this study.

The Overall Amount of Funding and its Effect on Educational Quality:

Version 1 of Table 3 shows the results from the regression of the state ratings of educational quality on the first group of variables to be considered in the question of the effect of the total amount of funds provided for education. Both revenues per pupil and revenues per $1,000 income are statistically significant at the 1-percent level with respective t-scores of 3.524 and -2.856. A one standard deviation increase in revenues per pupil ($2,188.28) translates to a .529 standard deviation increase in the quality rating for education (4.38). Similarly, a one standard deviation increase in revenues per $1,000 income (6.77) leads to a decrease in the quality rating by .443 standard deviations (3.67). The statistically insignificant variables have a negligible impact. Clearly, the total amount of revenues provided for education can have a substantial effect on the quality of education. The 4.38 increase in the quality rating that results from a one standard deviation increase in per pupil revenues is significant and can lead to a jump of nearly ten spots in the rankings in some cases. Although this economic effect has been established, some issues remain.

A major limit on the value of this information is the feasibility of raising such funds. Louisiana, the worst ranking state according to the model, had a 2005 enrollment in public elementary and secondary schools of 724,281, the 24th largest enrollment in the

nation. Therefore, a one standard deviation increase in revenues per pupil would require additional funds totaling $1,584,929,626.68. In a state that raised $5,980,918,000 in revenue in 2005, this translates to a 26.5% increase in total revenues. Therefore, if a state does wish to increase the revenues it allots to education it will have to determine how to obtain the funds. Diverting funds away from other uses or increasing taxes are both likely to face opposition. States will have to decide whether the additional benefit to educational quality is sufficient enough to warrant such a change in the finance of education. This is one of the social and political obstacles that will always impede a consensus on the issue of education finance. The positive association between revenue and quality is clear from the regression data, however the magnitude of the relationship will be scrutinized. We have seen that substantial increases in revenues must occur to see realized gains to educational quality. However, the strong statistical relationship would support a movement to increase revenues gradually. While it is unlikely that any major improvements in educational quality will be observed in the first few years,[2] perpetual increases in funding should stimulate meaningful growth in quality.

An interesting and initially perplexing result of the regression in Table 3 is the negative coefficient for revenue per $1,000 income. However, this is easily explained by variation in income across states. It may be the case that revenue per $1,000 income is large for low income states and small for high income states. This may be the result of differences in income across states being greater than differences in revenues for education. At this point the data suggests that income is likely a key determinant in educational quality. It has already been established that revenue has a positive effect on

[2] For example, a 5% increase in per pupil revenues in the state of Louisiana would only translate to a .697 increase in the rating for the quality of education.

the quality of education. It obviously isn't logical to believe that decreasing revenue in order to lower revenue per $1,000 income would result in a higher quality education, which is what the regression data seems to suggest. Revenue per $1,000 income is showing a negative impact on quality because the data is likely picking up the fact that the quality of education is dependent on personal income. Therefore, states with high revenue per $1,000 income are likely low income states with a lower quality of education. I add personal income and the percent of the population living below the poverty line as additional independent variables to measure their exact effect on educational quality. Results from regressions including personal income and the measure of poverty will be discussed later on.

Version 1 of Table 4 presents results from the regression of educational quality on the next group of variables. Not surprisingly, the results are similar to the regression on the first group of variables. Total expenditures per pupil and current expenditures per $1,000 income are both significant at the 1-percent level with respective t-scores of 4.686 and -3.872. The economic effect of the expenditure variables is slightly greater than that of the revenue variables. A one standard deviation increase in total expenditures per pupil ($1,914.01), results in a .694 standard deviation increase in the quality of education (5.74). A one standard deviation increase in current expenditures per $1,000 income (6.34), translates to a decrease in educational quality by .547 standard deviations (4.53). The statistically insignificant variables have minimal impact. This data essentially echoes the results of the regression on the prior group of variables. Total expenditures certainly have a significant positive relationship with the rating for the quality of education. The issue over the feasibility of increasing expenditures by a substantial amount remains. As

discussed previously, the relationship is strong enough to invoke a movement to begin increasing expenditures allotted to education on a yearly basis in order to realize gains in educational quality. The previous theory on the effect of income on educational quality is also likely the cause of the negative coefficient on current expenditures per $1,000 income.

The regression data confirms that a significant relationship does exist between the overall amount of funds provided for education and the quality of education. Additional funding can improve students experience in the classroom. It is important to remember the variables that comprise the model for the quality of education. The data suggests that increased funds for education can improve things such as class size, test scores, quality of teachers, graduation rates, student-teacher ratios, and other educational programs. With this relationship established, it will be valuable to examine the sources of these funds and whether the distribution of funds affects educational quality. Each state provides a different percentage of funds from the local, state, and federal levels of government. Empirical research suggests that states that provide a greater portion of funds at the state level demonstrate greater equity in educational quality within the state. Equity is a sensitive issue and is certainly something to strive for; however, other research suggests that states that provide a greater proportion of funds at the local level exhibit a higher degree of quality. But prior research does not examine quality in the same way that the model in this study does. Given the relationship between the overall level of funds and educational quality, it will be advantageous to examine how the proportion of funds provided by each level of government affects school quality.

