National Center for Education Statistics

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Education Finance Statistics Center

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Fiscal Proceedings From the Annual State Data Conference of July 2004

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July 2005

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National Center for Education Statistics

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July 2005

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The NCES education finance World Wide Web Home Page address is http://nces.ed.gov/edfin.

Suggested Citation

Fowler, W.J., Jr. (Ed.). (2005). *Developments in School Finance, 2004: Fiscal Proceedings From the Annual State Data Conference of July 2004* (NCES 2005-865). U.S. Department of Education, National Center for Education Statistics. Washington, DC: Government Printing Office.

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Foreword

Jeffrey A. Owings

Associate Commissioner
NCES Elementary/Secondary and Libraries Studies Division

At the 2004 National Center for Education Statistics (NCES) Summer Data Conference, scholars in the field of education finance addressed the theme, "New Partnerships in Data Development." Discussions and presentations dealt with such topics as measuring school efficiency, analyzing the "return" on education investment, calculating education costs per student, and assessing the financial condition of school districts.

Developments in School Finance: 2004 contains papers presented at the 2004 annual NCES Summer Data Conference. The presenters are experts in their respective fields; each offers a unique perspective on education finance or has conducted quantitative or qualitative research on emerging issues in education finance. It is my understanding that the reaction of those who attended the Conference was overwhelmingly positive. We hope that will be your reaction as well.

This volume is the ninth education finance publication produced from papers presented at the NCES Summer Data Conferences. The papers included present the views of the authors, and are intended to promote the exchange of ideas among researchers and policymakers. No official support by the U.S. Department of Education or NCES is intended or should be inferred. Nevertheless, NCES would be pleased if the papers provoke discussions, replications, replies, and refutations in future Summer Data Conferences.

Acknowledgments

The editor gratefully acknowledges the suggestions and comments of the reviewers at the National Center for Education Statistics (NCES): Jeffrey Owings, Associate Commissioner for the Elementary/Secondary and Libraries Studies Division, who provided overall direction; and Bruce Taylor, who provided technical review of the entire publication. At the Education Statistics Services Institute (ESSI), Tom Nachazel proofread and coordinated production of the publication, with assistance from other members of the ESSI editorial team. Also at ESSI, Heather Block performed the desktop publishing.

Contents

Introduction

William J. Fowler, Jr.
National Center for Education Statistics

The papers included in this volume of fiscal proceedings were presented at the July 2004 NCES Summer Data Conference. The presenters at the July 2004 conference were among those education finance experts identified by the NCES Finance Technical Review Panel as producers of some of the leading work in the field of elementary/secondary public school education finance. The papers covered such topics as improved financial reporting of school district and school costs, responses to and tools for detecting fiscal stress, and measuring school district productivity and efficiency.

The first paper discusses how current financial reporting of school district costs may be improved by the use of a measure of cost made available to school districts through the implementation of Governmental Accounting Standards Board (GASB) Statement 34. The second paper demonstrates the use of a diagnostic tool for anticipating fiscal stress in a school district that may enhance the ability of a district to take remedial steps financially. The third paper investigates the use of voluntary contributions as a response to fiscal stress in California's K–12 public schools. It examines the size and distribution of voluntary contributions across public schools and school districts, and discusses whether the equity concerns engendered by such contributions are well founded. The fourth paper introduces and describes a new methodology for analyzing the educational return on school district spending. The fifth paper proposes a model that may more accurately reflect how shared district resources are spent across schools, thus informing discussions about the variance between intended and actual school funding levels and helping decisionmakers as they grapple with the tradeoffs of funding one program over another. In the sixth, and last, paper, the authors compare four publicly available lists of best and worst New York City public schools, both to one another and to lists grounded in efficiency measures. They then discuss the public policy implications for their finding that a fundamental source of differences among the lists lies in the focus on performance, which does not take clientele and resources into account, versus efficiency, which does.

Abstracts

For this volume of papers from the NCES Summer Data Conferences, introductory matter is composed principally of abstracts written by the presenters of the papers. Presenters were asked to submit an abstract conforming to the structured abstract suggested by Mosteller, Nave, and Miech (2004).* The following abstracts, preceded by the paper title and the authors and their affiliations, describe the papers in this volume in the order in which they appear. Each paper's abstract contains only those components of the Mosteller, Nave, and Miech abstract that are applicable.

Expenditures Versus Expenses: Which Should You Use to Calculate Cost per Student?
(Dean Michael Mead, Governmental Accounting Standards Board)

Background: Cost per student may be the most widely utilized indicator of school district financial and operational performance. Traditionally, cost has been represented by *expenditures.* Although using expenditures to measure cost is problematic, until recently a better measure was not readily available. However, with the implementation of Governmental Accounting Standards Board (GASB) Statement 34, school districts now also report *expenses* in their annual audited financial statements.

Purpose: To describe the differences between expenditures and expenses and consider their relative virtues as measures of cost.

Setting: The discussion of expenses and expenditures is rooted in the context of generally accepted accounting principles for state and local governmental entities in the United States.

Population: The discussion focuses specifically on public school districts and how differences between expenditures and expenses impact the calculation of cost-per-student measures. The findings are equally applicable to any district, regardless of size, location, or other relevant characteristic, as well as to other state and local governmental entities.

Intervention: Cost per student is first calculated for individual school districts using expenditures. Adjustments are made to expenditures to obtain expenses for the same

* Mosteller, F., Nave, B., and Miech, E.J. (2004). Why We Need a Structured Abstract in Education Research. *Educational Researcher, 33*(1): 29–34.

districts, which are then used to recalculate cost per student. The two sets of measures are compared.

Research Design: Three illustrative cases, based on actual public school districts, are employed to demonstrate the comparability issues that arise when cost-per-student measures are based on expenditures versus expenses. A fourth illustrative case, also based on an actual district, is utilized to demonstrate the consistency issues that arise over time for an individual district.

Data collection: The financial data for the four illustrative cases were obtained from the audited annual financial statements of representative public school districts that have already implemented GASB Statement 34.

Findings: Expenditures are not truly a measure of cost, but rather of outflows of cash and other current financial resources. The repayment of long-term debt principal, for instance, is an outflow of resources, but is not a *cost* of providing service. Furthermore, the inclusion of capital outlays can make trends in expenditures volatile, leading to cost-per-student ratios that fluctuate substantially from year to year. On the other hand, expenses account more completely for the cost of operating a school district and providing educational services, producing a much smoother and more consistent trend over time.

Recommendation: Using expenses to calculate cost per student is more accurate and therefore more useful than expenditures for planning, budgeting, operating, and accountability purposes.

Avoiding Fiscal Stress: The Use of Expert Systems to Assess School District Financial Condition

(Salwa Ammar, Le Moyne College; William Duncombe, Syracuse University; Bernard Jump, Syracuse University; and Ronald Wright, Le Moyne College)

Background: Many state and local governments are slowly emerging from one of the most severe fiscal crises of the last 50 years. The serious financial problems experienced by a number of school districts exposed the lack of financial planning tools available to district administrators and state education policymakers. Most states provide only limited fiscal benchmarking information to school districts.

Purpose: The objective of the paper is to use an expert system to develop a financial condition indicator system (FCIS) that provides a detailed picture of short-term and long-term financial condition of school districts. The paper illustrates how the system can be used as a financial diagnostic tool by district and state officials, and how the results can be made readily accessible to non-finance professionals.

Setting: The system was developed for most New York State school districts using data for 2001, and the paper provides some results for several anonymous districts in New York.

Intervention: Expert systems have a long history of use in the private system, and this paper demonstrates how they can be employed for financial condition assessment of school districts. The particular expert system employed in this paper, fuzzy rule–based systems (FRBS), is specifically designed for complex evaluations of a number of factors, measured in different units, and often measured with imprecision, and where the context of the evaluation is important.

Research Design: The paper describes the application of an expert system methodology to financial condition analysis, and provides descriptive results from the application of this system to New York school districts.

Data Collection and Analysis: The data used in the FCIS are from published sources for financial, demographic, and education-related information from New York State government agencies and the U.S. Bureau of the Census. The data are converted into financial ratios, trend variables, and demographic measures that are commonly used in financial condition assessment.

Conclusions: Expert systems, such as FRBS, can be effectively used to develop financial evaluation systems for school districts. The financial condition indicator system (FCIS) developed for New York school districts is a detailed assessment of financial condition, which draws on the expertise of finance professionals and provides user-friendly diagnostic tools for non-finance professionals and citizens.

Fiscal Stress and Voluntary Contributions to Public Schools

(Eric J. Brunner, Quinnipiac University; and Jennifer Imazeki, San Diego State University)

Background: In the wake of school finance reforms that limit local tax revenue and, more recently, state budget cuts that have threatened K–12 education spending, an increasing number of schools and school districts have appealed to parents and communities for voluntary contributions to augment school resources. However, not all schools benefit equally from these contributions, leading to a common concern that voluntary contributions create inequities in school funding across communities.

Purpose: We examine the size and distribution of voluntary contributions to California's K–12 public schools in 2001. We explore how the characteristics of those schools that have been most successful in raising voluntary contributions differ from other schools, and consider one potential explanation for why the use of voluntary contributions is not more widespread.

Setting: All K–12 California public schools in 2001, a total of 6,595 elementary and middle schools plus 987 junior and senior high schools, in 739 districts.

Intervention: Voluntary contributions from nongovernment sources, raised by nonprofit organizations (e.g., parent-teacher organizations/associations and education foundations).

Research Design: Statistical description of size, growth, and distribution of voluntary contributions. Analysis of contributions by family income and school/district enrollment.

Data Collection and Analysis: All tax-exempt nonprofit organizations supporting K–12 schools in California are required to register with the Registry of Charitable Trusts of the California Attorney General's Office and are in the RCT's Charities Database. Data on contributions for these organizations are found in the Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service. We compare the size of contributions in 2001 to contributions in 1992 and calculate the average level of contributions for elementary/middle schools, junior/senior high schools, elementary districts, unified districts, and high school districts. We also calculate average contributions for schools by quintiles of family income and school enrollment.

Findings: Contributions have increased substantially over the past decade from approximately $123 million in 1992 to $238 million in 2001. We also find that voluntary contributions remain small, on average: If the $238 million in voluntary contributions were distributed equally across schools it would amount to less than $40 per pupil. Contributions are concentrated in schools and school districts that are high-income and small. However, the majority of students attend schools where contributions per pupil are relatively small. Even in the richest communities, fewer than a quarter of the schools raise more than $100 per pupil. This can be explained, in part, by the fact that when school spending is financed through voluntary contributions, the marginal price of that spending increases with the number of students.

Conclusions: It does not appear that these contributions have led to large inequalities in the distribution of revenue across most schools. Furthermore, because the voluntary nature of private donations means that they are subject to free-riding, which increases the price of spending per pupil for larger districts, it seems unlikely that contributions will ever be the source of wide-scale disruptions in the distribution of revenue across communities.

Measuring Educational Productivity in Standards-Based Accountability Systems: Introducing the SES Return on Spending Index (RoSI)

(Martin Hampel, Standard & Poor's)

Background: This paper introduces and describes a new methodology for analyzing the educational "return" that public educational entities, such as school districts, receive for their financial investment in education.

Purpose: The RoSI approach provides diagnostic information about the comparative educational return on resources generated by school districts. In combination with the "Error Band" method and the "Risk-Adjusted Performance Index" described in earlier Standard & Poor's methodology reports, the application of the RoSI allows the identification of school districts that achieve better educational performance for a given level of spending, while simultaneously considering the proportional enrollment of economically disadvantaged students served. This analytical approach is currently being implemented as one of a complex suite of offerings available within the expansion of Standard & Poor's School Evaluation Services (SES) to cover all 50 States, the District of

Columbia, and Puerto Rico. Taken together with additional indicators and indices, the RoSI approach facilitates insightful and objective data-driven analysis of public education data for educational decisionmakers, parents, educators, and policymakers.

Population: To demonstrate the RoSI methodology, district-level academic, financial, and environmental data of the State of New York were utilized. Data used include the 2001–03 time period. Some variables were complete for 635 New York school districts, while others were available for only 581 districts.

Research Design: Analytical essay.

Data Collection and Analysis: Data provided to Standard & Poor's as part of the *Resource Adequacy Study for the New York State Commission on Education Reform* were used for this analysis, covering available financial and performance indicators from school districts with sufficient grade coverage. After defining the "Multiple Performance Measures Index" as an appropriate performance indicator and selecting the appropriate corresponding spending variable, a RoSI can be defined, and subsequently a comparative "return" analysis can be performed. This entails transferring the principles of the Error Band and Risk-Adjusted Performance methodology to analyze the RoSI in relationship to the relative poverty. Combining the RoSI and the Risk-Adjusted Performance data in one framework provides a powerful approach to study both simultaneously.

Findings/Results: The feasibility of using the introduced methodology was demonstrated.

Conclusions: The RoSI approach presented in this paper expands the Error Band analysis of a performance measure in relationship to the enrollment of economically disadvantaged students to the study of spending and performance. It thus helps to provide actionable information using independent data concerning spending decisions that are under the control of educational decisionmakers. Further information can be found at www.SchoolMatters.com.

A Cost Allocation Model for Shared District Resources: A Means for Comparing Spending Across Schools

(Lawrence J. Miller, University of Washington; Marguerite Roza, University of Washington; and Claudine Swartz, Research Consultant)

Background/Context: As schools become the focus of accountability reform efforts, fully accounting for spending by school is of increasing importance. Yet most districts do not measure or report large portions of their spending by school. Unmeasured and unreported variations in school resources call into question whether all schools are provided equal resources to work toward yearly academic progress and other performance goals set by local, state, and federal policymakers.

Purpose/Objective/Research Question/Focus of Study: To improve our understanding of school spending, a model is developed here to fully account for the shared district resources realized at the school level.

Population/Participants/Subjects: The cost allocation model was applied to two middle schools from an existing dataset of school-level financial data collected from the Denver Public Schools (DPS). DPS is a large urban district serving approximately 72,000 racially and economically diverse students in 148 schools.

Research Design: This research develops a conceptual framework from basic accounting principles to design a cost allocation model for shared district resources. Application of the model is presented for illustrative purposes in a quantitative financial comparison of two middle schools before, and after, accounting for shared district resources.

Data Collection and Analysis: The cost model analyzes shared district resources in three steps: (1) identifying shared district resources, (2) allocating shared district resources, and (3) classifying costs according to student need. The model is based on a set of principles, costs are reported in terms of the schools they benefit, costs are reported in dollars, real rather than average costs are used, and costs are classified by student need.

Findings/Results: Centrally reported costs can represent a significant portion of school district spending; however, implementation of a cost model for shared district resources provides the means for comparing a greater portion of spending across schools.

Conclusions/Recommendations: A shared resource cost allocation model enables districts to make more meaningful school-level spending comparisons in that a greater portion of district costs are captured in the school's allocation. Without establishing and implementing a model to include shared district resources in school-level analysis, researchers, policymakers, and practitioners will continue to see an eclipsed view of the resources directed to our schools.

