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ABSTRACT

This paper examines the effects of enrollment on the financing of small rural K-8 versus K-12 school districts in Missouri and compares the educational outcomes of K-8 and K-12 districts. The sample included 48 K-8 and 48 K-12 districts with K-8 enrollments ranging from 70 to 370 students. Findings indicate that it is more difficult to financially support small rural high schools than small rural elementary schools. Rural districts had limited capability to raise local revenue because of their low assessed valuation per pupil, which was associated with low assessment rates of agricultural real estate compared to residential and commercial property. District expenditures per pupil were below the state average and declined as enrollment increased. The student-teacher ratio was lower in K-12 districts than in K-8 districts; these lower ratios were associated with higher expenditures per pupil, higher operating levies, and lower teacher salaries. All teachers were underpaid relative to the state mean, but teachers in small K-12 districts were paid less than teachers in small K-8 districts. This implies that the conversion of small K-12 districts to K-8 districts may be an effective strategy to improve rural teacher salaries. Compared to state averages, small rural schools had better educational outcomes, suggesting that underfunding and low teacher salaries did not influence educational outcomes. Contains 8 tables, 9 figures, and 12 references. (Author/TD)

School Size as a Factor in Financing Small Rural Schools

Prepared For

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School Size as a Factor in Financing Small Rural Schools

Abstract

The low student teacher ratios of small rural schools are a major factor limiting the ability of rural schools to pay acceptable teacher salaries. The larger S/T ratios of rural K-8 districts compared to rural K-12 districts allows the K-8 districts to pay higher teacher salaries. Expenditure per student is not correlated with average teacher salary within the small rural school districts. The small rural schools have higher than Missouri state average educational outcomes even though they have very limited financial resources. The findings imply that the conversion of small K-12 school districts to K-8 districts may be a potential strategy for improving the financial viability of small rural schools.

Because of the changing agricultural economy we are experiencing a rapid decline in the rural population. This is affecting the enrollments in many rural schools. The declining enrollments raises questions concerning the economy of scale for small rural school districts. This is associated with questions concerning both the financing of small rural districts and also educational outcomes within the districts. In years past many rural districts were forced to consolidate with other districts because of the idea that bigger schools are better. Consolidation as a strategy for helping rural schools financially has not paid off as expected (Lindsey, 1994). However, in recent years there is growing evidence that smaller schools have more desirable educational outcomes (Theobald &

Nachtigal, 1995). One alternative to school consolidation is for small K-12 districts to convert to K-8 districts and send their high school students to adjoining districts. The goal of this study was to evaluate the potential consequences of converting small rural K-12 school districts to K-8 districts.

Purpose of the Study

The purposes of this study were to evaluate the effects of enrollment on (1) the financing of small rural K-8 vs. K-12 school districts, and (2) to compare the educational outcomes of K-8 vs. K-12 schools . The two independent variables in the study were school district organization, K-8 vs. K-12 and number of students enrolled in grades K through 8. The dependent variables were a set of financial measures that reflect the financial operation of the school districts and a second set of educational outcome measures. Data from the 1996-97 school year for the expost facto study were from a random sample of 96 rural Missouri school districts. Forty eight were K-8 and forty eight were K-12. There were twenty four schools in each of four K through 8 enrollment groups as follows: 70-99, 100-149, 150-219 and 220-370. The data were analyzed using a two-way analysis of variance with twelve observations per cell for each of the dependent variables. An alpha of .05 was used for the analysis.

Educational Finance Factors

The ability of a school district to raise money locally is primarily determined by the assessed valuation of property within

the district and the operating tax rate approved by the local residents.