The Portion of Funds Provided by Each Level of Government and its Effect on Educational Quality:

The first group of independent variables that are examined in order to test the effect of the various sources of funding employed by different states consists of revenues per pupil at each the federal, state, and local level of government. Version 1 of Table 5 summarizes the results from the regression of the quality rating on these variables. Each variable is statistically significant in this model. Revenues per pupil at the federal level and revenues per pupil at the local level of government are each significant at the 1-percent level with respective t-scores of -3.331 and 3.233. Revenues per pupil at the state level of government is significant at the 2-percent level with a t-score of 2.661. The proportion of funds provided at the state and local levels have a bigger economic significance than those provided at the federal level. A one standard deviation increase in revenues per pupil at the local level ($1,879.34) leads to a .454 standard deviation increase in the quality rating (3.76). An increase in revenues per pupil from the state government of one standard deviation ($1,766.80) translates to an increase in quality of .427 standard deviations (3.53). A one standard deviation increase in revenues per pupil at the federal level (295.24) results in a .392 standard deviation decrease in the rating for educational quality (3.25).

It is slightly perplexing that revenues provided at the local and state level both have a fairly substantial positive effect on the quality of education. As shown in Table 1, these variables are slightly negatively correlated. This makes sense, especially in light of the trade-off that may exist when states finance a greater portion of funds for education at the state level. Baicker and Gordon (2004) examine the mandated equalization schemes

that states have undertaken to increase state aid to local school districts. However, they point out that these measures may be accompanied by parallel decreases in funds provided by local governments. Local governments tend to respond to increases in the level of state funding by reducing their own revenue-raising and their own spending on education.

Despite this possibility, the regression data is likely picking up the effect observed in the previous regressions of the total amount of funds on educational quality. Table 1 also shows that revenues per pupil at the local and state levels of government are fairly correlated with the total amount of revenues per pupil. This is due to the fact that the local and state governments comprise the major source of funds for education. The federal government provides an average of only 9.89% of the funds for education across all states. Therefore, funds provided at the local and state levels are the predominant determinants of a states total amount of funds. Thus, there is a strong positive correlation between these funds and the rating for the quality of education. No clear distinction between local and state funds can be made from the data. At this point it appears that it is not whether the funds originate from the local or state government that is of true importance. The total amount of funds provided from both sources in combination is what seems to drive educational quality.

Interestingly, the estimate for revenues per pupil provided by the federal government has a negative coefficient. To understand why this may be the case it is prudent to discuss the various mechanisms through which federal funds are distributed to the states. Entitlement programs provide funds to individuals who meet certain criteria. All individuals who are eligible are guaranteed funding. Formula or block grants allot

funds to states based on a predetermined formula, which may be linked to things such as the poverty rate. Discretionary or project grants can be applied for through a competitive bidding process. There is no guarantee of funding and there is no predetermined formula. Demonstration grants are also provided on a competitive basis and are generally allocated to test the effectiveness of a new program. Direct payments are provided directly to individuals who satisfy federal eligibility requirements. The nature of these mechanisms suggests that there is likely a significant negative correlation between personal income and the amount of funds provided at the federal level. Therefore, if the positive relationship between personal income and educational quality proves to be true, then the negative coefficient on revenues per pupil provided by the federal government is to be expected.

Version 1 of Table 6 presents regression results for the next group of variables, which break down revenues provided by the various levels of government as a percentage of total revenues. Federal revenues as a percentage of the total is the only statistically significant variable with a t-score of -5.026. Local revenues are statistically insignificant and state revenues could not be included in the regression. Table 1 shows that the correlation between state and local revenues as a percentage of total revenues is -.97, an extremely high negative correlation. To avoid obvious multicollinearity issues, state revenues were removed from the regression. Local revenues prove to be economically insignificant as well and have a negligible effect on the quality of education. However, federal revenues as a percentage of total revenues have a fairly strong and negative effect on educational quality. A one standard deviation increase in federal revenues as a percentage of the total (3.29), leads to a .602 standard deviation decrease in the rating for

educational quality (4.98). This is an interesting result. The greater the percentage of funds provided by the federal government, the worse the quality of education. This result is again likely tied to the mechanisms behind which federal funding is provided and to the likely effect of personal income on educational quality. Funds provided by the federal government are often provided on the basis of need. A greater amount of funds are delegated to states where lower income results in greater need. Therefore, the regression data is likely picking up the fact that a higher portion of federal revenues coincides with states that have lower personal incomes, resulting in a lower quality of education. It will be interesting to see exactly what kind of an effect, in terms of magnitude and statistical significance, that personal income has on the quality of education.

Personal Income and Poverty and Their Effect on the Quality of Education:

The regression data suggests that there is a probable link between personal income and educational quality. Data was obtained for per capita disposable personal income and the percent of the population living in poverty. These variables exhibit a high negative correlation, so in order to prevent multicollinearity they are introduced into the previous regressions one at a time. Table 1 shows that there is a strong correlation between personal income and both total revenues per pupil and total expenditures per pupil. Since these variables have been determined to be two of the most significant in terms of their explanatory power of educational quality, it is sensible to expect personal income to have a similar effect. Due to this correlation total revenues per pupil and total expenditures per pupil are removed from any regressions where personal income or the poverty level are included in order to avoid issues of multicollinearity.

Version 2 of Table 3 presents the estimates for the model that incorporates personal income and drops revenues per pupil. As you can see, personal income is now the only statistically significant variable in the regression with a t-score of 3.364. It is also fairly significant in economic terms. A one standard deviation increase in personal income ($3,959.83), translates to a .479 standard deviation increase in educational quality (3.96). It appears that there is indeed a positive relationship between personal income and the quality of education. The implications of this result are somewhat disquieting. It implies that students residing in wealthier areas receive a greater quality of education. One of the main concerns of economists and scholars who cover this issue is the possibility of a student's education depending on the wealth of their parents and neighbors. Many of the legislative measures that have been enacted in recent years intend to diminish this possibility and provide a fair and equal education for all students. At this point it seems that these measures have not been sufficient in achieving this goal and that the income in a given area is a large determinant of educational quality.