Best Schools, Worst Schools, and School Efficiency: A Reconciliation and Assessment of Alternative Classification Systems

(Leanna Stiefel, Hella Bel Hadj Amor, and Amy Ellen Schwartz, New York University)

Background/Context: While researchers and policymakers debate the relative merits of ranking schools and alternative methodologies for doing so, classifications of schools have become a feature of the educational landscape.

Purpose/Objective/Research Question/Focus of Study: Lists of best and worst schools differ in their criteria, data, and methodology, and some of them are high-stakes. None explicitly considers resource use efficiency, effectively ignoring the cost to the taxpayers and district resource constraints. If the lists fail to show significant overlap, what are the costs of misclassification? We address these issues by comparing four publicly available lists of best and worst New York City (NYC) public schools, both to one another and to lists grounded in efficiency measures.

Setting and Population/Participants/Subjects: The mayor of New York City has had control of the City's schools since fall 2002, and Children First is his plan to reform school governance and curriculum. Our best schools are those exempted from the Children First instructional approach and those designated as best by the nonprofit Advocates for Children. Our worst schools are those failing the requirements of the No Child Left Behind Act and the Schools Under Registration Review by the state.

Research Design and Data Collection and Analysis: We compare best (worst) schools to one another, to the rest of the schools, and to the most (least) efficient schools. We estimate school-level education production functions using fifth-grade reading performance, enrollment, and student characteristics to calculate efficiency for 602 elementary schools for years 1995–96 through 2000–01.

Findings/Results: We find a fair amount of agreement when the best (worst) schools are compared to the rest of the schools: the former have more (less) advantaged populations and lower (higher) spending. But there is not a perfect overlap between the two lists of best (worst) schools. There is some agreement between performance and efficiency (few of the best schools are highly inefficient); yet, being one of the best (worst) schools in the city does not necessarily imply being one of the most (least) efficient. The most efficient schools that are not among the best schools do well with their clientele, but not as well as schools with an easier clientele. Thus, a fundamental source of differences among the lists lies in the focus on performance versus efficiency.

Conclusions/Recommendations: Efficiency in public goods is in the public interest, yet no public entity has made an effort to publicize other numbers such as measures of efficiency. We discuss steps that state policymakers can begin to take, considering various combinations of performance and efficiency levels.

Expenditures Versus Expenses: Which Should You Use to Calculate Cost Per Student?

Dean Michael Mead

Governmental Accounting Standards Board

About the Author

Dean Michael Mead is project manager at the Governmental Accounting Standards Board (GASB). He is the author of GASB's seven-volume User Guide Series—nontechnical, plain-language introductions to government financial statements, written specifically for nonaccountants. He also authored the plain-language supplements to GASB's exposure drafts on note disclosures and other postemployment benefits. In addition to coordinating GASB's outreach efforts to financial statement users and acting as staff liaison to the Governmental Accounting Standards Advisory Council, Dean led GASB's project on net asset reporting (which resulted in GASB Statement 46), is manager of the project on economic condition reporting (the first product of which is the newly revised statistical section), and is part of the research team for the fund balance reporting project.

Prior to joining GASB, Dean was the deputy research director at the Citizens Budget Commission in New York City. Dean has also been a member of the adjunct faculty at New York University's Robert F. Wagner Graduate School of Public Service, where he is completing his doctorate in public administration. He holds an undergraduate degree in public policy from Cornell University. He can be contacted at dmmead@gasb.org.

Expenditures Versus Expenses: Which Should You Use to Calculate Cost Per Student?

Dean Michael Mead

Governmental Accounting Standards Board

Introduction

The issuance of Governmental Accounting Standards Board (GASB) Statement 34 brought accrual accounting for the basic activities of school districts into their financial statements for the first time. In its wake, educators have asked if they should begin to use expenses, instead of the traditional expenditures, to calculate cost per student measures. And besides, educators wonder, what's the difference between them? This article explains the differences and makes the case that the more comprehensive and less volatile expense measure is a superior indicator of the cost of providing educational services.

Background on Statement 34

Issued in June 1999, GASB Statement No. 34, *Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments,* substantially revised the content and form of the annual financial reports of school districts that follow generally accepted accounting principles (GAAP). Chief among its changes was the addition of two financial statements covering the entirety of a school district's operations and containing *accrual-based* information. These two accrual-based *districtwide* financial statements—the statement of net assets and statement of activities—present a comprehensive accounting of a district's assets and liabilities, including its buildings, equipment, and other capital assets, as well as its outstanding bonds and other long-term liabilities. The residual balances of a district—the difference between assets and liabilities—are called *net assets.* The inflows and outflows of *economic resources* are recognized as revenues and expenses, respectively.

By contrast, the district financial statements prior to Statement 34 reported virtually all district finances on a *modified accrual basis,* disaggregating the information into a variety of *governmental funds.* (The exception being activities operated like businesses, which have been reported on an accrual basis in the proprietary funds for many years.) These statements present information about *current financial resources*—essentially, those assets that will be liquidated or consumed within a year and liabilities that are expected to be satisfied within a year. Revenues and expenditures are flows in and out of these current financial resources. This information focuses on the short-term finances of a school district; the informa-

NOTE: The opinions expressed in this article are those of the author. Official positions of the GASB are established only after extensive due process.

tion in the districtwide statements covers both short-term and long-term finances.

Perhaps if the fund financial statements had simply been replaced by the districtwide statements, the question of which cost measure to use would not have arisen. However, because users of financial statements argued that the fund information would continue to be important to their analyses and decisionmaking, Statement 34 retained the fund statements while making certain improvements to the manner in which the information is presented. (See, for example, paragraphs 255–262 and 285 of GASB Statement 34 [1999].)

Differences Between Expenditures and Expenses

Expenditures are not truly a measure of cost. Rather, *expenditures are a decrease in net financial resources.* An expenditure occurs when a school district receives goods or services and the provider has a claim against the district's current financial resources. This is how expenditures most commonly happen—for employee salaries, supplies, utilities, and so on. Expenditures also occur when a portion of a general long-term liability—such as outstanding bonds or capital leases—is due to be paid from current financial resources. *Expenses are decreases in net assets* resulting from the using up of or outflows of *any* asset to operate a school district and provide services. As such, they are a fairly comprehensive measure of costs.

***Expenditures are not truly a measure of cost; rather,* expenditures are a decrease in net financial resources.**

Capital Costs

Under modified accrual accounting in the governmental funds, the entire cost of purchasing, constructing, or renovating capital assets is reported immediately as an expenditure. If a capital asset is donated to a school district (such as when another governmental entity builds a school and turns it over to a district), no cost related to using that asset is ever reported through expenditures.

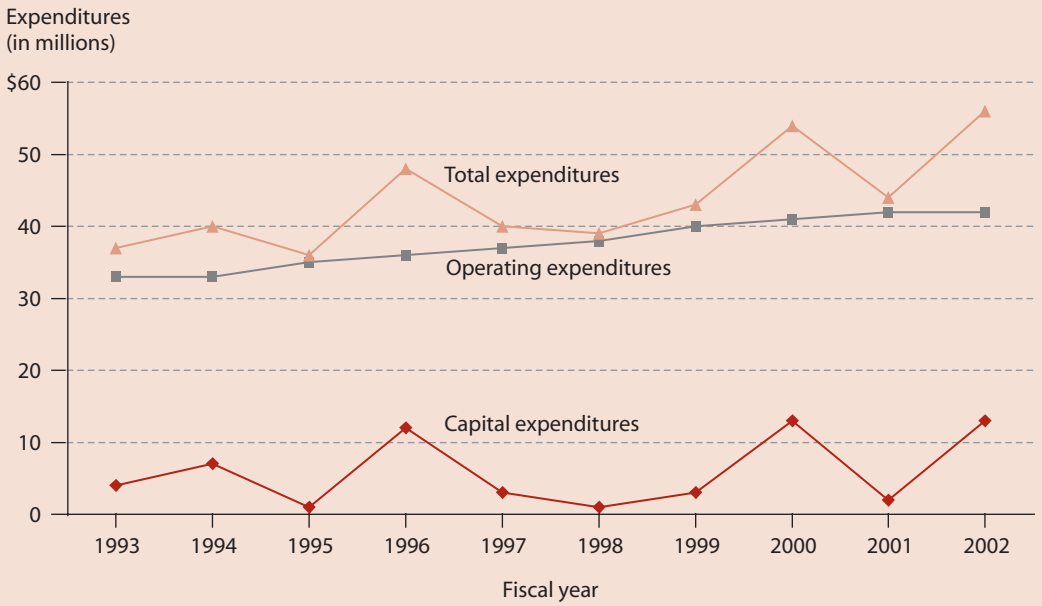
Except in larger school districts, where a significant amount of capital spending takes place every year, these capital expenditures tend to be "lumpy." In some years, capital expenditures can be relatively large, and in others they are miniscule. In any given year, therefore, capital expenditures may be significantly higher *or* lower than the actual cost of using a district's capital assets to provide services. In other words, capital expenditures almost never represent actual cost, unless serendipitously.

Under accrual accounting, the original or *historical cost* of newly acquired, constructed, renovated, or donated capital assets is added to the financial statements and then spread over the *useful life* of the assets—the years when the assets are expected to be used by the district to provide services. This systematic allocation of the cost of capital assets to each of the years in which they are used by a district is called *depreciation.* Depreciation expense for each year is most commonly calculated by subtracting the salvage value of a capital asset (what it is expected to be worth at the end of its useful life) from the historical cost and dividing the result by the useful life. In so doing, the cost of capital assets is recognized smoothly in each year they are used to provide services or support the activities of the district, without the lumpiness associated with expenditure-based measures.

The impact of the lumpiness that accompanies expenditure-based accounting measures is easy to see in figure 1. Although the operating expenditures tend to grow in a steady, relatively smooth trend, the capital expenditures are volatile. This volatility is picked up in the total expenditures line at the top of the figure. Cost per student calculations based on these total expenditure amounts would fluctuate wildly from year to year. The usefulness of a measure that varies so significantly is dubious at best.

Expense-based measures, on the other hand, tend to exhibit a much smoother trend, thereby producing cost per student calculations free of the up-and-down nature of expenditure-based measures. Depreciation is an estimation process and therefore may not precisely capture the cost of using capital assets, but it is considerably more accurate in any given year than expenditures and provides an approximation of the using up or diminishing utility of the assets. Finally, depreciation expense is allocated in the financial statements among the functional

Figure 1. Example of effect of lumpiness in capital expenditures: 1993–2002



SOURCE: Author's figure based on actual school district financial statements.

and programmatic expense categories—such as regular, special, and other types of instruction; support services of various kinds; transportation; food service; noninstructional services; and so on. This allows the calculation of more complete cost per student measures of specific functions and programs, which cannot be accomplished using expenditures because most capital outlays are aggregated and shown separately from other expenditures in the financial statements.

Long-Term Debt

Aside from capital assets, the treatment of the repayment of long-term debt represents the most significant difference between the use of expenditures versus expenses. Under modified accrual in the government funds, both the payment of *interest* and the repayment of *principal* (the original amounts borrowed) are reported as *debt service* expenditures. But in the accrual-based district-wide financial statements, the repayment of principal reduces the amount of long-term debt outstanding on the books. The only cost of borrowing reported as an expense is interest, which is the price of using someone else's money. Repayment of principal is not a cost—it is the returning of another party's assets. Expenditures are a good indicator of cash flow needs related to borrowing, but expenses show the actual cost of borrowing.

The main consequence of this difference is that in any given year, expenditures related to long-term debt substantially overstate the actual *cost* of borrowing because they include the amount of principal repaid. Furthermore, expenditures related to borrowing are double-counted over time: Expenditures are recorded when a capital asset is financed with long-term debt, and then expenditures are recorded again as the debt is repaid.

Accrued Costs

Some costs do not require the use of current financial resources. Consequently, although they are reported as expenses, they do not result in expenditures. For example, compensated absences are earned as district employees work each year, and are therefore reported as expenses. However, expenditures are reported only as payments are made when employees retire or leave for another job. Another example is interest—interest that accrues but is not due to be paid is an expense, but not an expenditure.

Expenses for compensated absences (and other costs, such as claims and judgments) are reported as they are incurred and therefore are smoother over time, producing more consistent per student cost calculations. With the exception of larger districts, where a steady number of employees are

retiring or departing every year, expenditures for these items will be lumpy and fluctuating from year to year, though perhaps not to the degree of capital expenditures.

Scope of Activities Covered

Expenditures are reported for just the governmental activities of a school district. Although governmental activities typically cover all or most of a district's activities, depending on how a district provides certain services and conducts certain activities, they may leave out significant costs. For instance, if a school district operates any activities similar to a business—food services are often handled this way—these activities are not accounted for in the governmental funds. They are reported instead on an accrual basis in the proprietary funds and the districtwide financial statements. In other words, expenses are reported for these activities, but not expenditures. The same is true for internal service funds—activities that provide services to other parts of a district, such as central supply and purchasing functions.

Over the years, the standard reporting systems have attempted to compensate for the shortcomings of expenditures as a measure of cost. The U.S. Census Bureau's F-33 form, which is used to collect school district financial information from the states, attempts to overcome the scope issue by requiring that expenditures be reported for food service funds, business enterprises, and support funds. This has the effect of making districts track expenditures even though these activities have been accounted for using accrual (expenses) under GAAP for decades.

The F-33 Census form also requires the inclusion of activity funds. Under GAAP, activity funds such as student clubs, scholarship funds, and so on, are typically reported as agency funds, a type of fiduciary fund. Agency funds are not included in expenses, because their resources do not belong to the district, and therefore the use of those resources is not a district cost. The fiduciary funds financial statements do, however, report accrual-based *additions* that are congruous with expenses and could be included, if appropriate. The Census requirement to report expenditures for activity funds again leads to districts reporting information not required by GAAP.

The primary impact of the differences in the scope of expenditure-based and expense-based measures is a potential comparability problem. Districts may operate activities like food service differently and consequently report them differently. If one district treats food service as a governmental activity, it will report both expenditures and expenses for it; if it is treated as a business-type activity, only expenses will be reported. The exclusion of business-type activities and internal service funds from expenditures means that cost per student calculations based on expenditures may not be comparable from district to district. The decision about whether to include agency funds is open to debate—it may be possible that some activities accounted for in agency funds in one district are financed directly by another district, which creates another comparability problem.

The primary impact of the differences in the scope of expenditure-based and expense-based measures is a potential comparability problem.

The Overall Impact of the Differences on Costs Per Student

Table 1 shows how the differences between expenditure-based and expense-based measures affect cost per student calculations for three illustrative school districts. For district A, cost per student calculated using expenses is more than 7 percent *below* the cost per student based on expenditures. The difference in the treatment of capital assets—$20.2 million of capital expenditures versus nearly $8.0 million of depreciation expense—alone causes a 5 percent difference. The remaining difference comes from the reporting of long-term debt repayment as an expenditure.

District B exemplifies how the relationship between expenditure- and expense-based unit cost measures can vary depending on the district. Rather than being lower, the cost per student based on expenses is close to 5 percent *greater* than the expenditure measure. Capital expenditures for this district *in this particular year* were relatively small. However, this district has both business-type activities and internal service funds, which are not reflected in expenditures.

