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A COST EFFICIENCY ANALYSIS OF SCHOOL DISTRICTS: IS LARGER MORE EFFICIENT?

C. William Garner*

ABSTRACT. Can school districts become too large whereby their size exceeds their point of efficiency? To investigate this question, all K-12 school districts in New Jersey were divided into three groups based on student body size. In a comparison of six average cost measures, larger districts were found to be more efficient on only one of the six measures. A more optimum size for school districts appeared to be in moderate sized districts. The theoretical grounds for this investigation regarded the suggested effects of vertical and horizontal decentralization.

INTRODUCTION

In the plethora of research on public school finance and school expenditures, the focus has typically been on either revenue inputs (property taxes) or costs and effectiveness (student outcomes). Cost and efficiency, on the other hand, regards the cost of outputs (regardless of the quality of the outcome) and is often taken for granted in the public sector. Further, an assumption is often made that larger is more efficient. As Luke, Ventriss, Reed and Reed (1988: 77) proposed, economies of scale have been historically achieved by expanding the size of a business or government enterprise; however, they explained that "largeness no longer automatically means reduced costs." Further, as Reich (1992) observed, the trend in the private sector is to move away from the massive, centralized, international corporate structures to a web of smaller enterprises.

* *C. William Garner, D.Ed., CGFM, is Associate Professor, Department of Educational Theory, Policy and Administration, Rutgers University, New Brunswick. His teaching and research interests are in public school finance.*

Regardless of the problems associated with overly large organizations, the benefits reaped by the division of labor in bureaucratic structures are still held foremost in the minds of most people. More specifically, corporate and public managers have learned that small organizations can be costly. At the same time, business leaders are having difficulty in accepting the evidence that when organizations become too large, they can become too costly as well. Likewise, local and state education officials continue to attempt to gain greater cost efficiencies by consolidating smaller districts into larger districts. For example, in 1940 there were 117,108 school districts in the United States while in 1990 this number was reduced to 15,449 (Odden and Picus, 1992). At the same time the number of students enrolled in these districts increased from over 25 million in 1939-40 to nearly 41 million in 1990 (Thompson, Wood and Honeyman, 1994).

When the number of students in a school district exceeds a certain level, the issue is whether districts encounter the dilemma suggested by White, Ross, Myrtle, Siegel and Rose (1980). They determined that at some point of efficiency, additional production is no longer profitable. Can school districts become too large and exceed their point of efficiency? Is there evidence to suggest that school districts have an optimum size? This is a pressing concern in New Jersey, as well as other states, where officials are discussing whether the number of school districts should be reduced from over 600 districts to less than one-half of that number.

The purpose of this research was to examine two sets of six costs (actual and budgeted) of all K-12 districts in New Jersey. The districts were divided into three groups based on the size of the student body to determine if there were significant differences in the average costs per student among the groups. In addition, the costs per student were studied to determine if there were any relationships between the costs within the district groups. A further examination regarded cost equity to determine if there was a difference in the average expenditure per student within each group.

THEORETICAL BASIS FOR THE STUDY

Like corporate businesses, school districts have expanded in size through the implementation of a centralized, hierarchical organizational

structure initiated by Adam Smith in his renowned book, *An Inquiry into the Nature and Causes of the Wealth of Nations*, published in 1776. In his book Smith pointed out the advantages offered by the division of labor whereby one person should not perform all tasks due to physical and knowledge limitations. Rather, he proposed, people would be more successful and easily trained if they perform repetitive tasks, such as one teacher per grade or teachers specializing in one or two subjects. Through the specialization of jobs, a company or school district could increase their outputs and, therefore, be more cost efficient. Thus, production costs per unit of output would decrease and profits would increase. Likewise, if production costs per student in a school district could decrease, then taxes would decrease, or not increase as rapidly.

Smith's division of labor principle was extended by Max Weber in 1947. He proposed the creation of an ideal management structure to facilitate the division of labor and, as a consequence, the term bureaucracy was coined. In Weber's (1947) structure, the division of labor was to be realized more efficiently through the establishment of a pyramidal hierarchy of positions. As a consequence, greater efficiency would reap lower costs and greater profits, or lower taxes.

