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.

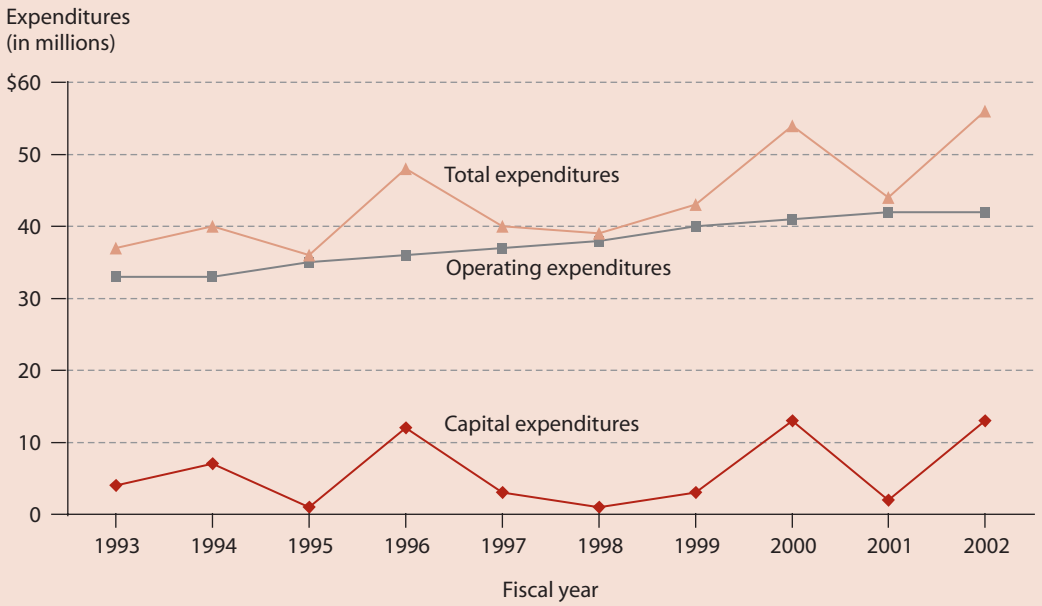
Except in larger school districts, where a significant amount of capital spending takes place every year, these capital expenditures tend to be "lumpy." In some years, capital expenditures can be relatively large, and in others they are miniscule. In any given year, therefore, capital expenditures may 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

Governmental Accounting Standards Board (GASB). (1999). *Statement No. 34, Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments.* Norwalk, CT: GASB.

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]

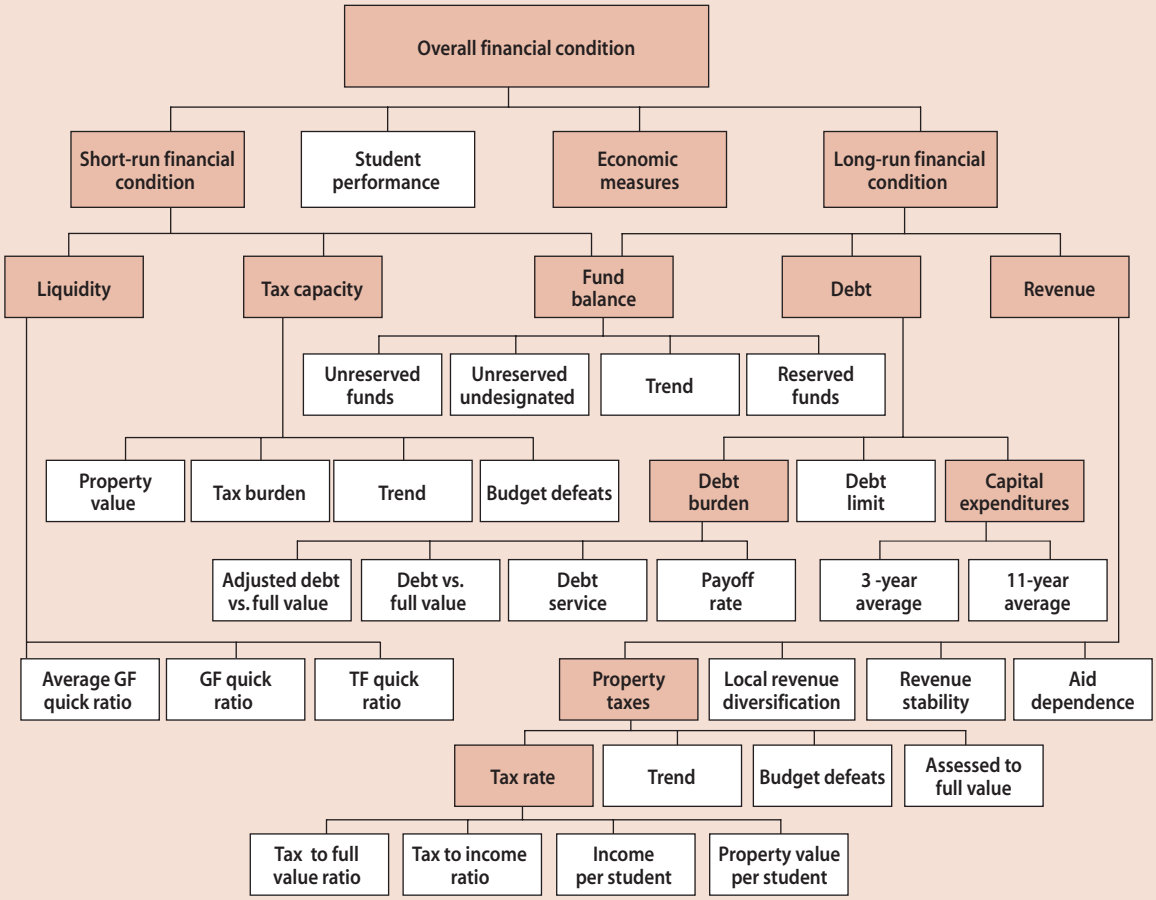
Fund balance is the difference between current assets and current liabilities, and can be either reserved for specific uses, or left unreserved. The unreserved fund balance, particularly if unappropriated (or undesignated), could

[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.

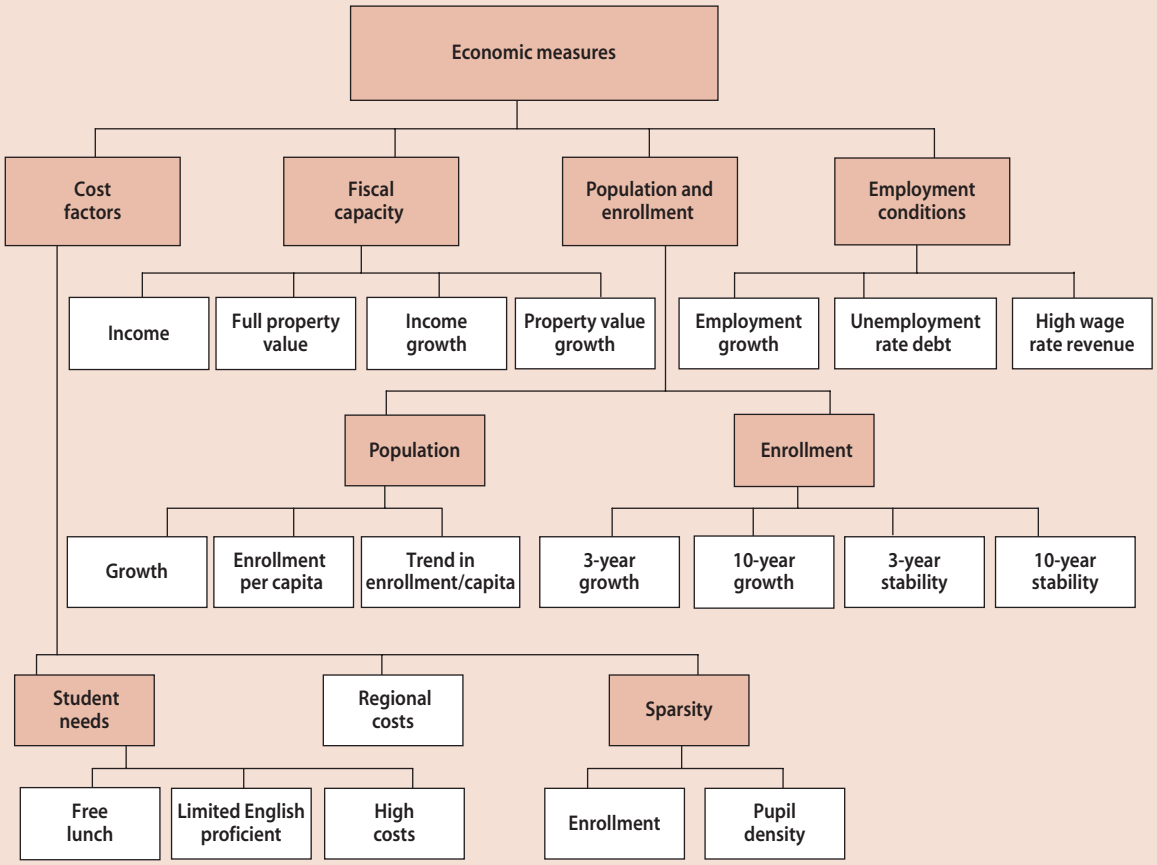
[6] Because the debt limit varies by type of district, the percentage of the debt limit used was calculated differently depending on the class of the district. See the following, on the New York State Education Department (SED) website, for a complete description of the debt limits: http://www.emsc.nysed.gov/mgtserv/debtlimi.htm.

[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.

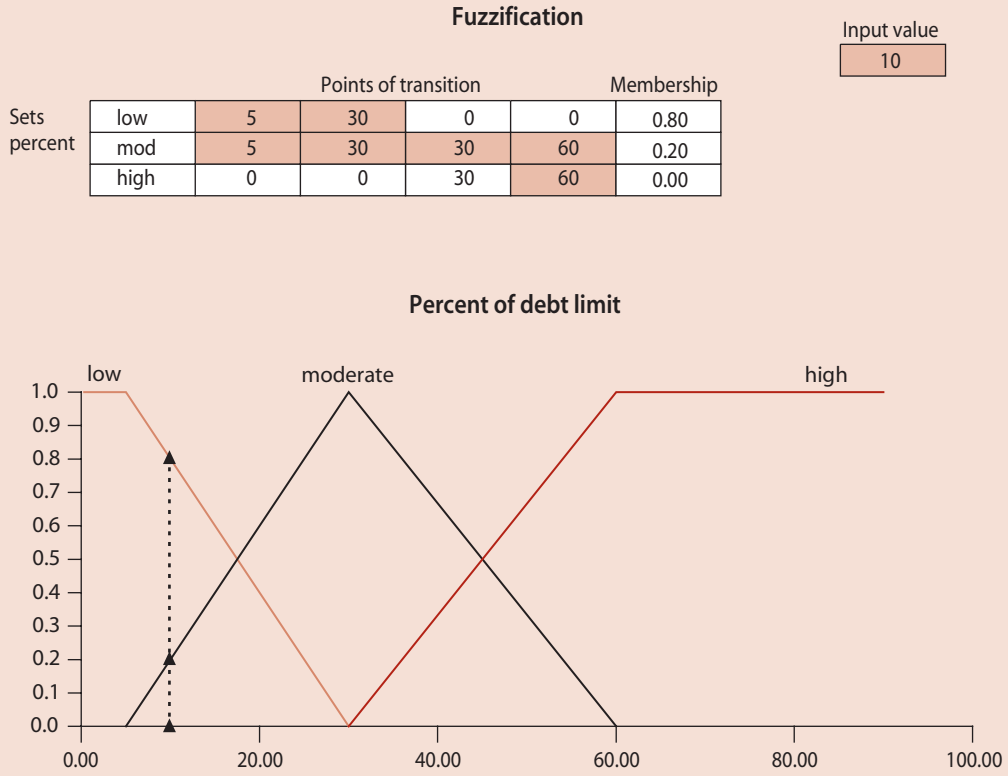
The recent development of multilevel fuzzy rule–based systems has enabled the use of expert systems to evaluate more complex structures. Multilevel fuzzy rule–based systems have been successfully used to evaluate the financial management and the financial condition of large U.S. cities (Ammar, Duncombe, 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:

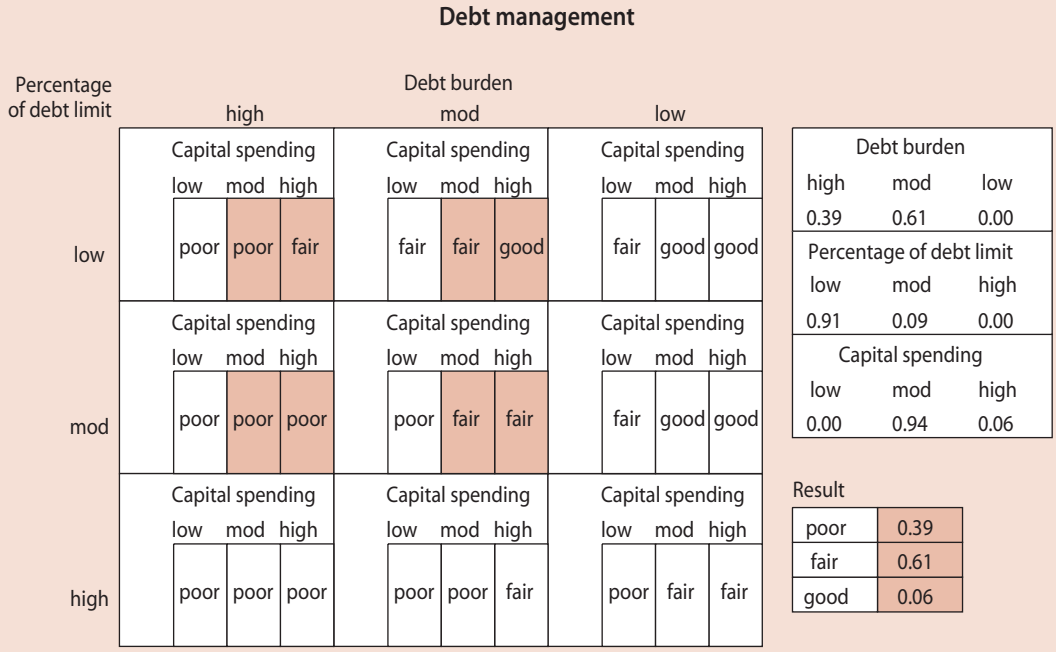
IF the debt burden is moderate AND
the percent use of debt limit is low AND
the capital spending is high
THEN the evaluation of the use of debt is GOOD.