Version 2 of Table 4 reinforces the effect of personal income on the quality of education. In this regression, expenditures per pupil are dropped to avoid multicollinearity. Again, personal income is the only statistically significant variable with a t-score of 3.515. The economic effect is identical to the previous regression. A one standard deviation increase in personal income ($3,959.83), leads to a .479 standard deviation increase in educational quality (3.96).

Version 2 of Table 5 displays results from the regression of educational quality on the proportion of revenues provided by each level of the government and personal income. Interestingly, revenues provided by the federal government is the most

statistically significant variable with a t-score of -3.348. Personal income is statistically significant with a t-score of 1.914, but only at around the six-percent level. A one standard deviation increase in revenues per pupil at the federal level ($295.24) results in a .392 standard deviation decrease in the rating for educational quality (3.25). An increase in personal income by one standard deviation ($3,959.83), leads to an increase in educational quality of .479 standard deviations (3.96). Again, we see that revenues provided at the federal level have a negative effect on the quality of education. Personal income also demonstrates the same effect on quality as we have seen. The effect and significance of revenues provided by the state and local governments are considerably less when personal income is added to the regression.

Version 2 of Table 6 yields very similar results to that of Table 5. Federal revenues as a percent of total revenues is highly significant with a t-score of -3.777, while personal income is moderately significant with a t-score of 1.929. Local revenues have been removed from the model due to multicollinearity and state revenues are statistically and economically insignificant. Personal income continues to exhibit the same positive relationship with educational quality. An increase in federal revenues as a percent of the total by one standard deviation (3.29), translates to a .489 standard deviation decrease in the quality of education (4.05).

When the percent of the population living below the poverty line is added to the regressions in place of personal income, it becomes the most statistically and economically significant variable. This is a very interesting and disquieting result, which suggests that states with large populations of the poor suffer from a lower quality of schooling. Version 3 of Table 3 shows that poverty is highly significant, with a t-statistic

of -7.279. Additionally, per pupil state expenditures for preschool is significant with a t-score of 2.582. Expenditures for preschool was not significant in any of the prior regressions. However, its effect is still rather modest. A one standard deviation increase ($2234.27) leads to a .270 standard deviation increase in educational quality (2.23). Poverty, on the other hand, has an extremely large, negative effect on the quality of education. A one standard deviation increase (3.28) leads to a .697 standard deviation decrease in the quality rating (5.77). This reinforces the concern that educators and scholars have over income's role as a determinant of educational quality. Interesting, the percent of the population below the poverty line has an even larger effect than personal income. This may suggest that the mechanisms through which income affects education (to be discussed shortly) are stronger amongst the very poor.

Version 3 of Table 4 tells a similar story. The percent of the population below the poverty line becomes the only statistically significant variable with a t-score of -6.534. Its economic significance is slightly stronger than in the previous regression. A one standard deviation increase (3.28) leads to a decrease in educational quality of .717 standard deviations (5.94).

Version 3 of Table 5 examines the role of the proportion of revenues provided by each level of government and poverty on educational quality. Both revenues per pupil provided by the federal government and the percent of the population below the poverty line are statistically significant, with respective t-scores of -3.219 and -5.278. A one standard deviation increase in revenues provided by the federal government ($295.24) translates to a .321 standard deviation decrease in the quality of education (2.66). An increase in the poverty level by one standard deviation (3.28) results in a .617 decrease in

the quality rating (5.11). Revenues provided by the state and local governments both have negligible effects. It is also noteworthy to point out that this regression yields the highest r^2 of any of the regressions, .620. In other words, 62% of the variation in educational quality can be explained by the variation in revenues provided by each level of government and the percent of the population below the poverty line.

The results of Version 3 of Table 6 echo those of the prior regression. Federal revenues as a percent of total revenues and the percent of the population below the poverty line are both very significant with t-statistics of -2.967 and -4.819, respectively. They both continue to show a substantial negative effect on the quality of education.

All of this data suggests that personal income and poverty are in fact major explanatory variables. The force behind their influence is likely the correlation between personal income and revenues. The education system depends heavily on income and property taxes to finance the necessary expenditures for schooling. These taxes are either directly or indirectly associated with personal income. Therefore, there is a flow-through effect, whereby personal income affects educational quality through its role in generating revenues. Fernández and Rogerson (1997) provide empirical evidence of this theory in their paper on the determinants of expenditures for education. They find that the growth in personal income per pupil is a key determinant in growth of spending per pupil over the long-run. However, personal income may also have an effect through other channels that are not readily measurable.

Generally, higher personal income is associated with higher education, implying that the parents in high income areas are likely well-educated. It is possible that well-educated parents put more emphasis on education than parents who are not as well-

educated. It could also be the case that more educated parents are endowed with greater skill and ability, which passed along to their offspring may result in better performance in school. Various studies have confirmed the persistence of economic status across generations, but relatively little is known about the forces driving this phenomenon. Oreopoulus, Page, and Stevens (2003) examine the influence of parental education on grade retention status for children aged 7 to 15. Their results indicate that a one year increase in the education of either parent reduces the probability that a child repeats a grade by two to seven percentage points. They conclude that parental education has an independent and substantial influence on children's education outcomes.

Black, Devereux, and Salvanes (2003) explore the same issue. They present two scenarios of why parents with higher education levels have children with higher education levels. The first is analogous to the innate ability theory, whereby parents with higher levels of income, higher salaries, etc., have children who will follow the same path. The second is that higher education makes you a different type of parent, and therefore leads to your children having higher educational outcomes. Black, Devereux, and Salvanes find little evidence of a causal relationship between father's education and children's education, and a small but significant causal relationship between mother's education and her son's education but no relationship with her daughter's education. These findings suggest that the high correlations between parent's and children's education are due primarily to family characteristics and inherited ability and not education spillovers.

