Research Report

Examination of Efficiency of Arkansas School Districts in 2007 and 2011

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CONTENTS

EXECUTIVE SUMMARY

The purpose of this report is to discuss efficiency analyses of the 239 existing school districts in Arkansas. Efficiency analyses have emerged in the professional literature as an empirical approach to assessing statewide educational adequacy. This method differs from others that rely more heavily on professional judgment. Specifically, efficiency is assessed by examining the linear relationship between per student expenditures and student performance and remediation. Two primary goals of P-12 education are increasing student performance and reducing remediation rates.

The statistic used to conduct efficiency analysis in this report is referred to as ordinary least squares (or OLS) regression. This statistic is used to derive predictions based on the efficiency assumption of a linear relationship between inputs and outputs, in this case between per pupil expenditures and student performance on state ACTAAP exams and remediation rates. The predicted data on performance and on remediation are derived from the relationships between per pupil expenditures and performance or remediation after statistically controlling for race and NSLA (National School Lunch Act) in multiple regression. Race and NSLA were selected from many factors included in data from the Arkansas Department of Education (ADE) and from the Adequacy Surveys conducted by the Bureau of Legislative Research (BLR) based on their strength of association with performance and remediation. The factors considered for selection in these analyses are found in the Appendices.

Data from the ADE and BLR included all 239 existing school districts in 2011. District averages on 2007 and 2011 math and literacy state ACTAAP exams came from the National Office for Research on Measurement and Evaluation Systems (NORMES) at the University of Arkansas in Fayetteville. Differences (or residuals) between the predicted data from regression analyses and the observed data from NORMES and ADE were plotted. Perfect efficiency assumes there is no difference (or zero residual) between predicted and observed data. Hence, efficiency analysis entails drawing a line up through the scatter plot from zero difference on the horizontal axis of per pupil expenses, and another line from zero difference on the vertical axis of student performance or remediation. The dots in the scatter plot indicate in which quadrant formed by the intersection of the two zero lines from per pupil expenses and student performance or remediation a school district is located. Districts with lower than predicted expenses and higher than expected performance are classified as highly efficient, and about 30% of the Arkansas districts in 2011 are in this quadrant (or classification). Approximately, 20% of the districts are classified as highly inefficient, with higher than predicted expenses and lower than expected student performance. Other districts are classified as less efficient and inefficient. This classification is often referred to as quadriform analysis in the professional literature (Guthrie et al., 2006).

Similar results are observed in 2007 for the 244 existing Arkansas school districts, and a report on efficiency analyses of 4th grade and 8th grade math and literacy by the BLR in 2010. These similar patterns of results indicate that districts can be distinguished. To enhance the policy-relevance of this study, further analyses were conducted with the 2011 data to determine what factors among those shown in the Appendices are associated with the quadriform analysis classification. These associated factors can offer valuable clues for policy-making. However, caution must be exercised in how these associations are interpreted because this cross-section study cannot test “causal” relations. Rather, the factors associated with efficiency categories in this study should be perceived as useful clues for further investigations, and as an empirical confirmation of information from other forms of assessing efficiency, such as professional experience and judgment.

In this study, efficient districts were distinguished from less efficient and inefficient districts by having fewer teachers and academic coaches; less expenses for instruction, student support services, and instructional staff support; higher beginning teacher salaries; less remediation in all tested areas and fewer daily absences among students. (See Appendices for details). Given the cross-sectional nature of this study, casual inferences should not be made.

HISTORICAL/INTRODUCTORY CONTEXT

Two ideological frameworks have served to guide policy-making in primary and secondary education in this country over the past half century. The *equality* framework grew out of the 1954 landmark case, Brown vs. Board of Education, which maintained that education "is a right which must be made available to all on equal terms." The New Jersey Supreme Court in 1973 inaugurated a second wave of equality polices in which the courts primarily sought to achieve "horizontal equity," or equalization of per pupil funding across school districts within a state.

In 1989 the Kentucky Supreme Court changed the emphasis in educational policy-making from an *equality* to an *adequacy* framework by interpreting the education article of Kentucky's constitution as requiring the state legislature to provide children with an adequate education (Reich, 2006). Over the next 30 years, many states, including Arkansas, followed Kentucky's lead (as a result of court actions) in focusing more on the concept of *adequacy* than on *equality* in policy-making. According to Reich (2006) and other major policy analysts (Picus & Blair, 2004; Reed, 2001), this shift came about primarily because implementing *equality* policies proved impractical and because of the increasing emphasis on accountability and outcomes in federal legislation [No Child Left Behind (NCLB) Act, 2002]. In regard to practicality, there were fears from the outset, borne out in practice (e.g., California), that states would level down the spending of wealthy districts instead of leveling up spending of the poorest districts. There was a general fear that leveling up spending of all districts would be prohibitively expensive. In addition, evidence was mounting that *equality* policies had not improved student performance or narrowed gaps in test scores. The increasing emphasis on higher achievement and narrowing gaps in test scores, with the passage of NCLB legislation, favored *adequacy* over *equality* because it is more closely associated with outcome performance of students (Odden & Picus, 2008; Reich, 2006).

ADEQUACY AND EFFICIENCY

Providing sufficient resources to ensure an adequate education for all students became the goal of state education systems throughout the country over the past two decades. According to Picus and Blair (2004), the concept of *adequacy* became the logical tool to link accountability required by NCLB and the school finance system. State policymakers need to supply sufficient resources for all districts to provide an adequate education to every child without encouraging "wasteful spending."

Determining an adequate level of resources has been difficult because *adequacy* has remained more of a heuristic concept than an empirical one. A heuristic is a sensitizing concept based on professional judgment or experiential observation rather than on empirical measurement. Adequacy has been evaluated mostly by professional judgment, comparisons to exemplary schools, and efforts to replicate empirically-based models found in the professional literature (see Picus & Blair, 2004). Each of these approaches to evaluation has real limitations. Common to all of these methods is the limitation of using judgment instead of systematic evidence as the basis for evaluation. Even the so-called empirically-based method relies mostly on making judgments about the suitability, integrity, and quality of implementing interventions noted in the literature. The use of judgment is subjective, and it does not systematically account for extraneous factors that impact outcomes, such as poverty or community characteristics. Finally, these approaches to evaluating adequacy have typically led to expensive policies and wasteful spending because they are not based on specific data about individual districts or schools (Odden & Picus, 2008).