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.

References

Ammar, S., Bifulco, R., Duncombe, W., and Wright, R. (2000). Identifying Low-Performance Public Schools. *Studies in Educational Evaluation, 26*(3): 259–287.

Ammar, S., Duncombe, W., Hou, Y., Jump, B., and Wright, R. (2001a). Using Fuzzy Rule–Based Systems to Evaluate Overall Financial Performance of Governments: An Enhancement of the Bond Rating Process. *Public Budgeting & Finance, 21*(Winter): 91–110.

Ammar, S., Duncombe, W., Hou, Y., and Wright, R. (2001b). Evaluating City Financial Management Using Fuzzy Rule–Based Systems. *Public Budgeting & Finance, 21*(Winter): 70–90.

Ammar, S., Duncombe, W., Jump, B., and Wright, R. (2005). A Financial Condition Indicator System for School Districts: A Case Study of New York. *Journal of Education Finance, 30*(3): 231–258.

Ammar, S., Duncombe, W., and Wright, R. (2001). Evaluating Capital Management: A New Approach. *Public Budgeting & Finance, 21*(Winter): 47–69.

Ammar, S., Wright, R., and Selden, S. (2000). Ranking State Financial Management: A Multilevel Fuzzy Rule–Based System. *Decision Sciences, 31*(2): 449–481.

Berne, R., and Schramm, R. (1986). *The Financial Analysis of Governments.* Englewood Cliffs, NJ: Prentice-Hall.

Blair, J. (2002, January 23). City Schools Feel the Pain of Fiscal Bites. *Education Week, 21,* pp. 1, 10.

Borga, R. (2003, March 5). Portland School's Financial Crisis Threatens Future. *Education Week, 22,* pp. 1, 16–17.

Boyd, D., and Wachino, V. (2004, January 26). *Is the State Fiscal Crisis Over? A 2004 State Budget Update.* (Issue Brief, Publication No. 7003). Washington, DC: Kaiser Commission on Medicaid and the Uninsured.

Dubois, D., and Prade, H. (1988). *Possibility Theory.* New York, NY: Plenum Press.

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.

Duncombe, W., Lukemeyer, A., and Yinger, J. (2003). Financing an Adequate Education: A Case Study of New York. In W.J. Fowler, Jr. (Ed.), *Developments in School Finance: 2001–02* (NCES 2003–403) (pp. 127–153). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Durkin, J. (1993). *Expert Systems: Catalog of Applications.* Akron, OH: Intelligent Computer Systems Inc.

Fitch Ratings. (2000). Local Government General Obligation Rating Guidelines. *Tax Supported Special Report* (May 23): 1–11.

Gehring, J. (2004, February 25). Bailout Deal Reached for Baltimore Schools. *Education Week, 23,* pp. 1, 18.

Groves, S.M., and Valente, M.G. (2003). *Evaluating Financial Condition: A Handbook for Local Government* (4th ed.) (Revised by K. Nollenberger). Washington DC: ICMA.

Mead, D. (2001). Assessing the Financial Condition of Public School Districts: Some Tools of the Trade. *Selected Papers in School Finance, 2000–01* (NCES 2001–378) (pp. 55–76). Washington, DC: National Center for Education Statistics.

Moody's Investors Service. (1999). The Determinants of Credit Quality. *Municipal Credit Research* (November): 1–16.

New York Office of the State Comptroller. (2002). Financial Condition Analysis. *Local Government Management Guide.* Albany, NY: Author.

New York State Education Department (SED). (2000, September). *Recognizing High Cost Factors in the Financing of Public Education.* Paper prepared for the New York State Board of Regents.

Richard, A., and Hoff, D. (2003, September 24). Schools Trim Fiscal Fat, and Then Some. *Education Week, 23,* pp. 1, 18.

Sack, J., and Johnston, R. (2003, June 11). Veteran Administrator Tapped for Oakland. *Education Week, 22,* 3.

Standard & Poor's. (2000). *Public Finance Criteria.* New York: Standard & Poor's.

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

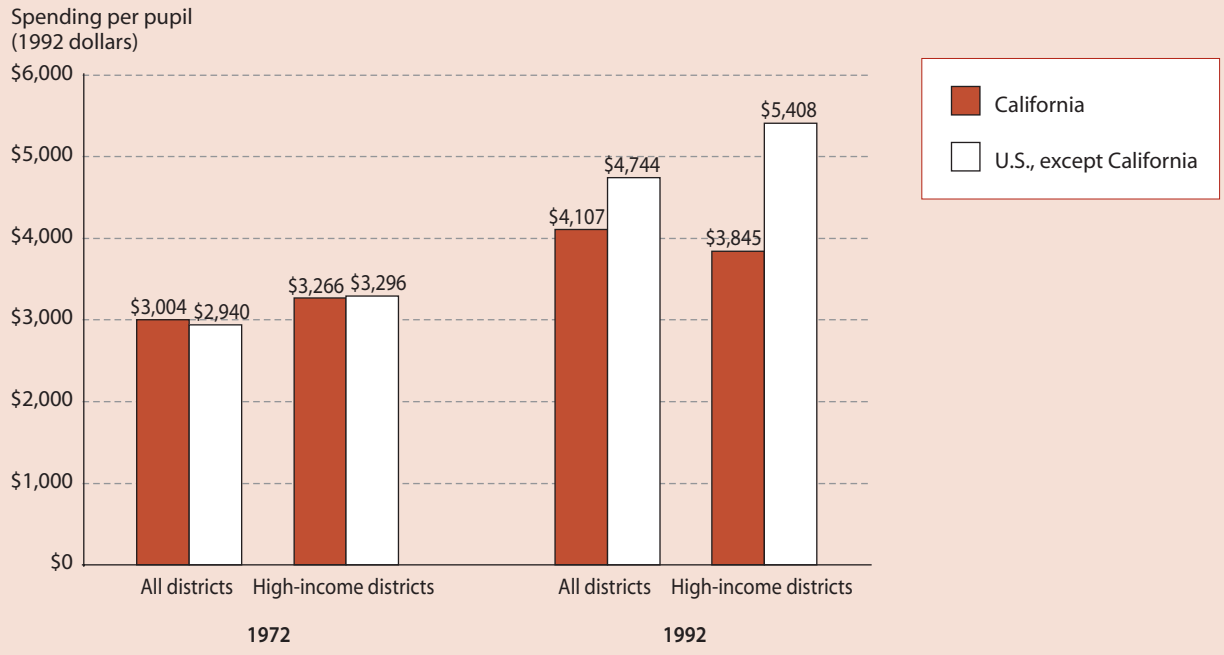
The revenue figures reported in tables 1 and 2 highlight several interesting facts. First, while the $238 million raised by nonprofit organizations to support public schools in California in 2001 represents a considerable sum, it nevertheless amounts to only about $39 per pupil. Second, as table 2 makes 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.

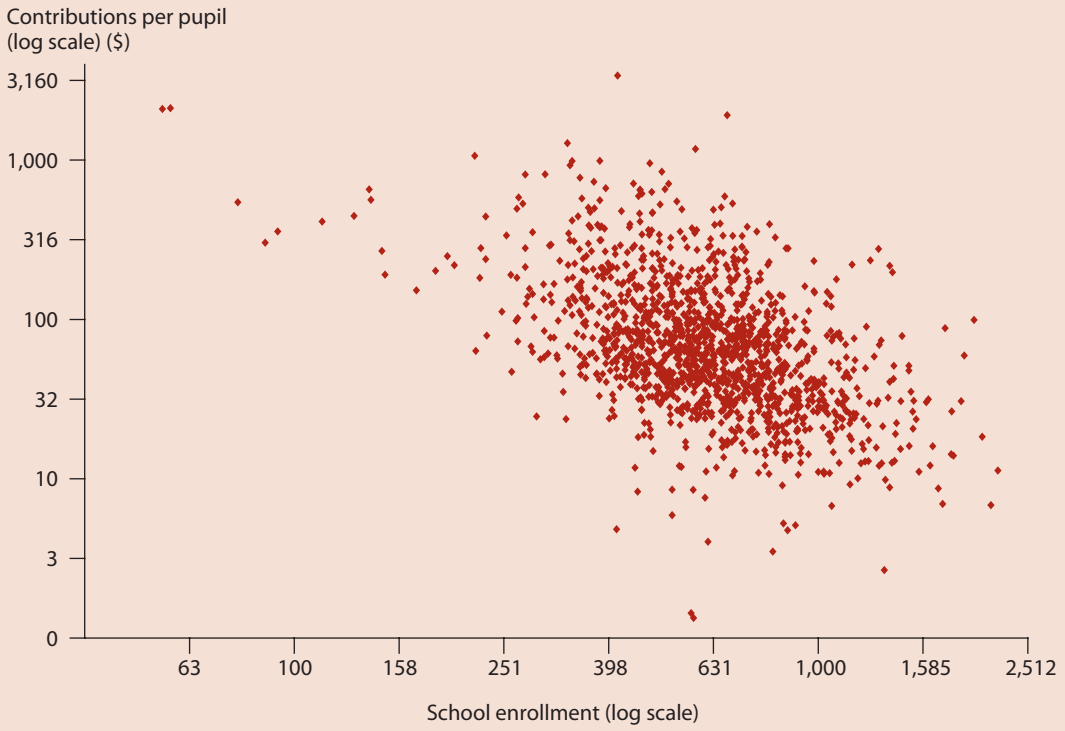
The discussion above suggests that contributions per pupil should be inversely related to school enrollment. Figure 3 provides evidence in favor of that hypothesis. The figure illustrates the relationship between school enrollment in 2001–02 and school-level contributions. As hypothesized, contributions 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

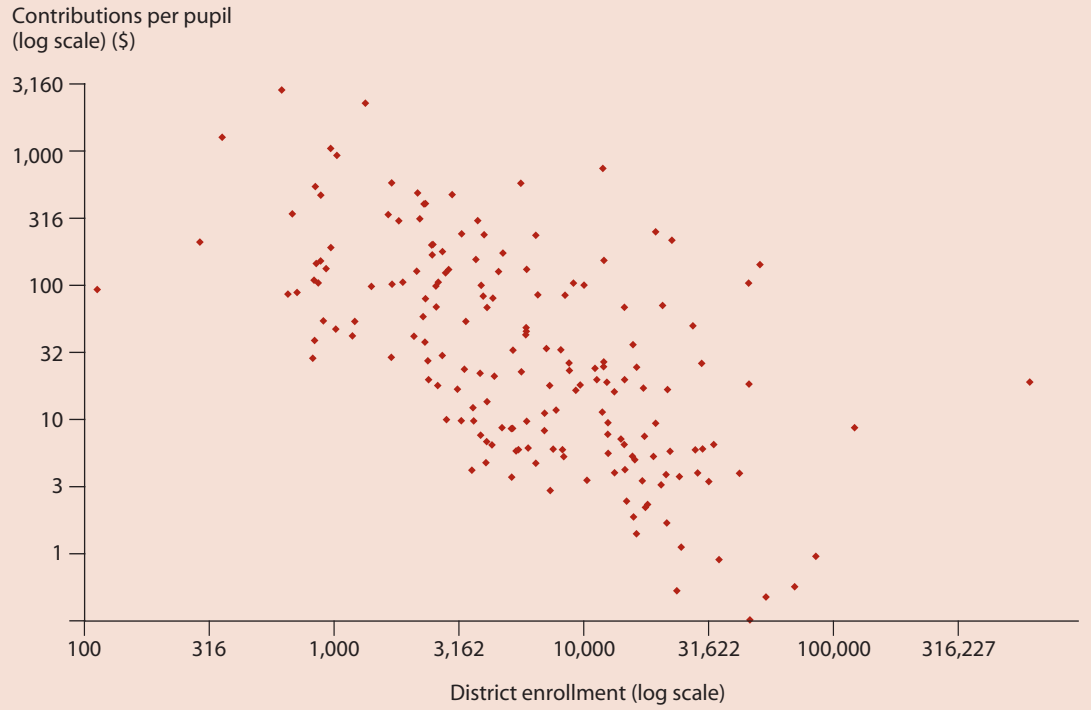


SOURCE: Contributions data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office and the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service; school enrollment from the California Department of Education.

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.

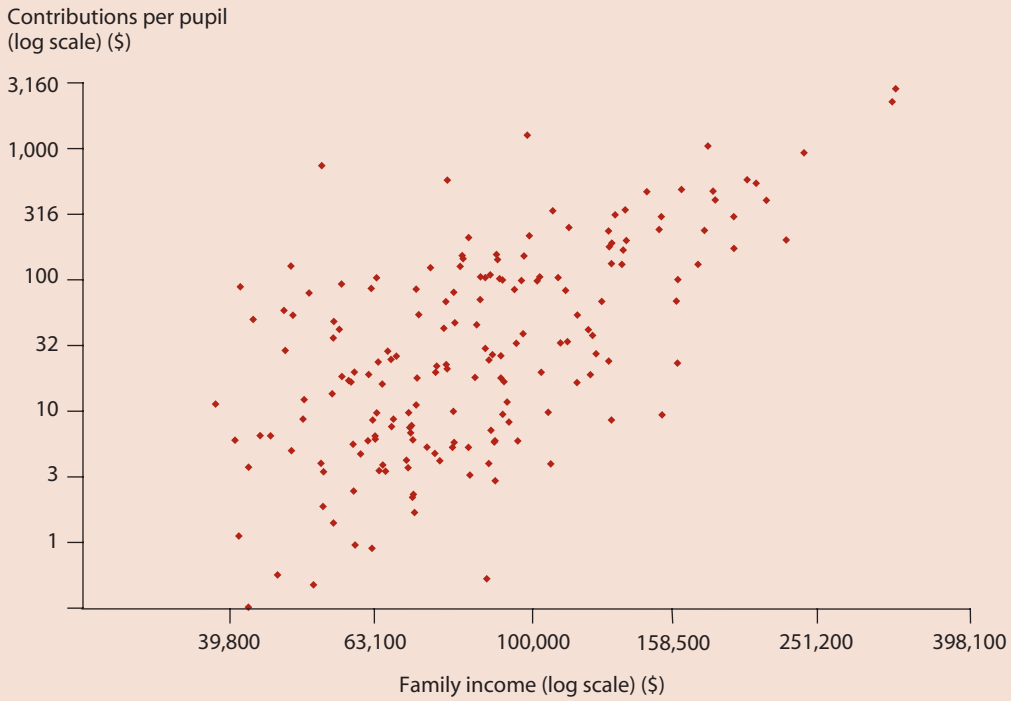
SOURCE: Authors' calculations using data from the "Charities Database" maintained by the Registry of Charitable Trusts of the California Attorney General's Office; the 2001 Master File of Tax-Exempt Organizations, maintained by the Internal Revenue Service; and the California Department of Education.