Assessed Valuation

The assessed valuation per pupil representing the ability of the districts to raise local funds by local taxation was the first dependent variable. The two-way anova in Table 1 found a statistically significant differences between the K-8 and K-12 schools and no differences among the four enrollment groups. The results are illustrated and compared to the Missouri state average in Figure 1. In Missouri the property assessment rate is 33% for commercial, 19% for residential and 12% for agricultural of the estimated actual value. Since most taxable property in the rural areas consists of farm land the difference in assessment rates may help explain the below state average assessed valuation per pupil in the rural school districts. A few small rural districts have iron and lead mines, electric generating plants, and other large commercial enterprises that give them an unusually high assessed valuation. Thus, assessed valuation per pupil is very inconsistent from district to district. The low assessed valuation per pupil in rural school districts compared to the rest of the state limits their ability to raise local money by property taxes. The two-way analysis of variance in Table 1 found a statistically significant difference between the assessed valuations per student in K-8 vs. K-12 districts. The K-8 districts have higher assessed valuations per student than the K-12 districts. The assessed valuations per student for the four enrollment groups are compared to the Missouri state mean in Figure 1.

Table 1
Two-Way Analysis of Variance for Assessed Valuation per Student in Thousands of Dollars by District Type and K-8 Enrollment Groups

Source	SS	DF	MS	F	p
Type	1137.14	1	1137.14	4.83	.031
Group	943.43	3	314.48	1.33	.268
T x G	475.76	3	158.59	.67	.571
Within	20738.59	88	235.67		
Total	23294.92	95			

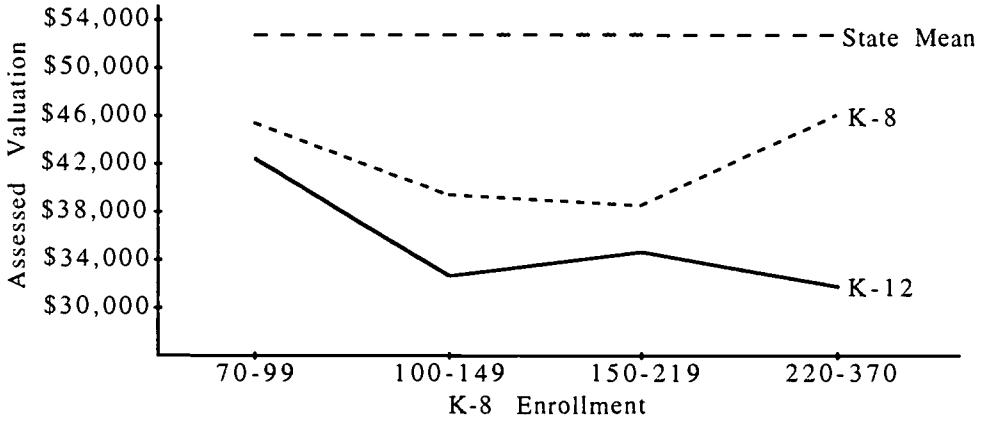

Figure 1. Assessed Valuation per Student

Operating Tax Levy

The operating tax levy in combination with the assessed valuation determines the amount of local revenue for a school district. Because of the wide variation in assessed valuation per pupil among school districts the state foundation formula is designed to increase the amount of state funding for school districts with low assessed valuation. The idea of the new foundation formula is for the total available revenue (local + state) to be determined primarily by the local operating tax rate.

The two-way anova with operating tax levy as the dependent variable in Table 2 found statistically significant differences for both independent variables and a statistically significant interaction. School districts must have an operating tax levy of at least of $2.75 per $100 assessed valuation in order to receive equalization money under the state foundation formula. School districts with low assessed valuation per pupil can establish high operating tax rates to leverage an increase in their state revenue. Figure 2 illustrates the relationship between the two independent variables and the operating tax levy. The high tax rates for the small K-12 districts may be partially off set by the low rates of assessed valuation of agricultural land. Because of the high cost of maintaining low enrollment high schools, the small K-12 districts have higher than state average operating levies. The statistically significant interaction is associated with the declining difference between the K-8 and K-12 tax rates as the enrollments increase. Most of the districts have not built new buildings in recent years and hence do not have a tax levy for debt service.