District C, on the other hand, had exceptionally large capital expenditures *in this particular year,* equal to one-third of total expenditures. Consequently, the cost per student based on expenses is almost *36 percent* lower than the expenditure amount.

The phrase "in this particular year" is emphasized to highlight that the relationship between expenditure and expense cost measures varies not only from district to district, but also for each individual district from year to year. Table 2 shows the differences between expenditure- and expense-based cost per student calculations for an illustrative school district over a 3-year period.

In 2001, this district's cost per student measure using expenses was nearly 9 percent *lower* than the expenditure calculation. However, in the next 2 years expenses per student were *higher.* What explains the shift? Simply put, in 2001, the district had relatively large capital expenditures. If not for a sizable expense accrual in that year, the difference would have been closer to 12 percent

Table 1. Examples of differences in cost per student measures using expenditures versus expenses

	District A (enrollment 30,743)			District B (enrollment 1,797)			District C (enrollment 2,191)		
		Cost per student			Cost per student			Cost per student	
	Expenditures/ expenses	Amount	Percent difference	Expenditures/ expenses	Amount	Percent difference	Expenditures/ expenses	Amount	Percent difference
Total expenditures, governmental funds	$237,886,275	$7,738		$10,249,465	$5,704		$29,444,094	$13,439	
Capital expenditures, governmental funds	(20,188,573)	7,081	-8.5	(309,185)	5,532	-3.0	(9,923,484)	8,909	-33.7
Depreciation expense, governmental activities	7,963,156	7,340	-5.1	147,776	5,614	-1.6	764,784	9,259	-31.1
Principal repayment, governmental funds	(6,100,000)	7,142	-7.7	(34,869)	5,594	-1.9	(1,347,091)	8,644	-35.7
Compensated absences and other expenses	—	—		17,937	5,604	-1.7	21,865	8,654	-35.6
Accrued interest	(87,171)	7,139	-7.7	—	—		—	—	
Accrued arbitrage	9,557	7,139	-7.7	—	—		—	—	
Business-type activities expenses	—	—		357,549	5,803	1.7	—	—	
Internal service funds expenses	709,658	7,162	-7.4	291,424	5,966	4.6	—	—	
Total expenses, districtwide	$220,192,902	$7,162	-7.4	$10,720,097	$5,966	4.6	$18,960,168	$8,654	-35.6

SOURCE: Author's table based on actual school district financial statements.

Table 2. Multiyear example of differences in cost per student measures

	District D					
	2001		2002		2003	
	Expenditures/ expenses	Cost per student	Expenditures/ expenses	Cost per student	Expenditures/ expenses	Cost per student
Total expenditures, governmental funds	$30,095,931	$12,244	$27,183,974	$10,800	$28,665,830	$11,132
Capital expenditures, governmental funds	(4,135,091)	10,562	(345,097)	10,663	(251,820)	11,035
Depreciation expense, governmental activities	1,694,474	11,251	1,724,678	11,348	1,740,693	11,711
Principal repayment, governmental funds	(1,851,461)	10,498	(1,922,867)	10,584	(1,729,348)	11,039
Accrued interest	13,807	10,504	14,348	10,590	131,397	11,090
Accrued expenses	862,691	10,854	188,522	10,665	35,351	11,104
Business-type activities expenses	763,358	11,165	701,303	10,944	757,992	11,398
Total expenses, districtwide	$27,443,709	$11,165	$27,544,861	$10,944	$29,350,095	$11,398
Percent difference between expenditures per student and expenses per student		-8.8%		1.3%		2.4%
Enrollment		2,458		2,517		2,575

SOURCE: Author's table based on actual school district financial statements.

because of both the capital expenditures and the repayment of debt principal.

Conclusions

Any educator who attempts to either maximize or minimize a school's cost per student calculations by selecting either expenditure-based or expense-based measures is going to be disappointed. Depending on the particular school district or the particular year one looks at, expenditures per student may be greater than expenses per student, or vice versa. And those are the main problems with using expenditures as the basis for measuring the cost of educating a student—such a measure is volatile over time and may not be comparable from district to district. This should not be surprising, because expenditures are not a measure of cost, but rather of outflows of cash and other current financial resources. This fact has either been forgotten or ignored in the absence of a better measure.

That better measure, one based on expenses, arrived with the implementation of GASB Statement 34. Expense-based measures account more completely for the cost of operating a school district and providing educational services, producing a much smoother and more consistent trend over time. Some may argue that current data gathering techniques, such as the F-33 form, have accommodated the shortcomings of expenditure-based reporting, obviating the need to migrate to expense-based measures. But this begs the question, Why cobble together an approximation of a real cost measure when one now exists in the expense-based measure?

Traditional, ingrained approaches can be powerful dissuaders. There are some who think it would be much easier and more convenient to stick with the familiar, if imperfect, expenditure-based measure of cost per student. But switching to an expense-based measure would give school districts a much truer sense of what it costs to operate. Accurate cost measures are necessary for appropriately determining the level of financial support that is needed to make ends meet, for allocating resources where they are needed most, for knowledgeably forecasting capital investment needs, and for tracking the efficiency of a district's activities. In a time of belt-tightening and scarce resources, thorough and accurate cost measures are a valuable commodity.

Reference

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Avoiding Fiscal Stress: The Use of Expert Systems to Assess School District Financial Condition

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Acknowledgments

This study was funded by the Education Finance Research Consortium in New York. We received significant assistance from the New York State Education Department and a number of education and finance professionals in New York, who kindly served on an advisory board for this project. We are fully responsible for errors and omissions. A summary of the project was presented at the Education Finance Research Consortium Forum, Albany, NY, June 6, 2003.

Introduction

Most state governments are slowly emerging from severe fiscal crises (Boyd and Wachino 2004) that left them and many of their local governments struggling to balance budgets. Given the dependence of school districts, particularly in large cities, on state aid, it is not surprising that a number of school districts are experiencing fiscal stress (Blair 2002). Recent state financial bailouts of city schools in Baltimore, Buffalo, Oakland, and Portland have highlighted the precarious situation a number of districts are in (Borja 2003; Gehring 2004; Richard and Hoff 2003; Sack and Johnston 2003).

With frequent fiscal stress and occasional fiscal crises being so commonplace among school districts, it would be helpful for school officials and others to have diagnostic tools to assist in anticipating short- and long-term fiscal problems and in preparing to take the necessary remedial steps. Unfortunately, districts face several challenges that limit their ability to assess their financial condition. First, most states provide only limited fiscal benchmarking information to school districts, typically aggregate spending and revenue measures. Fiscal benchmarks are much less likely to include balance sheet measures such as fund balance and liquidity ratios. Second, even in the states that provide a wider range of fiscal and economic information to school districts (e.g., Michigan and Pennsylvania), the information typically comes in the form of lists of financial ratios and economic indicators that will be difficult for non-financial experts to utilize to assess financial condition. Given the lack of financial training of many school board members and school administrators, the assistance of finance professionals is often necessary to interpret the data.

The challenge is to develop a financial indicator system that provides a more detailed picture of the district's current financial condition and its longer term outlook,

and to make the system's results readily accessible to non-finance professionals. The objective of this paper is to illustrate how an expert system can be developed for the assessment of the financial condition of school districts that draws on the expertise and complex evaluation processes used by finance professionals, but which can also be used by non-finance professionals. The particular expert system we employ, fuzzy rule–based systems (FRBS), is ideally suited for the public sector, where evaluations are often multifaceted and dependent on the legal and political context. The development process and potential use of expert financial systems will be illustrated using a prototype of a financial condition indicator system (FCIS) developed for school districts in New York. In the next section, we will briefly discuss the literature on financial condition and the specific framework developed for New York. We then review key components of expert systems and the particular methodology we have employed for the development of the FCIS. The fourth section of the paper illustrates the use of the FCIS to analyze the financial condition of several school districts.

Defining and Measuring Financial Condition

Fiscal condition analysis has received significant attention in public finance. Several scholars and practitioners have developed overall evaluation systems for state or local government financial condition (Berne and Schramm 1986; Mead 2001; Groves and Valente 2003; New York Office of the State Comptroller 2002). We have borrowed from previous research to develop an FCIS that is comprehensive and tailored to the unique characteristics of school districts.

For this study, the financial condition of a school district is defined as the degree to which a district is able to finance educational services necessary to assure adequate student performance over the long run with reasonable tax burdens and without temporary disruptions of service. The framework used for the FCIS that we develop includes four components: short-run financial condition, student performance, economic measures, and long-run financial condition (figure 1).[1] Student performance is included in the FCIS because a district whose current financial situation appears to be at least adequate but whose student population contains many low performers may face severe longer run financial risks as it tries to bring its students up to standards.

The framework used for the FCIS includes four components: short-run financial condition, student performance, economic measures, and long-run financial condition.

The short-run financial condition component captures the ability of the district to pay its bills and balance its budget without extraordinary measures. Short-run financial condition is evaluated using the measures of liquidity, fund balance ratios, and tax capacity.[2] The liquidity component is used to indicate the capacity of a district to meet its short-term obligations. One standard measure of liquidity is the current ratio, or ratio of current assets to current liabilities. A more conservative measure of liquidity is the quick ratio. This measure is the ratio of very liquid assets, such as cash, to current liabilities, which we calculate for the general fund alone (the general fund quick ratio) and for the general fund, special aid fund, and food service fund combined (the multiple funds quick ratio).[3]

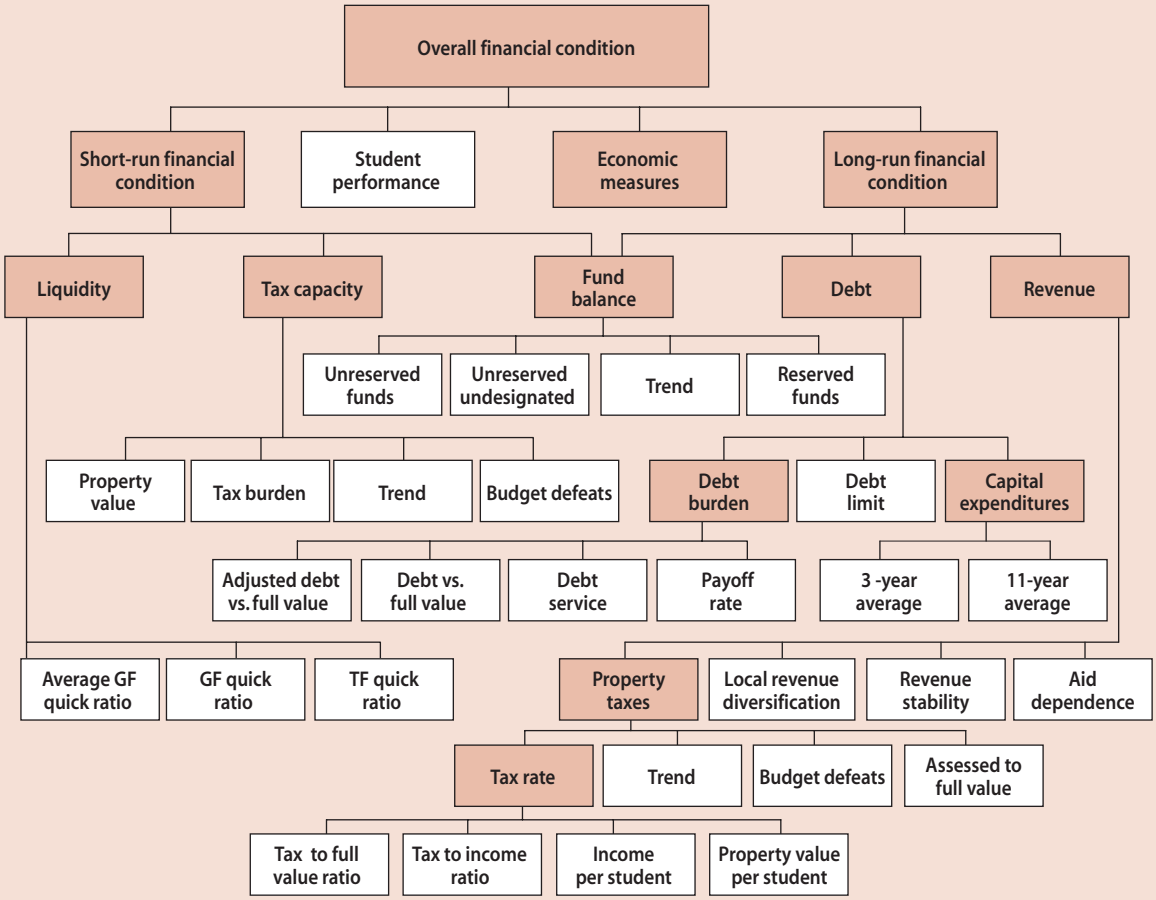
Fund balance is the difference between current assets and current liabilities, and can be either reserved for specific uses, or left unreserved. The unreserved fund balance, particularly if unappropriated (or undesignated), could

[1] For a more detailed review of the literature on financial condition and the measures used in the FCIS, see Duncombe et al. (2003) and Ammar et al. (2005).

[2] For a detailed list of indicators used in the FCIS, years of data, and data sources, see tables 1–3 in Duncombe, W., Jump, B., Ammar, S., and Wright, R. (2003). *Developing a Financial Condition Indicator System for New York School Districts.* (Condition Report for the Education Finance Research Consortium.) Albany, NY: Education Finance Research Consortium. The full report of the project is available at http://www.albany.edu/edfin/Duncombe.EFRC.june03.pdf and http://www-cpr.maxwell.syr.edu/faculty/duncombe/developingfcis4nyssd.htm.

[3] For the general fund, we include short-term investments and short-term receivables, in addition to cash. For the special aid fund and the food service fund, we only include cash.

Figure 1. Overall evaluation hierarchy



NOTE: Composite measures (rule bases) are shaded. GF = general fund; TF = total funds.
SOURCE: Figure by authors.

serve as a cushion during a financial emergency.[4] We include several measures of fund balances in the FCIS. The ability of a district to maintain service levels in the short run depends not only on its access to fund balances, but also on its capacity to tax. Districts with significant property wealth per pupil, relatively low tax burdens, and a history of supporting budget referendums may be able to resort to additional taxes to resolve structural deficits or other financial emergencies.

The long-run financial condition component is a measure of the capacity of a district to finance adequate services over the long run without onerous tax and debt burdens, and uses indicators similar to those employed by credit rating agencies (Fitch Ratings 2000; Moody's Investors Service 1999; Standard & Poor's 2000). Debt burdens are often measured in terms of outstanding debt relative to property values or debt service as a percentage of

[4] New York school districts are restricted by state law to a level of unreserved, unappropriated balance (UUB) that is no more than 2 percent of the planned operating budget (§1318 of the Real Property Tax Law). If the balance would otherwise exceed the 2 percent limit, districts can instead "appropriate" a portion of the unreserved balance, called the unreserved appropriated balance (UAB), to reduce property tax levels in the next year.

expenditures.[5] Districts can be constrained in the issuance of debt by state law limiting the level of long-term debt.[6] Debt burdens should also be balanced against the level of capital investment in evaluating a district's debt position. To measure capital investment, we take a multiyear average of per pupil capital spending adjusted for inflation and regional differences in construction costs.[7] Evaluation of revenue involves comparison of tax burdens, revenue stability, and revenue diversification. The level and trend in property tax burdens are measured as ratios of property taxes to either the full market value of property or to adjusted gross income (AGI). Factors that may be related to the ability of the district to raise taxes in the future include the district's history in passing budget referendums and its performance in administering the property tax.[8] Revenue diversification is measured for both local revenue sources (e.g., property taxes as a percentage of local revenue), and nonlocal sources (e.g., state and federal aid as a percentage of total revenue). To measure revenue stability, we calculated average variation around a trend line of per pupil revenue from 1991 to 2001.