EVALUATING ADEQUACY BY EXAMINING EFFICIENCY

Increasingly, efficiency analyses are being used as an (not "the") indicator of adequacy, with the assumption that efficiency requires sufficient resources to provide all students with an adequate education (Boser, 2011; Center on Education Policy, 2009; Guthrie et al., 2006; Houck et al., 2010). The method of efficiency analyses commonly used in the professional literature (Guthrie et al., 2006) and in this report examines the linear relationship between inputs (e.g., expenditures) and outputs (e.g., student performance). Examining the relative efficiency of similarly situated districts can lead to identification of lighthouse or exemplary (model) districts for the purpose of scaling up successful programs. The efficiency analyses presented also allow for classification of districts according to demographics and other influences on efficiency.

The efficiency analyses presented in this report are based on empirical data provided by Arkansas school districts to ADE and to the BLR in the Adequacy Survey and on state ACTAAP testing. A common problem with other approaches to evaluating adequacy is using “best practices” of school districts in other states, which often have dissimilar characteristics to Arkansas (Picus & Blair, 2004).

The concept and analyses of efficiency are based on the assumption of a linear relationship between inputs and outputs, whereby increases in inputs (e.g., per pupil expenditures) are accompanied by increases in outputs, such as student performance (Houck et al., 2010). If resources (inputs) are being used efficiently, there should be gains in student performance with each additional increase in per student expenditure. In examining efficiency in this report, actual (or observed) student performance data in each district are compared to data that would be predicted (or expected) using the linearity assumption of efficiency.

DETERMINING EFFICIENCY

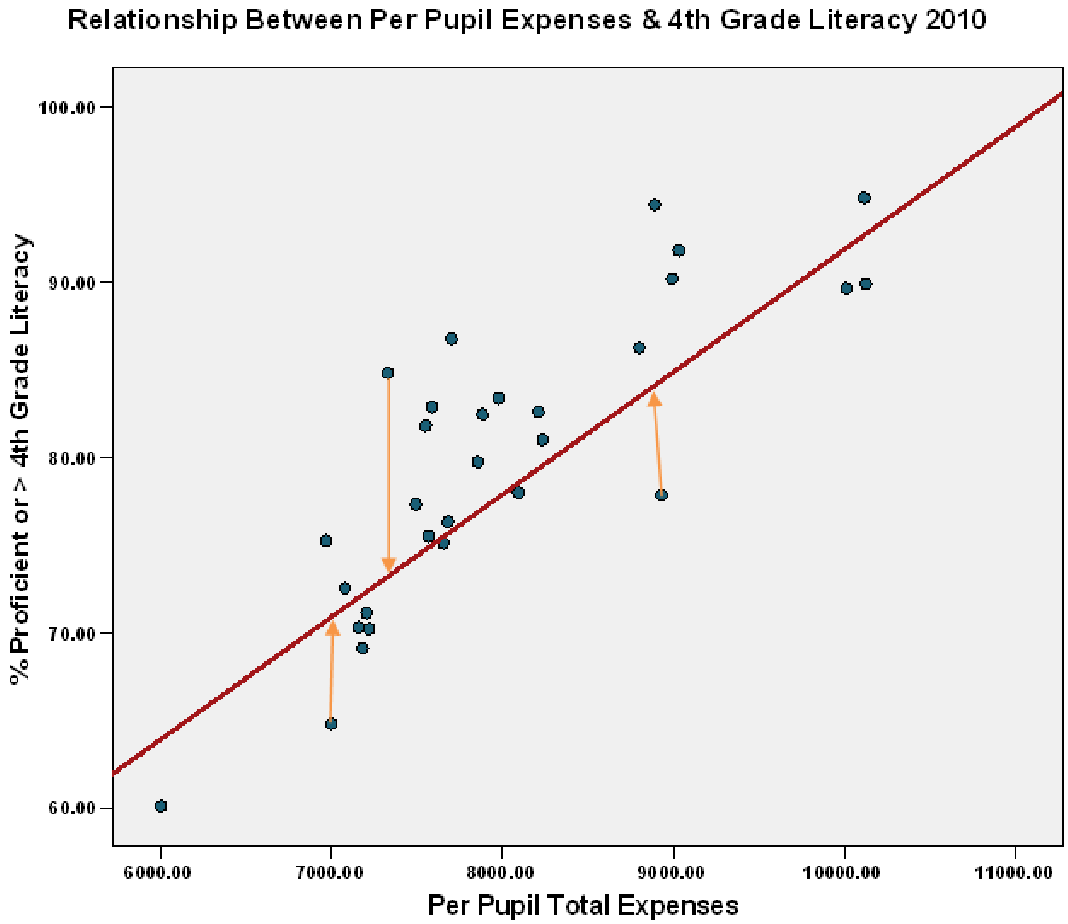
To determine efficiency, a simple mathematical formula was used that places a straight line through data points representing the intersection of actual (or observed) expenditures and student performance based on the strength of the relationship between these factors. The line drawn by the formula minimizes the differences between the line and all observed data points simultaneously. In other words, no other line can be derived that has less total differences between the line and all observed data points considered simultaneously. The line is derived from a mathematical procedure known as ordinary least squares (OLS) regression (Freund & Wilson, 1998). The chart on the next page is presented solely to illustrate the linear line, derived from the regression formula, that minimizes the differences between observed data points and the line.

The line drawn is referred to as the prediction line, and it represents the linear relationship between expenditures and performance expected when there is perfect efficiency. Points along the line represent how much output (e.g., ACTAAP scores) would be expected (or predicted data) with each level of input (dollar amounts) if school districts are operating with total efficiency. The data points (green dots) in the chart below, from a previous BLR study (2010), represent the intersection of actual per pupil total expenses and percentage of students in each district who are proficient or above in 4th grade literacy in 2010. Only 30 school districts were randomly selected to simplify this illustrative example of efficiency analysis.

In the efficiency analyses, the differences between the predicted data and the actual data are examined by plotting the intersection of these differences in per pupil total expenses and student performance. The differences between predicted data and actual data are known as residuals, and these residuals are plotted in the following charts representing efficiency analyses. Three of the residuals are shown in the illustrative example below by gold lines with arrows pointing to the prediction or efficiency line. The difference between the intersection of expenses and achievement (green dots) and the red prediction line is the residual (or difference plotted in the following charts).

