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THE REPORTING OF SCHOOL DISTRICT EFFICIENCY: THE ADEQUACY OF RATIO MEASURES

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ABSTRACT. Demands for accountability in education are not a new phenomenon, however, they have increased significantly in the recent past and have encompassed not only educational outcomes but also efficiency. In this study, ratio measures, similar to those recommended by the GASB, were compared to measures of relative efficiency determined through the use of data envelopment analysis (DEA). The consistency of the two approaches in distinguishing between relatively efficient and inefficient school districts was examined. It was found that compared to the DEA approach, the ratio measures, may be unable to provide reliable information for educational decision making.

INTRODUCTION

While demands for accountability in education are not a new phenomenon, they have increased significantly in the recent past and have encompassed not only educational outcomes but also efficiency. While a number of approaches have been used to assess educational efficiency, the Governmental Accounting Standards Board (GASB) has recommended the use of ratio indicators of efficiency in reporting to

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external stakeholders. The purpose of this study was to determine whether ratio indicators of efficiency, similar to those recommended by the GASB, can adequately distinguish between relatively efficient and relatively inefficient school districts, in a manner consistent with a more sophisticated approach such as data envelopment analysis. In order to meet this objective, the relative efficiency of a number of school districts in western and central New York State was determined through data envelopment analysis (DEA) and compared to ratio measures of efficiency, similar to those recommended by the GASB.

LITERATURE REVIEW

This section examines recent demands for accountability in education, as well as the inherent difficulties of measuring educational efficiency using ratio and regression approaches. The relative advantages of data envelopment analysis are also examined.

Demands for Accountability in Education

The reports of the National Commission on Excellence in Education (1983, 1987), the Holmes Group (1986) and the Carnegie Forum on Education and the Economy (1986) are among those which have formed the basis of the reform movement in American education. These reports were symptomatic of increasing dissatisfaction with public education and have resulted from perceptions that schools are not doing an adequate job. At the same time, governments have been subjected to increasing pressure to be ever more vigilant in their stewardship of public funds. These factors have contributed to increased demands for accountability in education, as well as in other areas of the public sector. As a result, the public and legislatures are seeking greater assurances that existing resources are being used in an effective and efficient manner.

In the U.S., the expectation of accountability for public sector organizations has been addressed by the Governmental Accounting Standards Board (GASB) in Concepts Statement Number 1, Objectives of Financial Reporting (GASB, 1987). The Board asserted that it is government's responsibility to be accountable and that the reporting function should enable users of public sector financial reports to assess that accountability (GASB, 1987, paragraph 77). In his foreword to GASB's Research Report dealing with elementary and secondary education, Martin Ives, Director of Research of the GASB, stated that in order to achieve this goal,

> governmental financial reporting needs to provide information to help users
>
> (a) determine whether current-year revenues were sufficient to pay for current year services;
>
> (b) ascertain whether resources were obtained and used in accordance with the entity's legally adopted budget; and
>
> (c) assess the service efforts, accomplishments, and related costs of the governmental entity (Hatry, Alexander & Fountain, 1989: iii).

The first two objectives are either being met through an organization's annual financial reports or can be met with a moderate effort. However, appropriate standards for the reporting of service efforts and accomplishments (SEA) must be established. Hatry et al. (1989: iii) note that the third objective is "clearly the most complex and controversial of the three elements of accountability reporting identified by the board."

In order to develop reporting standards for indicators which would be useful in assessing service efforts and accomplishments, the GASB has commissioned several research studies dealing with various aspects of the public sector. The Hatry, Alexander and Fountain report deals with the measurement and reporting of service efforts and accomplishments indicators for elementary and secondary education (Hatry et al., 1989). They make recommendations for performance indicators dealing with the assessment of school district effectiveness and efficiency. It is expected that such performance indicators would be reported to external stakeholders as part of a school district's annual reporting process. Generally, the effectiveness indicators are consistent with accepted school district performance measures; however, the determination and external reporting of efficiency indicators may be problematic due to the difficulty of determining educational efficiency.

