



**Bureau of Legislative Research**  
Policy Analysis & Research Section

# Examination of the Efficiency of Arkansas School Districts in 2007 and 2011

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2012 Adequacy

## Examination of Districts

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 inputs (per pupil expenditures) and outputs (student performance). Enhancing student achievement is one of the primary goals of P-12 education.

The linear relationship between per pupil expenses and student performance is examined with ordinary least squares regression, while controlling for the effects of NSLA and race. These latter factors are controlled because of their strong association with student achievement in this study and previous research.

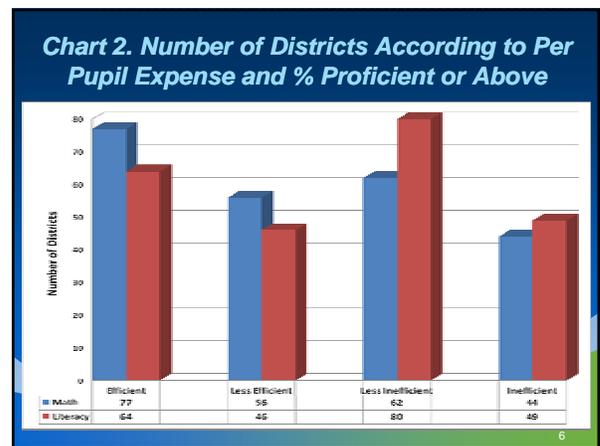
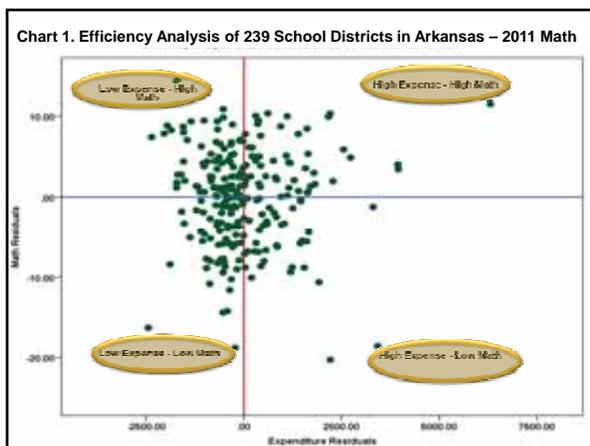
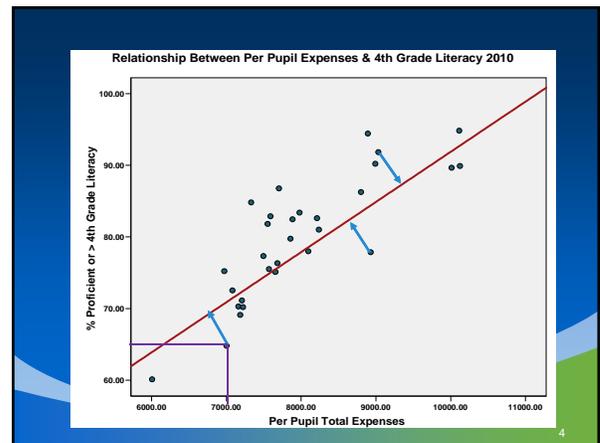
## Efficiency Analyses

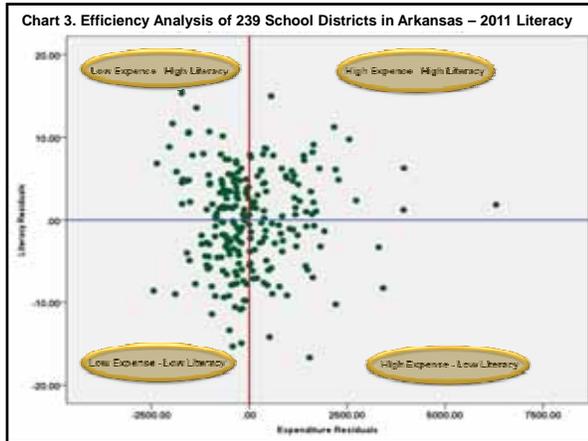
Data on all 239 existing school districts for the efficiency analyses came from the ADE and BLR Adequacy Surveys. Student performance (ACTAAP) data for each district came from NORMES at the U of A – Fayetteville.