School districts are then classified according to these differences or residuals into 4 groups: 1) low per pupil expenses - high student performance; 2) high expenses - high student performance; 3) low expenses - low performance; and 4) high expenses - low performance. This classification shows the relative performance of districts that are spending different amounts (Houck et al., 2010). This procedure has been called quadriform analysis because of the 4-group classification (Houck et al., 2010). The quadriform analysis is particularly advantageous because any inputs and outputs can be analyzed, and different inputs and outputs can be combined or compared in separate analyses.

Illustrative Example:



Also, to minimize the problem of fitting efficiency analyses (or models) to a specific dataset (or sample), efficiency analyses are conducted in two subject areas (literacy and math) and in two different school years (2007 and 2011).

EFFICIENCY ANALYSES

The efficiency analyses are based on a district-wide average percentage of students who scored proficient or above on the state ACTAAP exam. For example, in math the average represents the ACTAAP exams in grades 3 – 8, and the end-of-course algebra 1 and geometry. All efficiency analyses examine the linear relationship between per pupil expenditures in school districts and their student performance (math, literacy and remediation), after controlling for the effects of race (% White) and % NSLA. In other words, the effects of race and NSLA are considered simultaneously in the same regression equation as expenditures in predicting student performance because both factors are well-established, powerful predictors of achievement (Corallo & McDonald, 2002; Educational Testing Service, 2003). In separate bivariate regressions, % White and % NSLA accounted for a significant amount of variance in all measures of student performance (e.g., 47% and 28% respectively in math). As a single predictor, per student expenditures accounted for 44% of the variance in math; similar results were observed for literacy and remediation. These two demographics (race and NSLA) were selected, based on the amount of explained variance in student performance, from a wide range of factors shown in the Appendices.

As a preliminary test of multicollinearity, or redundancy in measures, the correlation matrix shown in Table 1 of the factors used in the efficiency analyses was examined. The correlations between predictors are moderate (e.g., -.46 between % White and % NSLA), suggesting the possibility of redundancy (or overlap) in measures. However, a test of tolerance and variance inflation factors (Freund & Wilson, 1998) did not indicate a problem with multicollinearity.

TABLE 1. CORRELATIONS BETWEEN FACTORS IN QUADRIFORM ANALYSES

	Math	Literacy	Remediation	Expenses	%NSLA	%White
Math						
Literacy	.90					
Remediation	-.62	-.59				
Expenses	-.67	-.67	.51			
%NSLA	-.53	-.58	.42	.53		
%White	.68	.66	-.52	-.59	-.46	

Note: * Expenses refer to per pupil expenditures in 2011. All correlations shown are statistically significant ($p < .01$).

QUADRIFORM ANALYSES

The efficiency analyses, based on regression procedures, are shown in Table 2. The probabilities (p-values) associated with relationships, separately and together, between predictors and outcomes (math, literacy and remediation) are statistically significant beyond the commonly used p = 0.05 level of significance.

TABLE 2. BIVARIATE AND MULTIVARIATE REGRESSION ON % PROFICIENT OR ABOVE IN MATH AND LITERACY AND % REMEDIATION

Predictors	% Proficient or > in Math			% Proficient or > in Literacy			% Remediation		
	β	p-Value	R^2	β	P-Value	R^2	β	p-Value	R^2
	Predictors Considered Separately								
% NSLA	-.53	0.000	28%	-.58	0.000	34%	.42	0.000	17%
% White	.68	0.000	47%	.66	0.000	44%	-.52	0.000	26%
Expenses*	-.67	0.000	44%	-.67	0.000	45%	.51	0.000	25%
	Predictors Considered Together								
% NSLA	-.17	0.001	**R^2 total 59%**	-.24	0.000	**R^2 total 60%**	.15	0.021	**R^2 total 34%**
% White	.41	0.000		.35	0.000		-.29	0.000	
Expenses*	-.34	0.000		-.33	0.000		.26	0.000	

Note: β is the standardized regression coefficient, p-value is the probability of β, and R^2 is the amount of variance in the outcome accounted for by predictor(s). Shown is a linear regression using ordinary least squares. *Expenses refer to per pupil expenditures.

For example, NSLA percentage (R^2 = 28%), percent White (R^2 = 47%), and per pupil expenses (R^2 = 44%) separately account for a large amount of variance (R^2) in math performance, and together these predictors account for (R^2 total) 59% of the differences in percentage proficient or above in math.

Chart 1 is a scatter plot of residuals resulting from the efficiency analysis of per pupil expenditures and math performance in 2011 shown in Table 2. If prediction is perfect, the residuals (differences between observed and predicted data) would be zero for both expenses and test scores. The red line indicates zero expense residuals, whereas the blue line represents zero percentage proficient residuals. The quadrants in Chart 1 indicate whether a district is more or less than zero in expenses and in math proficiency percentage. Each green dot represents a particular school district and its placement in the quadriform classification.

For example, there are 77, or 32%, of the 239 districts in Arkansas in the upper left quadrant in Chart 1, which indicates below zero expense residuals and above zero math proficiency residuals. In other words, these districts actually have less per pupil total expenses than predicted by the efficiency (or regression) analysis, and yet they are above the predicted math proficiency percentage. These 77 districts are the most efficient among those analyzed. Fifty-six districts have above zero expense residuals and above zero student performance (upper right quadrant), whereas 62 districts are below zero on both factors, and 44 districts have above zero expenses and below zero performance.