Economic condition reflects the importance that the local economy has on the capacity of the district to raise taxes and on the expenditures required to reach adequate student performance. We account for four broad categories of economic condition measures in this system: cost factors, fiscal capacity, population and enrollment, and employment (figure 2). Factors outside of a district's control that can raise the cost of providing educational services include geographic differences in resource prices, the proportion of a district's children living in poverty or requiring special services, and the sparsity of the district (Duncombe, Lukemeyer, and Yinger 2003).[9] The fiscal capacity of the district is measured using both actual values and time trends for per pupil property values and adjusted gross income (AGI). Other economic measures are included to capture population and enrollment growth and stability, and changing demographics in the school district. Employment growth rates and unemployment rates at the county level are included to provide a rough measure of economic change in the region.

Expert Systems for Evaluation of Public Financial Condition

Evaluating financial condition, using the parameters identified by experts, cannot be accomplished by merely collecting the relevant data and recording values.

Evaluating financial condition, using the parameters identified by experts, cannot be accomplished by merely collecting the relevant data and recording values. Obviously, the data must be processed in order to present some overall assessment of a school district's condition. It is also desirable that this evaluation be performed in a manner that can be consistently replicated for all the districts in a state. A common approach is to produce average state values for each parameter, to compare each district's values with the average, and to provide percentile rankings. However, limiting the analysis to looking at individual indicators may fail to provide a fair representation of the overall financial condition of a district.

For example, one of the factors used to evaluate financial condition is a district's ability to effectively use and manage debt. A key component in the analysis of debt is debt burden, which is often measured as annual debt service as a percentage of total annual expenditures. In general,

[5] New York provides generous Building Aid to districts to cover debt service on school facilities. Several of the debt burden measures used in the FCIS remove the portion of debt funded by building aid in calculating debt burden measures.

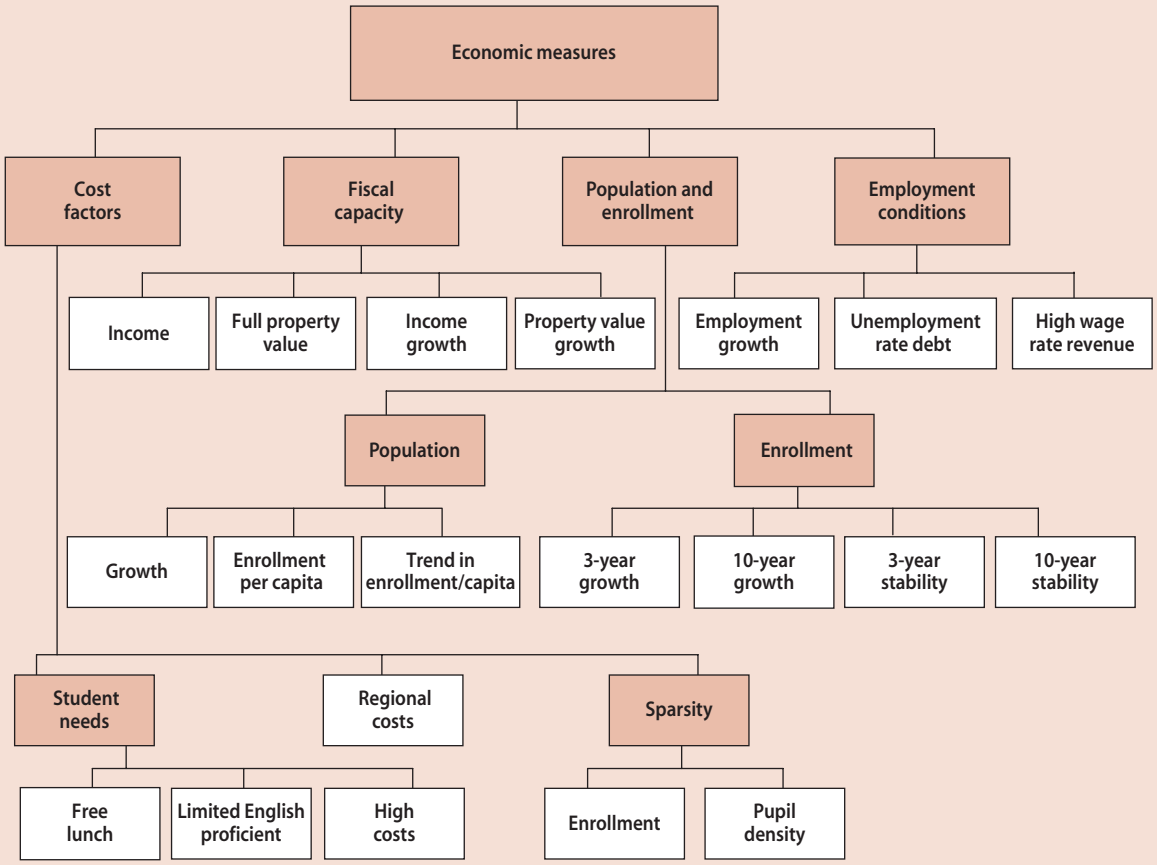
[6] Because the debt limit varies by type of district, the percentage of the debt limit used was calculated differently depending on the class of the district. See the following, on the New York State Education Department (SED) website, for a complete description of the debt limits: http://www.emsc.nysed.gov/mgtserv/debtlimi.htm.

[7] Inflation is measured by the consumer price index (CPI_U), and regional construction costs are measured using a construction cost index developed by the New York State Education Department (SED).

[8] Poorly administered property taxes are likely to result in significant horizontal inequity within the district, as similar houses are assessed at different rates. To measure property tax administration, we include the ratio of the assessed value over market value of property, commonly called the assessment ratio.

[9] Student needs are measured by the share of K–6 students receiving free lunch as part of the National School Lunch Program, the percentage of K–12 students classified as having limited English proficiency, and the percentage of all students classified as having high-cost special needs. Regional costs are measured using a regional cost index developed by the New York State Education Department (2000).

Figure 2. Economic evaluation hierarchy



NOTE: Composite measures (rule bases) are shaded.
SOURCE: Figure by authors.

a low debt service ratio is preferred. However, debt service needs to be evaluated in the context of the present condition of a district's physical plant. The unwillingness or inability to borrow money for capital improvement projects can lead to future requirements for higher levels of expenditures in order to deal with badly deteriorating facilities. Hence, in judging a district's management of its debt, conventional wisdom suggests that you should also consider the district's history of capital spending.

A school finance expert could examine a school district's customary financial and related reports and assess the district's liquidity, debt burden, and other indicators of financial condition and outlook. But such experts aren't easily available to all school districts, so the problem becomes how to overcome the obstacles so that school officials and other interested parties in all districts have access to expert judgment.

Within the past 20 years, computer-based expert systems have been developed that address the need for expert judgment to be applied repeatedly but without relying in each iteration exclusively on direct human involvement in the judgment process. Such rule-based systems have been successful in engineering and business applications (Durkin 1993). These expert systems model human expert judgment and make that judgment available for repeated use. Knowledge-based systems are a type of expert system that represents the expert judgment in terms of rules. An illustration of the use of such a rule in the context of debt burdens could be a knowledge, or rule-based, system that included this rule: If a district has a low debt burden and a poor history of capital spending (i.e., capital spending has been low relative to the district's needs for capital facilities), then the judgment regarding the use of debt results in a grade of *fair*.

However, the complexity of large financial operations has limited the use of traditional rule-based systems. For example, debt management also needs to be evaluated in the context of how near the debt level is to the constitutional or statutory limit. Necessarily, the required rules become more complex. In addition, debt management is only one small part of the overall evaluation of the financial condition of a school district. As a consequence, the number and the complexity of the required rules quickly overloads traditional rule-based systems.

Additional limitations on the use of rule-based systems result from the possibility that small changes in input values can produce abrupt changes in rule results. For instance, in the debt example, capital spending is measured in dollars spent per student (adjusted for inflation and regional cost indices). A simple average over a period of several years can be used as a measure of historical commitment to capital projects. By looking at the spending levels per student for all districts, a sense of what is relatively low and high is obvious. However, the exact point at which a spending level can be identified as low or not is difficult to determine.

The recent development of multilevel fuzzy rule–based systems has enabled the use of expert systems to evaluate more complex structures.

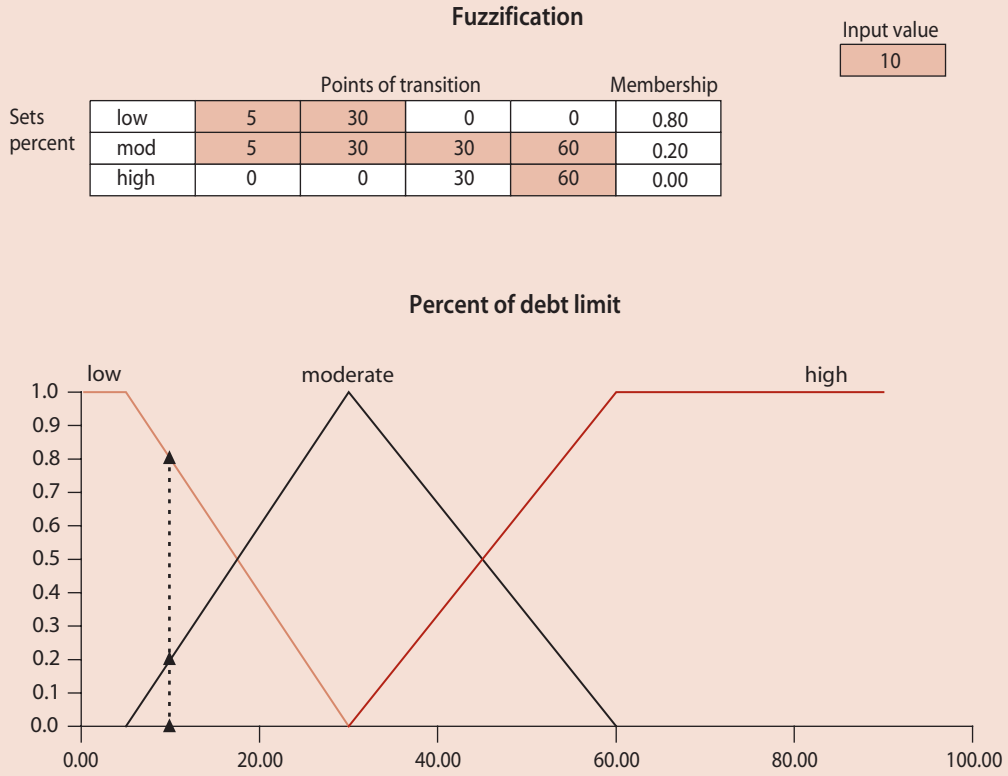
The recent development of multilevel fuzzy rule–based systems has enabled the use of expert systems to evaluate more complex structures. Multilevel fuzzy rule–based systems have been successfully used to evaluate the financial management and the financial condition of large U.S. cities (Ammar, Duncombe, and Wright 2001; Ammar et al. 2001a, 2001b) state financial management (Ammar et al. 2000a), and low-performing schools (Ammar et al. 2000). The multilevel aspect of these expert systems allows for an effective decomposition of complex problems into more manageable components before producing overall evaluations, and the rule bases aspect allows for inclusion of expert judgment in appropriate contexts to produce sound evaluations. It is, however, the fuzzy aspect, in combination with the decomposition and rules, that actually enables the system to work effectively in contexts in which other expert systems have failed.

The fuzzy component comes out of the growing mathematical field of fuzzy set theory (Dubois and Prade 1988). Fuzzy set theory allows for membership in more than one set and includes measures of levels of membership. In the debt example, we might define fuzzy sets for *low*, *moderate*, and *high* levels of usage of a district's debt limit. School finance experts might define a debt limit usage of up to 30 percent as *low*, while a debt limit usage between 5 percent and 60 percent might be regarded as *moderate*. Since the ranges overlap, a limit usage of, say, 10 percent would fall within both the *low* and *moderate* range. Fuzzy set theory uses membership functions defined on the interval [0,1] to define the degree to which a value falls within each set. Figure 3 contains the membership functions for the *low*, *moderate*, and *high* levels of debt limit usage. The input value of 10 corresponds to a membership of 0.80 in the *low* set and 0.20 in the *moderate* set. As the usage percent increases, the membership in *low* would decrease and the membership in *moderate* would increase. At usage levels above 30 percent, the membership in *low* would drop to zero, but the membership in the *high* set would become positive and gradually increase as the membership in the *moderate* set decreased.

Since the transition from one fuzzy set to an adjacent one is gradual, the concern that small changes in any input values might cause abrupt changes in rule conclusions is eliminated. In addition, since a particular value will likely have membership in more than one set, a rule-based system utilizing fuzzy inputs would have multiple rules applying simultaneously. Figure 4 contains a rule matrix that helps to illustrate the use of rules in a fuzzy rule–based system. The context is again the evaluation of a district's use of debt.

In this instance, the use of debt is being evaluated on the basis of three factors, debt burden, percent use of debt limit, and a history of capital spending. Each of these three factors is described by fuzzy sets representing *low*, *moderate*, and *high* levels. The three factors and three levels result in a possible 27 rules, each of which is represented in the matrix. The shaded cells in the matrix represent rules that are applicable to a selected school district. This particular district has a debt burden that is *high* to *moderate*; capital spending that is *high* to *moderate*; and a percent use of debt limit that is *low* to *moderate*.

Figure 3. Fuzzy sets for percent of debt limit used



NOTE: mod = moderate.
SOURCE: Figure by authors.