Table 2
Two-Way Analysis of Variance for Operating Tax Levy by District Type and K-8 Enrollment Group

Source	SS	DF	MS	F	p
Type	11.34	1	11.34	39.33	.000
Group	11.61	3	3.87	13.43	.000
T x G	3.80	3	1.27	4.40	.006
Within	25.36	88	.29		
Total	52.11	95			

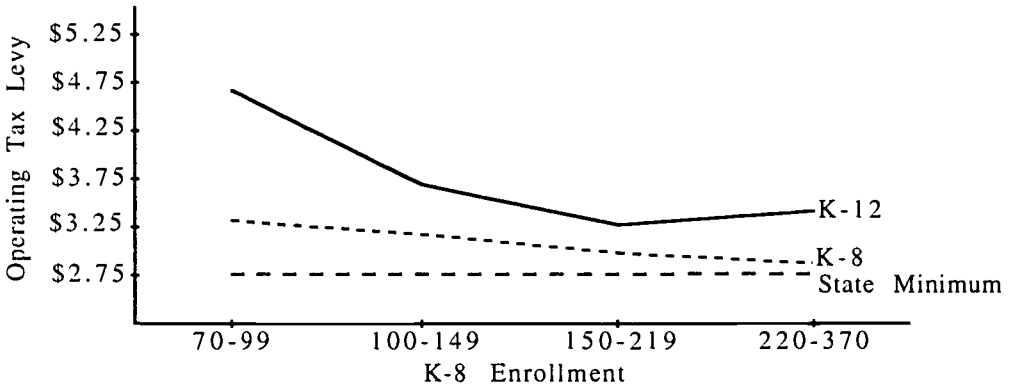

Figure 2. Operating Tax Levy

Expenditure per Pupil

The operating expenditures are primarily a mix of local and state money with a small amount of federal money. The split between local and state money is dependent upon the assessed valuation per student. Districts with low assessed valuation per student receive additional state money based upon their local operating tax rate.

The two-way analysis of variance in Table 3 for the total expenditures per pupil found statistically significant differences for both independent variables. Figure 3 illustrates the relationship between per pupil expenditures and the two independent variables. K-12 districts spend more money per pupil than K-8 districts. The difference in expenditures per pupil for K-12 and K-8 districts tend to decrease as the enrollment increases. Except for the smallest districts, rural schools generally spend less money per pupil than urban schools.

Table 3

Two-Way Analysis of Variance for Expenditures per Student by District Type and K-8 Enrollment Group

Source	SS	DF	MS	F	p
Type	8449156	1	8449156	11.61	.001
Group	31982867	3	10660956	14.64	.000
T x G	712353	3	237451	.33	.806
Within	64071732	88	728088		
Total	105216107	95			

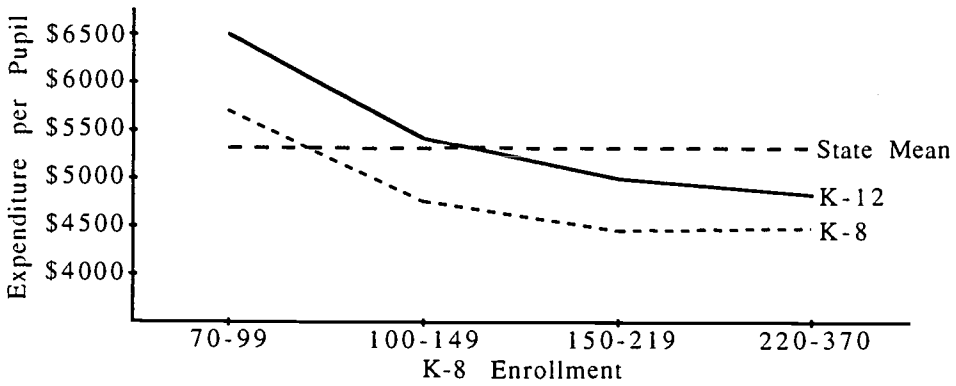

Figure 3. Expenditures per Student

From Figure 3 it is apparent that it cost more to support a small high school than a small elementary school. The consistent difference in per pupil expenditures for the four enrollment groups reflects the additional cost of maintaining a small high school. The cost difference tends to decline a little as the enrollment increases.