CHART 1. EFFICIENCY ANALYSIS OF 239 SCHOOL DISTRICTS IN ARKANSAS – 2011 MATH

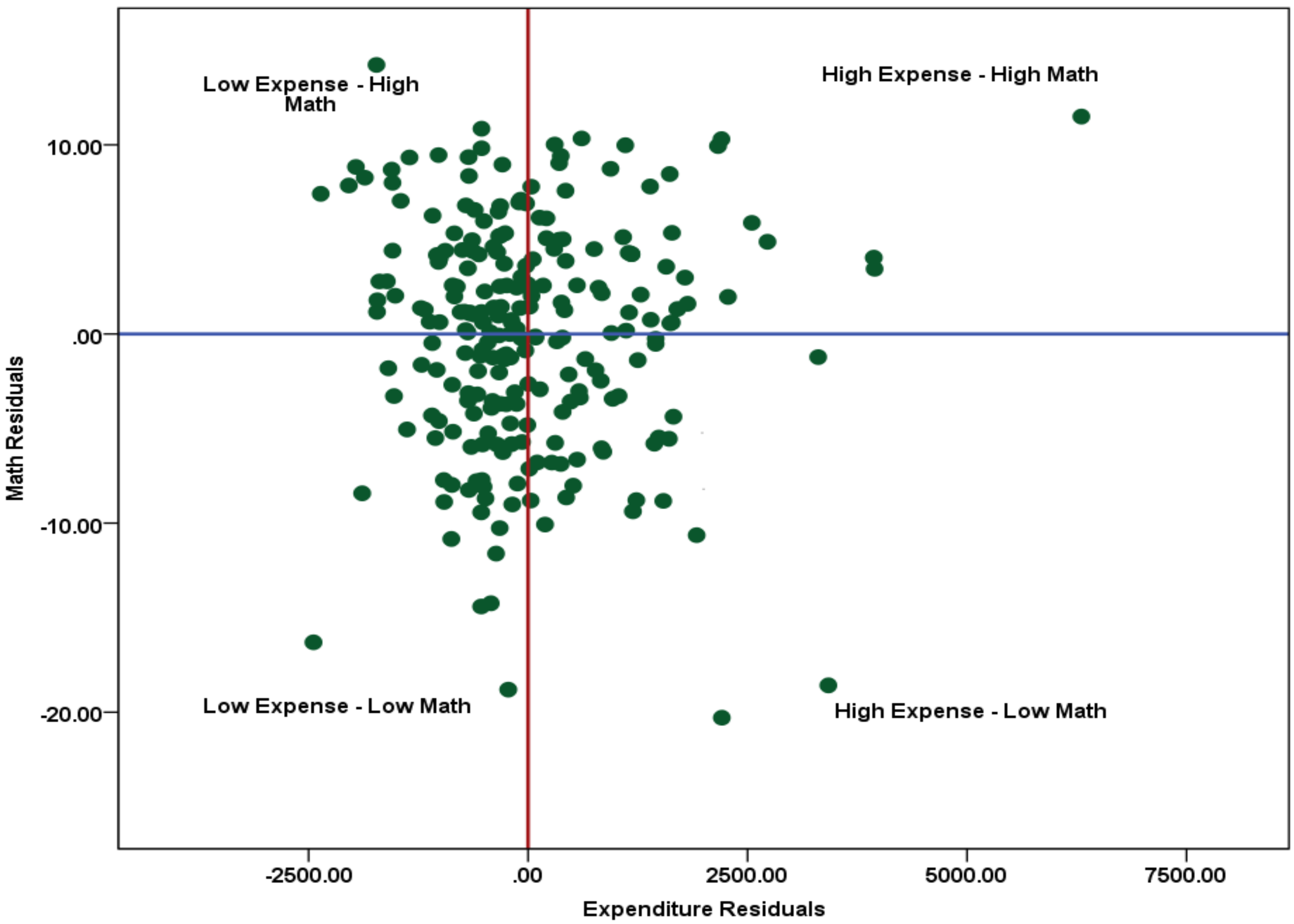
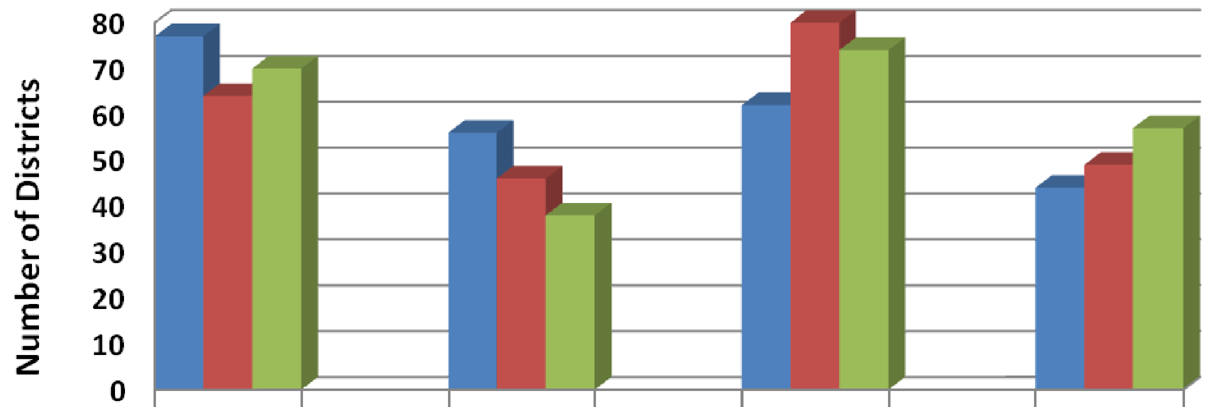


CHART 2. NUMBER OF DISTRICTS ACCORDING TO PER PUPIL EXPENSES ($) AND % PROFICIENT OR REMEDIATED



	Lo$-Hi%	Hi$-Hi%	Lo$-Lo%	Hi$-Lo%
Math	77	56	62	44
Literacy	64	46	80	49
Remediation	70	38	74	57

Note: Lo$ = below predicted per pupil expenses, Hi% = above predicted % proficient in math or literacy or above predicted remediation %.

A comparison of the number of districts in each quadrant of math and literacy in Chart 2 indicates that efficiency classification is affected by the output measure. These findings should come as no surprise, however, since math and literacy are not perfectly correlated (Table 1), and therefore, represent different outcomes in performance. These results suggest that careful thought must be given to which outcomes best represent efficiency in a given context. It is possible that more than one outcome is important in assessing efficiency, or an index might be constructed of two or more outcomes. For example, in combining math and literacy averages, these averages might be weighted according to the differentials in percentages that score proficient and above. Inclusion of remediation in a performance index would require additional complexity in weighting according to outcome percentages.

Selection of outcomes for efficiency analyses should be determined by the goals of the enterprise, in this case statewide education. Increasing student performance and reducing remediation would seem to be two primary goals of education in Arkansas and other states (Center on Education Policy, 2009).