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.

References

Bergstrom, T.C., and Goodman, R.P. (1973). Private Demands for Public Goods. *American Economic Review, 63*(3): 280–296.

Bergstrom, T.C., Rubinfeld, D.L., and Shapiro, P. (1982). Micro-Based Estimates of Demand Functions for Local School Expenditures. *Econometrica, 50*(5): 1183–1206.

Brunner, E.J., and Sonstelie, J. (1997). Coping With *Serrano*: Private Contributions to California's Public Schools. *Proceedings of the Eighty-Ninth Annual Conference on Taxation,* National Tax Association: 372–381.

Brunner, E.J., and Sonstelie, J. (2003). School Finance Reform and Voluntary Fiscal Federalism. *Journal of Public Economics, 87*(9–10): 2157–2185.

Murray, S.E., Evans, W.N., and Schwab, R.M. (1998). Education Finance Reform and the Distribution of Education Resources. *American Economic Review, 88*(4): 789–812.

Olson, M. (1965). *The Logic of Collective Action: Public Goods and the Theory of Groups.* Cambridge: Harvard University Press.

Rubinfeld, D.L. (1977). Voting in a Local School Election: A Micro Analysis. *Review of Economics and Statistics, 59*(1): 30–42.

Sandler, T. (1992). *Collective Action: Theory and Applications.* Ann Arbor: University of Michigan Press.

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

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I. Introduction and Motivation

For many years the school system in the United States has measured success by the number of dollars spent, computers and textbooks purchased, and programs created. Moreover, the measures of success have not focused on academic achievement. Since 1965, American taxpayers have spent more than $321 billion in federal funds on K–12 public education, yet the average reading scores for 17-year-olds have not improved since the 1970s, according to the U.S. Department of Education.[1] In an era where standards, testing, and accountability are at the forefront of the education community, parents, educators, administrators, legislators, and stakeholders are requiring an objective way of ascertaining the progress of public schools throughout the United States.

There is a rich body of literature studying the relationship between resources spent on education and educational outcomes such as performance on achievement tests, graduation rates, and other assessment indicators. Since there are several hundreds of studies investigating this topic, it is quite impossible to provide an exhaustive review of the literature, and any overview could not be comprehensive. However, a recent book by Armor (2003) provides a fairly representative synopsis of various groups of studies and ongoing discussions, in particular, investigations looking into a "production function" approach, i.e., the relationship between "input" variables, such as spending, and "output" indicators, such as performance on standardized tests. Armor had worked as a graduate student on the classic "Coleman" study (Coleman et. al 1966), which pioneered the identification of the relationship between socioeconomic background and student performance. His main thesis states that these family effects are greater than school grade level achievement, and therefore any influence of spending variables is typically less pronounced.[2]

Another literature review can be found in Monk, Walberg, and Wang (2001). Schweke (2004) provides an additional overview.

[1] U.S. Department of Education (n.d.). *How* No Child Left Behind *Ensures Schools Get Results*. Available at http://www.ed.gov/nclb/accountability/results/getting_results.pdf.

[2] One example of a discussion of the question "Does Money Matter?" is the exchange between Hanushek and Hedges. A thread of several related references can be found in Armor (2003).

While most academic research is obviously focused on identifying relationships between quantitative indicators, the methodology introduced here uses these underlying relationships as background variables but focuses on identifying the relative position of individual entities, such as school districts, to these environmental variables, which is important from a methodology perspective.[3]

Under the No Child Left Behind Act of 2001 (NCLB), states and school districts now have more flexibility in how they use federal education funds. Accordingly, Standard & Poor's School Evaluation Services (SES) introduces the "Return on Spending Index" (RoSI), which provides diagnostic information about the comparative educational return on resources generated by school districts in the United States. Used in combination with the "Error Band" method and the "Risk-Adjusted Performance Index" (described in two earlier SES reports, Gazzerro and Hampel [2004] and Hampel [2005], respectively), RoSI helps to identify school districts that achieve better educational performance for a given level of spending, while taking into consideration the proportional enrollment of economically disadvantaged students.

The "Return on Spending Index" (RoSI) provides diagnostic information about the comparative educational return on resources generated by school districts in the United States.

While the NCLB establishes the goal of educational proficiency in reading, math, and science, such proficiency is usually measured by cutoff scores that are used in a binary fashion, measuring a student's performance either above or below the standard. To rely upon standardized test scores to identify best practices in the classroom, more comprehensive measures of academic achievement are desirable.

"Gain scores" are measures of the progress that students make between the beginning and end of a school year. They are measures of the "return" on education resources and the public's investment in education. One way of analyzing gain scores is to use a costly system of annual value-added assessments that employ complex statistical models. The system also might require the use of unique student identifiers, so that the gains of student groups can be tracked over time. So far, cost, complexity, and in some cases, even mistrust, have kept most states from implementing value-added assessment systems.

Getting more out of test data

To assist states and districts that do not currently have value-added assessment systems but wish to get more out of their existing test data, SES offers a technique known as the "Error Band" analysis (Gazzerro and Hampel 2004). It determines whether a school is performing above or below the achievement range (the Error Band) typically associated with a concentration of disadvantaged and at-risk students.[4] Schools that consistently perform above this range may shed light on best practices that could be benchmarked and replicated by lower performing schools. This might be thought of as a bridge between traditional standardized testing and value-added assessment, with the benefit of meeting three elusive educational goals:

1. Accountability for school performance that takes into account different challenge levels for the purpose of measuring "Risk-Adjusted Performance" (Hampel 2005);
2. Diagnostic information that can be used to manage instruction; and
3. A potential source of best practices that work in practice, not just theory.

While this is a worthwhile approach in its own right and provides interesting and actionable insights, the "input" variable—poverty—cannot be controlled directly by

[3] An early study, which takes a somewhat similar approach, attempting to identify effective schools based on the analysis of residuals, can be found in Klitgaard and Hall (1973).

[4] The Error Band methodology performs a regression analysis and determines an index which is based on the distribution of schools' distances in performance from the regression line; these distances are commonly referred to as residuals. To make this approach more intuitively understandable for a lay audience, the performance Error Band is also referred to as "performance zone" in documents addressed to the general public.

education decisionmakers. It is therefore desirable to be able to analyze parameters that can actually be influenced, such as spending. Additionally, an important question to ask is what "return" in educational performance does a certain level of spending achieve?

Defining a return on spending index

Standard & Poor's methodology to analyze the return on educational spending will therefore be introduced in the following steps:

- Choosing an appropriate performance indicator.
- Selecting the appropriate corresponding spending variable.
- Defining a "Return on Spending Index" (RoSI). This indicator will provide a general productivity measure as a proxy for average educational return, given a certain spending level.
- Performing comparative "return" analysis. This entails transferring the principles of the Error Band and Risk-Adjusted Performance methodology to analyze the RoSI in relationship to relative poverty. Combining the RoSI and the Risk-Adjusted Performance data in one framework provides a powerful approach to study both simultaneously.[5]

II. Choosing an Appropriate Performance Indicator

An Error Band analysis can be performed for a single return indicator, such as the results of a standardized test, or for a combination of test results and other measures, such as graduation rate and retention rate.

An Error Band analysis can be performed for a single return indicator or for a combination of test results and other measures.

Figure 1 provides an example of a scatter plot showing the New York grade 8 Mathematics Test Proficiency Rate versus enrollment of economically disadvantaged students for 2002 at the district level. While passing and proficiency rates can be calculated at the school level as well, the often limited availability of financial data at the school level makes it necessary to perform the analysis at the district level.

In the *Resource Adequacy Study for the New York State Commission on Education Reform* (2004), Standard & Poor's introduced the "Multiple Performance Measures" (MPM) Index, which combines the weighted results of 13 state tests, averaged over 3 years (in this case, from 2001 to 2003), plus a corresponding graduation rate and retention rate indicator.[6] The corresponding Error Band plot is shown in figure 2.

While the poverty distribution in both plots is obviously identical, the slope of the regression line is much flatter for the MPM Index, and the width of the band is considerably smaller. This is due to the fact that the MPM Index is calculated as a comprehensive average of different performance indicators as well as over time, which reduces the statistical fluctuations. In addition, the aggregation of different tests and performance measures, which are not necessarily correlated and partly have a higher average, results in an increase of the average MPM Index value compared to the grade 8 mathematics test results.

Since financial information is usually only available at the district level and at a considerable degree of aggregation, an indicator such as the MPM Index is therefore more suitable for a productivity analysis than test results at a grade level, particularly when financial data for 1 year are used.[7] For this report, data come from the 2001–02 fiscal year.

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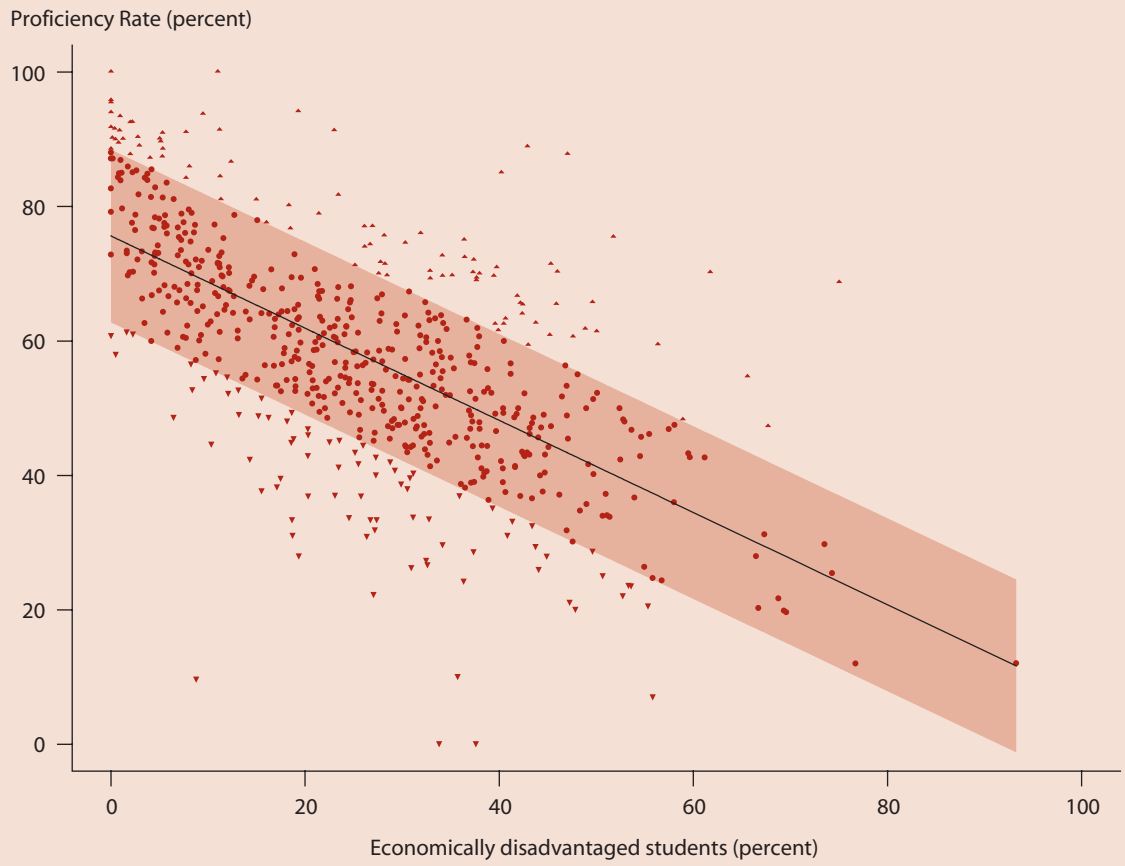
[5] In general, the principles of the Error Band and the Risk-Adjusted Return methodology can be applied to a wide range of statistical relationships, as long as some general underlying conditions regarding the data structure, such as conformity with assumptions typically made for regression analysis, are met. For additional information, see footnote 13.

[6] The report *Resource Adequacy Study for the New York State Commission on Education Reform* (2004), which provides further details, such as the exact definition of the MPM index, can be obtained at http://www.SchoolMatters.com. At the time of the publication of the study in March 2004, the latest financial data available were from the 2001–02 fiscal year, which are used in this paper.

[7] An aggregate performance indicator such as the MPM Index can be defined in any state using an analogous approach of combining available educational achievement measures.

Figure 1. Scatter plot of New York grade 8 mathematics test Proficiency Rate versus enrollment of economically disadvantaged students for 2002 (using available data for 635 school districts)



NOTE: The scatter plot includes a linear regression line and an "Error Band" that permits the identification of school districts that lie above, within, or below the band, indicated by upward facing triangles (▲), circles (●), and downward facing triangles (▼), respectively. The Proficiency Rate includes the percentage of students scoring at the proficient level or above.

SOURCE: Author's calculations from New York State data.