The problem in an expanding organizational pyramid is the dependence upon the maintenance of an effective span of control. Weber, and others that followed, recognized that limits had to be placed on the number of people placed directly under a person's supervision, for example, the number of teachers supervised by an administrator and the number of students taught by a teacher. When an organization violates the span of control principle, the pyramid becomes extended beyond a manageable size, whereby efficiency as well as effectiveness suffer the consequences. The result, therefore, is an increase (not decrease) in costs with a decrease (not increase) in profits. Unfortunately, when efficiency declines because the organization violates basic design principles, the quality of the product (effectiveness) must also decline.

Unfortunately, organizations such as school districts, are too often tempted to go beyond the boundaries of the pyramid. This occurs when too many districts are consolidated into one very large district, class sizes become too large and central office administrators supervise too many people, programs and operations. Efficiency must logically decline in

such a setting and this deterioration will clearly drive a corresponding decline in the effectiveness of the school district. On the other hand, problems also develop when a district is too small, too costly and too few administrative personnel are not available to handle multiple and unrelated assignments. In both cases, school district operations are extended beyond the structure and the span of control principle is violated.

When the management structure is extended beyond its limits, the organization also experiences either vertical or horizontal decentralization. Vertical decentralization occurs when there is a "dispersal of formal power" down the line of authority. In other words, subordinates (such as teacher aides or clerical personnel) assume the authority assigned to their superiors. Horizontal decentralization is the "extent to which non-managers control decision processes," meaning decision-making power flows from line managers to staff personnel outside the management structure. In both cases the span of control principle is violated (Mintzberg, 1983: 99). The passing of authority to personnel outside the structural realm of the organization suggests that unqualified, and possibly incompetent, personnel are responsible for directing operations. As a result, the efficiency plus the effectiveness of the organization will likely decline or not achieve the output and outcome levels anticipated.

METHODS

The definition for efficiency used by this study was gained from Asian (1964) who took the position that it represents "the amount of resources used to produce a unit of output" (p.8). The unit of output for the school districts in this study was the student enrolled in a district. The measure of the resources used to produce the output was the district's average cost per student.

The cost data for this study were collected from financial statements submitted to the New Jersey Department of Education. The statements were prepared in compliance with the principles of the Governmental Accounting Standards Board (GAS). From these reports, six cost measures were generated from the expenditures reported for 1994-95 and the proposed budgets for 1995-96.

The K-12 school districts were divided into three groups as follows: 0 - 1800, 1801 - 3500, and over 3500 students. In addition, the costs for 14 districts with enrollments from 9,983 to 45,396 students were separated for a simple comparison. The number of students in a district included students received from other districts but not those who were sent out of the district. The actual 1994-95 enrollment ranges for the three groups and the number of schools reporting in each group were: 524 - 1800 (n=57; one of the 58 districts did not file a report), 1801 - 3500 (n=71), and 3500 - 45,396 (n=81). For the 1995-96 budgeted data, information was available for all districts so that 58 districts with less than 1800 students were included in the comparisons.

The six cost categories examined were as follows:

Classroom Instruction (CAI). This category included all direct instruction for students in regular and special education such as basic skills, bilingual, local vocational, and others. The expenditures consisted of salaries and allocated benefits paid to teachers, substitutes, and teacher aides; additional compensation paid to teachers for other duties (such as detention and lunch room aides); dues and membership fees for teacher memberships in professional and other organizations; classroom supplies (purchases under $500 are considered a supply item in New Jersey) such as calculators, microscopes, textbooks, videos, CDS, chalk, paper, pencils and other items designated for classroom use; professional, educational, technical and other services purchased for the classrooms such as speech therapists and standardized exams; and charges for the rental or lease of equipment for classrooms.

Support Services (SS). This category contained expenditures supplemental to the teaching process as per the definition prescribed by the National Center for Educational Statistics (NC). This included expenditures for attendance, social work, health and guidance, child study team, educational media and library, physical and mental health, and nursing services. Also incorporated into the support services cost were all expenditures for the guidance office and library such as personnel salaries and benefits, professional and office supplies, books, bindings, the rental and leasing of equipment, travel, and the dues and fees for staff memberships in professional and other organizations.