CHART 3. EFFICIENCY ANALYSIS OF 239 SCHOOL DISTRICTS IN ARKANSAS – 2011 LITERACY

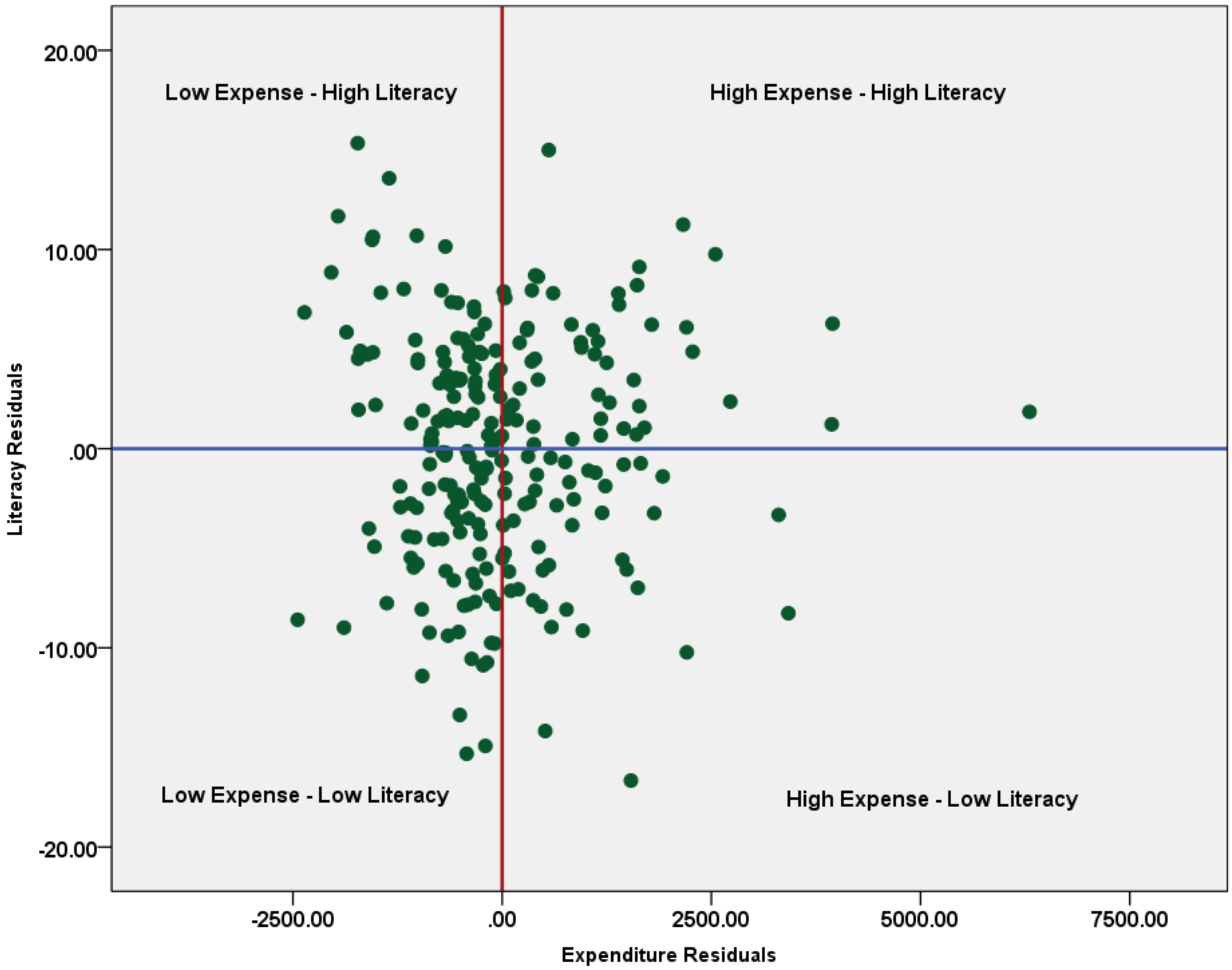


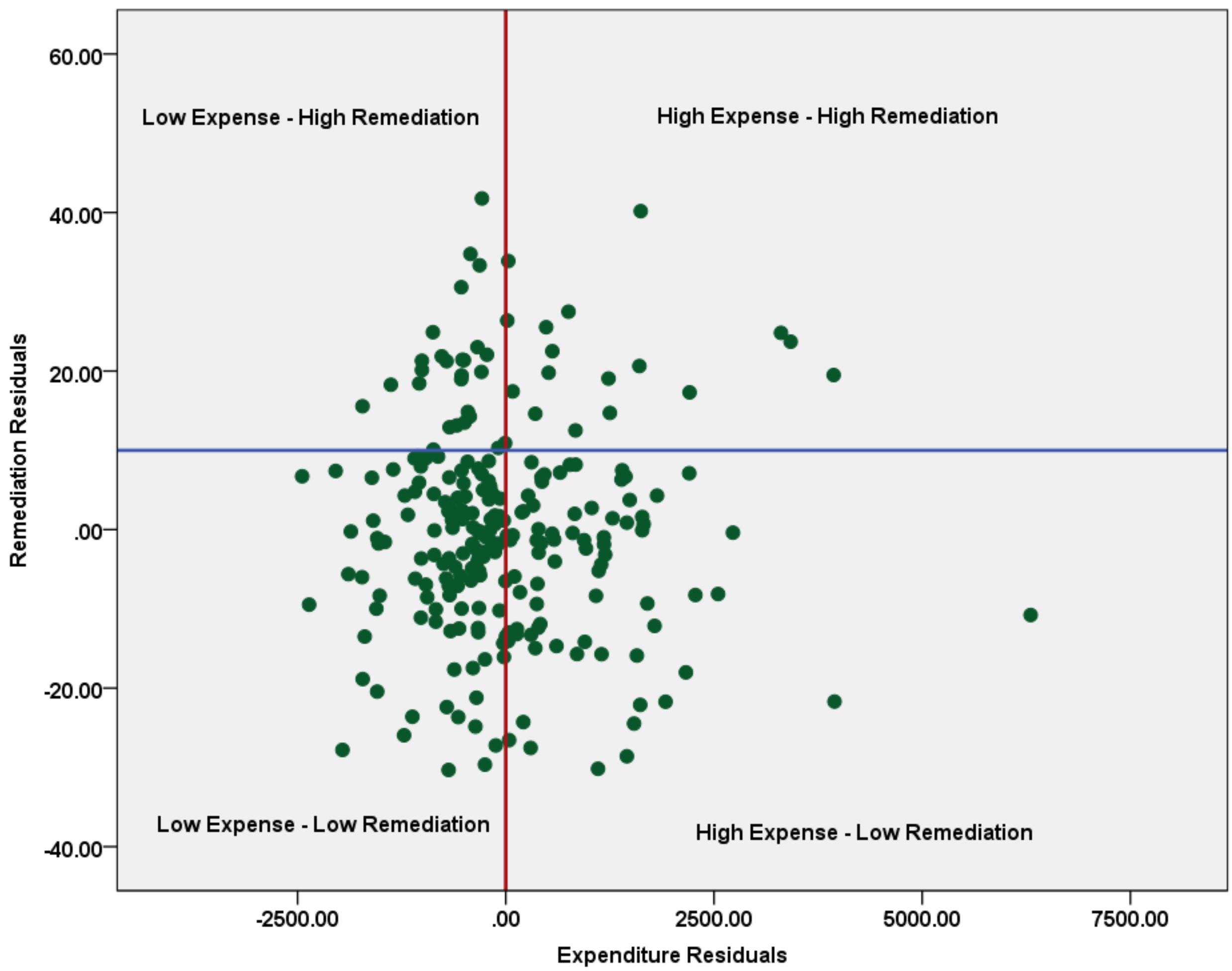
TABLE 3. OVERLAP IN QUADRIFORM CATEGORIES FOR MATH AND LITERACY PROFICIENCIES

Quadriform Categories for Literacy		Quadriform Categories for Math				
		Efficient	Less Efficient	Less Inefficient	Inefficient	TOTAL
	Efficient	55	2	7	0	64
	Less Efficient	1	41	0	4	46
	Less Inefficient	21	3	55	2	81
	Inefficient	0	10	0	38	48
	TOTAL	77	56	62	44	239

Note: Shown in Table 3 is the overlap between math and literacy categories derived from quadriform analyses. For example, 55 districts have low expenses and high performance in both math and literacy. Red numbers indicate a change in classification between math and literacy.

At the same time, there is considerable overlap in classification of school districts according to math and literacy performance (Table 3). Indeed, looking diagonally from top to bottom at the number of school districts in black print, it may be observed that the majority of these districts are classified the same in math and literacy performance. The numbers in red print indicate changes in classification between math and literacy. The largest change is the 21 districts that changed from lower than predicted expenses and higher math performance to lower than expected expenses and literacy performance.