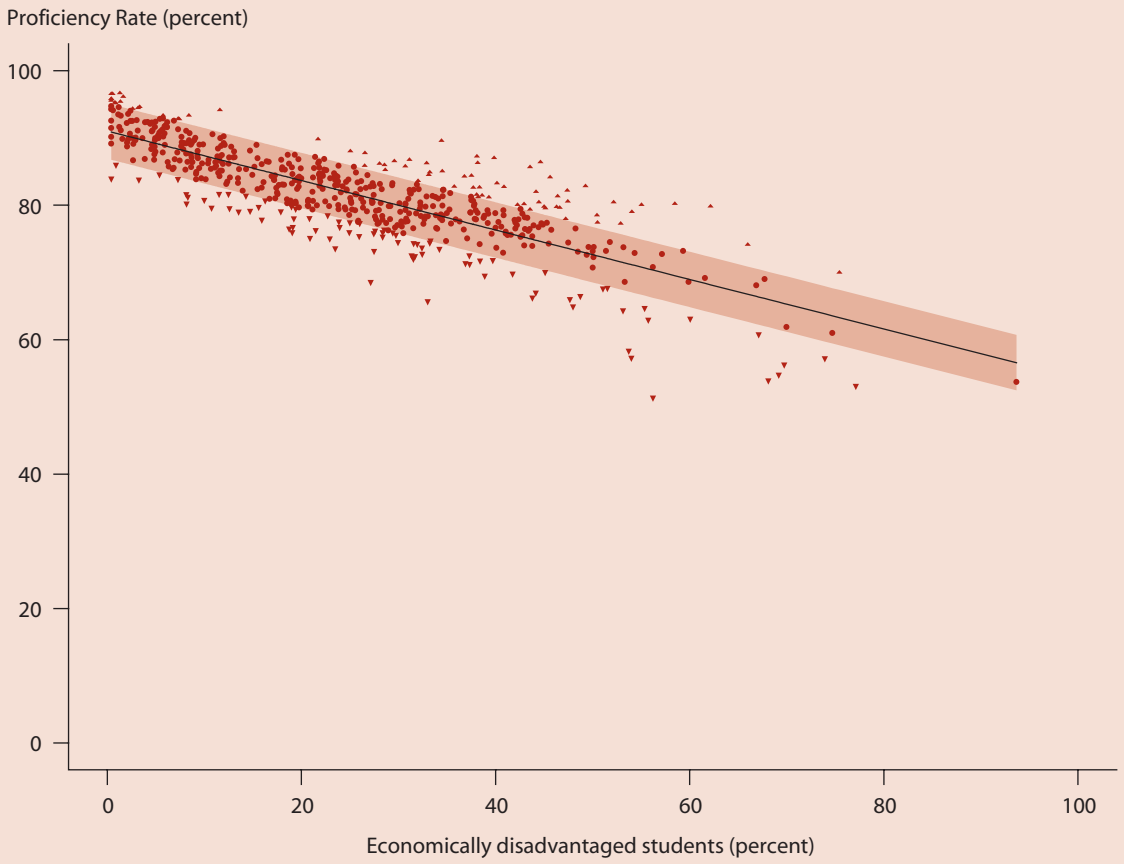
III. Selecting the Appropriate Corresponding Spending Variable

In order to combine the achievement indicator with a spending measure, an appropriate spending variable needs to be determined. Operating expenditures are suitable, since they exclude capital expenditures, which can vary widely from year to year and distort the influence of spending on day-to-day activities. For a similar reason, transportation expenses are excluded as well, as they depend to a large degree on the physical characteristics of each school district.

Another important aspect of the spending indicator is its scope. A "core" spending amount per student, which is defined as the total operating spending for the district divided by the number of enrolled students, provides a reasonable proxy for per student spending, since it includes the additional spending amounts assigned to students with limited English proficiency, students with disabilities, and economically disadvantaged students. Defining the spending variable in this way is particularly meaningful, since the subsequent RoSI Error Band analysis introduced below will explicitly take the proportional enrollment of economically disadvantaged students into account.

To control for in-state, regional differences in the purchasing power of the dollar, a geographic cost adjustment needs to be performed that expresses the spending amount in

Figure 2. Scatter plot of the Multiple Performance Measures Index (MPM) for New York State (using available data for 581 school districts), expressed as a Proficiency Rate



NOTE: As in figure 1, the scatter plot includes a linear regression line and an "Error Band" that permits the identification of school districts that lie above, within, or below the band, indicated by upward facing triangles (▲), circles (●), and downward facing triangles (▼), respectively. The Proficiency Rate includes the percentage of students scoring at the proficient level or above. For comparability purposes, the scale has been kept the same as the scale in figure 1.

SOURCE: Author's calculations from New York State data.

"standardized dollars," which are comparable across different districts. Standardized dollar amounts have a very well defined meaning that allows for a relative comparison of spending. However, since the scale of any cost adjustment is usually defined by normalizing spending to a particular geographic region, it should be recognized that within this context the absolute dollar amount is of limited use.[8]

For the purposes of this methodology paper, the standardized 2002 New York core expenditures per student were used, geographically cost adjusted by the New York Regional Cost Index.[9]

IV. Defining a "Return on Spending Index"

Standard & Poor's introduced the Performance Cost Index®(PCI) as a measure that allows for the comparison of spending and outcome measures in tandem. It was defined by the ratio of spending divided by a performance

[8] Further details about the aspects mentioned in this section can be found in *Resource Adequacy Study* (2004).

[9] The 2002 financial data were the latest data publicly available at the time of the publication of the New York Resource Adequacy Study. Since 2002 denotes the year in the middle of the 3-year period for the definition of the MPM Index, it can be seen as a reasonable spending proxy. To retain the properties of the spending data relative to other districts, no spending projections or inflation adjustments were made.

indicator, yielding the average amount of money spent per unit of achievement measured.[10]

The structure of such a measure with respect to the enrollment of economically disadvantaged students is usually dominated by the performance variable, which is typically much stronger than the relationship with the spending distribution. It is therefore suggested to invert the PCI to create a RoSI, which is defined as a performance indicator divided by a spending variable and can be interpreted as a productivity indicator.[11]

The additional benefit of the RoSI methodology lies in its more intuitive meaning as a measure of productivity. Larger values are often viewed more favorably than smaller values, as they indicate either higher performance, lower spending, or both; it is important to note that there may be exceptions where larger values should not be seen as better, depending on the underlying component values and local circumstances.[12]

V. Performing Comparative "Return" Analysis

The RoSI enables the use of an Error Band approach because when it is plotted against poverty it has a similar structure to the performance measure itself. Again, this behavior stems mainly from the trend of decreasing performance with increasing poverty, rather than the influence of spending. This means that one can identify statistically significant outperformers and underperformers in the RoSI, which combined with additional criteria such as a minimum performance level, signifies whether an entity is using resources efficiently.[13]

The RoSI enables the use of an Error Band approach because when it is plotted against poverty it has a similar structure to the performance measure itself.

Figure 3 shows the overlay of the performance Error Band of figure 2 with a RoSI Error Band in relationship to the enrollment of economically disadvantaged students. The right-hand scale for the RoSI variable has been adjusted such that the two regression lines lie on top of each other.[14] In order to make the plot easier to read, only districts that lie simultaneously above or below both Error Bands are shown; in addition, the Proficiency Rate range shown in the plot has been adjusted. To make the identification of corresponding data points easier, figure 3 shows a connection of the two data points for each district by a vertical line.

As one can see clearly, the Error Band for the RoSI is broader than the Error Band for the MPM Index itself. This is mainly due to the fact that the RoSI was calculated using the MPM Index as one input, increasing the statistical fluctuation in the RoSI value. It will therefore generally be the case that the RoSI Error Band is broader than the performance measure Error Band.

One possible follow-up analysis consists of looking at the Proficiency Rate value and the RoSI value for each district separately.

[10] Before the introduction of the NCLB testing requirements, an additional adjustment for test participation was usually included. Further details about the PCI can be found at http://www.SchoolMatters.com.

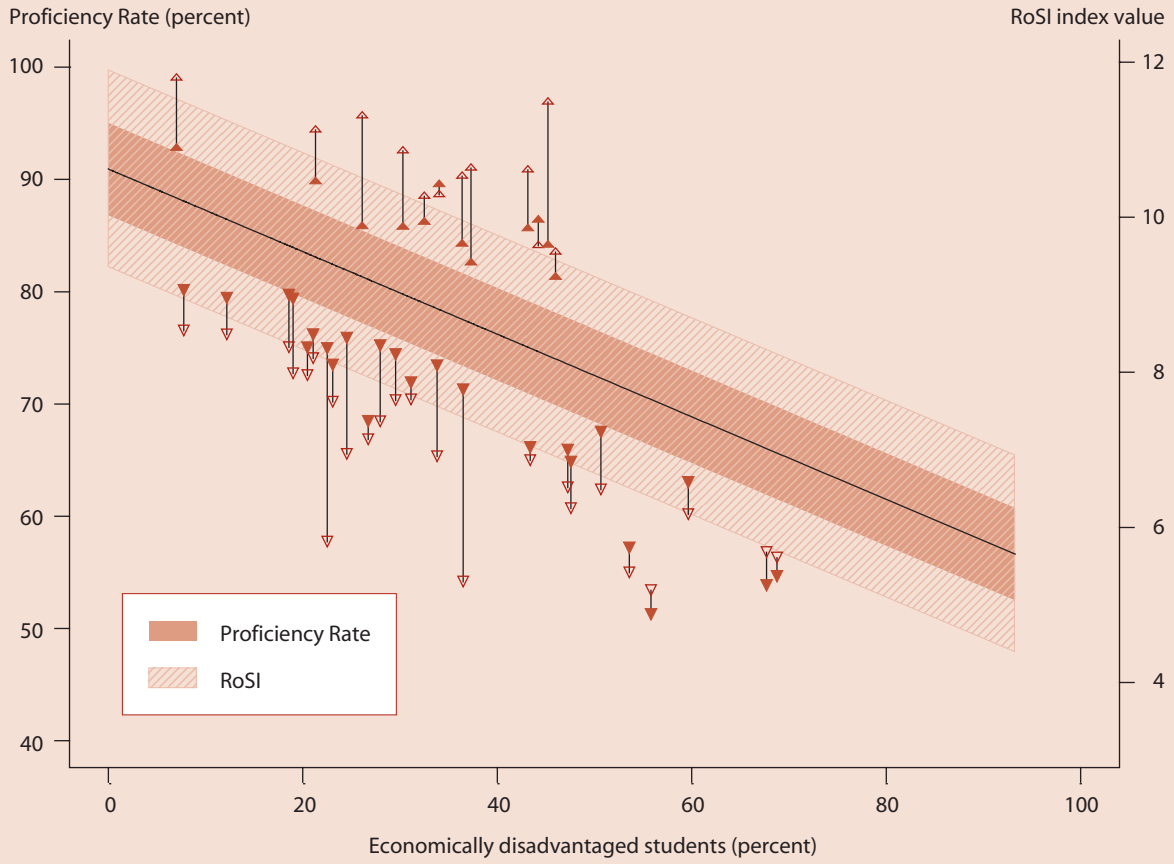
[11] In principle, any performance measure and any spending variable could be used to define a RoSI mathematically. However, a RoSI definition based on indicators with meaningful properties relating to the productivity relationship one is trying to measure is clearly preferable.

[12] Both the PCI and the RoSI are average indicators, not marginal. In the case of the PCI, it measures the average cost of a unit of student performance achieved, while the RoSI measures the average achievement level per unit of spending. It would generally be a mistake to assume that the return on spending or cost of student performance is always constant; in fact, one might expect diminishing returns at certain spending and performance levels. This is an important conceptual distinction, but not of any consequence for the analysis presented here since both spending and performance measures are defined as averages.

[13] As in the analysis of performance measures, the RoSI Error Band analysis needs to ensure that the criteria necessary for a regression analysis are sufficiently met. The goal of identifying outperformers and underperformers also requires the analysis of the data substructure such as by a localized and robust fit. This ensures that no nonlinearities in the relationships distort the results.

[14] This two-scale approach is always possible, as long as the signs of the slope of the regression lines are the same. Strictly, a RoSI has a unit of [%/$] if a passing or proficiency rate is used, but since the RoSI can be interpreted as an index, the unit-free representation is chosen, expressed as per $1,000 of spending. This also corresponds to the fact that the absolute scale of the index value is somewhat arbitrary due to the geographic cost adjustment of the spending indicator. This property (and the fact that each state generally uses its own performance indicator) usually prevents a direct comparison of RoSI values for different states.

Figure 3. Extended plot of scatter plot in figure 2, with the addition of a RoSI Error Band using the scale at the right-hand side of the plot, rescaled such that the linear regression lines overlap



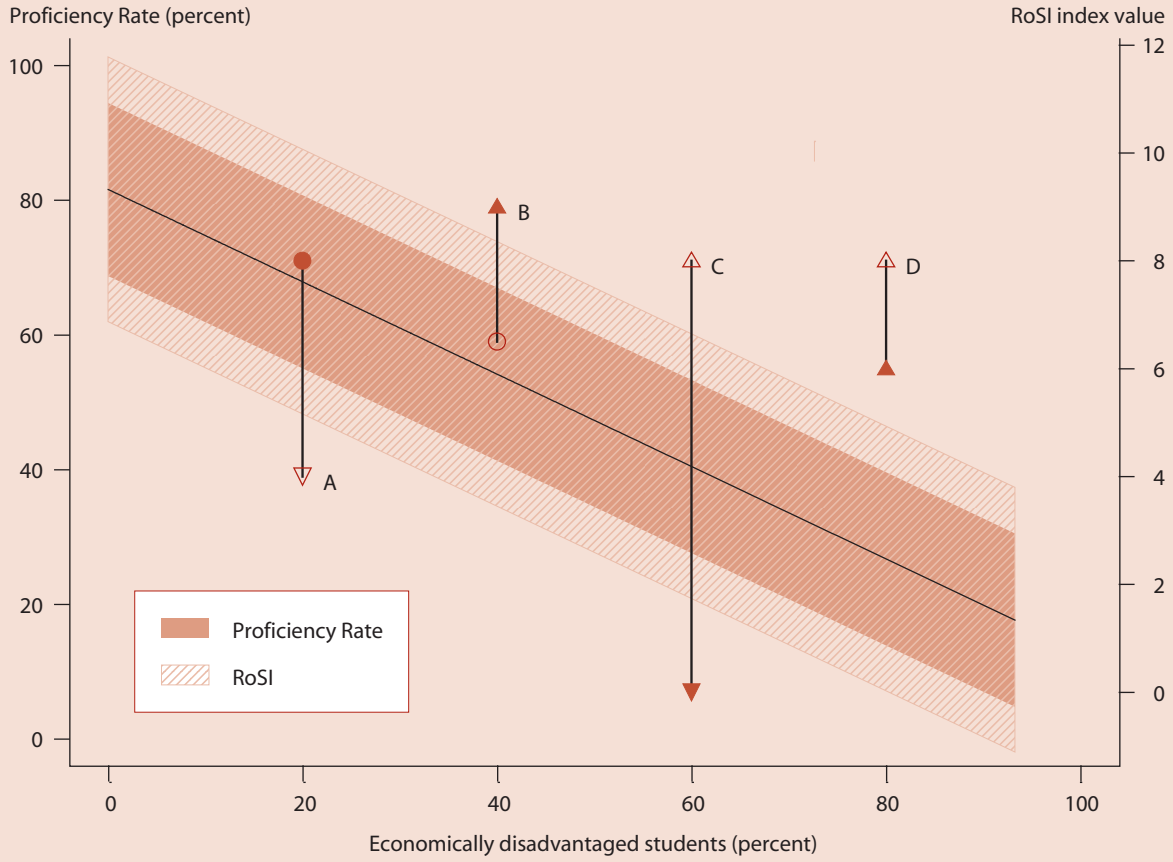
NOTE: Only districts that lie simultaneously above or below both Error Bands are shown; in addition, the Proficiency Rate axis scale has been adjusted. Proficiency Rates above and below the Proficiency Rate band are indicated by upward facing triangles (▲) and downward facing triangles (▼), respectively. RoSI values of districts that lie above or below the RoSI band are indicated by open upward facing triangles (△) and downward facing triangles (▽), respectively. In addition, Proficiency Rate and RoSI data points of each district are connected by a vertical line.