Classroom Supplies and Textbooks (CST). The costs in this category were included in the above category for classroom instruction (CAI). These expenditures, however, were limited to the direct instruction of students in regular and special education; such as basic skills, bilingual, local vocational, and others; for textbooks and regular supply items (such as paper, pencils, tablets, chalk, CD's, videos), and equipment items under $500 (such as calculators). The supply items were for classroom and not for general school use.

Total Administrative Services (AS). This category contained expenditures for general administration, school administration, business and other administrative support services, and services provided for the improvement of instruction. Examples of expenditures in this category were for the board of education and executive administrators, research and development, planning, evaluation, information services, data processing, negotiators, auditors, legal fees, election services, workshop presenters, consultants, school building administrators, administrative support staff, department heads, teacher in service and staff development training, travel, dues and fees for memberships in professional organizations including the school board association, and so on. In cases where an administrative assignment was on a part-time basis, the charges to this category for salaries and benefits were prorated.

Operation and Maintenance of Physical Facilities (O&M). The expenditures made in this category were to keep the physical plant open, comfortable and safe and to keep the grounds, buildings and equipment in effective working condition. Examples of expenditures in this category were salaries and benefits of professional, administrative and staff personnel; heat, electricity, water and sewage, and air conditioning and ventilation; repair and maintenance of facilities (not remodeling), equipment, and school vehicles (not student transportation vehicles); purchased professional and technical services; garbage disposal; security; snow plowing; equipment and vehicle rentals and purchases; property insurance; upkeep of buildings and grounds; travel expenses; dues and fees for memberships in professional and other organizations; and so on.

Total Cost Per Pupil (TC). Expenditures included in this category were the above costs for classroom instruction (CAI), that included classroom supplies and textbooks (CST); support services (SS); administration (AS);

and operations and maintenance (O&M) plus food services (from the general fund and not the proprietary fund), extracurricular activities and community services. This category did not include expenditures for tuition, interest payments on lease purchases of buildings, transportation costs, residential costs, judgements against the school district, equipment purchases (over $500), facilities acquisition and construction, debt services, and expenditures funded by restricted local, state and federal grants (special revenue fund).

RESULTS

1994-95 Costs

The average of the six average costs per student for the three groups of K-12 districts in 1994-95 are presented in Table 1. As shown in the Table, the largest districts had smaller averages in four of the six costs (SS, CST, AS, and TC) while the medium size schools had smaller averages for two of the costs (CAI and O&M). Each of the average costs in the three groups were compared via an analysis of variance with the

TABLE 1
1994-95 Average Costs K-12 School Districts

Cost Category	District Size		
	1800 & less (N=57)	1801-3500 (N=71)	3501 & larger (N=81)
CAI	$4.677.91	$4,542.93	$4,551.14
SS	747.47	726.31	690.68
CST	*185.11	170.72	*161.84
AS	*1,119.02	1,080.15	1,039.31
O&M	941.25	916.65	940.23
TC	7,780.82	7,499.99	7,397.54

Note: The smallest average expenditure is underlined.
* $p < .05$

alpha level set at .05. Only the differences in costs for CST were found to be significant $F(2, 206)=3.922$, $p=.021$. Using the Turkey honestly significant difference test with an alpha of .05, the difference was found to be significant between only the larger and smaller districts.

In addition to the comparison of costs among the three sizes of districts, the relationship of costs within each group was examined. As expected, using the Pearson two tailed test, the costs in smaller districts were all significantly related at $p < .02$ with the exception of CST. In the medium sized districts, the costs for CST were not related to any of the other costs and in the larger districts, there was a significant relationship between CST and O&M ($p = .007$) but not between CST and the other costs. As a consequence, the significant difference presented in Table 1 on CST costs between large and small districts must be regarded with suspicion.