CHART 4. EFFICIENCY ANALYSIS IN 239 SCHOOL DISTRICTS IN ARKANSAS – 2011 REMEDIATION



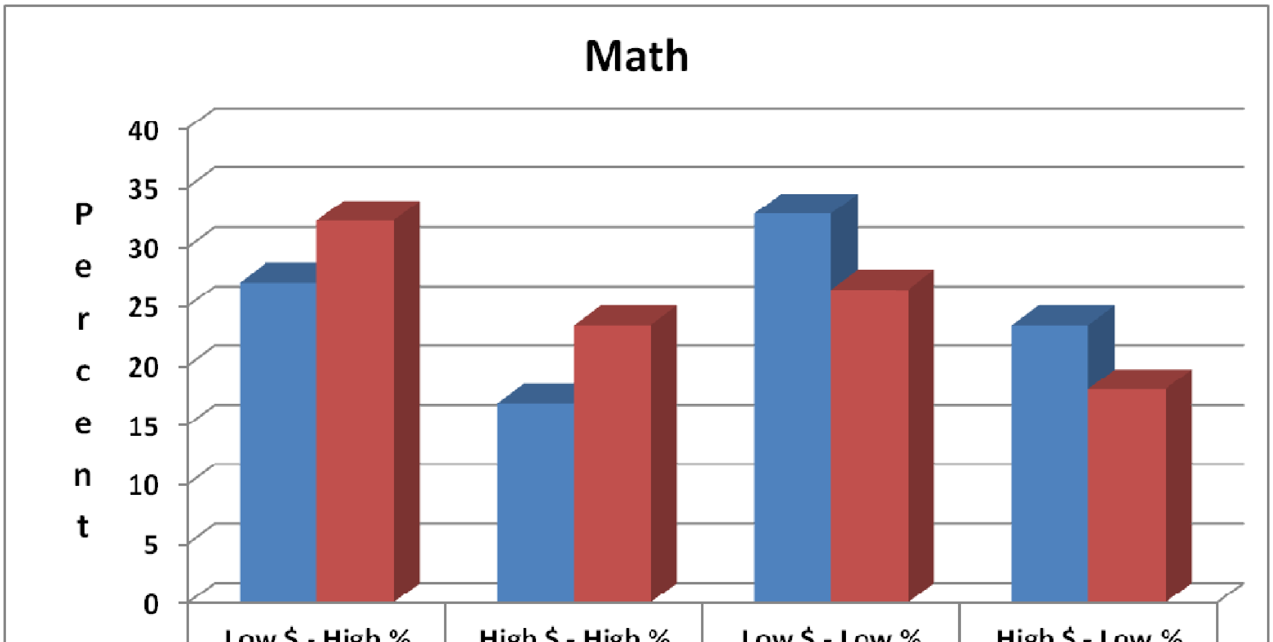
Confidence in these findings is also bolstered by their concordance with previous analyses by the BLR in 2010 of 4th and 8th grade math and literacy proficiency in the 244 existing school districts. The proportions in the quadrants of the efficiency classification are very similar in the two studies (Bureau of Legislative Research, 2010).

In terms of efficiency, remediation is classified differently than student performance because the most desirable statistical relationship is lower than predicted per pupil expense and lower than expected remediation (Lo$-Lo%). Chart 4 indicates that 74, or 31%, of the 239 districts are classified as efficient using remediation as the output. These 74 districts are located in the lower left quadrant of Chart 4 above. Fifty-six districts are in the lower right quadrant, with higher than expected expenses, but a lower than predicted remediation rate. Seventy districts have low per pupil expenses and high remediation, whereas 39 districts are above the predicted level of cost and performance. These latter 39 districts are the most inefficient in terms of remediation.