Therefore, eight rules are applicable to the evaluation of the use of debt for this district. Three of the rules lead to a conclusion of *poor*, four lead to a conclusion of *fair*, and one leads to a conclusion of *good*. To illustrate the matrix notation, consider the rule that leads to a conclusion of *good*, which can be stated as follows:

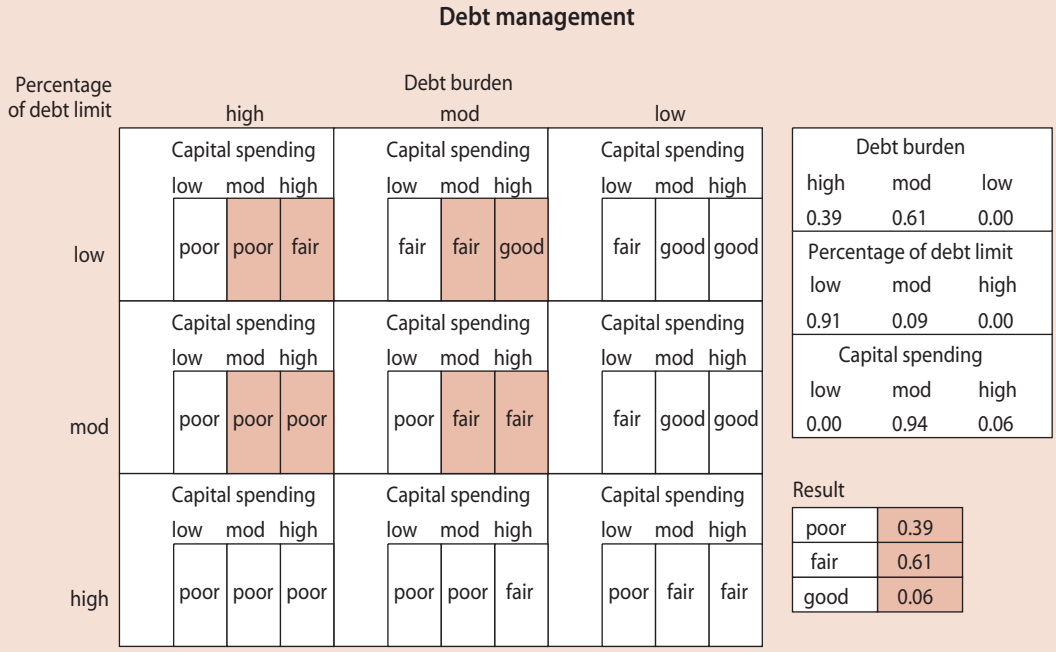
IF the debt burden is moderate AND
the percent use of debt limit is low AND
the capital spending is high
THEN the evaluation of the use of debt is GOOD.

The inputs to a fuzzy rule base are defined using fuzzy measures, and hence the rule conclusions will apply with fuzzy outputs. The evaluation of the use of debt for the selected district is determined to be *poor* to a degree (0.39), largely *fair* (0.61), and even *good* to a limited degree (0.06).

Since the representation of a selected district is described by multiple rules, rather than a single rule covering each variation, far fewer rules are required to have a robust model of a district's financial conditions. For that reason, combined with the fact that slight changes in any of the inputs will result in only slight changes in the degree of the conclusions, fuzzy rule–based systems can effectively model expert judgment with a manageable number of rules and without concern that small variations would cause abrupt changes in a district's evaluation.

Evaluation of debt is clearly only one part of the overall evaluation of financial condition. The multilevel aspect of this system allows us to evaluate small components individually and then use the fuzzy output of one rule base as the fuzzy input to a higher level rule base. Figures 1 and 2 contain the structure for the complete financial evaluation of a school district. In total, a hierarchy of 21 rule bases is used to evaluate each district using a total of 49 different measures.

Figure 4. Rule matrix for use of debt



NOTE: mod = moderate.
SOURCE: Figure by authors.

Using the FCIS to Evaluate Financial Condition

The FCIS described previously was designed for school districts in New York. The FCIS for New York should be viewed as a prototype or work-in-progress rather than a finished product. Undoubtedly, modifications would be made to this system were it to be implemented and made operational. The system was designed to utilize available data from the New York State Education Department (SED), New York Department of Labor, Office of the State Comptroller, and U.S. Bureau of the Census.[10] An advisory board composed of state-level finance experts, school district superintendents, business officials, and auditors was appointed by the SED to serve as a panel of experts in designing the system.

The objective of this section is to illustrate the type of output that can be generated using this expert system, and how the system can be used to examine the financial condition of school districts. The results of an expert system can be tailored to different audiences. The FCIS developed for New York school districts can be used by finance professionals in school districts and state government agencies to analyze the fiscal health of specific school districts and to identify districts at risk of a financial crisis. In the first part of this section, we will illustrate how the layers of the FCIS can be peeled back to examine the financial condition of two actual school districts in New York.

However, use of the results of an expert system does not have to be limited to experts. Quite the contrary. Persons who are not experts in either the FCIS's intricacies or in financial analysis can still draw upon the output of the FCIS to monitor the finances of a school district. In the second part of this section, we will illustrate user-friendly reports that could be automatically generated from the FCIS.

[10] The financial information used in the FCIS is based on unaudited annual financial statements submitted by school districts (ST3 reports). The latest financial information available at the time of system development was for the 2000–01 fiscal year.

Example of Decomposing Financial Condition Using the FCIS

The FCIS eventually produces an overall evaluation of each district. However, since that evaluation is based on the use of hundreds of rules, the individual rule outcomes can be accessed to understand fully the rationale behind an evaluation. A school finance professional (at the district or state level) can use the automated outputs to dig as deep as necessary to understand an individual district's condition. To illustrate the use of the system, we will look in some detail at the system's assessment of two actual New York State districts. Both districts were identified as potentially at risk of a fiscal crisis in the short run by knowledgeable staff in the SED. This identification was based on the districts' low fund balances and the fact that both districts incurred budget deficits over the previous 2 years.

A school finance professional can use the FCIS's automated outputs to dig as deep as necessary to understand an individual district's condition.

Figure 5 contains shots of four output screens available in the FCIS. Screen 1 provides an overall evaluation of our first district (district A). It has been evaluated as primarily *poor* (with fuzzy membership of 0.84) but also somewhat *fair* (0.16). The screen also includes fuzzy measures for the four factors that are eventually used to reach the overall conclusion (see figure 5). These are the short-run condition, the long-run condition, student performance, and the economic factors. In order to understand why the district financial condition is evaluated as *poor*, the FCIS user can click on the *poor* label (beneath "Overall Results") in screen 1, and screen 2 will appear. Screen 2 includes the highlighting of cells which indicate that the *poor* overall condition results from a *poor* short-run evaluation, a long run that is evaluated as *not good*, *moderate* student performance, and economics that are evaluated as *not good*. More in-depth information about any of these factors can be obtained. For example, in order to understand why the short run is evaluated as *poor*, the user can click on the "short run" label and obtain screen 3. This screen indicates (again by focusing on the highlighted cells) that the *poor* short-run evaluation results from a fund balance that is *poor* and a tax capacity that is *not good*. (Note that liquidity is not a factor. That is, liquidity is not part of the problem, and therefore a change in liquidity would not alter the situation when the fund balance is *poor* and the tax capacity is *not good*. In other combinations of fund balances and tax capacity, liquidity could be a factor.) One can continue to explore district A's evaluation by clicking on the "fund balance" label to produce the balance results (screen 4) that explain the reason the fund balance is evaluated as *poor*. In this case, the critical factors are the low level of unreserved funds and the *negative* trend in the fund balances. At this point, the system user has gotten down to the level of evaluation that is based on raw input data. The values used in the evaluation appear on the screen (an unreserved fund balance of 1.7 percent and a recent trend of fund balances declining at a rate of 2.6 percent a year). As desired, graphs of historical data can be produced. In screen 4, by clicking on the graph icon, the user can view a graph that shows a 5-year history of the fund balances (not shown).

At any point, the FCIS user can back up through the levels to gain an understanding of the effect of other factors. The short-run *poor* evaluation (screen 3) was also based on an evaluation that tax capacity was *not good*. By clicking on the "tax capacity" label in screen 3, the user could access the rule results that explain the reason the tax capacity was *not good*. From the resulting screen (not shown), the user can observe that the *poor* tax capacity was a consequence of a very *low* property value per student ($167,669) and a tax burden that was *moderate* to *high* (2.1 percent). *Low* property value per student but *moderate* to *high* tax burdens combined with a recent budget defeat suggest the district will have trouble resolving its budget deficits by raising taxes.

This just begins to illustrate the user's ability to work up and down the FCIS system to see the rationale behind all the judgments made in each of the 21 rule bases. For example, one could investigate the economic factors that are having an impact on this particular district. Within the economic factors, the rule base relating to population and enrollment inputs indicates that this district has enrollments that are growing at a high rate, while the general population growth is more moderate. This is additional evidence that the district will face difficulty

Figure 5. Sample FCIS output screens for district A

Screen 1

Overall Results — District A

Poor	0.84
Fair	0.16
Good	0.00

Short Run

poor	fair	good
0.84	0.16	0.00

Long Run

poor	fair	good
0.61	0.39	0.12

Performance

low	mod	high
0.00	1.00	0.00

Economics

poor	fair	good
0.49	0.51	0.00

Clicking on the "Poor" label (beneath "Overall Results") in screen 1 produces screen 2.

Screen 2

Overall Results — District A

Poor	0.84
Fair	0.16
Good	0.00

Short Run

poor	fair	good
0.84	0.16	0.00

Long Run

poor	fair	good
0.61	0.39	0.12
		NOT

Performance

low	mod	high
0.00	1.00	0.00

Economics

poor	fair	good
0.49	0.51	0.00
		NOT

Clicking on the "Short Run" label in screen 2 produces screen 3.

Screen 3

Short-Run Results — District A

Poor	0.84
Fair	0.16
Good	0.00

fund balance

poor	fair	good
0.84	0.16	0.00

tax capacity

poor	fair	good
0.75	0.25	0.00
		NOT

liquidity

poor	fair	good
0.00	0.78	0.22

Clicking on the "fund balance" label in screen 3 produces screen 4.

Screen 4

Balance Results — District A

Poor	0.84
Fair	0.16
Good	0.00

unreserved funds

low	mod	high	
0.84	0.16	0.00	1.7%

unreserved, unappropriated

low	mod	high	
0.00	0.15	0.85	1.9%

trend

neg	stable	pos	
1.00	0.00	0.00	-2.6%

reserved funds

low	mod	high	
0.00	1.00	0.00	3.0%

Clicking on the graph icon in screen 4 produces a graph of a 5-year history for various fund balances (not shown).

NOTE: mod = moderate; neg = negative; pos = positive.

SOURCE: Figure by authors.

when it tries to tap relatively fewer taxpayers for the additional revenues needed to accommodate the growing student population. All told, in this example, the FCIS presents a district that is likely to have to undertake some fundamental changes in its budgeting and spending and to do so quickly.

District B, on the other hand, is in a very different situation (figure 6). Districts A and B have both run deficits in the past 2 years and both have *low* fund balance levels. Yet district B receives an overall evaluation by the FCIS of primarily *fair* (0.99) and even a bit *good* (0.01). A similar effort to understand the rationale for this assessment (screen 1) would indicate that the *fair* conclusion was a consequence primarily of a *fair* (0.99) short-run evaluation and mostly *good* (0.64) economics. Investigating the *fair* short-run evaluation shows that although the fund balance evaluation is *poor* (0.99), the tax capacity is *good* (1.00) and the liquidity is *not poor* (screen 2). The *poor* fund balance rating is due to a *low* unreserved fund balance that has been declining (screen 3). The *good* tax capacity can be seen to be a consequence of a very *high* property value per student ($1,041,033), a *moderate* tax burden (1.6 percent), and a tax rate that has been actually declining at 4.6 percent a year over recent years (screen 4). The FCIS system has in fact been able to recognize a district that has been keeping property taxes low, in part, by keeping very low fund balances. Given the presumed ability to raise additional taxes, if necessary, and the fact that this district has historically maintained low fund balances, the recent budget deficits do not present the same cause for concern that exists for district A.

The FCIS permits the analyst to identify in rapid fashion both the nature and the severity of a district's problems.

Based on a less refined methodology, both of the districts we have labeled A and B were placed by SED officials on a list of districts potentially facing financial crises. But the list did not provide any information that would enable analysts to rank districts in terms of the severity of their financial problems. As we have demonstrated, the FCIS permits one to make precisely that kind of distinction. It also allows the analyst to identify in rapid fashion both the nature and the severity of a district's problems. And by helping the analyst to drill down several levels to the proximate source(s) of the fiscal stress, the FCIS contributes to the identification of options that might be available for addressing the stress. It is noteworthy, too, that FCIS analysis has the added virtue of being consistent in how it is applied across all the districts for which it is used. That might not be the case when more conventional analytical techniques are used.

Fiscal Monitoring Tools for Other Interested Parties in the Public Arena

As schools face increasing financial difficulties, there is a growing public interest in understanding and even evaluating financial performance. Certainly, school board members are interested in better understanding the financial condition of the schools for which they are responsible. Beyond elected officials, other parties interested in the existence of publicly available information that can be used to evaluate school financial conditions include parents, taxpayers, and, as a consequence, journalists. But monitoring government finances can pose significant challenges for anyone who doesn't have an extensive background in school finance.

An approach for making raw data and simple descriptive statistics available to the interested public may not enable people to make informed evaluations. In some cases, this simple approach can inhibit the complete understanding of the actual financial evaluation. Again using the debt example for an anonymous district (district C), providing the public with the usual debt ratios, such as those in figure 7, could potentially lead to a misunderstanding of a district's financial management. Looking at individual data items, a new school board member or journalist could focus on the long-term debt per student. Observing that the district's long-term debt per student ($12,643) is well above the state average ($5,890), one might wonder if this represents some cause for concern or even evidence of some possible mismanagement of resources. In reality, the FCIS would evaluate the use of debt for this district as among the best in the state by looking not only at debt levels but also at the percent of the debt limit used and the

Figure 6. Sample FCIS output screens for district B

Screen 1

Overall Results — District B

Poor	0.00
Fair	0.99
Good	0.01

Short Run

poor	fair	good
0.00	0.99	0.01

Long Run

poor	fair	good
0.62	0.38	0.01
		NOT

Performance

low	mod	high
0.00	1.00	0.00
NOT		

Economics

poor	fair	good
0.00	0.36	0.64
NOT		

Clicking on the "Short Run" label in screen 1 produces screen 2.

Screen 2

Short-Run Results — District B

Poor	0.00
Fair	0.99
Good	0.01

fund balance

poor	fair	good
0.99	0.01	0.00

tax capacity

poor	fair	good
0.00	0.00	1.00

liquidity

poor	fair	good
0.00	0.81	0.19
NOT		

Clicking on the "fund balance" label in screen 2 produces screen 3.

Screen 3

Balance Results — District B

Poor	0.99
Fair	0.01
Good	0.00

unreserved funds

low	mod	high	
0.96	0.04	0.00	1.2%

unreserved, unappropriated

low	mod	high	
0.10	0.90	0.00	1.4%

trend

neg	stable	pos	
0.99	0.01	0.00	-2.0%

reserved funds

low	mod	high	
0.09	0.91	0.00	2.7%

Clicking on the "tax capacity" label in screen 2 produces screen 4.

Screen 4

Tax Capacity Results — District B

Poor	0.00
Fair	0.00
Good	1.00

property value per student

low	mod	high	
0.00	0.00	1.00	$1,041,033

tax burden

low	mod	high	
0.20	0.80	0.00	1.6%
		NOT	

trend

dec	low	high	
1.00	0.00	0.00	-4.6%

budget defeats

0	1	2+	
0.00	1.00	0.00	100.0%

NOTE: mod = moderate; neg = negative; pos = positive; dec = declining.
SOURCE: Figure by authors.

history of capital spending. Since the FCIS evaluation is the result of applying certain rules, the rationale behind those rules could be used to produce automated reports that not only provided an evaluation but also explained the reasoning behind the evaluation. Figure 8 contains a possible form for reporting this information. This report refers to the same anonymous district (district C) used as the basis for the debt ratios in figure 7.