Student Teacher Ratio

Approximately half of the total expenditures by Missouri schools are for teachers salaries not including staff benefits. Previous research has also shown that student teacher ratio (S/T) is a

primary factor in determining teacher salaries (Alspaugh, 1993). The S/T ratios in this study include only classroom teachers and do not include librarians, counselors and other professional support staff. The two-way ANOVA in Table 4 found statistically significant differences between the S/T ratios for the two types of schools and the four enrollment groups. Figure 4 shows the relationship between S/T ratios and the two independent variables. The S/T ratio increases as the enrollment increases for both the K-8 and K-12 schools. The difference between the S/T ratios for K-8 vs. K-12 districts tends to decrease a little as the enrollment increases. Part of the difference between the S/T ratios for K-8 vs. K-12 districts may be associated with the difference in S/T ratios for elementary schools compared to high schools

Table 4
Two-Way Analysis of Variance for Students per Teacher by District Type and K-8 Enrollment Group

Source	SS	DF	MS	F	p
Type	36.26	1	36.26	6.61	.012
Group	471.78	3	157.26	28.65	.000
T x G	28.62	3	9.54	1.74	.165
Within	483.08	88	5.49		
Total	1019.74	95			

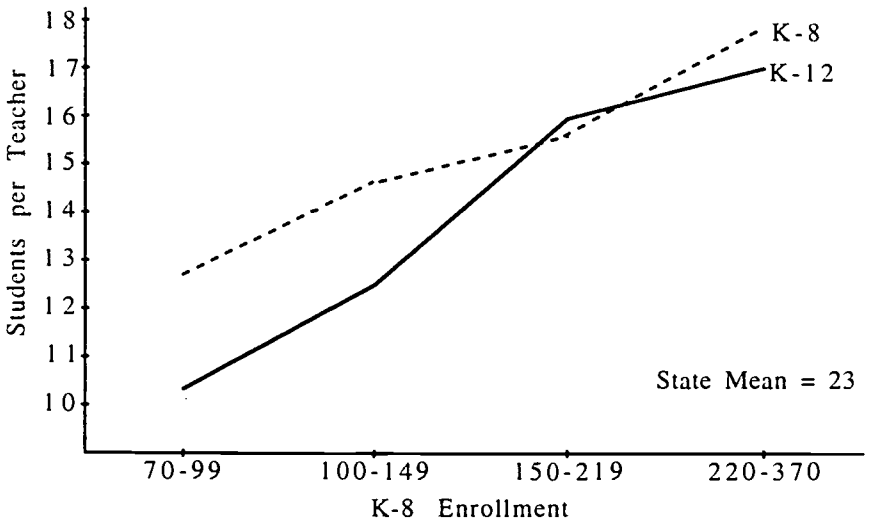

Figure 4. Students per Classroom Teacher

Teacher Salaries

One of the major problems confronting rural schools is being able to pay appropriate teacher salaries. Teacher salaries are lower for rural schools than for urban schools. Figure 5 illustrates the relationship between teacher salaries in K-8 vs. K-12 districts in the four enrollment groups of school districts relative to the state average teacher salary. The two-way analysis of variance in Table 5 found a statistical significance difference among the four K-8 enrollment groups.

Table 5
Two-Way Analysis of Variance for Teacher Salaries by District Type and K-8 Enrollment Group

Source	SS	DF	MS	F	p
Type	13538277	1	13538277	3.17	.079
Group	152750623	3	50916874	11.90	.000
T x G	4007644	3	1335881	0.31	.816
Within	376456272	88	4277912		
Total	546752816	95			