QUADRIFORM CLASSIFICATIONS ACROSS YEARS

A comparison of efficiency analyses of math performance (Chart 5) indicates a little higher percentage of districts in the lower than predicted expense and higher than expected performance (highly efficient) quadrant in 2011 than in 2007. Also, there is a lower percentage of districts in the inefficient quadrant of high expenses and low math performance in 2011 than in 2007 (18% versus 23.4% respectively). Percentages are shown in Charts 5 and 6 because the number of districts differ due to consolidation during the years between 2007 and 2011. This shrinkage in the number of districts from 244 to 239 over four years means caution must be exercised in interpreting the results as clear evidence that there was improvement in the efficiency of districts because the statistics classify districts relative to each other within a given year.

CHART 5. PERCENT OF DISTRICTS ACCORDING TO PER PUPIL EXPENSES ($) AND % PROFICIENT OR ABOVE IN MATH IN 2007 AND 2011



	Low $ - High %	High $ - High %	Low $ - Low %	High $ - Low %
2007	27	16.8	32.8	23.4
2011	32.2	23.4	26.4	18

FURTHER ANALYSES OF EFFICIENCY

To provide more details for policy implications of the efficiency analyses, differences between means (or averages) of factors available in the ADE and BLR datasets were examined with multiple comparison tests (Tukey), commonly called post hoc tests. These multiple comparisons were conducted in 200 districts that lie outside a 10% band (or box) placed around the intersection of the zero residual expenses (red) line in Chart 1 (p. 6) and the zero residual math performance (blue) line. School districts within this 10% box were removed from the multiple comparison analyses because they were too close to lines that classified districts in terms of efficiency. In other words, the 39 (16%) districts that were not included in the multiple comparisons were considered too “borderline” in terms of efficiency classifcation for analyses of associated factors.

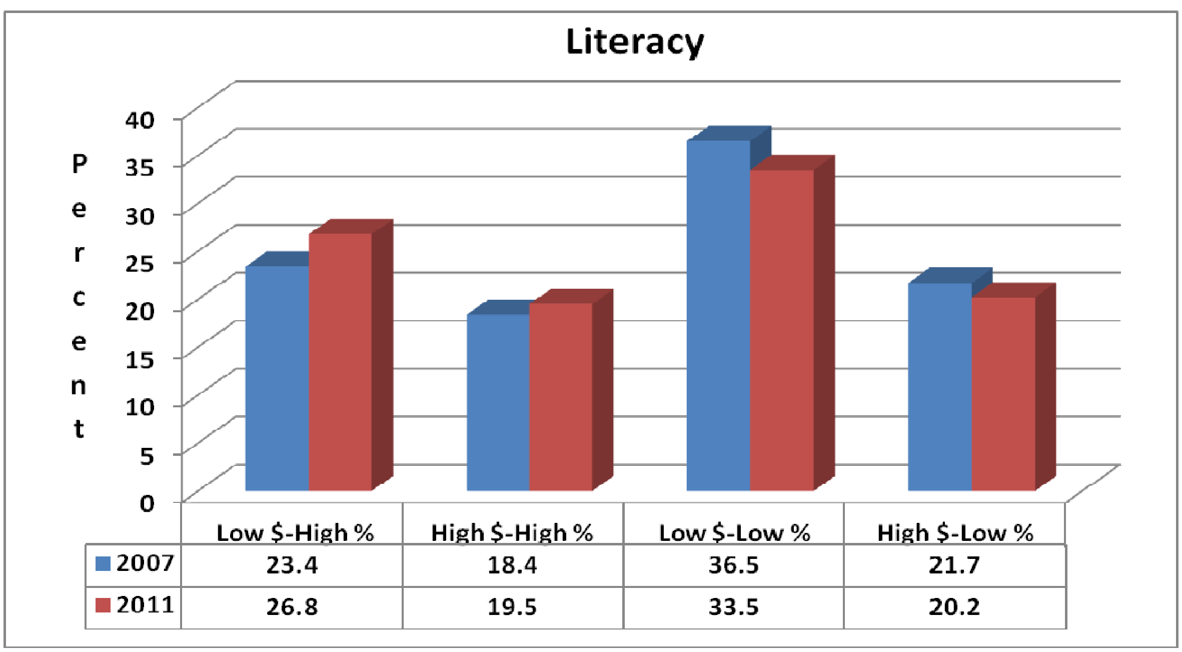
The statistically significant ($p < 0.05$) and insignificant differences in means are shown in the Appendices because of the number of factors examined. The results of these statistical analyses provide strong support for the validity of the quadriform classifications. In the cells of the tables in the Appendix A are the averages (or means) for districts according to their efficiency classifcation in math from the quadriform analysis shown in Chart 1 (p. 6). Each efficiency classification is numbered in Appendix A, so statistically significant differences between classifictions can be identified in the cells (**Bold numbers** in parentheses). For example, the first comparison shows that the efficient (#1) districts, on average, are larger than the "less inefficient" (#3) and "inefficient" (#4) districts. The "**bold numbers**" inside the parentheses indicate which efficiency classifications differ significantly ($p < 0.05$) from the cell mean. As an illustration, "efficient" districts have less per pupil expenditures ($ 8,614.87) than "less efficient"($10,458.55) or "inefficient" ($10,237.92) districts (#s 2 and 4).

All of the statistically significant differences in the Appendix A support the conceptual framework of the efficiency classication derived from the quadriform analysis. An overview of Appendix A indicates that the "efficient districts (#1) have higher beginning salaries for teachers, fewer student absences, lower percentages of remediation, and fewer staff and less staff expenses than "inefficient" districts (#4), and in most cases than "less efficient" districts. These latter districts are those classified in the quadriform classification as having higher than predicted per pupil expenses and higher than expected math performance. These results are in accord with case studies and onsite interviews with superintendents and principals and existing professional literature (Houck et al., 2010).

Appendix B shows the study factors that did not have statistically significant differences between averages with the multiple comparison statistical tests. For example, no statistically significant differences were observed for % White students, % NSLA, % single-female households, square miles in a district, inexperienced teachers, dropouts, % opting out of Smart core, and % tutored or in summer school. These statistically insignificant findings offer encouragement that these factors are not disportionately represented in the efficiency groups.