The last set of computations regarded expenditure equity. In view of the recent legal challenges about educational equity in New Jersey, the coefficient of variation (division of the standard deviation by the mean) was calculated for each cost category within each group (Guthrie, Garms and Pierce, 1988). As exhibited in Table 2, the coefficients indicated insignificant variation among the districts within each group (the smaller

TABLE 2
Coefficient of Variation: 1994-95 Costs

Cost Category	District Size		
	1800 & less (N=57)	1801-3500 (N=71)	Over 3500 (N=81)
CAI	.16	.13	.16
SS	.25	.22	.21
CST	.26	.28	.30
AS	.16	.22	.20
O&M	.24	.18	.21
TC	.15	.13	.17

the coefficient or smaller the standard deviation is in relation to the mean, the greater the equity). To be noted again, however, is that the largest coefficients were in CST and this casts concerns about the validity of the significant difference presented in Table 1.

Finally, the costs of the 14 largest districts (enrollments from 9,983 to 45,396) as well as the total costs for all 209 K-12 districts in New Jersey (including the largest 14 districts) were assembled and are shown in Table 3. The average costs of the largest districts were less than the state average, however, the differences were less than $100 per student with the exception of TC which was less than $200 per student. While the coefficient of variation shown in Table 3 for all districts as well as the 14 largest districts were still reasonable, the greatest variation was again found for CST.

1995-96 Budgets

The next phase of the investigation concerned the examination of the K-12 district budgets submitted and approved for the following fiscal year. As shown in Table 4, the larger and medium districts had the lowest average cost per student. One difference between the 1994-95

TABLE 3
1994-95 Costs and CV for K-12 Districts

Cost Category	All Districts (N=209)		Larger Districts (N=14)	
	Average Cost Per Pupil	(CV)	Average Cost Per Pupil	(CV)
CAI	$4,582.92	(.15)	$4,569.47	(.09)
SS	718.27	(.22)	642.21	(.16)
CST	171.20	(.29)	170.50	(.29)
AS	1,074.92	(.20)	1,011.29	(.25)
O&M	932.50	(.20)	939.50	(.23)
TC	7,536.88	(.21)	7,389.39	(.10)

TABLE 4
1995-96 Average Budget Costs in K-12 Districts

Cost Category	District Size			
	Up to 1800 (N=58)	1801-3500 (N=71)	Over 3500 (N=81)	All District
CAI	$4,842.74	$4,718.78	$4,740.16	$4,761.26
SS	*774.31	751.68	*704.73	739.82
CST	*194.26	175.78	*171.24	179.13
AS	*1,112.26	1,051.07	*1,029.78	1,059.76
O&M	951.33	924.47	943.82	939.35
TC	7,986.17	7,610.14	7,646.37	7,727.97

Note: The smallest average expenditure is underlined, and * indicates $p < .05$

costs and the 1995-96 budgeted costs was that the medium sized districts had lower costs in three (CAI, O&M, and TC) and not two of the six measures. The average costs were again compared via an analysis of variance with a follow-up using the Turkey honestly significant difference test. The analysis of variance revealed significant differences as follows: SS $F(2, 207)=3.968$ $p=.0204$, CST at $F(2, 207)=3.399$, $p=.0353$, and AS $F(2, 207)=3.408$, $p=.0350$. The Turkey indicated that the differences were significant between the largest and smaller districts.

In the examinations of the relationships of the costs within the groups of districts, the Pearson Product Moment correlations for the budgeted costs were quite similar to those found for the 1994-95 costs. Specifically, the costs of the small districts were significantly related to each other ($p < .001$) with the exception of CST. The CST costs had a weak relationship with IS ($p = .007$) and TC ($p = .036$) but not to the other costs ($p > .10$). The costs of the medium sized districts were significantly related to each other ($p < .01$) except for CST. This cost category had a weak but significant relationship ($p < .10$) with all other costs except O&M. The larger districts also had a strong relationship

among all costs ($p < .001$) except CST. Only AS had a significant ($p < .10$) but weak relationship with this cost category.

The coefficient of variation was also computed for the 1995-96 budget categories. The coefficients were within reason, as shown in Table 5, and quite similar to those found for the 1994-95 costs. The largest coefficients were again in CST.