Differences (or residuals) between these observed data and predicted data from regression analyses are plotted in what is called a scatter plot, and these residuals are classified according to levels of efficiency.

The Chart on the following slide illustrates the differences (or residuals) between observed and predicted data, and the regression (or prediction) line derived from the regression formula.

Data in the Chart are actual (or observed) data from a random sample of 30 districts from the BLR efficiency analyses of student performance in 2010. Results of this earlier efficiency study are on the BLR website and were reported to the Education Committee in December, 2010.





**Table 1. Overlap in Efficiency Classifications for Math and Literacy Proficiencies**

Efficiency Classification for Literacy	Efficiency Classification for Math				TOTAL
	Efficient	Less Efficient	Less Inefficient	Inefficient	
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

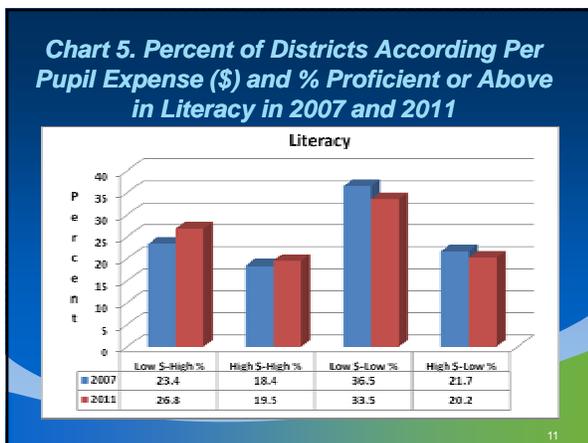
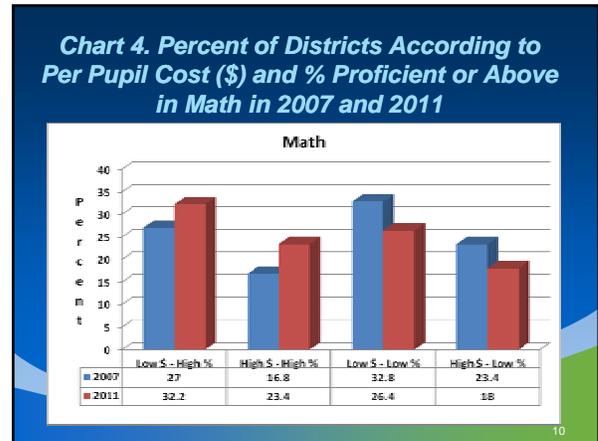
**Comparison to 2007 Efficiency Analyses**

The validity of these efficiency classifications is supported by similar findings in the 2010 BLR efficiency analyses of 4<sup>th</sup> and 8<sup>th</sup> grade math and literacy (ACTAAP) proficiencies. The proportions in the different efficiency classifications are very similar in the two studies.

In addition, efficiency analyses were conducted in 2007 data on the same factors analyzed in the 2011 data. A comparison of the analyses in 2007 and 2011 are presented in the following slides (Charts 4 & 5).

Percentages are shown in Charts 4 and 5 because the number of districts differ due to consolidation of districts between 2007 and 2011.

This shrinkage in the number of districts from 244 to 239 over four years means caution much 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.



**Factors that Distinguish Efficient from Inefficient Districts**

To provide more details for policy implications of the efficiency analyses, several factors found in the Appendix were examined with multiple comparison tests (Tukey).

The results of these multiple comparisons provide strong support for the validity of efficiency classifications. They are in accord with the BLR case studies, onsite interviews with superintendents and principals, and other efficiency research.

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 Appendix for details).

Efficient districts, on average, have larger ADM's and a higher wealth index than less efficient or inefficient districts.