There is obviously still a good deal of discrepancy over the effect of parent's involvement, education, and personal income on their children's education. There are an

excess of books, journal articles, and reports on the subject and the research does suggest certain relationships. Cotton and Wikelund (1989) summarize many of these findings. There is overwhelming support of parent involvement in children's learning being positively related to achievement. The relationship between parent involvement and student outcomes other than achievement, such as attitude toward school, classroom behavior, time spent on homework, and motivation, although not as extensively researched, appears to be strong and positive. Significant to my work, is the role of parent involvement among populations whose socioeconomic status may put them at an educational disadvantage relative to their peers. This ties the influence of parent involvement back to the effect of personal income and poverty on education.

Researchers have discovered that minority or low-income parents are often underrepresented among the scope of parents involved with their children's schools. There are several theories as to why this may be the case. Reasons include: lack of time or energy (due to long hours, for example), embarrassment about one's own educational level, lack of understanding about the structure of the school, teacher's assumptions of parent's disinterest or inability to help with their children's education. For example, almost half of principals (48 percent) in K-8 Title I schools report that lack of staff training in working with parents is a great or moderate barrier to parent involvement (U.S. Department of Education, 1997). This research suggests a correlation between personal income and parent involvement, suggesting that parents of greater income are likely more willing and more able to positively influence their children's education. However, an important finding of the research is that involvement of minority or low-income parents in their child's education can and does have a positive influence. With

proper training and encouragement in the types of involvement that can be beneficial to their children, parents of low-income can make a difference. In fact, the research suggests that disadvantaged students have the most to gain from parent involvement programs.

The fact that personal income and poverty were two of the most statistically and economically significant variables in this study is very telling. The especially strong effect of poverty indicates that the theories just discussed may be even more potent at very low levels of income. In other words, the negatives that may be associated with lower income may be stronger and in effect offset the benefits that may be achieved at higher income, as a whole. This issue has emerged as an important topic, as 12.9 million children under the age of 18 in the U.S., or more than one is six children, were living in poverty in 2003 (U.S. Census, 2004). Dahl and Lochner (2005) examine the consequences of growing up poor for a child's education and development. They find that income does have a significant effect on a child's math and reading test scores. They also find that supplementing the income of the poor can significantly increase student achievement. This is an important finding, which suggests that efforts to assist poorer families can help close the gap in the quality of education across incomes.

Clearly, personal income and poverty have the ability to affect educational quality through a variety of channels. Obviously, a goal of the education system is to provide an equal experience for all students. The relationship between personal income and educational quality suggests that students from more advantaged backgrounds are more likely to receive a higher quality of education than those of less fortunate backgrounds. Unfortunately, it would require a major transformation in the structure of the education finance system to change personal income's role in the collection of revenues. There does

not appear to be any viable solution to eliminating the effect of personal income through revenues. Changes to the way in which education is funded are a possibility, but we are too far from any consensus on what these changes should be. The current system of taxation appears to be the only adequate means of acquiring the necessary funds. However, personal income and the amount of poverty in a given state are likely to effect the learning environment in which children grow up. Although there will certainly still be discrepancies across socioeconomic backgrounds, programs encouraging parent involvement in their children's education can go a long way in contributing to a better educational experience. This is an area that can undoubtedly be approved upon. Educating parents, specifically those of particular backgrounds, in the most valuable ways to involve themselves in their children's education may greatly improve educational quality on several fronts.

6. Conclusion

The importance of education finance in the United States and the lack of a consensus on the most efficient funding scheme have led many scholars to approach the issue from multiple angles. My work merges some of these approaches in the attempt to establish the key determinants of the quality of education. My model allows me to discuss the quality of education in a broad sense, which extends beyond the quantitative measure of a test score. Using the quality ratings derived from the model as the dependent variable, several regressions were performed against a variety of monetary variables, which produced a number of interesting results.

First, the overall amount of funds does have a significant effect on educational quality. Both revenues and expenditures per pupil have a substantial positive relation to the quality of education. Revenues and expenditures per $1,000 income both have a negative effect on quality, but this is likely due to differences in income across states being greater than differences in revenues for education. States with high revenue per $1,000 income are likely low income states, and personal income is positively related to educational quality. The portion of funds provided by each level of government is also telling. Revenues per pupil provided at the local and state government both have a significant positive effect on the quality of education. Given the negative correlation between local and state revenues, this result is perplexing at first. However, the local and state governments provide the majority of funds for education. Therefore, the data is most likely picking up the effect of total revenues on education, which is a strong positive one. Revenues per pupil provided at the federal level has a negative relationship with the quality of education. This can be attributed to mechanisms through which federal funds are distributed to the states. Funds provided by the federal government are often provided on the basis of need, so that states of lower income receive greater federal funding. Given the positive relationship between personal income and educational quality, the negative estimate on revenues provided at the federal level makes sense. This also explains the negative relationship between educational quality and funds provided by the federal government as a percentage of the total amount of funds. As previously discussed, the data indicates a strong positive relation between personal income and educational quality. The effect of personal income operates through a few different channels, including its

link to the collection of revenues and its influence on the learning environment in which children are raised.

The aim of this paper is to establish what factors lead to a greater quality of education, in order to determine how educational policies can be molded to provide the greatest quality of education for the greatest number of students. The regression analysis has exposed various relationships in the data, which suggest that certain measures can be taken in an attempt to improve educational quality across the United States.