SOURCE: Author's calculations from New York State data.

The data presentation in figure 3 combines a wealth of information into a single plot. To illustrate this relationship more explicitly, a hypothetical example is drawn in figure 4, with four potential combinations of data point pairs A through D.[15] Pair A denotes an entity with performance within the performance Error Band, but a RoSI value that lies below the RoSI Error Band. This could be interpreted as demonstrating performance within statistical expectation accompanied by educational returns on spending below the statistical expectation, i.e., a spending level that is relatively high given the associated performance level and the proportional enrollment of economically disadvantaged students. Correspondingly, pair B shows a proficiency outperformer with a RoSI value within the RoSI Error Band, which could be interpreted as a spending level within statistical expectation. Pair C combines a proficiency underperformer with a RoSI value above the RoSI Error Band, i.e., a spending level significantly below expectation. Finally, pair D shows a proficiency outperformer combined with a RoSI value above the RoSI Error Band. This entity demonstrates arguably the most desirable behavior, which consists of proficiency above the statistical

[15] Since a data point for each Error Band can lie above, within, and below the respective band, a total of nine combinations for each data point pair are possible for the analysis of two simultaneous Error Bands.

Figure 4. Hypothetical example of data point pairs relative to the Risk-Adjusted Performance Error Band and RoSI Error Band



NOTE: Proficiency Rates above, within, and below the Proficiency Rate band are indicated by upward facing triangles (▲), circles (●), and downward facing triangles (▼), respectively. RoSI values of districts that lie above, within, or below the RoSI band are indicated by open upward facing triangles (△), circles (○), and downward facing triangles (▽), respectively. In addition, Proficiency Rate and RoSI data points of each district are connected by a vertical line.

SOURCE: Figure by author.

expectation, while at the same time obtaining this proficiency level with a high level of productivity (i.e., relatively low spending for the given level of performance).

A particular RoSI value could be due to a relatively high performance level and correspondingly high spending level or, conversely, relatively lower performance and lower spending. Therefore, analyzing the RoSI value in connection with the actual performance indicator provides insight into whether a large RoSI value is due to higher performance or just lower spending.

One particularly valuable output of this method is that the RoSI Error Band permits the production of a measure of "Risk-Adjusted Return," i.e., a "Risk-Adjusted Productivity" similar to the Risk-Adjusted Performance Index value for the performance indicator. This way, one can quantify how far away the RoSI value lies from the regression line, given the relative enrollment of economically disadvantaged students.

Since the MPM index is defined as a 3-year average, fluctuations are already smoothed out considerably, which inherently increases the robustness and usefulness of the RoSI analysis. In addition, Error Band analyses could be performed for a sequence of years with a correspondingly adjusted MPM Index definition and spending adjustments, which would allow for the study of the develop-

ment of the productivity of each district over time similar to a multiyear analysis of the performance Error Band.

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.[16]

In addition to presenting the graphical representation, which is instructive in its own right, Standard & Poor's is currently considering integrating this type of analysis as part of its analytical website offering, and adding tools to allow the identification of districts by Risk-Adjusted Performance and Risk-Adjusted Productivity criteria. Further information can be found at http://www.SchoolMatters.com.

Other directions of potential future research include the extension of this approach to school buildings, if financial information at the school building level becomes available. One likely difficulty at the school level would be the probable increase in data uncertainties and fluctuations due to reporting issues and varying interpretations of accounting standards and reporting requirements between schools.

Furthermore, the productivity approach discussed here could be analyzed in more detail by including additional indicators on the spending as well as the performance side, and by also taking demographic environment variables into account. Some of these enhancements might be performed based on the Error Band analysis framework, allowing for a rich view of educational data.

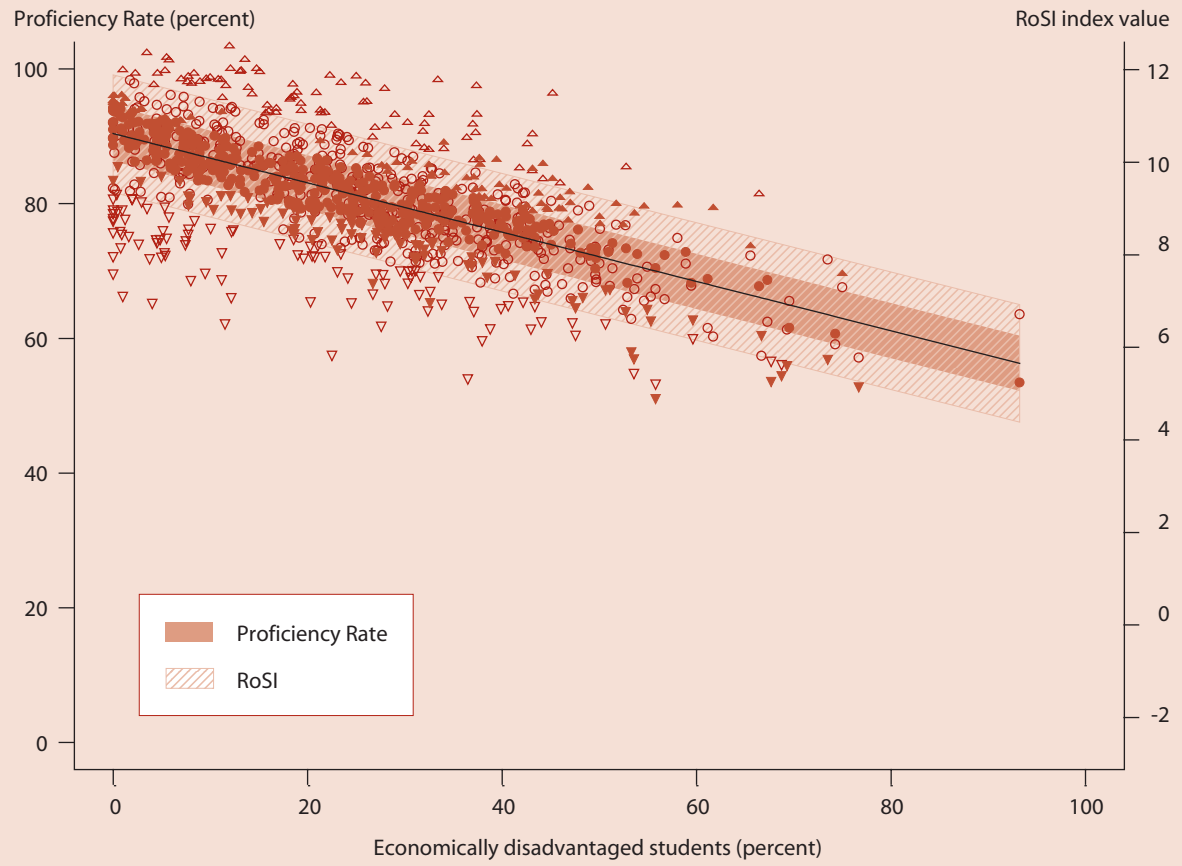
VI. Appendix

This appendix shows two plots containing the full set of data points utilized for the Proficiency Rate and RoSI Error Band analysis. Figure 5 contains essentially the same two Error Bands as figure 3 without the connecting lines between data points. All data points are shown, and the Proficiency Rate scale has been kept the same as in figure 2 to allow for a direct comparison.

Figure 6 shows the same information as figure 5, with corresponding data points connected by vertical lines. Although this plot contains information similar to figure 3, it shows all data points, not only those where both the Proficiency Rate and the RoSI values lie simultaneously above or below the corresponding bands. This way, a direct comparison to figure 2 is possible, and the dramatic effect of the range of possible combinations of Proficiency Rates and RoSI values is illustrated.

[16] One possible extension of this approach could be a true multivariate analysis of either the Proficiency Rate and/or the RoSI as a function of a set of other learning environmental or demographic variables that have been shown to be correlated with student performance. Such an analysis would obviously be more challenging to present graphically, and the relatively small number of available sample data points would likely make the meaningful identification of outperformers in each dimension more difficult, particularly since the analysis is focusing on the distribution of residuals rather than only the accuracy of the regression itself. The current approach takes additional characteristics into account when benchmarking studies are conducted to match underperformers and outperformers, requiring that the entities under consideration are matched with respect to additional variables, thus avoiding the density dilution effect of multidimensionality.

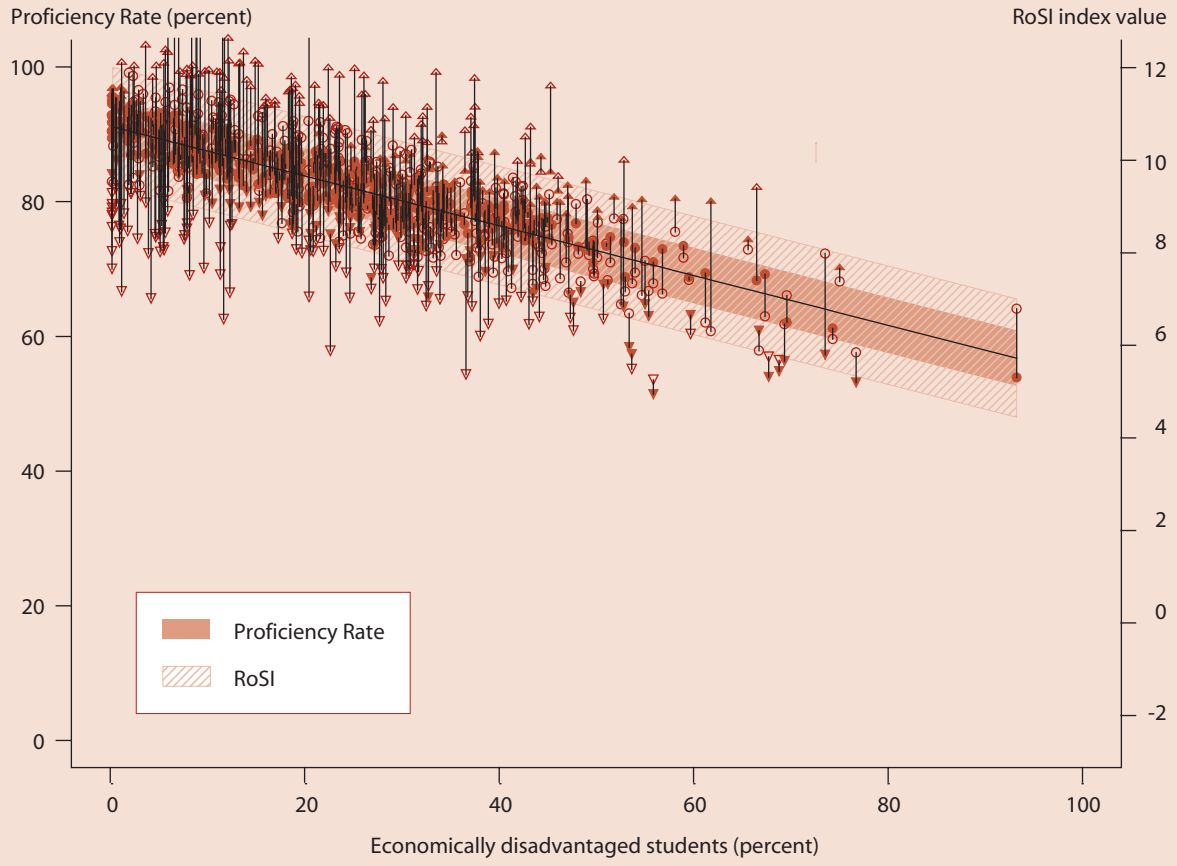
Figure 5. The same plot as in figure 2, with the addition of a RoSI Error Band using the scale at the right-hand side of the plot, rescaled such that the linear regression lines overlap



NOTE: Proficiency Rates above, within, and below the Proficiency Rate band are indicated by upward facing triangles (▲), circles (●), and downward facing triangles (▼), respectively. RoSI values of districts that lie above, within, or below the band are indicated by open upward facing triangles (△), circles (○), and downward facing triangles (▽), respectively. The Proficiency Rate axis scale has been kept the same to allow for direct comparisons with figure 2.

SOURCE: Author's calculations from New York State data.

Figure 6. The same plot as in figure 5, with the addition of performance and RoSI data points of each district connected by a vertical line



SOURCE: Author's calculations from New York State data.

VII. References

Armor, D.J. (2003). *Maximizing Intelligence.* New Brunswick, NJ: Transaction.

Coleman, J., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weinfeld, F., and York, R. (1966). *Equality of Educational Opportunity*. Washington, DC: U.S. Government Printing Office. (ERIC ED012275)

Gazzerro, P., and Hampel, M. (2004, May). *Identifying Outperforming and Underperforming Schools: Introducing the SES "Error Band" Method* (SES Research Methods Paper No. 1). New York: Standard & Poor's. Available at http://www.SchoolMatters.com.

Hampel, M. (2005, March). *Introducing the SES Risk-Adjusted Performance Index* (SES Research Methods Paper No. 2). New York: Standard & Poor's. Available at http://www.SchoolMatters.com.

Klitgaard, R.E., and Hall, G.R. (1973). *A Statistical Search for Unusually Effective Schools* (RAND R-1210-CC/RC). Santa Monica, CA: RAND.

Monk, D.H., Walberg, H.J., and Wang, M.C. (2001). *Improving Educational Productivity.* Research in Educational Productivity. Greenwich, CT: Information Age.

Schweke, W. (2004). *Smart Money: Education and Economic Development.* Washington, DC: Economic Policy Institute.

Resource Adequacy Study for the New York State Commission on Education Reform (2004, March). New York: Standard & Poor's. Available at http://www.SchoolMatters.com.

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

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Acknowledgments

We thank Jerry Wartgow, Superintendent of the Denver Public Schools, and his staff for their help in gaining access to that district's budget detail. We also thank Paul Hill, Dan Goldhaber, and Leslie Breitner of the Daniel J. Evans School of Public Affairs, University of Washington, for their helpful comments on earlier drafts.