In contrast to the possible conclusions that someone not trained in finance might reach, the report describes a district that manages its debt exceptionally well (top 2 percent in the state). The score of 19.3 out of 20 is obtained by processing the output from the rule base for this district.[11] The evaluation rationale shown in the box at the bottom of the figure is one that was written to correspond to the specific rule that reached the conclusion of *good*. In order to automatically generate such reports, a written statement must be created explaining the rationale behind each possible rule. Once a user has been provided this written statement, making the actual data available could be constructive. In the example in figure 8, icons are included (at the far left) that allow the user to click for graphical representations of historical data. Of course, any level of data detail and definitions could be provided.

For this particular school district (district C), the unevaluated debt numbers, described in figure 7, could lead a non-finance professional to conclude that the district's use of debt is worse than average. However, the evaluation rationale in figure 8 indicates a district that actually manages its debt very well. It is also the case that a school district with low debt numbers could be judged to have management that is less than ideal. To illustrate, debt use in a second actual, but anonymous, school district in New York (district D) is evaluated in figure 9. Without this evaluation, it is possible that a non-finance professional could reach the conclusion that the school was managing its debt very well merely because of a low debt level. The evaluation that includes a rationale is much more informative and could lead to more constructive public input.

The full financial evaluation performed by the FCIS takes into account over 50 measures and includes over 20 rule bases. A fully operating reporting system would allow a user to investigate the rationale behind the complete evaluation in as much detail as desired. The focus could be limited to high-level rule bases or taken down to the most detailed levels of judgments. School district officials could use such a system to fully understand how their evaluation had been performed and hopefully to understand more precisely how to improve their financial management. Public users could also gain a better understanding of the realities facing their districts and could perhaps be encouraged to focus their support or criticism in a constructive manner.

[11] This process is called "defuzzification," and produces a result similar to an average. See Ammar, Wright, and Selden (2000).

Figure 7. Sample debt-related data for district C

	District			State		
	2001	State percentile	Ave. annual change	2001	Ave. annual change	District as percent of state
Long-term debt	3,325,000	26%	92%	12,129,000	16%	27%
Long-term debt/student	12,643	90%	86%	5,890	15%	215%
Long-term debt as percent of property value	0.6%	27%	90%	2.4%	16%	25%
Debt payments	456,887	16%	131%	2,043,093	13%	22%
Debt payments/student	1,737	88%	124%	1,016	13%	171%
Debt payment as percent of expenditures	9.1%	76%	114%	6.7%	8.7%	136%
Capital spending/student	900	60%	122%	1,548	20%	58%

SOURCE: Figure by authors.

Figure 8. Possible evaluation of debt report for district C

Report on Debt Evaluation

Debt of school district **C** is evaluated as **good.**

	District C	State percentile	Peer percentile
Score (out of 20)	19.3	98%	86%

Debt burden	**moderate**
% of debt limit used	**low**
Capital spending	**high**

Debt is evaluated based on **debt burden** in the context of **capital spending** and **the percentage of the debt limit used**. In general, a *low* debt burden is desirable and leads to a *good* evaluation of debt management. If, however, capital spending over the last 10 years has been at a consistently high level and if the district's indebtedness is a low percentage of its debt limit, then the overall debt evaluation can be judged to be *good* even when the debt burden is above average.

SOURCE: Figure by authors.

Figure 9. Evaluation of debt report for district D

Report on Debt Evaluation

Debt of school district **D** is evaluated as **fair.**

	District D	State percentile	Peer percentile
Score (out of 20)	10	41%	37%

Debt burden	**low**
% of debt limit used	**low**
Capital spending	**low**

Debt is evaluated based on **debt burden** in the context of **capital spending** and **the percentage of the debt limit used**. In general, a *low* debt burden is desirable and leads to a *good* evaluation of debt management. However, if the *low* debt burden is a result of inadequate capital spending over the last 10 years, then the debt evaluation is downgraded to *fair*. This scenario suggests that the debt burden will increase in the short run to meet neglected capital expenditures.

SOURCE: Figure by authors.

Conclusions

The recent fiscal crises facing many state and local governments have raised again the importance of financial condition analysis. If school districts are going to avoid fiscal stress, then they need to be able to evaluate their fiscal health and identify areas where they are at risk in the short run and long run. Unfortunately, the lack of detailed and readily available financial information for all school districts in a state and the complexity of financial condition assessment have limited the use of financial condition analysis by school districts.

The objective of this paper has been to demonstrate how expert systems can be used to develop a financial condition indicator system (FCIS) for school districts. The particular expert system we use, fuzzy rule–based systems (FRBS), is well suited to address several of the challenges facing financial condition assessment—organizing complex evaluations, combining indicators measured in different units, and capturing the contextual judgment of experts. The advantages of using an FRBS over traditional financial condition assessments are that the expert decisions are applied consistently for all governments, users can interact online with the system to determine why they received a particular evaluation and what changes would improve their score, and user-friendly reports can be generated automatically.

To illustrate the use of FRBS for financial condition analysis, we developed an FCIS for New York school districts. The FCIS included 50 measures of short-run financial condition, long-run financial condition, economic condition, and student performance. This is a much more comprehensive set of indicators than used in most financial condition analysis. An FCIS provides several potential benefits. First, it helps state governments identify districts at risk of a fiscal crisis and suggests corrective actions to be taken. We demonstrate how the FCIS can be used to evaluate short-run financial condition using two anonymous school districts in New York that the SED identified as at risk of a fiscal crisis. Second, an FCIS can provide a benchmarking tool for district officials that can be both comprehensive and user friendly. We compare the types of reports that might come out of an FCIS with data-driven tables common in other systems. Finally, it could also be used as a training tool for school board members on how to effectively monitor school district finances.

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Fiscal Stress and Voluntary Contributions to Public Schools

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Fiscal Stress and Voluntary Contributions to Public Schools

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I. Introduction

Throughout the country, school fundraising is being taken to new levels as a weak economy threatens not only extracurricular programs but core academic offerings as well. The traditional bake sale has been replaced with celebrity fundraisers and wide-scale mail campaigns, as an increasing number of public schools and districts are appealing to their communities for private contributions to help counter dwindling local tax revenue and budget cuts at the state level. While schools on the receiving end of these contributions certainly welcome the assistance, the increasing prevalence of voluntary donations has raised concerns about the equity of allowing some schools to benefit while other schools, often in less affluent areas, do not have access to the same resources.

Yet it is unclear whether these concerns are well founded. Much of what we know about the magnitude and distribution of voluntary contributions to public schools is anecdotal. While popular press stories now abound about schools that manage to raise exceptional amounts of money, the amount raised by most schools is likely to be far more modest. For example, in their examination of the level and distribution of voluntary contributions to California public schools in the early 1990s, Brunner and Sonstelie (1997) found that while a few schools managed to raise significant amounts of money, contributions tended to be quite small, on average. However, the prevalence of voluntary contributions has increased over the last decade, raising the possibility that contributions now have a greater impact on the distribution of revenue across communities. The purpose of this paper is to investigate that possibility by documenting the level and distribution of voluntary contributions to California's public schools in 2001.

California provides an ideal setting to examine the level and distribution of voluntary contributions for two reasons. First, while the use of voluntary contributions to fund public school programs is a relatively recent phenomenon in most states, it is a long-established practice in California. As documented by Brunner and Sonstelie (1997), the growth of private donations to public schools in California is directly related to two events: the California Supreme Court ruling in *Serrano v. Priest,* which mandated the equalization of per pupil property tax revenue across districts, and Proposition 13, the 1979 property tax initiative that capped property tax rates at 1 percent of assessed value. Combined, these events reduced the amount of tax revenue available to many school districts, particularly wealthy districts, and prohibited school districts from raising property taxes to fund school spending in the future. In response to those

restrictions, many school districts have attempted to replace lost property tax revenue with voluntary contributions. Second, California is a diverse state, both in terms of the number and size of its schools and school districts and the socioeconomic status of its student body. As a result, California provides an excellent setting to examine how the characteristics of schools and school districts affect the distribution of voluntary contributions.

The remainder of this paper is organized as follows. In section II, we discuss the sources of our data on voluntary contributions. Section III documents the size of voluntary contributions in 2001. We find that contributions have increased substantially over the past decade from approximately $123 million in 1992 to $238 million in 2001. Even so, we also find that voluntary contributions remain small on average: If the $238 million in voluntary contributions were distributed equally across schools it would amount to less than $40 per pupil. Of course, voluntary contributions are not equally distributed across schools. In section IV, we document the distribution of voluntary contributions across schools and school districts and examine how the characteristics of those schools that have been most successful in raising voluntary contributions differ from schools that have been less successful. Finally, in section V, we examine one potential explanation for why the use of voluntary contributions is not more widespread.

There are only a few wide-scale studies that examine the size and distribution of voluntary contributions to public schools.

II. Identifying Voluntary Contributions

There are only a few wide-scale studies that examine the size and distribution of voluntary contributions to public schools. This is due, in part, to the fact that schools and school districts often do not report private contributions in their official statements of revenue and expenses and even when they do, private contributions are not singled out as a separate source of revenue. Consequently, studies that examine the distribution of dollars per pupil (e.g., Murray, Evans, and Schwab 1998) typically use data that either do not include contributions or do not identify contributions separately from other local revenue. However, as noted by Brunner and Sonstelie (1997), most contributions to public schools flow through nonprofit organizations with tax-exempt status, and these organizations are required to report their revenue and expenses to the state and federal government. Using those reports, we have attempted to identify all nonprofits in California that direct voluntary contributions to public schools and to link each with the school or school district that it supports. Our data are from the same sources as Brunner and Sonstelie (1997), updated to 2001; therefore, we give here only a brief description of the data and refer the reader to their paper for a more detailed discussion of the methodology employed to construct the dataset.

At the school level, contributions are raised primarily by PTAs (Parent Teacher Associations), PTOs (Parent Teacher Organizations), and booster clubs. At the district level, contributions are raised primarily by local educational foundations. To identify the contributions raised by these organizations, we utilized two data sources. The first is the "Charities Database" maintained by the Registry of Charitable Trusts (RCT) of the California Attorney General's Office. With the exception of PTAs, all tax-exempt nonprofit organizations supporting K–12 schools in California are required to register with the RCT. Using information contained in the Charities Database, we attempted to identify all nonprofit organizations (except PTAs) supporting K–12 schools in 2001. Because the RCT's Charities Database provides only limited information on the revenue raised by registered organizations and no information on individual PTAs, we also made use of the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service (IRS). The IRS requires all tax-exempt organizations with annual gross revenue of $25,000 or more, including PTAs and all other nonprofit organizations supporting K–12 schools, to file annual financial statements. The IRS Master File contains information on the revenue raised by these organizations and a unique Employer Identification Number that can be used to match the financial information contained in the IRS Master File with the data on nonprofit organizations contained in the RCT Charities Database. Thus, by combining the information contained in the RCT Charities Database with the information contained in the IRS Master File, we can identify all nonprofit organiza-

tions supporting K–12 public schools in 2001. For the subset of organizations with gross revenue of $25,000 or more, we can also identify the gross and net revenue raised by these organizations.[1]

III. The Size of Voluntary Contributions

Table 1 documents the size of voluntary contributions in 1992 and 2001; the 1992 data are from Brunner and Sonstelie (1997). The left-hand column subdivides organizations into five categories: local educational foundations, PTAs/PTOs, booster clubs/other, and urban foundations. The "other" category that is reported with booster clubs includes organizations such as school alumni associations and school bingo clubs. The category "urban foundations" includes large foundations located in urban districts, such as Los Angeles Unified. While local educational foundations and urban foundations are similar in the respect that both tend to operate at the district level, local educational foundations rely heavily on individual donations, while urban foundations rely primarily on donations from businesses and corporate sponsors.

For each type of organization, columns 1 and 3 report the total number of organizations with gross revenue of $25,000 or more in the 1992 and 2001 tax years, respectively. Similarly, columns 2 and 4 report the total net revenue raised by each type of organization during the 1992 and 2001 tax years.[2] Table 1 shows that during the last decade, there was a large increase in both the number of organizations involved in raising private contributions and in the total amounts raised. In 1992, nonprofit organizations raised approximately $123 million in constant 2001 dollars. By 2001, that amount had nearly doubled to over $238 million. Not surprisingly, the sharp increase in total contributions between 1992 and 2001 was also accompanied by a sharp increase in contributions per pupil. Specifically, in 1992 there were approximately 5.1 million students enrolled in California's public schools, implying an average contribution of $24 per pupil, measured in constant 2001 dollars. In contrast, in 2001 there were approximately 6.1 million students enrolled in California's public schools, implying an average contribution of $39 per pupil. Thus, between 1992 and 2001 contributions per pupil rose by approximately 62.5 percent.

Table 2 documents the average net revenue per pupil raised by K–12 nonprofit organizations in 2001. For each type of school or school district listed in the left-hand column, column 1 shows the total number of schools or school districts operating in California during the 2001–02 school year. Among those, column 2 lists the total number with a nonprofit organization that raised over $25,000 in gross revenue, and column 3 reports the average revenue per pupil raised by those organizations. For example, of the 6,595 elementary and middle schools in California, 1,441 (22 percent) had a nonprofit organization that raised over $25,000 in gross revenue. Among

[1] Throughout the paper, we refer only to monetary contributions. Although many schools benefit from contributions of parental time or direct donations of materials, we are unable to measure these in-kind contributions. To our knowledge, there are no wide-scale data available on these nonmonetary donations.

[2] Net revenue is gross revenue minus the organization's expenses, i.e., the amount actually spent on schools.

Table 1. Total net revenue of K–12 nonprofit organizations: 1992 and 2001 tax years

Type of organization	Nonprofit organizations with gross revenue of $25,000 or more: 1992 tax year (constant 2001 dollars)		Nonprofit organizations with gross revenue of $25,000 or more: 2001 tax year	
	Number	Net revenue	Number	Net revenue
Local educational foundations	294	$36,651,156	320	$96,972,199
PTAs/PTOs	654	45,280,218	1463	83,412,310
Booster clubs/Other	310	29,006,764	322	34,149,470
Urban foundations	6	12,323,896	13	23,890,392
Total	1,264	$123,271,034	2,115	$238,324,371

SOURCE: 1992 data are from Brunner and Sonstelie (1997); 2001 data are from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service.

Table 2. Net revenue per pupil, by school/district type: 2001 tax year

School level/ district level	Number of schools/ school districts	Schools/school districts with a nonprofit organization having gross revenue of $25,000 or more		Schools/school districts with a nonprofit organization having average net revenue of $100 per pupil or more	
		Number	Average net revenue per pupil	Number	Average net revenue per pupil
School level					
Elementary/middle	6,595	1,441	$122	427	$298
Junior/senior high	987	267	$89	76	$227
District level					
Elementary	325	64	$219	26	$489
Unified district	323	102	$68	19	$274
High school	91	16	$42	2	$188

NOTE: 235 elementary school districts, 3 unified school districts, and 1 high school district contain just one school. We include contributions made to single school districts in the school-level figures.

SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service.

these 1,441 schools, net revenue per pupil averaged $122. Similarly, of the 325 elementary school districts in California, 64 had a nonprofit organization that raised over $25,000 in gross revenue, and among those 64 districts average revenue per pupil was $219.

The last two columns of table 2 focus on those schools and school districts that were particularly successful in raising contributions. Column 4 shows the total number of schools and school districts with a nonprofit organization that raised $100 per pupil or more, while column 5 gives the average revenue per pupil raised by those organizations. Clearly, there are far fewer schools and districts in this group, but they were able to raise substantial amounts. For example, only 427 elementary and middle schools (6.5 percent) had a nonprofit organization that raised $100 per pupil or more; among those 427 schools, contributions per pupil averaged $298. Similarly, among the 26 elementary school districts (7.9 percent) with a nonprofit organization that raised $100 per pupil or more, contributions per pupil averaged $489.

IV. The Distribution of Voluntary Contributions

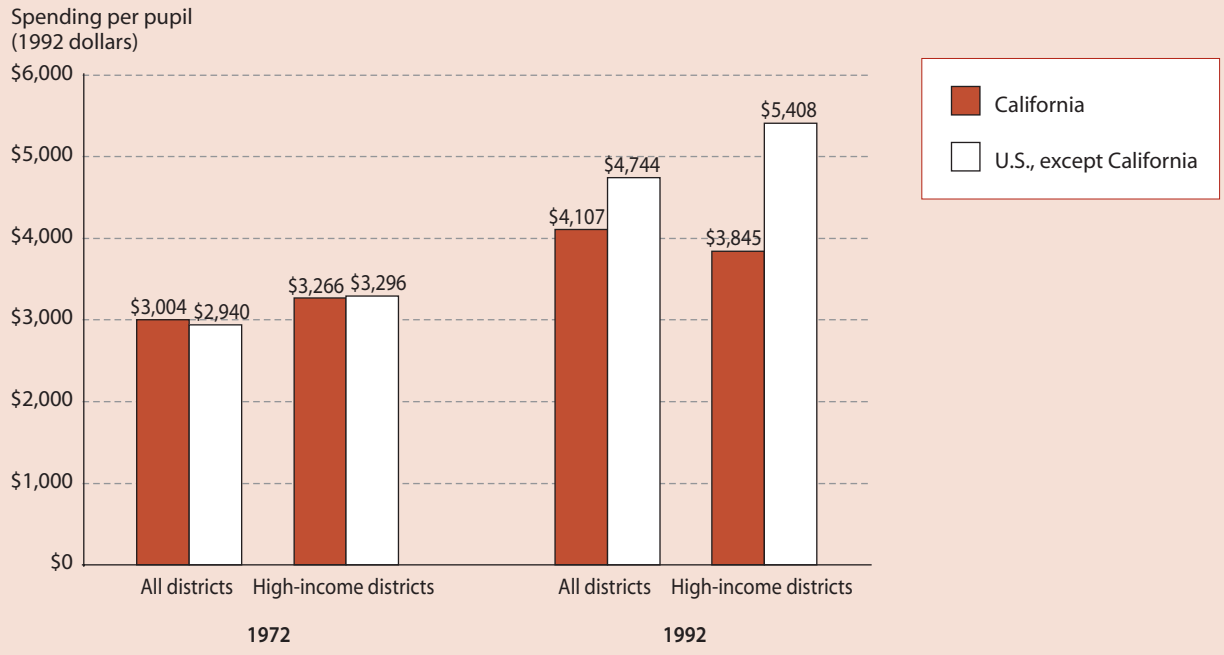
The revenue figures reported in tables 1 and 2 highlight several interesting facts. First, while the $238 million raised by nonprofit organizations to support public schools in California in 2001 represents a considerable sum, it nevertheless amounts to only about $39 per pupil. Second, as table 2 makes clear, although contributions per pupil tend to be small on average, several schools and school districts have been able to raise significant amounts of private contributions. This second fact raises the question: Which schools have been most successful in raising voluntary contributions? This section addresses that question by examining the relationship between voluntary contributions and family income.

Numerous studies have shown that the demand for school spending is positively related to income.[3] Furthermore, it was high-income communities that suffered the most from the relative decline in school spending that occurred in California in the aftermath of school finance reform. Specifically, before *Serrano* and Proposition 13, spending per pupil was about 10 percent higher in California than in the rest of the country. Over the next two decades, however, spending per pupil in California fell about 15 percent relative to the national average, and it was California's wealthiest communities that witnessed the largest relative decline in school spending.

Figure 1 illustrates that point. The figure gives 1972 and 1992 average spending per pupil in California and the rest of the country for all students attending unified school districts and for students attending a high-income

[3] See, for example, Bergstrom and Goodman (1973), Rubinfeld (1977), and Bergstrom, Rubinfeld, and Shapiro (1982).

Figure 1. Spending per pupil in California relative to the rest of the United States: 1972 and 1992



SOURCE: Murray, Evans, and Schwab (1998).

unified school district.[4] In 1972, high-income districts correspond to districts with a median household income of $10,965 or more in 1970. Of all the students attending a unified school district in the United States in 1972, 25 percent attended one of these high-income districts. Similarly, in 1992, high-income districts correspond to districts with median household incomes of $41,420 or more in 1990. Of all the students attending a unified school district in the United States in 1992, 25 percent attended one of these high-income districts. To account for differences in district size, 1972 and 1992 spending per pupil is weighted by district enrollment.[5] In addition, for comparison purposes, 1972 spending per pupil is expressed in constant 1992 dollars.

As figure 1 illustrates, in 1972, spending per pupil in California roughly equaled that of other states. In 1992, however, spending per pupil in California was about 13 percent lower than in the rest of the country ($4,107 compared to $4,744). Furthermore, relative to high-income districts in other states, California's high-income districts suffered a particularly sharp decline in spending per pupil. Specifically, in 1972 high-income districts in California spent about the same amount as high-income districts in other states. By 1992, however, that situation had changed dramatically. The average spending per pupil in California's high-income districts was $3,845, whereas the corresponding figure for high-income districts in other states was $5,408. Thus, by 1992, high-income districts in California were spending approximately 29 percent less than high-income districts in other states.

Figure 1 suggests that it was high-income communities that were particularly constrained by school finance reform in California. That fact, coupled with the fact that high-income communities also tend to have greater demands for school spending, suggests that contributions

[4] We wish to thank Sheila Murray for providing the data on household income and spending per pupil used to construct figure 1. A detailed description of the data can by found in Murray, Evans, and Schwab (1998).

[5] Weighting by district enrollment changes the unit of observation from the district to the student. Thus, weighting by district enrollment allows one to make comparisons of the number of *students* living in high-income districts rather than comparisons simply of the number of districts that are high income.

per pupil should be highest in high-income communities. Figure 2 provides evidence in favor of that hypothesis. The figure illustrates the relationship between family income in 2000 and school-level contributions in 2001. The vertical axis measures contributions per pupil for schools with contributions of $25,000 or more, and the horizontal axis gives, for each school, the average income of families in the school's census tract. As hypothesized, contributions per pupil appear to be positively related to family income. As shown in figure 2A of the appendix, a similar relationship holds for district-level contributions and family income.

The relationship between family income and school-level contributions per pupil is examined in greater detail in table 3. The table summarizes the distribution of contributions per pupil among elementary and middle schools by quintiles of family income, where the quintiles are weighted by student enrollment. For example, of all students attending an elementary or middle school, 20 percent attended a school in which average family income was less than $42,292, while 20 percent attended a school in which average family income was greater than or equal to $86,321. For each income range reported in the left-hand column, column 1 lists the number of schools with average family income within that range. The total number of schools with a nonprofit organization that raised over $25,000 in gross revenue is shown in column 2, while column 3 reports the average revenue per pupil raised by those organizations. There is a clear difference in the contributions raised by low- and high-income schools. In schools with an average family income of $42,292 or less, only 27 (2.4 percent) had a nonprofit that raised $25,000 or more in 2001. Among those schools, revenue per pupil averaged just $32. In contrast, in schools with an average family income of $86,321 or more, 718 (50.4 percent) had a nonprofit that raised $25,000 or more. Among those schools, revenue per pupil averaged $135.

The disparity is even greater when looking at schools that raised $100 or more per pupil. For each range of family income, the fourth column gives the number of schools with a nonprofit organization that raised $100 or more per pupil in 2001, and the fifth column gives the average revenue per pupil raised by these organizations. Only 3 of the schools in the lowest income quintile were able to raise $100 or more per pupil. In contrast,

Figure 2. Family income (2000) and school-level contributions per pupil (2001).

SOURCE: Contributions data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service; family income from the 2000 Census.

Table 3. School-level contributions per pupil, by quintiles of family income: Elementary and middle schools (pupil-weighted), 2001

2000 average family income	Number of schools	Schools with a nonprofit organization having gross revenue of $25,000 or more		Schools with a nonprofit organization having average net revenue of $100 per pupil or more	
		Number	Average net revenue per pupil	Number	Average net revenue per pupil
$42,292 or less	1093	27	$32	3	$134
$42,293–$53,184	1352	84	37	7	147
$53,185–$65,480	1324	209	49	16	245
$65,481–$86,320	1377	400	59	68	157
$86,321 and above	1425	718	135	335	263

SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service.

335 schools (23.5 percent) with an average family income of $86,321 or more raised $100 per pupil or more.

Table 3A of the appendix documents the relationship between family income and contributions to junior and senior high schools, while table 3B documents the relationship between family income and district-level contributions. Once again, there is a clear difference in the contributions raised by low- and high-income schools and school districts.

V. Voluntary Contributions and the Price of School Spending

As we have seen, some schools have been quite successful in raising voluntary contributions, particularly high-income schools that were most constrained by school finance reform. However, the question still remains: Why isn't the use of voluntary contributions more widespread? For example, even among the 1,425 elementary and middle schools with the highest income, less than 25 percent managed to raise more than $100 per pupil. The limited use of voluntary contributions is particularly perplexing given the relatively large decline in spending per pupil high-income communities experienced over the last several decades. As we saw in figure 1, by 1992, high-income communities in California were spending approximately $1,560 less per pupil than high-income communities in other parts of the nation.

Why haven't California's schools and school districts used voluntary contributions to close that difference? One answer is directly related to California's transformation in school finance. In other states, the source of discretionary school revenue is still the local property tax. In California, however, school finance reform and Proposition 13 have changed the source of discretionary revenue from the property tax to voluntary contributions. That change altered the marginal price of school spending, which may have decreased the demand for public school spending.

The marginal price of school spending is the additional amount an individual must pay to increase spending per pupil by $1. When school spending is financed through the property tax, that additional payment manifests itself in a higher property tax payment. Specifically, when spending per pupil is financed through the property tax, the marginal price of school spending is

$$N * \frac{V}{T},$$

where N is the total number of students in a district, V is the assessed value of an individual's home, and T is the total assessed value of all property in the district. For example, consider a school district with 100 students and 100 owner-occupied homes, each with an assessed value of $100,000. In that case, the marginal price of school spending is

$$\frac{100{,}000}{10{,}000{,}000} * 100, \text{ or exactly } \$1.$$

Now consider how the marginal price of school spending changes when the discretionary source of school revenue is changed from the property tax to voluntary contributions. Specifically, consider once again a district with 100 students and 100 families, with each family having

exactly one child. Suppose the district wanted to increase spending per pupil by $1 and finance that increase with voluntary contributions. If families were to cooperate fully, each family would have to contribute $1 to increase spending per pupil by $1. In that case, the price of school spending would be the same as it was when spending was financed through the local property tax. However, the literature on collective action suggests that full cooperation is unlikely since each family has an incentive to "free ride" on the contributions made by other families.[6] For example, take the extreme case where each family treats the contributions of other families as given (i.e., no cooperation) when deciding how much they will contribute. In that case, the price to a family of increasing spending per pupil by $1 would be the number of students, namely *N*. While this example may be extreme, it illustrates an important point: When the source of discretionary revenue is changed from the property tax to voluntary contributions, the price of school spending is likely to rise since no enforcement mechanism exists to ensure that each family contributes.

In Brunner and Sonstelie's model, school size (student enrollment) represents the price parents face for increasing spending per pupil.

Brunner and Sonstelie (2003) examine this issue in more detail by developing a model of partial cooperation among families in making voluntary contributions to their public schools. In their model, school size (student enrollment) represents the price parents face for increasing spending per pupil. An increase in student enrollment increases the incentive for parents to free ride and hence reduces the fraction of parents who contribute to their public school. As a result, the price of increasing spending per pupil by $1 rises as the school size increases. Using data on voluntary contributions to California's public schools in 1994, they find that contributions per pupil decline with an increase in school size, supporting the prediction of their model. Specifically, they obtain an estimate of the school size elasticity of demand of –0.56. Thus, their results suggest that, all else equal, a doubling of school size would lead to a 56 percent decline in contributions per pupil. For a school of 600 students, roughly the average size elementary school in California, this would imply a marginal price of school spending of approximately $2, a substantially higher price than would exist if schools were financed through the local property tax.

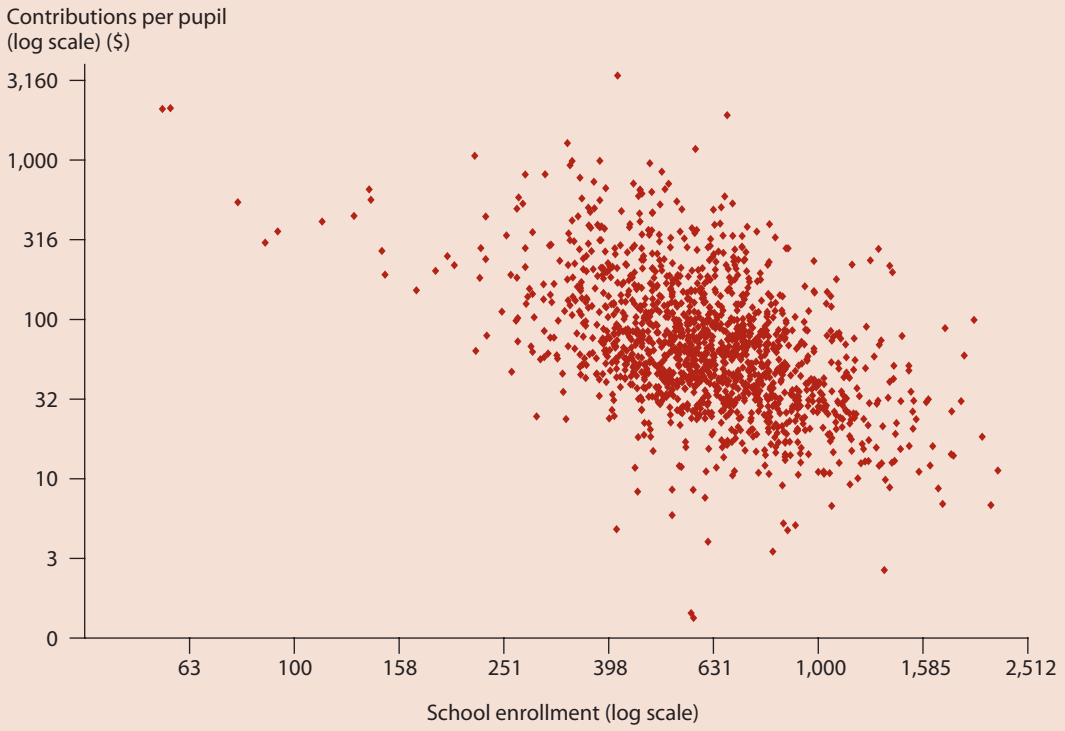
The discussion above suggests that contributions per pupil should be inversely related to school enrollment. Figure 3 provides evidence in favor of that hypothesis. The figure illustrates the relationship between school enrollment in 2001–02 and school-level contributions. As hypothesized, contributions per pupil appear to be negatively related to school enrollment. However, it is also important to point out that the apparent strong negative relationship between the two variables may be somewhat misleading due to the censoring of contributions. Because of the IRS filing rules, we do not observe contributions unless gross revenue are above $25,000. Consequently, among small schools, we only observe contributions if contributions per pupil are quite high. The negative relationship between the censoring point and enrollment is clearly visible in figure 3: We observe relatively few small schools with contributions, and those that we do observe have relatively high contributions per pupil.