## Implications of Analyses

The similarity in results from efficiency analyses by the BLR in 2007, 2010, 2011 data indicate that districts can be classified according to at least 4 levels of efficiency, ranging from "efficient" to "inefficient."

Careful consideration must be given to selection of outputs in efficiency analyses because classifications are affected by outcome measures. Output measures should be determined by the system goals, such as increasing student performance or reducing remediation.

This study indicates that factors associated with efficiency classifications can be identified with existing administrative data. While causal inferences cannot be drawn from this cross-section study, these factors are supported by other research and practice experience.

The findings on associated factors indicate that efficiency is not necessarily achieved by increasing funding or staff. (See Appendix for details)

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Based on this efficiency study and other research, it seems reasonable to infer that quality rather than quantity in staffing and expense management is more relevant to policy-making concerning student performance. Other research, for example, indicates that quality of teaching and leadership, including efficient management of resources, are among the most important influences on student performance and remediation.

This study also indicates that indirect measures of poverty (e.g., NSLA, % single-female household heads) and race are not related to efficiency classification, although these factors are strong predictors of performance (See Appendix for details on statistically insignificant factors).

The primary reason these factors are not related to efficiency is very likely due to the extra funding provided to districts for students with "higher needs," which is discussed in the BLR equity report (2012) that follows and is on the Bureau website.

There are a few factors that may be statistically insignificant due to the measure available. For example, quality and type of tutoring and courses may be more relevant to efficiency than % tutored or % that opted out of Smart Core.

Efficiency studies need to be carefully designed in terms of measures used to indicate factors amenable to policy intervention, such as teaching, professional development, and tutoring. Measurement largely determines the validity and reliability of information, as well as its usefulness to policy decisions.

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## APPENDIX A

### Statistically Significant\*\* (p < 0.05) Factors / Means

Factors	Efficient (1)	Less Efficient (2)	Less Inefficient (3)	Inefficient (4)
3 <sup>rd</sup> Quarter ADM	2,784.7 (3,4)	1,929.0	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	5.0% (4)	5.3% (4)	5.2% (4)	6.0% (1,2,3)
Wealth Index	0.5946 (2,4)	0.4122 (1,3)	0.6327 (2,4)	0.4473 (1,3)
Read Remediation	22.4% (4)	24.1%	25.9%	29.9% (1)
Math Remediation	31.6% (4)	33.9% (4)	37.9%	44.2 (1,2)
Engl. Remediation	26.6% (4)	27.2%	30.2%	34.3 (1)
Any Remediation	43.7% (4)	46.2%	49.3%	53.9% (1)
Total Instruction*	\$5126.94 (2,4)	\$5876.84 (1,3)	\$5160.91 (2,4)	\$5769.59 (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*	.0606 (2,4)	.0676 (1)	.0635 (4)	.0702 (1,3)
Academic Coaches	.0017 (2,4)	.0028 (1)	.0024	.0030 (1)

Note: \*Staff per 3<sup>rd</sup> 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).

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## APPENDIX B

### 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

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## APPENDIX C

### BIVARIATE AND MULTIVARIATE REGRESSION ON % PROFICIENT OR ABOVE IN MATH AND LITERACY

Predictors	% Proficient or > in Math		% Proficient or > in Literacy			
	β	p-Value	β	P-Value		
Predictors Considered Separately						
% NSLA	-.53	0.000	28%	-.58	0.000	34%
% White	.68	0.000	47%	.66	0.000	44%
Expenses*	-.67	0.000	44%	-.67	0.000	45%
Predictors Considered Together						
% NSLA	-.17	0.001	R <sup>2</sup> total	-.24	0.000	R <sup>2</sup> total
% White	.41	0.000	59%	.35	0.000	60%
Expenses*	-.34	0.000		-.33	0.000	

Note: β is the standardized regression coefficient, p-value is the probability of β, and R<sup>2</sup> is the amount of variance in the outcome accounted for by predictor(s). Shown is a linear regression using ordinary least squares. \*Expense refers to per pupil expenditure.

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