The Measurement of Educational Efficiency

The measurement of efficiency has proven to be difficult in educational settings. Hanushek (1986: 1142) acknowledges this difficulty, noting that efficiency is "a concept that has a very clear meaning in textbook analyses of the theory of the firm but that becomes quite cloudy in the world of public schools." In evaluating educational efficiency there are several significant factors which complicate the process. These include:

1) Educational organizations have multiple objectives and multiple outputs and outcomes. There are often conflicting opinions regarding the goals of education and the relative importance of those goals, by the stakeholders of education.

2) Many of the outputs of an educational organization cannot be unambiguously measured or quantified. A related problem is the nonseparability of educational outputs. The education process results in multiple outputs which are produced simultaneously. For example, the development of cognitive skills in one subject area leads to improved skills in other areas; or, an improvement in cognitive skills is associated with an enhancement of self-esteem. Many analyses treat the outputs as if they were separable or independent. However, it is preferable to consider them simultaneously in evaluations of the organization.

3) A final problem is the limited knowledge of the true relationship between inputs and outputs. In education the relationships between inputs and outputs may be inconsistent and the precise nature of the relationship is unknown. Numerous studies have dealt with the educational production function; however, for a variety of reasons, we know very little about the relationships between educational inputs and outputs (see Hanushek, 1986; Monk, 1989).

If these problems did not exist, it would be possible to determine precisely the level of resources necessary to achieve a particular educational outcome. By comparing actual results to optimal results, absolute efficiency could be determined. However, this ideal state of affairs is not possible given our current understanding of the education process.

Three approaches to measuring educational efficiency have been developed: ratio analysis, regression analysis and data envelopment analysis. Under the ratio approach, relationships between single outputs and single inputs are examined. Regression techniques have been used to determine production relationships, which provide a basis for the estimation of the production function and the assessment of efficiency. Data envelopment analysis uses linear programming concepts to determine the production function's efficient frontier

The technical and conceptual limitations of ratio analysis and regression techniques with respect to the measurement of efficiency or the determination of the educational production function have been well documented (Hanushek, 1986; Monk, 1989; Sherman, 1984, 1986). Among a number of problems cited, one difficulty is their inability to deal readily with multiple, nonseparable outputs; another is that regression techniques require parametric specification of the production function. On the other hand, data envelopment analysis is preferable to either ratio analysis or regression analysis in determining the efficiency of organizations which produce multiple outputs (see Banker, Charnes, Cooper, Swarts & Thomas, 1989; Banker, Conrad & Strauss, 1986; Bowlin, Charnes, Cooper & Sherman, 1985; Charnes, Cooper, Divine, Ruefli & Thomas, 1989; Seiford & Thrall, 1990; Sexton, 1986; Sherman, 1986). The following advantages of the DEA approach are particularly relevant to education (see Sexton, 1986; and Sexton, Silkman & Hogan, 1986):

1) DEA is able to deal with multiple inputs and multiple outputs on a simultaneous basis.

2) DEA does not require parametric specification of the production function, thereby avoiding assumptions regarding its mathematical form. This is particularly advantageous in education since our knowledge of the relationship between educational inputs and educational outputs is limited.

3) Managerial strategies for improvement of inefficient decision-making units can be determined. Returns to scale information may also be available.

4) DEA can be used to determine either technical or economic efficiency, if appropriate information is available.

The primary limitation of DEA is that it is an extremal technique,[(1)] and thus is more sensitive to misspecification problems than mean-based techniques. DEA is also unable to provide measures of statistical association between inputs and outputs and this makes it more difficult to choose among different model specifications.