Figure 4 illustrates the relationship between district enrollment and district-level contributions per pupil. Similar to the relationship shown in figure 3, district-level contributions appear to be negatively related to student enrollment. Furthermore, for district-level contributions, the censoring of gross revenue at $25,000 is less of a problem. Over 75 percent of all school districts have an enrollment of 1,000 students or more. For a school district with 1,000 students, the censoring of gross revenue per pupil occurs at only $25 per pupil. Given that net revenue is on average about 60 percent of gross revenue, this would imply that censoring of net contributions per pupil occurs at only $15.

While figures 3 and 4 suggest that contributions per pupil decline markedly with school size, those figures do not control for other factors that might be correlated with both the demand for school spending and student

[6] See, for example, Olson (1965) and Sandler (1992).

Figure 3. School enrollment and school-level contributions per pupil: 2001–02

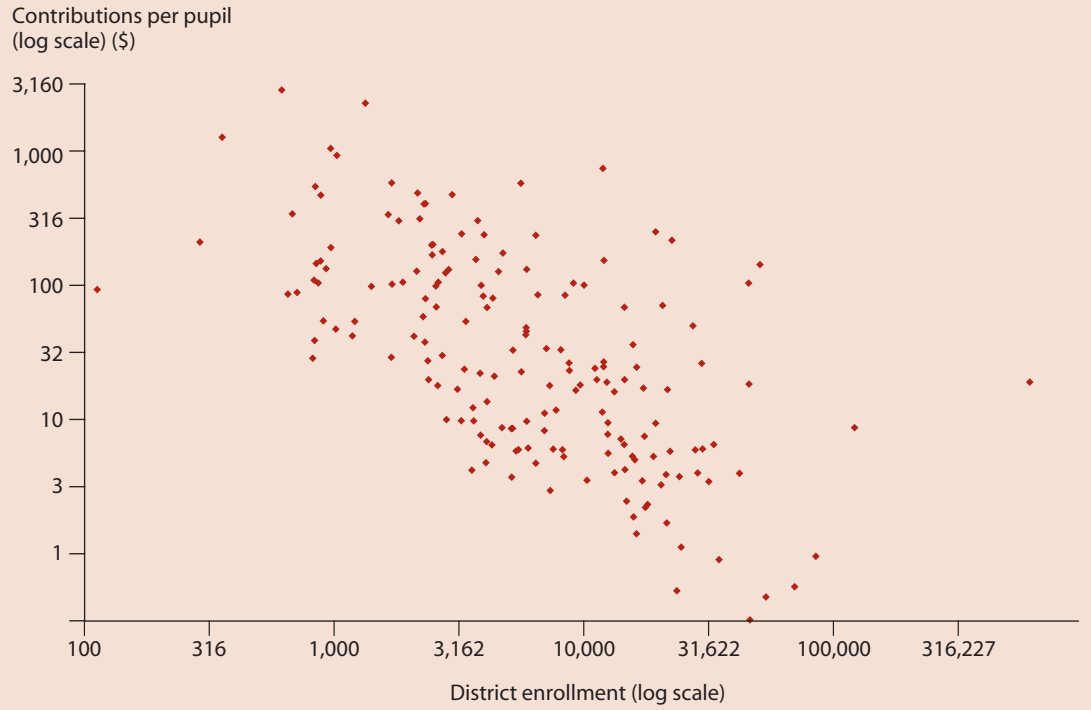


SOURCE: Contributions data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service; school enrollment from the California Department of Education.

enrollment. For example, among elementary and middle schools with 500 students or less, the average family income in 2000 was $74,500. In contrast, among schools with more than 500 students, the average family income in 2000 was $66,700. Thus, the apparent negative relationship between school size and contributions per pupil could simply be due to the fact that high-enrollment schools tend to be less wealthy on average. We investigate that possibility in table 4, which isolates the enrollment relationship from income by documenting the relationship between school-level contributions and school size in high-income and low-income schools. Columns 1 through 3 provide information on the distribution of contributions per pupil among high-income schools. Columns 4 through 6 provide the same information for low-income schools. For each of the four ranges of school enrollment in the left-hand column, columns 1 through 3 list the number of schools with student enrollment within that range for high- and low-income schools, respectively. The total number of high-income schools with a nonprofit organization that raised $25,000 or more in gross revenue is shown in column 2, while column 3 lists the average revenue per pupil raised by those organizations. Columns 4 through 6 provide the same information for low-income schools.

As table 4 makes clear, contributions are concentrated in small, high-income schools. Columns 3 and 6 show that average contributions per pupil fall significantly as enrollment increases. For example, in high-income schools, the average contribution per pupil is over four times as large in schools with an enrollment of less than 400 students than in schools with an enrollment of 800 or more ($308 versus $73). Furthermore, a comparison of columns 2 and 3 and columns 5 and 6 reveals that, for each enrollment range, the fraction of schools with a nonprofit that raised over $25,000, and the average contribution per pupil among those schools, are both substantially higher in high-income schools than in low-income schools. Tables 4A and 4B in the appendix show that a similar relationship holds for junior and senior high schools, as well as for all school districts.

Figure 4. District enrollment and district-level contributions per pupil: 2001–02



SOURCE: Contributions data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service; district enrollment from the California Department of Education.

We began this section by asking, why isn't the use of voluntary contributions more widespread? The results reported in this section provide a partial answer to that question: Attempting to raise significant sums of money through voluntary contributions may be of limited appeal to all but the smallest and wealthiest schools and school districts. Specifically, the demand for public school spending depends on more than just income and preferences; it also depends on the marginal price of that spending. As a result, even among California's wealthiest communities, contributions per pupil tend to be relatively small if school enrollment is high.

Table 5 reinforces that point. The table lists the proportion of students who benefited from the different levels of voluntary support. For example, approximately 43 percent of all students attended a school in which contributions per pupil were less than $1. Table 5 suggests that the use of voluntary contributions is quite limited: An overwhelming majority of students attended a school in which contributions per pupil were quite small. Specifically, 90 percent of all students attended a school in which contributions per pupil were less than $100, and only 1.2 percent of all students attended a school with contributions per pupil of $500 or more.

VI. Conclusion

The rise in voluntary contributions to public schools over the last few decades, and particularly the surge in contributions during recent months in response to budget cuts, has helped many schools and districts to purchase and maintain programs that would not have been otherwise possible. In California, where the school finance system does not allow local communities much flexibility in educational spending, fundraising is one of the few instruments available to parents trying to obtain a higher quality of education for their children. But when some communities are able to raise significant amounts and others are not, concerns naturally arise about the equitable distribution of funds and the resources they buy. In this paper, we set out to ascertain whether such concerns are warranted by examining the size and distribution of contributions across schools and school districts in California.

Table 4. School-level contributions per pupil and school enrollment: Elementary and middle schools, 2001

	High-income schools ($86,321 or above)			Low-income schools ($42,276 or less)		
		Schools with a nonprofit organization having gross revenue of $25,000 or more			Schools with a nonprofit organization having gross revenue of $25,000 or more	
School enrollment	Number of schools[1]	Number	Average net revenue per pupil	Number of schools[2]	Number	Average net revenue per pupil
Less than 400	320	115	$308	178	4	$115
400–599	509	264	186	232	7	39
600–799	344	215	121	252	6	34
800 or more	252	124	73	231	10	27

[1] 20 percent of all elementary and middle school students attended one of these high-income schools.

[2] 20 percent of all elementary and middle school students attended one of these low-income schools.

SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office; the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service; and the California Department of Education.

Table 5. The distribution of students by ranges of contributions per pupil: 2001

Range of contributions per pupil[1]	Fraction of students in range
$0–$0.99	43.13%
$1–$49.99	38.62
$50–$99.99	8.19
$100–$199.99	5.82
$200–$499.99	3.06
$500 and above	1.18

[1] Contributions represent the sum of school-level and district-level contributions.

NOTE: We assume district-level contributions are distributed equally, on a per pupil basis, among all schools within a district.

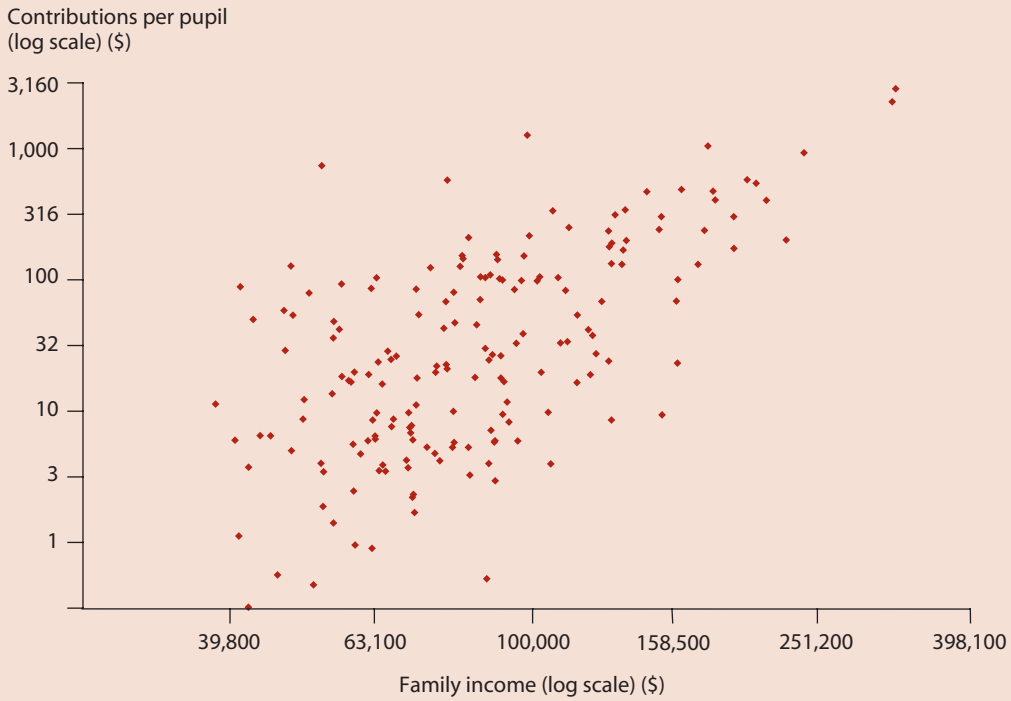
SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office; the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service; and the California Department of Education.

We find that although contributions are highest in high-income schools and school districts, the majority of students attend schools where contributions per pupil are relatively small. Even in the richest communities, fewer than a quarter of the schools raise more than $100 per pupil. This can be explained, in part, by the fact that when school spending is financed through voluntary contributions, the marginal price of that spending increases with the number of students. Therefore, larger schools, even if higher income, will have a more difficult time raising significant contributions. Not surprisingly then, we see contributions primarily concentrated in schools that are both wealthy and small.

Thus, although it is true that a small number of schools raise large amounts of voluntary contributions and it is likely that such schools will continue to receive much media attention, it does not appear that these contributions have led to large inequalities in the distribution of revenue across most schools. Furthermore, because the voluntary nature of private donations means that they are subject to free-riding, which increases the price of spending per pupil for larger districts, it seems unlikely that contributions will ever be the source of wide-scale disruptions in the distribution of revenue across communities.

Appendix

Figure 2A. Family income (2000) and district-level contributions per pupil (2001)



SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service.

Table 3A. School-level contributions per pupil, by quintiles of family income: Junior and senior high schools (pupil-weighted), 2001

2000 average family income	Number of schools	Schools with a nonprofit organization having gross revenue of $25,000 or more		Schools with a nonprofit organization having average net revenue of $100 per pupil or more	
		Number	Average net revenue per pupil	Number	Average net revenue per pupil
Less than $44,129	197	26	$34	1	$103
$44,130–$54,151	210	30	57	6	160
$54,152–$67,832	199	51	50	8	175
$67,833–$87,756	185	59	80	12	132
$87,757 and above	183	100	120	47	227

SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service.

Table 3B. District-level contributions per pupil, by quintiles of family income: All school districts (pupil-weighted), 2001

2000 average family income	Number of schools	Schools with a nonprofit organization having gross revenue of $25,000 or more		Schools with a nonprofit organization having average net revenue of $100 per pupil or more	
		Number	Average net revenue per pupil	Number	Average net revenue per pupil
Less than $51,824	250	20	$8	1	$124
$51,825–$60,925	147	19	33	1	685
$60,926–$64,782	46	14	20	0	—
$64,783–$82,177	135	38	20	3	418
$82,178 and above	156	91	80	42	216

SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service.

Table 4A. School-level contributions per pupil and school enrollment: Junior and senior high schools, 2001

School enrollment	High-income schools ($87,757 or above)			Low-income schools ($44,129 or less)		
	Number of schools[1]	Schools with a nonprofit organization having gross revenue of $25,000 or more		Number of schools[2]	Schools with a nonprofit organization having gross revenue of $25,000 or more	
		Number	Average net revenue per pupil		Number	Average net revenue per pupil
Less than 1,199	41	10	$216	80	4	$42
1,200 – 1,799	47	24	195	34	7	35
1,800 – 2,499	64	47	101	35	9	18
2,500 or more	31	19	94	48	6	45

[1] 20 percent of all junior and senior high school students attended one of these high-income schools.

[2] 20 percent of all junior and senior high school students attended one of these low-income schools.

SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service, and the California Department of Education.

Table 4B. District-level contributions per pupil and district enrollment: All school districts, 2001

School enrollment	High-income schools ($82,178 or above)			Low-income schools ($51,824 or less)		
	Number of schools[1]	Schools with a nonprofit organization having gross revenue of $25,000 or more		Number of schools[2]	Schools with a nonprofit organization having gross revenue of $25,000 or more	
		Number	Average net revenue per pupil		Number	Average net revenue per pupil
Less than 2,000	42	21	$536	126	3	$50
2,000–3,999	38	26	161	53	4	67
4,000–7,999	26	13	86	31	2	7
8,000 or more	50	31	45	71	13	8

[1] 20% of all students attended one of these high-income districts.

[2] 20% of all students attended one of these low-income districts.

SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service, and the California Department of Education.

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