Introduction

According to figures reported by the Cross City Campaign for Urban School Reform (2001), school-level budgets in 10 North American urban school districts consume from 38 to 95 percent of total district appropriations (see table 1).[1] With such enormous variation, one is left wondering whether the differences reflect drastically different spending patterns or simply reflect different accounting methods. In either case, the data fuel the mounting concerns about how to report costs among our nation's schools (Educational Testing Services 2004). Centrally reported costs can represent a significant portion of a district budget, but we have relatively little sense of how these dollars are distributed among or benefit different schools.

Schools receive many shared district resources, which can be important drivers of variation in school spending. Shared resources are the people, equipment, grants, and services housed or supervised by the central office that directly service and benefit schools in their efforts to educate students. Shared resources are reported centrally despite the fact that much of these resources are deployed outside the central office and inside schools. For example, services for non-English-speaking students are often delivered by a team of centrally managed specialists, despite the fact that students receive these services within their own building. Gifted and talented

[1] All but one, the Edmonton, Alberta, district, are U.S. school districts.

NOTE: Earlier versions of this paper were presented at the 2004 American Education Finance Association conference in Salt Lake City, UT, and at the 2004 National Center for Education Statistics summer data conference in Washington, DC.

Table 1. Reported school-level spending varies significantly: By district, 2001–02

School district	Total district appropriations	Percent of district budget reported at school level
Denver, CO	$ 910,555,851	38
Baltimore, MD	881,167,245	46
Chicago, IL	4,400,000,000	52
Oakland, CA	600,000,000	53
Seattle,WA	610,100,000	56
New York, NY	14,900,000,000	63
Philadelphia, PA	1,900,000,000	77
Edmonton, AB	545,000,000	80
Los Angeles, CA	9,800,000,000	99
Milwaukee, WI	1,000,000,000	95

SOURCE: Adapted by authors from data from the Cross City Campaign for Urban School Reform, Annual Decentralization Progress Comparison Across Ten Cities, 2001–02 school year. Appropriations for Baltimore, MD, were for 1999–2000.

programs, many of which include specialists that teach pullout programs within schools, are often controlled centrally. Other central services deployed outside the school building also benefit schools and students. For instance, many districts have centrally run professional development programs aimed at building teaching skills at low-performing schools. Because shared resources are centrally reported, rather than accounted for at the school level, it is difficult to compare spending on shared resources from school to school.

There are at least four reasons why lack of clarity around how shared district resources are distributed among schools is problematic. First, fully accounting for spending by school is critical for accountability reforms. Unmeasured and unreported variations in school resources call into question whether all schools are provided equal resources to meet accountability requirements. Second, the courts have not tolerated between-district inequity and, given that recent studies show significant variation in spending between schools, districts should be similarly concerned about legal remedies in within-district inequity cases (Iatarola and Stiefel 2003; Rubenstein, Schwartz, and Stiefel 2004). Third, district managers and board members currently rely on insufficient school-level accounting data to inform resource allocation decisions. Incomplete school-level funding data increase the probability of misalignment between spending decisions and district strategy. Fourth, the findings of resource effectiveness studies rely on data that, in some districts, capture as few as one-third of the dollars actually spent in the school. New studies that utilize data that more fully account for school-level spending may find a stronger relationship between resources and student outcomes.

To improve our understanding of school spending, a model to fully account for shared resources at the school level is developed here. The model both accounts for resources by schools and classifies resources according to type of students served. The model repairs outdated budgeting and accounting practices, bringing them into alignment with new policies where schools, not districts, are the focus.

Background

Two ways of measuring resources at the school level are currently utilized: a resource-based approach and an accounting approach. The resource-based approach classifies district funds according to the nonmonetary resources purchased (e.g., teacher characteristics, teacher-pupil ratios) and can facilitate answering questions about the effectiveness of different combinations of resources, including teacher qualifications, length of the instructional day, and class size (Chambers 1999). The accounting approach records resources in terms of their cost in dollars. Several researchers have used the accounting approach to compare spending across schools, examining different portions of district spending (Iatarola and Stiefel 2003; Roza and Hill 2004; Rubenstein, Schwartz, and Stiefel 2004). The accounting approach lends itself well to addressing questions involving comparisons of total resources across schools, because it provides a single metric (dollars per pupil) by which to compare all resources.

Districts use the accounting approach to meet the financial reporting requirements of regulators, private creditors, and other external stakeholders (Chambers 1999; Fowler 2001; Hartman, Bolton, and Monk 2001). Such external pressure has resulted in widely available district-level financial information, but there has been little pressure to report much of this spending at the school level. As a result, we often know how much is spent districtwide on instructor salaries and textbooks, but fail to know how these resources are distributed among schools. Efforts to address weaknesses in school-level data have resulted in some improvements; for example, 20 states now require school budgets that enable some degree of school-level comparisons (Fowler 2001). However, school budgets do not include many centrally reported resources that appear instead in consolidated central department budgets, making it unknown which schools ultimately benefit from them.

We often know how much is spent districtwide on instructor salaries and textbooks, but fail to know how these resources are distributed among schools.

One plausible explanation for why school budgets, including shared resources, do not reflect the full cost of educating students is the lack of consensus on the primary objective of school-level information. Researchers have proposed several different school budget models, each with a different objective in mind. For example, school budgets that reflect educational strategies report information in a format that facilitates the comparison of school reform models, instructional strategies, and resource deployment (Odden et al. 2003). Another model uses the locus of control to define costs allocated at the school level, including only those resources over which the school has budgetary authority (Odden and Busch 1998). As a result, a school's budget includes teacher salaries only if the school is given recruiting and staffing authority. While these approaches accomplish their stated objectives, neither seeks to fully account for school-level spending.

Other models suggest a trend toward accounting for more spending at the school level. One model, developed by Coopers & Lybrand, accounts for a greater share of district resources at the school level by allocating costs based on the face-to-face principle. With this model, only the cost of personnel who physically work within schools is reported at the school level, while administration and operations costs associated with central services remain centrally reported (Coopers & Lybrand LLP 1994). While this strategy enables us to report a greater portion of shared resources at the school level than is typically reported, it excludes indirect costs and effectively underprices the marginal cost of shared resources delivered at the school site.[2] As a result, when school-based resources are compared to shared district resources, shared resources appear more cost effective than they actually are and some within-district variation is lost.

The Core Finance Task Force of the National Forum on Education Statistics calls for districts to allocate *all* spending to schools, including district administrative and school board costs. The rationale states that "the provision of educational services through operation of schools is the only product of a school district [and] the allocation of these costs is necessary to full costing of the schools and their programs" (National Forum on Education Statistics 2003). No cost allocation model has yet been developed to execute the recommendation.

In sum, although different accounting models have been proposed to allocate more resources to school budgets, none of them are designed to fully capture shared resources in a way that allows for comparing spending differences between schools. The next section proposes a model by which typical school budget data are supplemented with spending data on shared district resources in order to gain a more complete picture of district spending on each school.

Shared District Resources Cost Model

New methods for accounting for district resources inevitably involve numerous decisions about how and where to record resources. The model proposed here has been

[2] The indirect portion of centrally reported costs can be significant; for example, Denver Public Schools (DPS) Title I costs were $22.2 million in fiscal year (FY) 2002–03, and $1.7 million (8 percent) of those costs were spent on the administration function.

developed specifically to facilitate meaningful spending comparisons among schools within a district. Toward this end, we use a set of principles to guide the design of the model. Most importantly, the model must properly account for resources in terms of the *schools* that they benefit. In addition, the model must generate comparable data (to enable resource comparisons) and thus must convert resources into a common metric (dollars). Moreover, the conversion must use real, instead of average, costs, as average costs mask spending variations between schools (Roza and Hill 2004). Finally, the model must account for spending by student need in order to delineate spending differences among schools with differing student needs.

Using these guiding principles, the model outlined here follows three structured steps: First, we identify shared district resources that benefit different schools and thus ought to be included in spending comparisons across schools. Second, we allocate those costs (in real dollars) to the schools that receive them. Third, we classify costs based on student need.

There are no widely accepted guidelines for determining which costs to report at the district versus the school level.

Step 1: Identifying Shared District Resources to Allocate

There are no widely accepted guidelines for determining which costs to report at the district versus the school level. Historically, costs have been classified as one of two types, central or school based. The vague term "central" necessitates further clarification, as it includes resources used to benefit students (sometimes unevenly) among schools. We divide central costs into two categories in order to identify resources relevant to spending differences among schools and those that are not: shared district resources and resources for district leadership and operations (see figure 1). The addition of typical school site budgets to the combination of these two types of central costs rounds out a district's overall spending framework: (1) school budgets; (2) shared district resources; and (3) resources for district leadership and operations.

School budgets generally report site-based costs, including the cost of the teachers and administrators who work there. Examples of site-based costs include classroom teachers, principals, librarians, and instructional aides. Other site-based costs sometimes reported in school budgets include facilities, operations, supplies, and materials.

Shared district resources, as defined here, include the people, equipment, grants, and services housed and supervised by the central office and used to directly service and benefit students and schools by central office managers or the school board. Shared district resources are currently reported in a consolidated fashion, typically in line-item, department, and program budgets. Examples of shared district resources include itinerant art and music teachers, centrally operated gifted programs, professional development, psychologists, and curriculum services.[3]

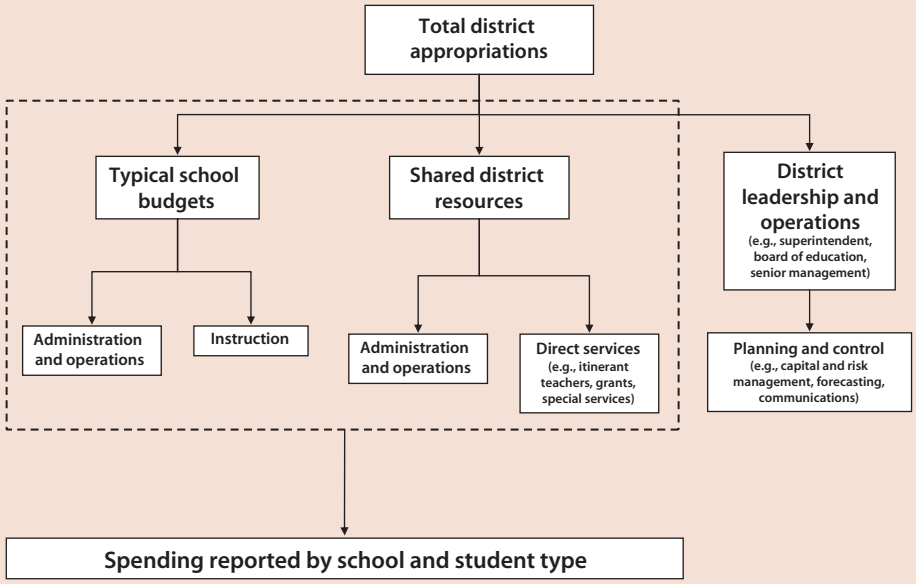
Resources for district leadership and operations, in contrast to shared district resources, do not include services for specific schools or students. District leadership and operation costs are composed entirely of indirect support services that are not used at the school level (e.g., the office of the superintendent, governance costs such as the board of education, and capital and risk management expenses). Indirect services can only be allocated to schools formulaically, typically on a per pupil or per school basis. For instance, because the superintendent's office (in medium and large districts) does not typically direct its services toward one school versus another, these costs could only be allocated to the school level by allocating them in an equal dollar amount per pupil. Such information adds little to our understanding of actual between-school spending variations. For this reason, our model keeps these costs consolidated.

Step 2: Allocating Shared District Resources

Allocating shared district resource costs to schools is challenging for two reasons: First, in contrast to site-based costs, shared resources generally serve multiple schools, and this often necessitates data collection activities to

[3] Although most districts opt to provide such services centrally, they may also choose to decentralize and grant control to schools or procure services from outside providers.

Figure 1. District spending framework



SOURCE: Framework by authors.

trace the schools, students, or school-based personnel on which the resources were ultimately brought to bear. Second, overhead costs related to shared district resources must be disentangled from district leadership and operations costs in order to allocate the full cost of shared services.

While there is no one approach to dividing shared resources among multiple sites, the practice is common in other public and private sectors (Cooper and Kaplan 1999; Horngren, Data, and Foster 2002). For this model, various cost accounting practices were adapted to create a seven-step process to guide the allocation of shared district resources: (1) identify the cost objects to be allocated (e.g., labor hours, program materials, grant dollars); (2) identify the direct costs associated with each cost object; (3) identify indirect costs associated with each cost object; (4) define the cost-allocation basis for allocating indirect costs to the cost object (e.g., flat rate, per pupil weighting); (5) compute the indirect cost per unit; (6) compute the direct cost per unit; and (7) compute the total cost per unit. Additional information and examples of each step are outlined in table 2.

Some discussion of direct and indirect costs can clarify the above steps. Direct costs are costs that can be traced directly to the schools where they are used. For a gifted program, the cost of itinerant gifted teachers is a direct cost because the labor hours for each of these teachers can be traced directly to a school. "Labor hours" then becomes the "cost object." Other examples of cost objects might be the number of students participating in a centrally offered program, and the number of school personnel participating in professional development or receiving support services. Undoubtedly, tracking costs by these new "cost objects" will require additional data collection in some cases.

Shared district resource costs that cannot be traced directly to a school are referred to as indirect costs. In the gifted program example, the costs of the administrator and support staff necessary to run the program are classified as indirect costs because staff time is not traceable to individual schools. What makes the allocation of indirect costs for shared resources unique in this model is that they have direct costs to guide their allocation, which markedly improves the accuracy of reported school-level resources.