The primary advantage of ratio analysis is that it is relatively easy to apply and the data requirements are less onerous. For ratio analysis, the data required can be provided by the organization under consideration. Both the DEA and regression approaches require that the analyst have relevant information for a number (preferably a large number) of similar organizations. In many cases, this either is not feasible or cannot be accomplished on a timely basis. Ratio indicators enable an organization to report on its *own* activities, using information generated by the organization. The ability to provide timely external reports is thus facilitated by the use of ratio indicators. However, the utility of ratio analysis may be limited when dealing with organizations which simultaneously produce multiple outputs from multiple inputs. Since comparisons between school districts based on the efficiency indicators are likely to occur, it is worthwhile to determine whether ratio indicators for school districts are relatively consistent with those resulting from a more sophisticated approach such as DEA. The ability of such measures to discriminate effectively among school districts on the basis of efficiency could have significant implications for education finance, particularly when such information has the potential to play a role in educational decision making (e.g., in resource allocation, funding, budget approvals, etc.).

The purpose of this study was to determine whether ratio indicators of efficiency, similar to those recommended by the GASB, can adequately distinguish between relatively efficient and relatively inefficient school districts, in a manner consistent with DEA models. However, the GASB's recommendations for school districts are relatively new and, as far as we know, few school districts have adopted them. Consequently, a number of ratios similar to those recommended by the GASB were prepared from publicly available data. The same data set was used to develop a number of DEA models, which were compared to the ratios.

METHODS

Data

The study uses data from the New York State Education Department for the year 1989-90. The primary sources were:

- *New York: The State of Learning*. A Report to the Governor and the Legislature on the Educational Status of the State's Schools for 1989-90, Volume 2 (New York State Education Department [NYSED], 1991b). This is an annual report dealing with the educational system at the district level;
- *New York: The State of Learning* (A Report to the Governor and the Legislature on the Educational Status of the State's Schools for 1990-91), Volume 2 (NYSED, 1992);
- *Third Annual School District Fiscal Profile Report, 1985/86--1989/90 School Years* (NYSED, 1991a); and
- *District Data Pertaining to the Third Annual School District Fiscal Profile Report, 1989-90* (NYSED, 1991c).

Two hundred fourteen districts from western and central New York State were included in this study. The districts are from four Standard Metropolitan Statistical Areas (SMSA). When classified by district type, the districts appear as follows:

TABLE 1
Distribution of Districts by Standard Metropolitan Statistical Areas

District Type	Number of Districts
Large City	3
Other City	18
Suburban	99
Rural	94
Total	214

GASB's Requirements

Hatry, Alexander and Fountain's report (1989) recommends that, in order to assess a school district's service efforts and accomplishments, information pertaining to the following areas should be provided:

- educational inputs,
- educational outputs,
- educational outcomes,
- efficiency, and
- explanatory data.

With respect to efficiency, they discuss two sorts of indicators: ratios of input to output and ratios of input to outcome. Outputs are defined as indicators of workload handled while outcomes are indicators of program results or achievements. Outcomes are described as including "indicators of service quality (such as timeliness), effectiveness, and amount or proportion of "need" that is (or is not) being served" (Hatry, Alexander & Fountain, 1989: 8). Each category consists of several types of indicators (Hatry, Alexander & Fountain, 1989: 16) as follows:

Ratios of Inputs to Output:

- Average cost per student-day or per student-year, and
- Average cost per student promoted or graduated.

Ratios of Input to Outcome:

- Cost per student who achieved prespecified targets on cognitive and noncognitive indicators during the school year,
- Cost per student who achieved prespecified targets as the amount of gain on cognitive and noncognitive indicators during the school year, and
- Cost per unit of gain summed over all students.

The final recommendations regarding efficiency included only numbers one, two and four. Numbers three and five were not recommended by

Hatry et al. due to expected difficulties in obtaining relevant outcome information.

Ratio Indicators

Ratio indicators, similar to those recommended by the GASB were developed, as follows:

Average Cost per Student-Day. Two ratios were calculated to represent Average Cost per Student-Day. This ratio is described as "total school system cost divided by the total number of student-days throughout the school year" (Hatry et al., 1989: 43). They suggest average daily attendance for the denominator. CAADM, combined adjusted average daily membership, was used for this purpose.[(2)] Hatry et al. (1989: 43) suggest that the numerator be defined as current operating expenditures or as total expenditures (current operating expenditures plus capital outlays plus interest on debt). For this analysis two analogous definitions of cost were used:

- ***Total Current Operating Expenditures.*** This includes all expenditures for administration, instruction, transportation, and operations and maintenance; and

- ***Total Current Operating Expenditures plus Debt Service Costs and Interfund Transfers (Capital Funds, Casualty and Liability Reserves, and Miscellaneous School Funds).*** The corresponding ratios are identified as "Op Cost" and "Op Cost +." The second expenditure amount was also used as the numerator for the remaining ratios.[(3)]

Cost Per Student Promoted/Graduated. Hatry, Alexander and Fountain (1989: 44) describe this ratio as "average cost per student promoted or graduated is calculated by dividing the total system costs by the number of students who are promoted one or more grade levels at the end of the school year or who graduate from high school." Since the number of students who were promoted one or more grade levels was not available, total expenditures per student *graduated* was used for this ratio (Cost/Grad).

Cost Per Student who achieved prespecified targets as the amount of gain on cognitive and noncognitive indicators during the school year. In determining a suitable measure for this ratio significant problems are evident. In discussing this type of ratio, Hatry et al. (1989: 44) note that determination of a suitable denominator is difficult.

> A way to more truly reflect the efficiency (cost-effectiveness) of school systems in producing the desired result (learning or development) is to compare costs to a measurement of outcome, such as including in the denominator of the ratio only those students who have achieved some specific gain during the school year. To our knowledge, no school system in the country currently calculates and reports efficiency indicators of this type.

In dealing with this ratio, two representations of this type of ratio were determined. In one ratio, the denominator was determined as the product of enrollment and the average percentage of students scoring above the State Reference Point on the PEP Tests pertaining to reading comprehension, mathematics and writing in the elementary grades and enrollment times the retention rate for the secondary grades. The other ratio used the percentage of high school graduates obtaining a Regents' Diploma for the secondary grades, rather than the retention rate. These ratios are referred to as Outcome 1 (Out1) and Outcome 2 (Out2), respectively.

The DEA Models

Several forms of the DEA approach exist (see Banker et al., 1989). The choice of which form of the DEA approach is used should be based on a priori knowledge of the characteristics of educational production functions as well as the modeler's objectives. As noted previously, despite an extensive literature pertaining to the educational production function, our knowledge of its mathematical form is still rather limited. Furthermore, ratios provide an overall measure of efficiency without distinguishing between technical and scale inefficiency. The CCR ratio form (Charnes, Cooper & Rhodes, 1981), a basic form of the DEA approach, was used since it considers technical and scale inefficiencies simultaneously.

The inputs and outputs for the DEA model were chosen to be relatively consistent with the ratio indicators. The inputs used by the DEA efficiency models were expenditure-related variables and a dropout variable. Three models were developed. All models used expenditure inputs, but they differed in terms of the level of aggregation of the expenditures. Model A used a single expenditure category, while Models B and C divided the expenditures into five categories: administration, instruction, transportation, operations and maintenance, and other expenditures. Model C also included a socio-economic status (SES) variable in the analysis. Model A is most similar to the ratio approach, while Model C is least similar. A summary of the DEA models is presented in Table 2.

The expenditure inputs used in Models B and C pertain to the following areas (the terminology is based on that used by the New York State Education Department):

1. Administration: central administration expenditures;
2. Instruction: the sum of teacher salary expenditures, pupil personnel staff instructional salaries expenditures, curriculum development/ supervision expenditures, BOCES expenditures, other instructional expenditures;
3. Operations: district operations and maintenance expenditures;
4. Transportation: district transportation expenditures; and
5. Other: the sum of teacher retirement expenditures, health insurance expenditures, other employee benefits expenditures, other undistributed expenditures, other expenditures and debt service expenditures.