The positive relation between the total amount of funds provided for education and the quality of education is clear; money does matter! The impact of additional revenues can be substantial. The 4.38 increase in the quality rating that results from a one standard deviation increase in per pupil revenues can lead to a jump of nearly ten spots in the rankings in some cases. Unfortunately, money does not grow on trees and the feasibility of raising a significant amount of funds is an issue. Louisiana, the worst ranking state according to the model, had a 2005 enrollment in public elementary and secondary schools of 724,281, the 24th largest enrollment in the nation. Therefore, a one standard deviation increase in revenues per pupil would require additional funds totaling $1,584,929,626.68. In a state that raised $5,980,918,000 in revenue in 2005, this translates to a 26.5% increase in total revenues. Obviously, an increase of funds of this magnitude cannot be achieved overnight. However, gradual increases over time should still lead to quality gains.

There are several ways in which these gains may be achieved. Gradual increases in taxes or a gradual diversion of funds away from other areas are both possibilities. Education is believed to be a top priority among the American public, so funding should

reflect that. In a poll conducted by Princeton Survey Research Associates, 76% of the respondents asserted that the federal government should increase spending for education, thus ranking education as the most important issue among 14 issues including health care, Medicare and crime (Public Agenda Online, 2002b). It would appear that these increases in funding are already underway. According to the U.S. Census Bureau (2008), the total government spending on education at federal, state and local levels was $488.5 billion in 2005, an increase of 5.3% ($25.8 billion) from 2004. Finding ways to continue to increase the funds available for education should be a focus in improving educational quality going forward.

Another important result comes from Version 1 of Table 5. This data suggests that there is no real discrepancy between the value of funds from local and state sources. This is due to the fact that the local and state governments comprise the major source of funds for education. The federal government provides an average of only 9.89% of the funds for education across all states. Therefore, funds provided at the local and state levels are the predominant determinant of a states total amount of funds, which is positively related to educational quality. Previous literature (Moser and Rubenstein, Baicker and Gorden, Murry, Evans, & Schwab) presents evidence that states where a greater portion of funds are provided by the state rather than the local government experience a greater amount of equity in quality of schooling. One reason that a predominantly state financed education system has not been adopted is that other literature suggests an equity-efficiency trade-off. Some scholars argue that states financed more heavily by local governments achieve a higher quality of education. It is necessary to remember that there is a large discrepancy in how quality is defined. Many of these studies link quality to a standardized test score, a

very narrow definition of educational quality. The model of quality employed in this paper encompasses a broad array of measures, and the regression data suggests that states where a higher portion of funds are provided locally do not have a distinct quality advantage over states where a larger portion of funds are provided by the state. Therefore, it seems reasonable to promote funding by the state government. In order to augment educational quality, state funds cannot simply replace local funds. Baicker and Gordon (2004) point out that state equalization schemes may be accompanied by parallel decreases in funds provided by local governments. So while state aid may increase equality, offsetting losses due to a crowding out effect may be detrimental to the total amount of funds allotted to education and to the quality of education. However, if states take on a larger burden of the finance of education without negatively affecting the provision of local funds, there is room for significant quality gains and what some consider more important, significant equity gains.

The regression data confirms the sizeable role of personal income and poverty as determinants of educational quality. This is a disconcerting result. Many scholars and educators argue that the funds available for education should not be determined by relative property value and personal income. This argument has held up in court and led to significant changes in the portions of federal, state, and local funding over the past 30 years. Clearly, equality across socioeconomic backgrounds is something that legislators have deemed to be consistent with the laws regarding public education in the United States. While the changes in education finance have been significant, personal income remains a key determinant of quality and will continue to be a factor unless there is a major restructuring of the education finance system. A restructuring of this nature is both

unlikely and unfeasible. At this point in time, income and property taxes are the main sources of funds. Unfortunately, in order to provide anywhere near an adequate amount of funding for education, taxes based on personal income are a necessity. However, we can try to mitigate the role of personal income as much as possible.

The aforementioned thought of increasing the proportion of funds provided by the state government should promote equity across districts within a given state, but not necessarily across states themselves. The federal government, however, has the ability to assume a larger role in the finance of education and promote a more equitable distribution of educational quality across states. The negative coefficient on the estimates related to funds provided by the federal government is most likely tied to the mechanisms behind which federal funding is provided and to the effect of personal income on educational quality. Funds provided by the federal government are often provided on the basis of need, whereby a greater amount of funds are delegated to states where lower income results in greater need. This result should not be interpreted to mean that federal funding should be scaled back in order to increase educational quality. Rather, the funds provided by the federal government are simply insufficient to warrant any realized gain in the quality of education. Education and training comprise a mere 3.1% of the federal government's budget. In addition, only 43.5% of these funds are delegated to elementary, secondary, and vocational education (2008 Budget of the United States Government). It is true that the responsibility for public education rests with the states under the U.S. Constitution. Therefore, the federal government provides assistance to the states and schools in an effort to supplement, not supplant, state support. However, there is also a compelling national interest in the quality of the nation's public schools. An interest that

is strong enough to warrant more than 3.1% of the federal budget. If the federal government can increase its outlays to states in need the benefits will be twofold. First, by the association between funding and quality, additional funds should enhance educational quality across the board. Second, by targeting states and schools of lower income the federal government can assist in promoting equity across states. The federal government may also wish to target families living below the poverty line. The percent of the population living in poverty was the most significant variable in both statistical and economic terms in each of the regressions in which it was included. As Dahl and Lochner point out, increasing aid to the poor can lead to improvements in the educational achievement of their children. The federal government indeed strives to do these things, but the data suggests that the magnitude of their efforts is insufficient to produce any significant gain in educational quality.