Step 3: Classifying Costs According to Student Need

The final step in the model is to classify shared district resources based on the student needs they intend to serve. We do so by classifying resources as categorical or

Table 2. Shared resource cost allocation

Activity	Description	Examples
1. Identify the cost objects to be allocated.	The unit of measure for the product or service the model is costing.	Service hours (e.g., psychologists, nurses, social workers, gifted teachers), pages translated (e.g., translation department), or dollars distributed (centrally controlled school grants).
2. Identify the direct costs associated with each cost object.	Costs that can be traced to their recipients.	The total compensation of itinerant and substitute teachers.
3. Identify the indirect costs associated with each cost object.	Costs related to the cost object that cannot be traced to that cost object in an economically feasible way.	Administration and overhead costs of shared district resource departments, including gifted programs and psychologists, and curriculum and development.
4. Define the cost-allocation basis for allocating indirect costs to the cost object.	There are several methods to consider, including weighting the allocation by direct cost or computing a flat rate per unit produced. Weighting the allocation by direct cost works well in departments where the cost object is heterogeneous, whereas weighting by unit produced works best when cost objects are homogeneous.	Allocating indirect costs in a gifted program can use a flat rate per hour of service because the department provides a single type of service. The curriculum and development department, with multiple service lines and programs, is better served by a weighted direct cost allocation model.
5. Compute the indirect cost per unit.	Divide the indirect cost allocation by the number of units in the cost object.	
6. Compute the direct cost per unit.	Divide the direct costs by the number of units in the cost object.	
7. Compute the total cost per unit.	Combine the direct and indirect costs for each unit.	

SOURCE: Table by authors.

noncategorical. Categorical costs are earmarked to serve specific student needs, and are further classified according to the common student identifiers of poverty, minority, bilingual, gifted and talented, and vocational education.[4] Categorizing funding allows for comparison of schools with different school populations and an assessment of whether a particular school receives greater, or less, than the district average cost for a given type of student need. By default, costs not labeled categorical are classified as noncategorical costs.[5]

Application of the Model

The shared resources cost allocation model was applied to an existing dataset of school-level financial data collected from the Denver Public Schools (DPS) during the 2002–03 school year. The DPS is a large urban district serving approximately 72,000 racially and economically diverse students in its 148 schools.

The model was applied to the DPS dataset according to the steps outlined above: (1) shared district resources were identified using the district spending framework; (2) shared district resource costs were allocated to the schools that received them; and (3) costs were classified according to student need. For illustrative purposes, this paper also reports how application of the model illuminates spending differences (by accounting for shared district resources) in two DPS middle schools (Middle School A and Middle School B). The schools were selected for comparison because of their similar demographics and size (summarized in table 3), and state academic rating (both were labeled "low academic performers").

Step 1: Identifying the DPS's Shared Resources

In the DPS, school budgets represented 45 percent of operating costs, while 55 percent of operating costs were reported centrally. Twenty-five percent of these centrally

[4] For this model, a district would use any student characteristics that would dictate additional need, such as homeless, pregnant, migrant, etc.

[5] Because these dollars do not intend to serve a specific student need, we might expect them to be equally distributed to all students (Berne and Stiefel 1994).

reported costs were identified as shared district resources and allocated to the schools that received them. Where district data were insufficient or unavailable, we were not able to allocate shared district resources to schools, resulting in a significant portion of shared district resources that are not tracked by student or school.

Step 2: Allocating the DPS's Shared Resources

After allocating a portion of shared district resources in the DPS, school-level resources increased by nearly one-third, relative to the original amount reflected in school budgets.[6] The distribution of shared resource costs in the DPS allowed us to gain information about how an additional $92 million was spent from school to school. On average, it added an additional $1,058 in per pupil costs, but these resources were not distributed evenly. The maximum gain from shared resources at a school was $1,985 per pupil, while the maximum loss was $666 per pupil, a $2,651 range.[7]

After allocating a portion of shared district resources in the DPS, school-level resources increased by nearly one-third, relative to the original amount reflected in school budgets.

Comparing two middle schools (see table 3), Middle Schools A and B, before the allocation of shared resources, we found that the former received $8 per pupil ($6,728 total) less than the district average and the latter received $117 per pupil ($84,708 total) more than the district average. In short, comparing school budgets alone, it appears that the DPS spent $125 more per pupil ($91,436 more total) on Middle School B than on Middle School A.

When we looked at how Middle Schools A and B fared after shared resource costs were allocated by student need, a new picture emerged. Middle School A received $331 more per pupil ($278,371 total) than the district average while Middle School B received $549 less per pupil ($397,476 total) than the district average. Comparing the combined resources of school budgets and shared resources reversed our original assessment; a greater share of district resources was expended on Middle School A, which actually received $880 per pupil (or $675,847) more than Middle School B.

Step 3: Classifying the DPS's Costs According to Student Need

Shared resource costs were classified as categorical (e.g., bilingual, gifted) or noncategorical as described in table 3. Classifying costs in this way illuminated variation by student type. We found that the additional resources received by Middle School A were concentrated in two categories: noncategorical and poverty. Conversely, those same two categories represented where Middle School B was shortchanged on most of its shared resources. We identified similarities as well; both schools received less than the district average per pupil cost on bilingual education.

District Implementation

Just how likely is district implementation of a shared resource cost allocation model? This question raises issues about demand for the model, cost of implementation, and other key challenges. As earlier acknowledged, there are clear benefits to measuring shared district resource costs, but district demand for this level of information is not clear. The practice of maintaining central control over a large portion of district resources is widely accepted and the will to untangle, and account for, this money is not now evident. It is likely that demand will only surface with external pressure from interest groups, researchers, and parents who are interested in understanding whether resources are equitably distributed.

[6] It is important to note that the data used here to demonstrate the significance that shared resources have on actual school spending do not represent a full and complete shared resources analysis of the DPS. Of the $371 million in centrally controlled budgets, this database contains $92 million worth of shared resources that have been identified as shared resources and allocated to the schools that received them. The amount of resources present in a school that are centrally controlled and not reported in school budgets is underreported by this data.

[7] Student need is controlled for in this financial analysis by calculating the district average cost for each student type and multiplying the average cost by the number of students in the school. For example, if the district spends $600 per pupil on children of poverty, a school serving 100 students who qualify for free or reduced-price lunch would expect to receive $60,000 in compensatory education funds. To facilitate interpretation, schools that receive the district average are set to zero; schools that receive more than the district average are reported as a positive value, and schools that receive less than the district average are reported as a negative value.

Table 3. A comparison of school allocations to district averages: 2002–03

Characteristic	Middle School A	Middle School B
School type	General education	General education
Demographics		
Enrollment	841	724
Percent minority	94	80
Percent limited English proficient	28	16
Percent poverty	93	74
Percent gifted	8	13
Academic performance	Low	Low
Financials (in dollars per pupil)		
School budget	(8)	117
Shared resources		
Noncategorical	107	(237)
Poverty	214	(387)
Limited English proficient	(127)	(162)
Gifted education	7	(30)
Homeless education	(77)	204
Total shared resource allocation	331	(549)
Combined allocation (school budget and shared resources)	323	(432)

NOTE: Parentheses are used to indicate negative values.
SOURCE: Computed by authors from DPS data.

Accounting for shared resource costs will require some upfront investment, in part to modify current financial software and reporting systems. More significant, perhaps, would be the costs of tracking spending by the new "cost objects." For instance, recording how itinerant staff spends time between schools and how district administrators allocate services school to school creates an additional workload and, consequently, additional expense for the district.

Other implementation challenges revolve around the ability of districts to actually collect information to plug into the model. It is time intensive to collect data on shared resource costs and, as a result, efficiency and efficacy questions must be addressed. Under current systems, data collection is not straightforward, and multiple information sources must be tapped to learn, for example, how Title I money is distributed versus bilingual education spending. Streamlining the accounting process and identifying clear priorities for accounting information is a critical first step in implementation of any new model.

Furthermore, for the model to be useful, districts must ensure that all, or a majority of, shared district resources are measured. Sidestepping accounting challenges by over-categorizing resources as "district leadership and operations" will hinder efforts to capture more spending in school-cost comparisons. As evidenced by school-based, and student-based, budgeting formulas, funding equity cannot be assessed if only a small portion of resources are examined (Miles and Roza 2004). As evidenced by our analysis of DPS data here, it is difficult to make unequivocal statements about equity when only 25 percent of central office shared resources were allocated.

Conclusion

A shared district resource cost allocation model enables more meaningful school-level spending comparisons in that a greater portion of district costs are captured in the school's allocation. Application of the model to the DPS allowed greater understanding of how 25 percent of the central office budget was utilized; we know which schools received shared resources and we know how those resources were spent by student type. A comparison of two middle schools demonstrated significant variation in school spending caused by the inequitable distribution of shared district resources.

There is a clear need for a methodology that accounts for shared district resources and tracks the distribution of these funds. This model has the potential to inform resource allocation decisions because it reveals a more complete school-by-school funding picture. Such information can inform discussions about the variance between intended and actual school funding levels and help decisionmakers as they grapple with the tradeoffs of funding one program over another. Additionally, a greater understanding of how to account for central office resources has the potential to make within-district equity analysis more reliable. Lastly, with this kind of accounting, researchers and policymakers can better compare the cost of different types of schools, including charters, magnets, and alternatives, with better insight into their access to shared resources. Without establishing and implementing a model to include shared resources in school-level analysis, researchers, policymakers, and practitioners will continue to see an eclipsed view of the resources directed to our schools.

References

Berne, R., and Stiefel, L. (1994). Measuring Equity at the School Level: The Finance Perspective. *Educational Evaluation and Policy Analysis, 16*(4): 405–421.

Chambers, J.G. (1999). *Measuring Resources in Education: From Accounting to the Resource Cost Model Approach* (NCES 1999–16). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

Cooper, R., and Kaplan, R.S. (1999). *The Design of Cost Management Systems*. Upper Saddle River, NJ: Prentice Hall.

Coopers & Lybrand LLP. (1994). *Resource Allocation in the New York City Public Schools*. New York City: Author.

Cross City Campaign for Urban School Reform. (2001). *Annual Decentralization Progress Comparison Across Ten Cities 2001*. Retrieved August 17, 2004, from http://www.crosscity.org/pdfs/10city2001.pdf.

Educational Testing Services. (2004). *Survey: Americans Seek Fairness in Public School Funding*. Retrieved August 17, 2004, from http://www.ets.org/news/04070101.html.

Fowler, W.J., Jr. (2001). Financial Reporting in the New Millennium. In S. Chaikind and W.J. Fowler, Jr. (Eds.), *Education Finance in the New Millennium. Yearbook of the American Education Finance Association, 2001* (pp. 35–51). Larchmont, NY: Eye On Education.

Hartman, W.T., Bolton, D.G., and Monk, D.H. (2001). A Synthesis of Two Approaches to School-Level Financial Data: The Accounting and Resource Cost Model Approaches. In W.J. Fowler, Jr. (Ed.), *Selected Papers in School Finance, 2000–01* (NCES 2001–378) (pp. 77–119). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Horngren, C.T., Data, S.M., and Foster, G. (2002). *Cost Accounting: A Managerial Emphasis* (11th ed.). Upper Saddle River, NJ: Prentice Hall.

Iatarola, P., and Stiefel, L. (2003). Intradistrict Equity of Public Education Resources and Performance. *Economics of Education Review, 22*(1): 69–78.

Miles, K.H., and Roza, M. (2004). *Understanding Student-Based Budgeting as a Means to Greater School Resource Equity.* Working paper.

National Forum on Education Statistics, Core Finance Data Task Force. (2003). *Financial Accounting for Local and State School Systems: 2003 Edition* (NCES 2004–318). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Odden, A., Archibald, S., Ferminick, M., and Gross, B. (2003). Defining School-Level Expenditure Structures That Reflect Educational Strategies. *Journal of Education Finance, 28*(3): 323–356.

Odden, A., and Busch, C. (1998). *Financing Schools for High Performance: Strategies for Improving the Use of Educational Resources.* The Jossey-Bass Education Series. San Francisco: Jossey-Bass.

Roza, M., and Hill, P.T. (2004). How Within-District Spending Inequities Help Some Schools to Fail. In D. Ravitch (Ed.), *Brookings Papers on Education Policy* (pp. 201–227). Washington, DC: Brookings Institution Press.

Rubenstein, R., Schwartz, A.E., and Stiefel, L. (2004). *From Districts to Schools: The Distribution of Resources Across Schools in Big City School Districts*. Working paper presented at annual conference of the American Education Finance Association, Salt Lake City, UT.

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

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The papers in this publication were requested by the National Center for Education Statistics, U.S. Department of Education. They are intended to promote the exchange of ideas among researchers and policymakers. The views are those of the authors, and no official endorsement or support by the U.S. Department of Education is intended or should be inferred.

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

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Acknowledgments

This research benefited from the generous support of the U.S. Department of Education, Institute for Education Sciences, through Field-Initiated Studies Grant #R305T010115. All responsibility for omissions and errors is ours.

I. Introduction

While academic researchers and policymakers debate the relative merits of ranking public schools and the alternative methodologies for doing so, classifications of public schools have become a feature of the educational landscape. In many cases, the goal is to distinguish the "best" schools or the "worst" schools from the others—for rewards or sanctions, for intervention, or as a guide for parents or students. In New York City, for example, a local not-for-profit education advocacy organization, Advocates for Children of New York, Inc. (AFC), has published two guides to the best public schools (Hemphill 1999, 2002). At the same time, the New York City school district recently identified a set of schools performing so well that they were exempted from a systemwide curriculum and governance reform. At the other end of the spectrum, both New York State and the federal government have identified a set of schools performing so poorly as to require special interventions to spur improvement.

Interestingly, while these lists of best and worst schools differ in their criteria, data, and methodology, none explicitly considers the efficiency with which these public schools use their resources. That is, they effectively ignore the cost of the schools to the taxpayers. Thus, these measures alone may not provide useful guidance to school districts facing resource constraints. As an example, if the "best" schools achieve their high performance because they have garnered especially generous budgets—through grants or donations, perhaps—then looking to them for best practices to replicate in more modestly funded schools may well lead to disappointing results. In this paper, we compare these four lists of best and worst New York City public schools, both to one another and to lists grounded in efficiency measures. We explore the characteristics of schools classified as "best" or "worst," those in which the different methods agree, and those in which they disagree. We then discuss the implications for public policy.

The rest of this paper is organized as follows. The lists of best and worst schools are described individually in section II. In section III, we present the two best schools lists and the two worst schools lists. Section IV

presents current research on the measurement of school performance in a context of increased accountability. In section V, we provide an overview of the New York City public schools and the institutional context in which they operate. In section VI, the efficiency-based lists of schools are introduced, and they are compared with schools in the other lists. In the sixth section, we also conclude with the implications of the results for policymakers and school system participants.

II. Lists of Best and Worst Schools

A. The "Best" Schools

New York City's Best

AFC promotes quality and equal public education services for New York City's poorest families and children who are at greatest risk of discrimination and failure in schools. AFC provides legal services, technical assistance, training about children's educational entitlements and due process rights, organizing, research, and policy analysis.[1]

"Children First" is Mayor Michael Bloomberg's blueprint for reforming the governance and curriculum of the New York City public schools.