In Model A, the expenditures were combined into a single variable. Rhodes (1986, 57) notes that changing the number or type of variables can affect the DEA evaluations,

> In DEA efficiency calculations, the chances that a unit has of being good enough in terms of at least one input or output increase as the mix of inputs and outputs increases. Thus, varying both the number and the composition of input-output mixes means that the

TABLE 2
Summary of Data Envelopment Analysis

	Inputs/Characteristics	Outputs
Model A	• Total expenditures • Dropouts	• Competency • Regents Diploma • College
Model B	• Administration expenditures • Instruction expenditures • Operations expenditures • Transportation expenditures • Other expenditures • Dropouts	• Competency • Regents Diploma • College
Model C	• Administration expenditures • Instruction expenditures • Operations expenditures • Transportation expenditures • Other expenditures • Dropouts • Majority students	• Competency • Regents Diploma • College

> input or output factor in which a given unit is strong has the effect either of making that factor predominate or, conversely, of eliminating it, and the unit's efficiency rating increases or decreases as a result.

In this case, reducing the number of variables can be expected to reduce the efficiency evaluations for individual school districts under Model A.

Dropouts have also been included in the analysis as a characteristic of the education process in all three models. The problem of students dropping out of the educational system before graduating is a serious one and has been the subject of substantial public attention. The New York State Education Department has noted that the issue of dropouts "has become an urgent public policy issue" (NYSED 1992: 181). Dropouts can be regarded as an undesirable, but partially controllable, characteristic of the education process. Such characteristics are included with the inputs; in this way they are treated as items to be minimized in order to attain efficiency.

Model C also incorporates a socio-economic status variable in the analysis. Socio-economic status (SES) has often been found to be a highly significant factor affecting school outcomes. Hatry et al. (1989) also recommended that SES information be reported as explanatory data. In dealing with environmental variables, Boussofiane, Dyson, and Thanassoulis note that "the environmental factor which adds resource may be included as an input whereas one that requires resource to overcome a poor environment may be included as an output" (Boussofiane, Dyson & Thanassoulis, 1991: 3). Model C used the same inputs as Model B, but it also includes majority (i.e., nonminority) students as an input.

The output variables used in all three DEA models related to student achievement. They included:

1. ***The Number of Students Achieving at a Basic Level of Competency***: This is an estimate of the number of elementary pupils above the state reference point on Program Evaluation Tests[(4)] (PET) plus secondary pupils in grades nine through eleven. The tests included: 3rd grade reading, 3rd grade math, 5th grade writing, 6th grade reading and 6th grade math as well as the students above the State Reference Point on the preliminary competency tests for reading and writing (grade eight).

2. ***Regents' Diplomas***: The number of high school graduates who received the more demanding Regents' Diploma.

3. ***College Students***: The number of 1989-90 high school graduates entering a postsecondary institution in the fall of 1990.

RESULTS

Tables 3 and 4[(5)] provide summary statistics and correlation coefficients for the ratios. Except for the Cost/Grad ratio, the ratios are relatively consistent with one another. Both the product moment and the

TABLE 3
Summary Statistics - Ratios

	Op Cost	Op Cost+	Cost/Grad	Out1	Out2
Mean	6217	6703	85106	6632	7155
Std. Dev.	833	925	17955	838	966
Maximum	10499	11226	191177	9892	11596
Minimum	4547	4641	52797	4790	5209

rank order correlations between Op Cost, OP Cost+, Outcome 1 and Outcome 2 are relatively high, ranging from .79 to .96, indicating an overall consistency between these ratio measures. The correlation between Cost/Grad and the other ratios is considerably lower, reflecting the fact that it is substantially different from the other ratios. Other than Cost/Grad, the ratio models are similar and result in similar relative ratings of efficiency and in similar rankings of the districts.

Summary results for the DEA models are presented in Table 5. DEA provides efficiency evaluations between zero and one, where one represents relative efficiency with respect to the other organizations in the sample. As expected, the efficiency evaluations increased as the number of inputs was increased. Furthermore, the correlations (Table 4) between these models range from .68 to .88, indicating that they are also relatively consistent.

The critical issue is whether the ratio models are consistent with the DEA models. Two approaches were used to compare the efficiency ratios to the DEA models:

1. The initial analysis examines the correlations (product moment and rank order) between the ratios and the DEA evaluations. The correlation coefficients are presented in Table 4.