There are other channels through which personal income is thought to affect the quality of education. A child's education extends beyond the classroom into the home. The environment that a child grows up in can have a substantial impact on many aspects of the education process. Research has shown that there is positive correlation between personal income and the involvement of parents in their child's education. There are several theories as to why this may be the case, many of which center around the fact that parents are not aware of the importance of their involvement or are not involved in the proper way. The introduction of parent involvement programs could be instrumental in closing the gap in educational quality across incomes. An important finding of the research is that involvement of minority or low-income parents in their child's education can and does have a positive influence. With proper training and encouragement in the

types of involvement that can be beneficial to their children, parents of low-income can make a difference. In fact, the research suggests that disadvantaged students have the most to gain from parent involvement programs.

Children in lower income areas are also likely to have fewer resources at their disposable. Schools in low income areas often lack resources, in terms of books, computers, libraries, sports equipment, media centers etc., in comparison to schools in higher income areas. School libraries and other resources can be critical in achieving instructional goals. In addition, these students are less likely to have the same kinds of resources in their home. Programs to provide resources to the less fortunate are another way to close the gap in equity of educational quality across personal income. These types of programs already exist, as do various after-school programs. However, educators and researchers are constantly attempting to discover ways to improve their efficacy.

After-school programs can be extremely valuable to a child's education process. The children who benefit from these programs are often from lower income households where both parents work full-time. In 2003, an After-School Summit hosted by the U.S. Department of Education was held in Washington D.C. in order for educators, researchers, and government officials to discuss ways to improve and measure the effectiveness of after-school programs. Research has suggested that these programs can "contribute to a range of positive outcomes including academic, social and emotional, health and safety, and community engagement" (C.S. Mott). Educators and legislators have been clear on the desire for increased equity in public education. In addition to changes to the education finance system, these other programs and measures can

contribute to a more efficient and equitable distribution of educational quality across the United States.

Clearly, there are ways to improve the quality of education in this country. Since education is such a high priority it is not surprising that there is so much debate surrounding the issue of education finance. As discussed previously, a portion of this debate is due to the lack of a consensus on what a quality education consists of. Much of the previous literature examines test scores as a measure of student achievement. This paper develops a more encompassing model that seeks to include several other factors that significantly contribute to a quality education. A model of this nature could be highly useful for both the federal and state governments in assessing the need of funds in various states and school districts. The data suggests a significant and positive relationship between the amount of funds provided for education and educational quality. Therefore, we should be seeking the most efficient and effective manner to continue to increase the funds made available for education and to distribute them in an equitable fashion, so that we can provide the greatest number of students with the greatest quality of education given the resources available.

7. Definition of Terms

a. *The federal range ratio*- the difference between the values of the 5th and 95th percentiles divided by the value for the 5th percentile. This measure provides an indication of how much greater allocations of resources are at the high end of the distribution than at the low end. (Marshak, 1999)

b. *The coefficient of variation*- 100 times the standard deviation divided by the mean. It roughly indicates the percentage above and below the mean within which 68% of the observations lie. A value of zero indicates perfect equity. (Marshak, 1999)

c. *The McLoone Index*- compares the total revenue for all students below the median student with a calculation of what would have to be received to bring all of them up to the median revenue per student in the state. The closer this value is to 1, the less dispersion there is among students in low revenue districts. (Marshak, 1999)

d. *The Gini coefficient*- compares the cumulative proportion of the aggregate revenues per student with the cumulative proportion of students, when students are ranked in ascending order of revenue per student. The coefficient ranges from 0 to 1, with 0 indicating perfect equity. (Marshak, 1999)