TABLE 5
Coefficient of Variation 1995-96 Budget Costs

Cost Category	District Size			
	Up to 1,800 (N=57)	1,801-3,500 (N=71)	Over 3,500 (N=81)	All Districts
CAI	.16	.13	.12	.13
SS	.23	.19	.19	.21
CST	.30	.30	.29	.30
AS	.18	.15	.17	.20
O&M	.25	.20	.19	.21
TC	.15	.14	.12	.14

DISCUSSION

The objective of this study was to examine three sizes of K-12 districts in New Jersey to determine if larger districts were significantly more cost efficient. The six cost measures generated from the 1994-95 expenditures and 1995-96 budgets were found to be less in either the medium or larger districts. Therefore, the larger districts were not always more cost efficient, let alone significantly more cost efficient. In only one cost category (classroom supplies and materials) in 1994-95 was the group of larger districts significantly more efficient than the smaller districts. In 1995-96 three of the six budgeted costs (administrative services, classroom supplies and textbooks, and operation and maintenance of facilities) were significantly less for the larger districts

than the smaller districts. However, the other three average costs (classroom instruction, support services and total costs) were lowest in the medium sized districts. When the costs for the 14 largest districts in New Jersey were reviewed, their averages showed a relatively small dollar reduction in costs when compared to the state average for all K-12 districts.

Thus, the analyzes of the costs in relation to district size did not provide any convincing evidence to permit a generalization that large districts are significantly more cost efficient. The difference in the findings of the comparisons for the 1995-96 proposed budget costs versus the comparisons for the 1994-95 actual expenditures suggests a need for additional study. Are the more efficient proposed budgets submitted by larger districts evidence of organizational structural problems or did they make adjustments to improve their efficiencies?

Because of the results of the actual 1994-95 expenditures, a further in-depth analysis of the 1994-95 costs for the smaller and larger districts was conducted. As shown in Table 6, the differences in dollars between the two groups and the percentage of the reduction in cost in relation to the costs of the smaller districts were calculated. These results dismissed any concern that the dollar decrease in the larger districts might exhibit a practical savings to the taxpayer (a range from $1.02 to $383.28 per

TABLE 6
Differences in 1994-95 Costs between Large and Small Districts

Cost Category	Difference in 1994-95 Costs Between Small and Large Districts	Percent Reduction
CAI	$126.77	2.7%
SS	56.79	7.6
CST	23.27	12.6
AS	79.71	7.0
O&M	1.02	0.1
TC	383.28	4.9

student). Likewise, the reductions in costs were only 7.6 percentage or less, with the exception of CST in which the difference was $23.27 per child. The question, therefore, is (excluding CST) whether the range of reductions from 0.1 percentage (O&M) to 7.6 percentage (SS) with a range of savings from $1.02 for O&M to $383.28 (4.9 percentage) in total costs (TC) per child signifies the expected efficiencies to be gained by larger school districts and, thereby, justifies their creation.

In terms of the investigations of the relationships of the 1994-95 and 1995-96 costs, the correlations revealed that all costs were strongly related with the exception of CST. In addition, the coefficient of variance exhibited an equitable distribution of the cost measures with the highest coefficient found for CST. The interesting exceptions in CST merit further examination. Are these findings atypical because these expenditures are more cyclical in nature or because they have a low priority in some school districts? For example, do expenditures in this category depend upon the amount of a projected surplus?

The weakness in this study was the absence of any measures for capital costs and the use of capital assets. Since the accounting standards do not call for the depreciation of capital assets, particularly buildings and transportation vehicles, these costs cannot be factored into any operational analyzes. The inclusion of such costs would likely have a significant influence on an examination of cost efficiencies.

In conclusion, the findings did not support the popular perception that large school districts are significantly more cost efficient. Likely greater efficiency, and therefore effectiveness, exists within the more medium sized districts. One reason why the analysis of the cost data leads to such a conclusion may be the impact from vertical and horizontal decentralization.

As a consequence, decision makers should establish the savings expected prior to forming a larger school district in order to gain an idea of the optimum size, estimate the costs required to create the consolidated district and then compare the savings and costs to the existing costs in the districts to be consolidated. At the same time the cost of alternatives should be considered, such as combining some services or operations and not entire districts.

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