2. The second approach examines how consistently districts are assigned to efficiency quartiles based on the ratio and DEA measures. This analysis determines to what extent the ratio measures result in the same, higher or lower quartile rankings than

TABLE 4
Product Moment Correlation Coefficients

	Op Cost	Op Cost+	Cost/ Grad	Outcome1	Outcome2	Model A	Model B
OP Cost+	.8997						
Cost/Grad	.3647	.4943					
Outcome1	.7912	.8991	.5904				
Outcome2	.8026	.9000	.4759	.9594			
Model A	.5202	.6473	.6770	.7515	.7195		
Model B	.5883	.5506	.4926	.6513	.6361	.7830	
Model C	.4475	.4319	.3989	.5229	.5217	.6758	.8678
Spearman Rank Order Correlation Coefficients							
OP Cost+	.8864						
Cost/Grad	.3548	.4737					
Outcome1	.8132	.9178	.5373				
Outcome2	.8159	.9140	.4401	.9613			
Model A	.5539	.6724	.6659	.7645	.7406		
Model B	.5869	.5603	.4776	.6434	.6369	.7993	
Model C	.4381	.4294	.4183	.5152	.5133	.7094	.8814

the DEA measures. The analysis was done for districts in all efficiency quartiles, as determined by the DEA models, and then was repeated for districts in the first and fourth quartiles only.

The correlations between the ratio models and the DEA models range from .40 to .76, indicating a somewhat lower level of consistency between these models. Thus the ability of the ratio models to identify adequately efficient or inefficient districts in a manner consistent with the DEA models is questionable. To examine this issue further, the second analysis examines how consistently the various models assign the districts to quartiles, where the quartiles were based on the efficiency evaluations.

TABLE 5
Summary Results, Models A, B and C

DEA Evaluation	Distribution		
	Model A	Model B	Model C
1.00	8	35	52
>.95	1	17	26
>.90	12	33	31
>.85	11	28	33
>.80	36	43	32
>.75	46	29	25
>.70	45	17	8
>.65	26	9	6
>.60	14	1	1
>.55	9	2	0
>.50	4	0	0
>.45	2	0	0
Number of districts	214	214	214
Mean	.7574	.8635	.8935
Standard Deviation	.1033	.0990	.0936
Maximum	1.0000	1.0000	1.0000
Minimum	.4948	.5928	.6227

The results of the second analysis appear in Table 6, which reports the number of districts which appear in the same quartile ('eq' column), a higher quartile (> column - less efficient) or a lower quartile (< column - more efficient) under the ratio models as opposed to the DEA

TABLE 6
Quartile assignments

	Eq	>	<	Total
Model A				
Op Cost	103	51	60	214
Op Cost+	114	45	55	214
Cost/Grad	106	55	53	214
Outcome1	122	40	52	214
Outcome2	113	45	56	214
Average	111.6	47.2	55.2	214
Percentage	52.1	22.1	25.8	100
Model B				
Op Cost	89	54	71	214
Op Cost+	86	58	70	214
Cost/Grad	93	58	63	214
Outcome1	96	54	64	214
Outcome2	93	56	65	214
Average	91.4	56.0	66.6	214
Percentage	42.7	26.1	31.1	100
Model C				
Op Cost	76	61	77	214
Op Cost+	71	67	76	214
Cost/Grad	80	68	66	214
Outcome1	81	60	73	214
Outcome2	82	61	71	214
Average	78.0	63.4	72.6	214
Percentage	36.4	29.6	33.9	100

models. Quartile one represents the most efficient group, while quartile four is the least efficient. As Table 6 indicates, thirty-six to fifty-two percent of the districts appear in the same quartile under the ratio models and the DEA models, depending on which DEA model is being used. As expected, the consistency is greatest for Model A, which is most similar to the ratios.