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Table 1

		Rating	2004-2005 Revenues (per pupil)				2004-2005 Revenues (per $1,000 income)				2003-2004 Revenues (% of Total)				2004-2005 Revenues (% of Total)		
			Total	*Federal*	*State*	*Local*	*Total*	*Federal*	*State*	*Local*	*Federal*	*State*	*Local*	*Private*	*Federal*	*State*	*Local*
Rating		1															
2004-2005 Revenues (per pupil)	*Total*	0.403589	1														
	Federal	-0.441647	0.0643	1													
	State	0.142326	0.58997	0.1722	1												
	Local	0.405511	0.59964	-0.24411	-0.2802	1											
2004-2005 Revenues (per $1,000 income)	*Total*	-0.136305	0.51926	0.49472	0.51479	0.0429	1										
	Federal	-0.589764	-0.25488	0.91297	0.00282	-0.443	0.460647	1									
	State	-0.165485	0.1944	0.32944	0.8511	-0.626	0.614006	0.351484	1								
	Local	0.234624	0.33429	-0.18081	-0.5246	0.9108	0.088847	-0.264099	-0.706379	1							
2003-2004 Revenues (% of Total)	*Federal*	-0.643501	-0.48171	0.80051	-0.1386	-0.556	0.145586	0.919559	0.219973	-0.384146	1						
	State	-0.110154	-0.04098	0.19897	0.66041	-0.7	0.266382	0.253161	0.793062	-0.762529	0.24108	1					
	Local	0.282407	0.21125	-0.38165	-0.5282	0.8025	-0.242922	-0.474753	-0.755811	0.803303	-0.5002	-0.956	1				
	Private	-0.137958	-0.47818	-0.09154	-0.4349	-0.134	-0.39604	0.029681	-0.31241	-0.012912	0.18397	-0.272	0.10126	1			
2004-2005 Revenues (% of Total)	*Federal*	-0.627267	-0.50915	0.80425	-0.2175	-0.515	0.108944	0.920192	0.136927	-0.320304	0.98107	0.17058	-0.4325	0.20543	1		
	State	-0.126852	-0.03112	0.1285	0.77594	-0.786	0.241582	0.180799	0.908519	-0.902993	0.18167	0.8589	-0.8186	-0.1931	0.0943973	1	
	Local	0.273167	0.15369	-0.31791	-0.6818	0.8698	-0.255363	-0.395722	-0.893797	0.933303	-0.4114	-0.855	0.88078	0.13276	-0.333368	-0.9700558	1
2003-04 Total Expenditures (per pupil)		0.436402	0.9562	0.0479	0.51729	0.6196	0.498396	-0.247452	0.143232	0.373255	-0.4933	-0.1007	0.26786	-0.4645	-0.50919	-0.0820598	0.201941
2004-05 Current Expenditures (per pupil)		0.375949	0.97212	0.09119	0.54477	0.6054	0.510262	-0.217093	0.167246	0.347344	-0.4445	-0.0759	0.2326	-0.4666	-0.464927	-0.0634704	0.173537
2004-05 Current Expenditures on		0.389071	0.94434	0.05564	0.52785	0.5946	0.455098	-0.253555	0.142675	0.334506	-0.4628	-0.0879	0.24784	-0.4614	-0.480473	-0.0622685	0.176192
2004-2005 Current Expenditures (per $1,000		-0.153954	0.49318	0.49209	0.44811	0.0757	0.928421	0.459986	0.542487	0.10614	0.15821	0.19321	-0.1808	-0.3766	0.1356922	0.1816146	-0.205099
2004 Capital Expenditures (per pupil)		0.20674	0.29039	0.19798	0.18967	0.1287	0.295685	0.112253	0.125267	0.100051	-0.0426	-0.0234	0.04892	-0.1611	-0.054309	0.0275301	-0.012822
2004 Salaries and Wages (per pupil)		0.407378	0.94871	0.01891	0.49889	0.6327	0.429773	-0.287716	0.100485	0.37034	-0.4963	-0.1168	0.28421	-0.4719	-0.513913	-0.1032535	0.223164
% Expenditures Used for Salaries		-0.065547	-0.35183	-0.20534	-0.3076	-0.088	-0.36839	-0.112088	-0.245621	-0.02594	0.02047	-0.14	0.1123	0.1119	0.0104348	-0.1054141	0.097284
Expenditures for Instruction (per pupil)		0.401483	0.94439	0.0407	0.51056	0.6133	0.445835	-0.269358	0.119104	0.358237	-0.4824	-0.1084	0.27214	-0.4648	-0.494127	-0.0874138	0.203336
% Expenditures Used for Instruction		0.212028	0.30085	-0.22171	0.05878	0.3299	-0.056663	-0.344239	-0.147459	0.219245	-0.379	-0.2638	0.35935	-0.178	-0.357981	-0.1521633	0.23144
State Expenditures for Preschool (per pupil)		0.307992	0.30723	-0.31568	0.29135	0.1334	-0.063634	-0.388761	0.087346	-0.054216	-0.3994	0.14071	-0.0146	-0.1123	-0.411793	0.1731501	-0.063512
Federal Allocations for Head Start Program (per		0.34541	0.39969	-0.02708	0.3041	0.1838	0.022979	-0.192235	0.070428	-0.007492	-0.2582	-0.0383	0.12552	-0.229	-0.247433	0.070948	-0.006823
Disposable Personal		0.520022	0.72414	-0.12876	0.25303	0.6255	-0.017776	-0.426227	-0.193799	0.33459	-0.5389	-0.2738	0.41715	-0.2474	-0.528662	-0.2323728	0.349041

2003-04 Total Expenditures (per pupil)	2004-05 Current Expenditures (per pupil)	2004-05 Current Expenditures on Instruction	2004-2005 Current Expenditures (per $1,000 income)	2004 Capital Expenditures (per pupil)	2004 Salaries and Wages (per pupil)	% Expenditures Used for Salaries
1						
0.970353527	1					
0.936711576	0.979718222	1				
0.531979775	0.568712493	0.525786711	1			
0.384709018	0.262272559	0.23934352	0.198284207	1		
0.948362133	0.967600384	0.955186184	0.484241733	0.25455879	1	
-0.362033982	-0.376341239	-0.325982003	-0.400447276	0.000673972	-0.159399688	1
0.946618133	0.980260833	0.995776724	0.52058234	0.225061733	0.964279045	-0.325332804
0.30169596	0.353386159	0.507688015	0.059452201	-0.102818579	0.39519594	0.105423039
0.361867719	0.334766057	0.315913208	0.000401961	0.167713882	0.368000367	0.001922807
0.396310262	0.380696316	0.414317722	0.033138104	0.33347867	0.423556156	0.050206858
0.718546623	0.675384662	0.656128378	-0.051482767	0.371424052	0.716389101	-0.047858741

Expenditures for Instruction (per pupil)	% Expenditures Used for Instruction	State Expenditures for Preschool (per pupil)	Federal Allocations for Head Start	Disposable Personal Income
1				
0.509912443	1			
0.313768708	0.004911152	1		
0.413105194	0.368559794	0.101057645	1	
0.659239566	0.233738735	0.287909124	0.549209276	1