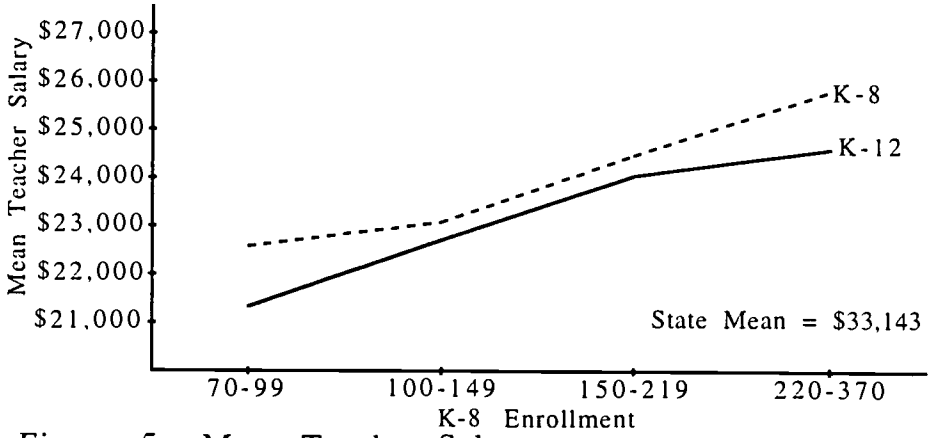

Figure 5. Mean Teacher Salary

A correlation matrix showing the relationship among the school finance factors is presented in Table 6. The type of school district in Table 6 is coded as 1 for K-8 districts and 2 for K-12 districts. The correlations indicate the relative influence each of the finance factors individually to teacher salaries. There are a high correlations between K-8 enrollments, S/T ratios and teacher salaries. This high correlation between K-8 enrollments and S/T is an indication of the economy of scale problem that rural schools are confronted with in supporting teacher salaries. The beta weights in Table 7 indicate the relative association of the finance factors to teacher salaries when they are considered as a collective group. The largest beta weight of .420 is consistent with Alspaugh's(1993) finding that S/T ratio is the primary factor influencing teachers salaries in Missouri. The higher S/T ratios in the K-8 districts enable them to pay higher teacher salaries than the K-12 districts with similar K-8 enrollments, even though the expenditures per student are lower in K-8 districts.

Table 6

Correlation Matrix for School Finance Factors (N = 96)

	Ass. Val.	Op. Tax	Exp/P	K-8 Enr.	S/T	Salary
Type	-.198	.466**	.283**	.011	-.189	-.157
Ass. Val.		-.049	.265**	-.138	-.152	-.013
Op. Tax			.652**	-.423**	-.532**	-.206*
Exp/S				-.423**	-.584**	-.126
K-8 Enr.					.637**	.514**
S/T						.504**

* p< .05 ** p < .01

Table 7
Multiple Regression of Finance Factors with Teacher Salary as the Dependent Variable

Variable	Slope	Beta Weight	p
Type	-1082.870	-.227	.026
Ass. Val.	-6.851	-.045	.615
Op. Tax	341.309	.105	.396
Exp/S	.685	.300	.013
K-8 Enr.	123.494	.416	.000
S/T	307.602	.420	.000
Intercept	14001.958		
R^2	.403		

Educational Outcomes

Because of the limited financial resources and low teacher salaries in the rural schools one is led to be concerned about the educational outcomes within these schools. The following outcomes

were considered in this analysis, (1) attendance rates, (2) sixth grade reading and mathematics achievement test scores and (3) high school dropout rates. The educational outcomes in the K-8 and K-12 districts were compared to each other and to the Missouri state means. The outcomes were for the four enrollment groups were compared to each other.

Attendance Rates

The percent average daily attendance for the K-8 and K-12 rural schools in the four enrollment groups are compared to the Missouri state average in Figure 6. An anova found a statistically significant difference between the percent attendance for the K-8 vs. the K-12 districts at the .05 level. The percent attendance for the rural schools were consistently higher than the state average.