If one were using the ratio efficiency information to identify efficient or inefficient districts, a significant proportion of the districts would be misclassified in comparison with the DEA approach. If one were concerned with evaluating the relative performance of the districts or the district administration, the SES Model would be more appropriate and in this case the misclassification is even higher. In either case, the ratio approach may not provide satisfactory information for decisions where the consequences of incorrect decisions could be significant. Table 7 explores the preceding issue in greater depth by considering only the top and bottom efficiency quartiles for each DEA model. In this table we examine the ratio model classifications of those districts which are considered to be the most efficient (top quartile) and the least efficient (bottom quartile) under the DEA approach. For the efficient districts, the ratio models classify the districts correctly 49% to 60% of the time. For the least efficient districts, the correct classifications are somewhat higher, ranging from 49% to 71%. Table 7 also indicates 72.5% to 83.3% of the districts in the first quartile are classified as being in the top two quartiles under the ratio approach while between 80.0% to 94.7% of the districts in the bottom quartile are classified in the bottom two quartiles by the ratio models.

DISCUSSION

Hatry et al. (1989) recommended that efficiency indicators have characteristics similar to those required for external financial reporting. These characteristics include understandability, reliability, relevance, timeliness, consistency and comparability (Governmental Accounting Standards Board, 1987, Par. 62). Timeliness indicates that the information "must be available to a decision maker before it loses its capacity to influence decisions" (Hendriksen & van Breda, 1992: 136). Reliability requires that the information be "reasonably free from error and bias and faithfully represents what it purports to represent" (Financial Accounting Standards Board, 1980: Par. 63). Attainment of both characteristics is often difficult since greater reliability often decreases timeliness. In many cases a decision maker must determine which characteristic is more pertinent to the decision at hand.

TABLE 7
Quartile Assignments

	Quartile 1					Quartile 2				
	Q1	Q2	Q3	Q4	Total	Q1	Q2	Q3	Q4	Total
Model A										
Op Cost	30	12	7	4	53	2	4	12	35	53
Op Cost+	31	12	7	3	53	0	1	14	38	53
Cost/Grad	31	17	2	3	53	2	4	15	32	53
Outcome1	35	10	6	2	53	0	0	10	43	53
Outcome2	32	11	8	2	53	0	1	11	41	53
Average	31.8	12.4	60	2.8	53	0.8	2.0	12.4	37.8	53
Percentage	60.0	23.3	11.3	5.3	100	1.5	3.8	23.4	71.3	100
Model B										
Op Cost	27	12	12	2	53	0	3	18	32	53
Op Cost+	24	16	9	4	53	0	4	19	30	53
Cost/Grad	24	16	9	4	53	7	3	16	27	53
Outcome1	28	13	10	2	53	0	5	13	35	53
Outcome2	28	13	9	3	53	0	5	15	33	53
Average	26.2	14.0	9.8	3.0	53	1.4	4.0	16.2	31.4	53
Percentage	49.4	26.4	18.4	5.7	100	2.6	7.5	30.6	59.2	100
Model C										
Op Cost	24	12	11	6	53	2	8	19	24	53
Op Cost+	21	18	9	5	53	3	7	20	23	53
Cost/Grad	21	20	5	7	53	7	6	15	25	53
Outcome1	24	14	10	5	53	0	10	15	28	53
Outcome2	25	13	10	5	53	2	8	14	29	53
Average	23.0	15.4	9.0	5.6	53	2.8	7.8	16.6	25.8	53
Percentage	43.4	29.1	17.0	10.6	100	5.2	14.7	31.3	48.7	100

When dealing with public sector organizations such as school districts, the public has a right to determine whether the districts are operating efficiently and should be able to do so on a timely basis. On the other hand, given the long term implications of decisions which may be affected by publicly reported efficiency indicators, it may be preferable not to report any indicators than to report indicators which are not reliable. In dealing with school districts, the provision of efficiency indicators which are both reliable and timely would be relatively difficult. Ratio measures can be determined relatively easily by the districts themselves and thus could be reported much sooner than other approaches. Indicators based on an approach such as DEA require data for all districts under consideration, and thus would probably have to be determined by some central authority, such as a state education department. However, since there are often delays in gathering and processing educational data, the reporting of such indicators would be much slower.