Table 2

State	Rating	State	Rating
Alabama	(17.84)	Minnesota	16.86
Alaska	(6.13)	Massachusetts	12.36
Arizona	6.12	Washington	12.03
Arkansas	(6.51)	Connecticut	11.60
California	(4.04)	New Jersey	11.08
Colorado	7.87	Colorado	7.87
Connecticut	11.60	Pennsylvania	7.71
Delaware	0.51	Wisconsin	7.69
Florida	(1.63)	Oregon	7.40
Georgia	(6.00)	Iowa	6.88
Hawaii	(2.21)	Arizona	6.12
Idaho	5.64	New York	5.86
Illinois	3.98	Idaho	5.64
Indiana	1.18	Utah	5.45
Iowa	6.88	Vermont	4.62
Kansas	2.25	Michigan	4.27
Kentucky	(4.69)	Illinois	3.98
Louisiana	(21.36)	New Hampshire	3.54
Maine	1.01	Ohio	3.33
Maryland	3.07	Maryland	3.07
Massachusetts	12.36	Nebraska	2.81
Michigan	4.27	Kansas	2.25
Minnesota	16.86	Virginia	1.91
Mississippi	(19.08)	Indiana	1.18
Missouri	(2.16)	Maine	1.01
Montana	(0.19)	Delaware	0.51
Nebraska	2.81	South Dakota	0.48
Nevada	(4.63)	Montana	(0.19)
New Hampshire	3.54	North Carolina	(0.43)
New Jersey	11.08	Florida	(1.63)
New Mexico	(14.62)	Missouri	(2.16)
New York	5.86	Hawaii	(2.21)
North Carolina	(0.43)	North Dakota	(3.03)
North Dakota	(3.03)	Wyoming	(3.62)
Ohio	3.33	California	(4.04)
Oklahoma	(5.12)	Nevada	(4.63)
Oregon	7.40	Texas	(4.66)
Pennsylvania	7.71	Kentucky	(4.69)
Rhode Island	(6.10)	Oklahoma	(5.12)
South Carolina	(7.22)	Georgia	(6.00)
South Dakota	0.48	Rhode Island	(6.10)
Tennessee	(11.65)	Alaska	(6.13)
Texas	(4.66)	Arkansas	(6.51)
Utah	5.45	South Carolina	(7.22)
Vermont	4.62	Tennessee	(11.65)
Virginia	1.91	West Virginia	(12.58)
Washington	12.03	New Mexico	(14.62)
West Virginia	(12.58)	Alabama	(17.84)
Wisconsin	7.69	Mississippi	(19.08)
Wyoming	(3.62)	Louisiana	(21.36)

Table 3

	1	2	3
Revenues Per Pupil	0.002***	---	---
	(0.001)		
Revenues Per $1,000 Income	-0.542***	-0.137	-0.175
	(0.190)	(0.151)	(0.114)
Percent Expenditures Used for Instruction	0.015	0.305	0.171
	(0.407)	(0.384)	(0.289)
State Expenditures for Preschool Per Pupil	0.000	0.001	0.001***
	(0.001)	(0.000)	(0.000)
Per Capita Disposable Personal Income	---	0.001***	---
		(0.000)	
Percent of Population Below Poverty Line	---	---	-1.759***
			(0.242)
Constant	2.591	-42.400	18.258
	(26.182)	(24.381)	(19.746)
R-Squared	0.334	0.321	0.610
Observations	50	50	50

Notes: Dependent variable is the quality of education ratings from Table 2. Standard errors are in parentheses.
* Significant at the 5-percent level
** Significant at the 2-percent level
*** Significant at or beyond the 1-percent level

Table 4

	1	2	3
Total Expenditures Per Pupil	0.003***	---	---
	(0.001)		
Current Expenditures Per $1,000 Income	-.714***	-0.248	-0.170
	(0.184)	(0.185)	(0.150)
Capital Expenditures Per Pupil	0.001	0.002	0.001
	(0.003)	(0.003)	(0.003)
Percent Expenditures Used for Salaries	-0.082	-0.305	0.063
	(0.334)	(0.353)	(0.294)
Per Capita Disposable Personal Income	---	0.001***	---
		(0.000)	
Percent of Population Below Poverty Line	---	---	-1.810***
			(0.277)
Constant	6.761	-3.286	25.822
	(24.686)	(28.210)	(20.874)
R-Squared	0.401	0.300	0.542
Observations	50	50	50

Notes: Dependent variable is the quality of education ratings from Table 2. Standard errors are in parentheses.
* Significant at the 5-percent level
** Significant at the 2-percent level
*** Significant at or beyond the 1-percent level

Table 5

	1	2	3
Revenues Per Pupil (Federal)	-0.011***	-0.011***	-0.009***
	(0.003)	(0.003)	(0.003)
Revenues Per Pupil (State)	0.002**	0.001	0.000
	(0.001)	(0.001)	(0.001)
Revenues Per Pupil (Local)	0.002***	0.001	0.000
	(0.001)	(0.001)	(0.001)
Per Capita Disposable Personal Income	---	0.001	---
		(0.000)	
Percent of Population Below Poverty Line	---	---	-1.558***
			(0.295)
Constant	-4.208	-18.113	25.551
	(5.329)	(8.925)	(7.051)
R-Squared	0.384	0.430	0.620
Observations	50	50	50

Notes: Dependent variable is the quality of education ratings from Table 2. Standard errors are in parentheses.
* Significant at the 5-percent level
** Significant at the 2-percent level
*** Significant at or beyond the 1-percent level

Table 6

	1	2	3
Federal Revenues as % of Total	-1.515***	-1.231***	-0.830***
	(0.302)	(0.326)	(0.280)
State Revenues as % of Total	---	-0.014	-0.011
		(0.073)	(0.061)
Local Revenues as % of Total	0.044	---	---
	(0.074)		
Per Capita Disposable Personal Income	---	0.001	---
		(0.000)	
Percent of Population Below Poverty Line	---	---	-1.363***
			(0.283)
Constant	13.000	-4.029	25.896
	(4.923)	(11.951)	(4.115)
R-Squared	0.398	0.443	0.600
Observations	50	50	50

Notes: Dependent variable is the quality of education ratings from Table 2. Standard errors are in parentheses.
* Significant at the 5-percent level
** Significant at the 2-percent level
*** Significant at or beyond the 1-percent level