Discriminant analyses (Klecka, 1981) of the entire 4-classification quadriform show very similar results as these multiple comparison tests. The policy implications of these findings are presented in the following section.

CHART 6. PERCENT OF DISTRICTS ACCORDING TO PER PUPIL EXPENSES ($) AND % PROFICIENT OR ABOVE IN LITERACY IN 2007 AND 2011



CONCLUSIONS AND CONSIDERATIONS

Efficiency analyses demonstrate that school districts can be distinguished in terms of per pupil expenditures and student performance and remediation. Using OLS regression procedures to derive predicted data from observed data on per pupil expenses and student performance and remediation, differences (or residuals) between these data were plotted. Based on the efficiency assumption of a linear relationship between inputs (expenses) and outputs (performance or remediation), there would be no difference between observed and predicted data with perfect efficiency.

These quadriform procedures classified approximately 30% of the school districts in Arkansas as efficient, using the criteria of having lower than predicted per pupil expenditures and higher than expected student performance (or lower than expected remediation). In contrast, nearly 20% of the school districts are classified as highly inefficient, based on the criteria of having higher than predicted per student expenses and lower than expected performance or higher than expected remediation. There is considerable overlap in the classification of districts according to the math and literacy outcomes – this overlap is indicated in the relatively high correlation of 0.90 between these outcomes.

A comparison of quadriform classifications shows small increases in the number of efficient districts from 2007 to 2011 for math and literacy, and small decreases in inefficient districts for math during this time period. As stated, caution needs to be exercised in interpreting these findings as clearly demonstrating improvement in efficiency of the statewide educational system because of the shrinkage in number of districts from 244 to 239 and chance fluctuations in data. At the same time, the quadriform analyses in two studies conducted by the BLR have yielded similar classifications in three separate years (Bureau of Legislative Research, 2010). Also, the multiple comparisons of factors associated with the efficiency classification according to math performance indicated results that are congruent with the conceptual framework for the efficiency analysis. That framework assumes efficient use of resources (input), including expenditures and staff, is associated with maximum performance (outputs).

Furthermore, these findings are in complete agreement with the Bureau’s experiences with case studies (Bureau of Legislative Research, 2011) and onsite interviews with superintendents and principals, and with other efficiency studies (Houck et al., 2010). In summary, districts that are managed efficiently tend to be the same districts that have fewer student absences, less remediation, fewer staff and lower staffing expenses, and higher beginning teacher pay.

In conclusion, these efficiency analyses offer valuable clues for policy-making concerned with enhancing the efficiency of school districts in Arkansas. The concordance between statistical results and experience suggest that these efficiency classifications are useful for distinguishing “efficient” from “inefficient” districts, and for identifying factors associated with these classifications. It must be kept in mind that these are associational relationships and not “causal” relations. Experimental and longitudinal studies are required to establish causality. Together, these findings should be considered in tandem with information from other sources, such as practitioner experience, expert opinion, and other research.

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APPENDIX A - STATISTICALLY SIGNIFICANT FACTORS

Statistically Significant** ($p < 0.05$) Factors / Means								
Factors	**Efficient (1)**		**Less Efficient (2)**		**Less Inefficient (3)**		**Inefficient (4)**	
3rd Quarter ADM	2,784.70	(3,4)	1,929.00		1437.6	(1)	1226.9	(1)
Beginning Salary	$33,502.42	(2,3,4)	$31,825.42	(1)	$32,194.96	(1)	$31,034.49	(1)
Daily Absences	5.00%	(4)	5.30%	(4)	5.20%	(4)	6.00%	(1,2,3)
Wealth Index	0.5946	(2,4)	0.4122	(1,3)	0.6327	(2,4)	0.4473	(1,3)
Read Remediation	22.40%	(4)	24.10%		25.90%		29.90%	(1)
Math Remediation	31.60%	(4)	33.90%	(4)	37.90%		44.2	(1,2)
Engl. Remediation	26.60%	(4)	27.20%		30.20%		34.3	(1)
Any Remediation	43.70%	(4)	46.20%		49.30%		53.90%	(1)
Total Instruction*	$5,126.94	(2,4)	$5,876.84	(1,3)	$5,160.91	(2,4)	$5,769.59	(1,3)
Student Support*	$292.38	(2,4)	$461.88	(1,3)	$397.54	(2)	$452.71	(1)
Inst. Staff Support*	$683.80	(2,4)	$867.49	(1)	$720.02		$894.92	(1)
Total Teachers*	0.0606	(2,4)	0.0676	(1)	0.0635	(4)	0.0702	(1,3)
Academic Coaches	0.0017	(2,4)	0.0028	(1)	0.0024		0.003	(1)

Note: *Staff per 3rd Qtr. ADM).
**Statistical tests are Tukey multiple comparisons.
In parentheses are shown efficiency classifications that significantly ($p < 0.05$) differ from the cell value (mean).

APPENDIX B - STATISTICALLY INSIGNIFICANT FACTORS

Statistically Insignificant ($p < 0.05$) Factors / Means				
Factors	**Efficient**	**Less Efficient**	**Less Inefficient**	**Inefficient**
% White	72.0%	77.2%	74.6%	75.4%
% NSLA	62.8%	63.3%	64.6%	63.3%
% Single Female Household Head	12.3%	12.3%	12.6%	12.7%
Square Miles	204.8	230.2	254.6	210.5
Teachers < 2 years experience	18.6*	17.7*	8.8*	11.4*
Dropouts	6.3%**	13.9%**	10.1%	11.8%
Opt Out of Smart Core	12.0%	12.8%	12.8%	14.0%
Administrative***	$441.99	$468.86	$424.83	$468.73
Categorical***	$84.36*	$72.26*	$117.15*	$103.71*
Ass't Principals***	.0018	.0015	.0012	.0022
% Tutored	4.6*	5.0*	6.1*	7.4*
% Summer School	1.5	1.8	2.0	2.0

Note: * Some apparent differences are not statistically significant due to large standard deviations;
** $p = .075$ between "Efficient" and "Less Efficient" in Dropouts;
*** Administration expenses per ADM;
*** Categorical expenses per ADM;
*** Assistant Principals per ADM