In this study there were significant inconsistencies between the ratio and DEA approaches in terms of being able to identify the relatively efficient and inefficient districts, even when quartile classifications are used as measures of efficiency. In terms of classifying the districts on the basis of efficiency, the overall agreement between the two approaches was not high (Table 7). However, for quartiles one and four there was somewhat greater consistency. In general, agreement was highest for Model A and lowest for Model C. Furthermore, the correlations between the ratio models and the DEA models indicate only a moderate level of consistency between the two approaches (Table 7). From this one may conclude that, at best, the ratios may suffice only as relatively crude or "ball-park" indicators of relative efficiency. The relatively low agreement between the ratios and Model C, which incorporated the SES input, is particularly disturbing. It raises the concern that faulty decisions would be more likely to occur if the district has greater numbers of disadvantaged students. Research has shown that, with respect to student achievement, schools have considerably less impact than environmental factors related to SES and family background (Sadowski, 1995). In districts where there are significant numbers of disadvantaged students, additional resources are often required to meet basic educational objectives. As a result such districts are more likely to appear less efficient, unless the evaluation explicitly accounts for SES factors. In order to recognize the difficulties that districts face when there are significant numbers of disadvantaged students, it is advisable to consider explicitly the impact of SES when evaluating district effectiveness and efficiency. Furthermore, in order to provide a more balanced perspective, it may be worthwhile to consider reporting indicators of adequacy and equity as well as efficiency.

Whether or not the ratio models are adequate indicators of efficiency depends on the consequences of a wrong decision. If the consequences are significant, one would be ill-advised to rely on the ratio models. Misclassifications with respect to efficiency could have dire consequences when dealing with decisions affecting a district's resources or its personnel. Such decisions include the allocation of educational resources, consolidation of school districts, taxpayers' approval of a district's budget or the evaluation of a district's personnel, among others. Perceptions of inefficiency based on a faulty model could lead to reductions in funding which are not warranted, misallocations of resources and unwarranted allegations of poor management, all of which would have long term consequences for the attainment of educational goals. Crude indicators, which would be relatively easy to misinterpret, have the potential to cause more harm than good in the highly political environments in which most school systems operate. An argument may be made that an appropriate set of ratios may be useful as supplementary information when there is an inordinate delay in the provision of more reliable indicators and some sort of interim information was desired for *monitoring* purposes. In these cases, one may be concerned with providing general indications of possible changes from prior periods. In a subordinate capacity such as this, the ratios would only provide signals of possible changes, which would warrant further investigation by the district. However, such indicators would be more appropriate as part of a district's internal management accounting system, rather than as a component of externally reported information.

The reporting of efficiency indicators should be encouraged in order to evaluate the operations of school systems. The indicators must provide a credible representation of efficiency and they should be available within a time period which is appropriate for the types of decisions to be made. On their own, ratios are not adequate for this purpose. It is conceivable that they may be useful in some limited capacity, perhaps as supplementary indicators. However, the limitations of ratios as indicators of efficiency and their potential inconsistency with more sophisticated approaches would have to be clearly communicated. Before this occurs additional work is required. Issues to be investigated include the feasibility of providing more sophisticated measures through central agencies, the determination of appropriate efficiency models including inputs and outputs which represent the activities of schools and the possible use of ratios as supplementary indicators which could be provided on more timely basis.

NOTES

1. Extremal techniques are based on extreme points in determining the items of interest. DEA determines relatively efficiency by identifyingthe organizations with the optimal relationship between inputs and outputs. Such organizations are extreme points with respect to the less efficient organizations.
2. The number of handicapped pupils was excluded.
3. Expenditures relating to handicapped students are not included in either amount.
4. Ungraded pupils are included, but handicapped pupils are excluded.
5. For the ratios, lower values represent better performance and thus negative correlations are ordinarily expected between ratios and DEA measures. However, prior to determining the correlations, ratios were scaled by dividing each value by the maximum value of that ratio in order to put the ratios on the same basis as the DEA evaluations - with values between zero and one, with a higher value representing better performance. Thus, if the approaches are consistent, positive correlations would be expected.

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