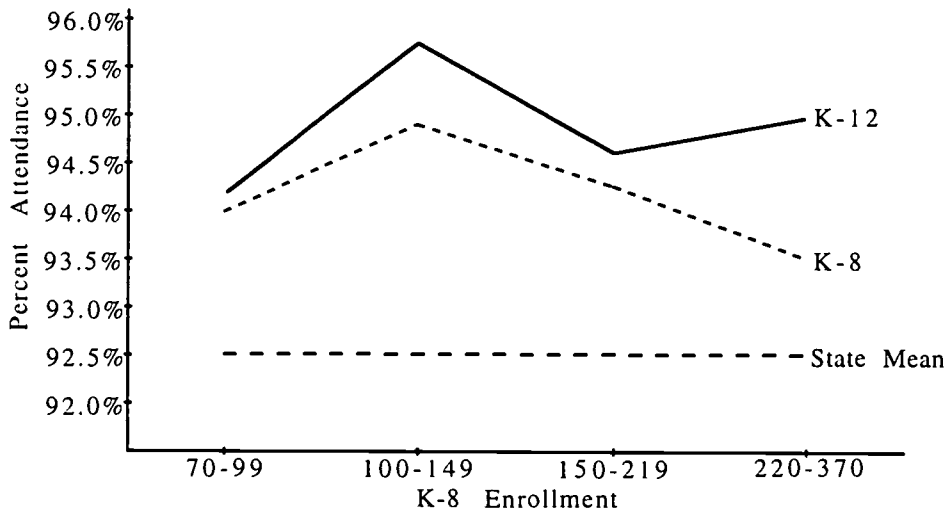

Figure 6. Percent Average Daily Attendance

Achievement Test Scores

In years past the Missouri Mastery and Achievement Tests (MMAT) were a set of state mandated tests for all schools. Starting

in 1997 the tests became optional. When the tests were mandated the small rural schools had consistently higher scores than the state mean. When the tests became optional many large urban districts with low test scores discontinued the administration of the MMAT. As a result the current state mean is inflated because it is based primarily scores from high achieving school districts. Figures 8 and 9 illustrate the relationship between the sixth grade Reading and Math achievement scores for the sample of rural schools and the 1997 state mean. There is no statistically significant differences between the K-8 vs. the K-12 districts and for the rural schools vs. the state mean. Researchers have found that small school size has a positive effect on student achievement when controlling for SES (Howley, 1989). Friedkin and Necochae (1988) found that low SES has a negative effect on student achievement in large schools, whereas low SES has a limited effect on student achievement in small schools. Hence, one may be inclined to believe that the high achievement scores for the sample of schools may be associated with their small enrollment sizes.

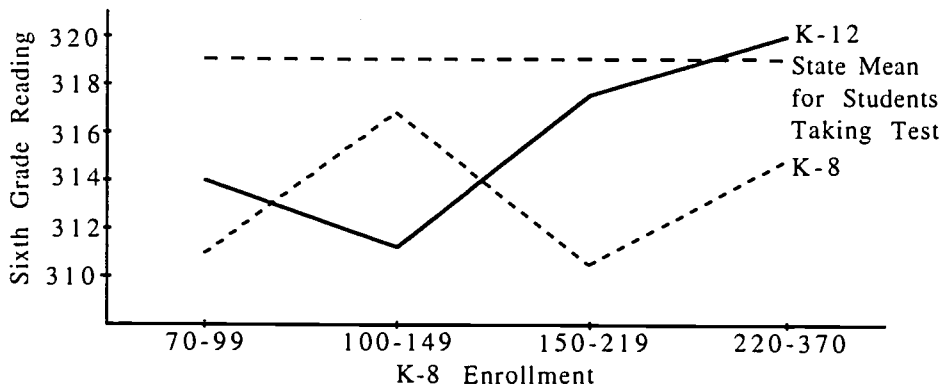

Figure 7. Sixth Grade MMAT Reading Achievement Scores

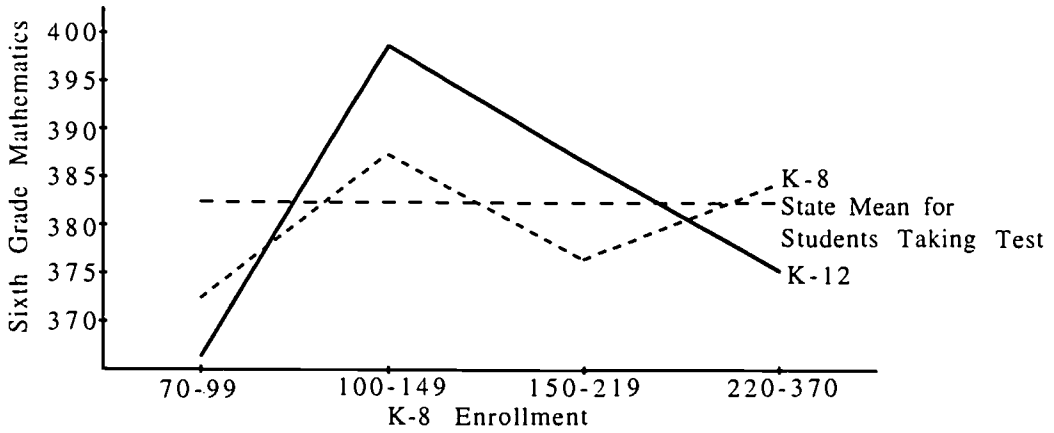

Figure 8. Sixth Grade MMAT Math Achievement Scores

High School Dropout Rates

Figure 9 illustrates the relationship among the annual grade nine through twelve dropout rates for the four size groups of rural school districts. The dropout rates for these small rural high schools are much lower than the state mean of 6.2%. This is consistent with Alspaugh's (1998) finding that there is a positive relationship between school size and high school dropout rates.

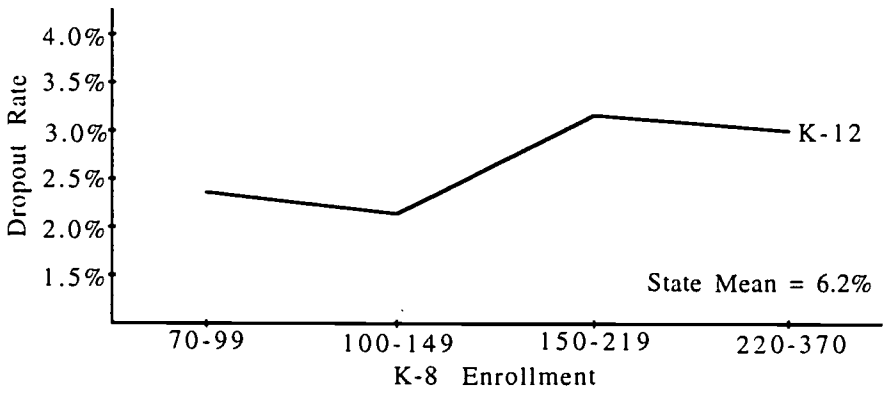

Figure 9. Dropout Rates for Grades 9 Through 12 in K-12 Districts

Correlations Between Finance Factors and Educational Outcomes

It has generally been concluded that there is no relationship between the financial resources of schools and their educational outcomes (Hanushek, 1989, 1994). However, Stiles(1993) found a positive relationship between the expenditures per student for Missouri schools with less than 100 students per grade and their achievement test scores. The correlations in Table 8 show no consistent relationship between the finance factors and the outcome measures for this sample of small schools.

Table 8

Correlations Between Finance Factors and Educational Outcome Measures

Finance	Outcome Measures			
Factors	% Attendance	Reading	Math	%HS Dropout
Type	.216*	.048	.027	
Ass. Val.	-.170	.024	-.114	-.157
Op. Tax	.066	-.060	-.007	-.114
Exp/S	-.103	-.088	-.045	-.141
Enr/Gr.	-.071	.078	.032	.066
S/T	-.082	.158	.161	.172
Salary	-.030	.065	.087	-.083

* $p < .05$ ** $p < .01$ for a two tailed test

Summary

The findings indicate that it is more difficult to financially support small rural high schools than to support small rural elementary schools. The rural districts have limited capability to raise local revenue because of their low assessed valuation per pupil. The low assessed valuation per pupil in the small rural schools is associated with the low assessment rates of agricultural real-estate compared to the assessment rates for residential and commercial property. Their expenditures tended to be below the state average and declined as the enrollment increased. The low S/T ratios in the small high school districts is associated with higher expenditures per pupil, higher operating levies and lower teacher salaries. S/T ratio is a major factor in the financial operation of small school districts. The student teacher ratio was lower for the K-12 districts than the K-8 districts. Hence, teachers in small K-12 districts are often paid less than teachers in small K-8 districts. All of the rural teacher were under paid relative to the state average teacher salary. This implies that the conversion of small K-12 districts to K-8 districts may be an effective strategy to improve rural teacher salaries. The under funding and low teacher salaries do not appear to be factors influencing the educational outcomes.

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