Perhaps the most well thought out, highly regarded, accessible information for parents looking for public schools in New York City is the set of guides written by Clara Hemphill of AFC (Hemphill 1999, 2000). Hemphill interviewed teachers and parents, observed schools, and examined school statistics to gather information on atmosphere, homework, student stress, competition among students, quality of the teachers, condition of the building, safety records, class size, test scores, ethnic diversity, admission requirements, and teaching methods.[2] The schools in the books may not be "the best," especially since there is not a formula for selecting them—Hemphill did not necessarily pick schools with one particular feature (high test scores) but a combination of features (e.g., nice building)—but she advertises them as the best.

Hemphill's method is similar to that used in a number of well-known college guidebooks. For example, Fiske (2002) ranks colleges and universities by selecting over 300 of the "best and most interesting institutions in the nation" (out of more than 2,000).[3] At the heart of his methodology is a ranking along three lines, academics, social life, and quality of life, on a scale from one to five.[4] Fiske states that these classifications are subjective and general and that they summarize a write-up for each school that includes information on academics, campus setting, the student body, financial aid, housing, food, social life, and extracurricular activities.[5] Likewise, Hemphill's choice of best schools contains subjective, judgment factors.

Schools Exempted From the "Children First" Instructional Approach

"Children First" is Mayor Michael Bloomberg's blueprint for reforming the governance and curriculum of the New York City public schools beginning with academic year 2002–03. One component of Children First is a new systemwide instructional approach in reading and math curricula, which was phased in starting in September of 2003.[6] The Chancellor's schools are (the only) schools that have received a waiver based on designated performance criteria in reading/writing and math and will not be required to

[1] For more information, see http://advocatesforchildren.org.

[2] This list of schools may be obtained from two sources: Hemphill (2002) and Hemphill (1999). Information on individual schools may be found at http://www.insideschools.org.

[3] Criteria for selection include more than academic strength: there is an effort to achieve geographical diversity and a balance of public and private institutions and to include schools that offer popular or unusual programs and schools that have experienced recent improvements.

[4] Academics include the academic climate of the institution, its reputation, the quality and the seriousness of the faculty (as teachers and researchers) and students, and the quality of facilities and services such as libraries. Quality of life may reflect the level of competition among students, the nature of the social system, the community, the campus, and its location.

[5] Additional information includes the male/female ratio on campus, the range of SAT and ACT scores, the percentage of applicants who are accepted and enroll, and the percentage of students who return and graduate.

[6] http://www.nycenet.edu/childrenfirst/faqs.asp.

implement the new instructional approach. Initially, in April of 2003, 209 schools received such a waiver; they are called Chancellor's schools. [7,8,9]

B. The "Worst" Schools

No Child Left Behind Schools

Prior to 2002, the traditional role of the federal government in education had been to provide aid to disadvantaged pupils and fund research and development. The No Child Left Behind Act (NCLB), which President Bush signed into law in January of 2002, expanded the role of the federal government to stimulate states to raise the achievement of low-performing students. NCLB emphasizes accountability, provides for investment in effective instructional techniques and reform, stresses reading, and allows a more flexible use of federal school funds. It also involves greater choice for parents and students, particularly in instances where students are attending low-performing schools: in such instances, students can transfer out of the low-performing schools while retaining their Title I funds.[10]

The emphasis on accountability, and its accompanying rewards and sanctions, is key. States must put in place comprehensive accountability systems based on ambitious standards in reading and mathematics, annual testing for all students in grades 3 through 8, and annual statewide progress objectives for subgroups based on poverty, ethnicity, disability, and language ability. Practically speaking, a performance index is calculated for each school based on its test scores. If a school's performance index falls below the state standard, then it is assigned an adequate yearly progress goal (AYP), which consists of a set of targets that it needs to reach in the following 3 years to get above the standard. Schools and districts that fail to meet their AYP within 2 years are subject to improvement, and those that fail within 3 years are in need of corrective action.[11] Restructuring measures are taken to make them achieve their goal. Schools that fulfill or go beyond their AYP objectives and those that close performance gaps are rewarded. We call NCLB schools the failing schools under these guidelines.[12]

Under NCLB, if a school's performance index falls below the state standard, then it is assigned an adequate yearly progress goal (AYP).

Schools Under Registration Review (SURR)

The New York State Education Department requires that all schools operating in the state be registered. Schools that are farthest from meeting the state's performance standards are in danger of having their registration revoked if they fail to show adequate

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[7] This list may be found at http://www.nycenet.edu/PRESS/02-03/HS_CSD_List_by_District_and_school.htm.The following quote from an article describes the criteria for selecting the original exempted schools: "Under the formula to get onto the list, each school was put into a high, middle, or low poverty category, based primarily on the number of free lunches students qualify for. Each school was then scored based on test results and modifying factors such as the number of special education students, non-native English speakers, and recent improvements. The top 20 percent of each category made the list, and schools facing more challenges didn't have to score as high to get on." (Yan 2003) (In fact, 209 schools received waivers, not 208.)

[8] Note that these descriptions reflect the way schools are *said* to be chosen based on these methods, which may differ from what was actually implemented. The number of schools picked is indeed peculiar.

[9] It is anticipated that additional schools will receive waivers as the new systemwide curriculum produces results. In addition, the Chancellor's office has established a petition process whereby schools or programs within schools can request a waiver from either the comprehensive literacy or math portions of the new curriculum—or both. Schools petitioning for waivers will be evaluated based on past and expected student performance as well as the rationale for their request. A list of the schools that petitioned for the waivers and received them as of April 2003 may be found at http://www.nycenet.edu/SchoolsGrantedWaivers.pdf. Note that some of these schools received waivers only in math, some only in reading, and some in both subjects.

[10] More information may be found at http://www.ccsso.org/federal_programs/NCLB/index.cfm and http://www.ed.gov/nclb/overview/intro/execsumm.html.

[11] *Assessment and Accountability in the Fifty States: 1999–2000, New York.* Consortium for Policy Research in Education (CPRE) (July 2000) http://www.cpre.org/Publications/ny.pdf.

[12] A list of NCLB schools as of April 2003 is available on the New York City Department of Education website at http://www.nycenet.edu/nclb/PSChoice.asp.

improvement within 3 years. Schools that have been warned that their registrations may be revoked are considered "Schools Under Registration Review" (SURR).[13]

All public schools are expected to have at least 90 percent of their students scoring above the state standard for their grade on state standardized tests and a dropout rate of less than 5 percent. SURR schools are identified as schools that are farthest from meeting this standard. As an example, in the 1998–99 school year, schools "farthest from the state standard" on a standardized test included schools in which less than two-thirds of the students performed at or above level 2 on the grades 4 and 8 English language arts examination and the grade 4 mathematics examination, and schools in which less than a third of the students performed at or above level 2 on the grade 8 mathematics exam.[14,15] SURR schools are also schools that have a "poor learning environment." Such an environment is one in which the school is the subject of persistent parent complaints or where conditions threaten the health, safety, or educational welfare of students (such as high rates of absenteeism or a high level of violence).[16]

New York State schools that have been warned that their registrations may be revoked are considered "Schools Under Registration Review" (SURR).

The three government lists of best and worst schools would be labeled "high stakes" by most observers. If the lists fail to show significant overlap or if they diverge significantly from the efficiency-based lists, then it will be important to discuss openly the costs of errors of inclusion or omission of schools that might be "misclassified."

III. Literature on Measuring School Performance

Efforts toward identifying good schools is not a new phenomenon. Thirty years ago, in response to the Coleman report (1966), the Effective Schools Movement argued that, while family background matters, schools also play an important role in children's learning (Edmonds 1982). More specifically, a number of features common to schools that successfully educated students with diverse backgrounds were believed to be both associated with school success and under the control of the school system: a strong emphasis on high-quality, focused instruction supported at the highest levels of the school hierarchy; high expectations for all students and regular evaluation of their performance; and safe, well-organized schools (Edmonds 1979, 1982). Some precepts of the Effective Schools Movement are timely today in that they advocate holding schools accountable and reporting disaggregated measures of student performance to verify school success for students of different sexes, races, and poverty levels.[17]

More recently, the measurement of school performance for the purpose of school accountability has been the subject of a small but growing research literature. This literature addresses the properties of a "good" performance measure, as well as the features of the school system that threaten that measure. For example, numerous authors analyze features of measures used for accountability. According to Hanushek and Raymond (2002) and Ladd (2002), the quality of a performance measure depends on whether it reflects the material covered in the classroom and the performance of all the stakeholders—students, teachers, and administrators. They go on to say that, in order to promote accountability, a performance measure should provide a balance between challenge and feasibility. This, in turn, depends on the choice of levels of performance targets or rates of improvement and the incentives and disincentives the different options create. Feasibility also depends on the data requirements of a measure and the possible impact of error.

[13] Note that, by definition, the SURR schools are a subset of the NCLB schools such that we expected to find a substantial overlap, yet in our best effort to identify these schools in our sample, they are not. We continue to explore this perplexing find.

[14] Level 2 is the second lowest of four.

[15] Kadamus (2000). Lists of SURR schools may be obtained from the New York State Education Department website at http://www.emsc.nysed.gov/nyc/regrev.html#SURRList/2001AugSURRlist.pdf or http://www.emsc.nysed.gov/nyc/SURR/SURRJan2003.html.

[16] New York State Education Department Office (1998).

[17] For an update on the Effective Schools Movement today and more detail on the correlates, see http://schools.tdsb.on.ca/albertcampbell/spri/docs/Revolutionary.pdf and http://ali.apple.com/ali_media/Users/1000059/files/others/lezotte_article.pdf.

For many authors, fairness requires that factors over which schools have no control be taken into account when measuring performance. Adjusting performance measures for client and environmental characteristics is generally considered an improvement over raw measures (Rubenstein, Stiefel and Schwartz 2003). However, while it is widely accepted that student poverty raises the educational challenge faced by schools, the effect of, and the appropriateness of including, for example, minority representation in the student body, is more controversial (Clotfelter and Ladd 1996; Ladd 1999, 2002; Ladd and Walsh 2002).

Student mobility, which is especially prevalent in schools with disadvantaged populations, may affect the quality of a performance measure. This problem may be alleviated by comparing specific cohorts across grades (Hanushek and Raymond 2002) or calculating value-added measures only for the students who attend a given school for a minimum number of days during the school year (Ladd and Walsh 2002), rather than comparing successive cohorts in a school. Cohorts may also differ across years if schools exempt some students from testing. Reliance on several tests as well as other measures of school performance, including attendance and dropout rates, as in Dallas (Ladd 1999), helps to circumvent this problem.[18]

Improvements in achievement varied across low- and high-achieving students and across subjects.

Scores can change from one year to the next due to measurement error (Hanushek and Raymond 2002; Kane and Staiger 2002; Ladd 2002; Ladd and Walsh 2002).[19] This is especially true in small schools and when changes or gains are used rather than levels. Averaging and weighting scores over several years, combining data across grades and/or subjects, or using more sophisticated techniques may reduce measurement error at the cost of a loss of transparency.

Several authors study the effects of the measurement of school performance in specific accountability systems on student and school outcomes and, in the process, describe in detail the measurement methods used. An early evaluation of school-based incentive programs on student outcomes is provided in Ladd (1999). She compares gains in student performance in Dallas, which implemented an accountability system starting in 1991, to those in five other large Texas cities and finds that the reform seems to have resulted in positive and relatively large effects for some students in selected grades.

The introduction of high-stakes testing in the Chicago schools raised student achievement, especially for students in the lowest performing schools (Roderick, Jacob, and Bryk 2002). Improvements in achievement varied across low- and high-achieving students and across subjects, which underlines the importance of taking the distributional effects of accountability systems into account in order to fully judge their effectiveness.

School classifications across various performance measures in Dallas and in South Carolina are compared in Clotfelter and Ladd (1996). The authors compare a series of performance measures based on changes in test scores, which turn out to be highly correlated, as well as a number of measures based on residuals. These are correlated as well, but correlations across the two groups are not quite as high.

Overall, researchers agree that a number of choices must be made when designing school accountability systems: whether to use levels, changes, or value-added measures; whether to exempt certain students from testing; whether to take into account factors outside a school's control; etc. There is no consensus on what constitutes a "best" measure, or, more specifically, on the effect of these choices on how accountability systems affect school performance. Despite these issues, early evidence indicates that accountability systems appear to have a positive effect on performance.

[18] Kane and Staiger (2002) state that broadening the range of measures under consideration is also important because the narrow focus on commonly reported subjects such as math and reading disadvantages schools that focus on other outputs.

[19] Ladd and Walsh (2002) focus on measurement error, how it affects school classifications, and how to correct for it. They find evidence of serious measurement error in North Carolina and South Carolina samples, and correcting for this error changes the ranking of schools according to their value-added performance measures. In addition, they find that using averaged residuals or fixed effects as measures of effectiveness seems to cause some changes in the classifications of schools.

IV. Education in New York City

In 2001, New York City's newly elected mayor, Michael Bloomberg, successfully pressed the state to grant control of the city schools to the mayor, beginning in school year 2002–03. Mayor Bloomberg, in association with School Chancellor Joel I. Klein, then launched Children First, a plan to reform governance and curriculum in the New York City public schools over the next several years.

The New York City school system educates over a million students in almost 1,300 schools and programs. About half of these pupils are in elementary schools; about 20 percent are in middle schools and 20 percent in high schools; and the rest are in collaborative or vocational schools or alternative or special education programs. The New York City Department of Education approved a budget of $12 billion for the school year *2002–03,* with a corresponding average cost per pupil of a little above $11,000. In the spring of *2002*, slightly fewer than 40 percent of elementary school students in grades 3 through 8 met or exceeded the grade level on the state and city reading exams, and about 35 percent did the same on the mathematics exam in grades 4 through 7. [20]

We have constructed a rich school-level database using data provided by the New York City Department of Education on elementary schools.

We have constructed a rich school-level database using data provided by the New York City Department of Education on elementary schools. The Annual School Reports and School-Based Budgeting Reports are school-level databases, which we augmented with student-level data in order to construct grade-level variables (e.g., race/ethnicity, immigrant status, free and reduced-price lunch eligibility). Our data contain information on student characteristics, test scores, and school resources for the years 1995–96 through 2000–01. We use a balanced panel of 602 schools with grades 3, 4, and 5 and valid reading and math scores for each grade in each year.[21,22] Descriptive statistics on schools (unweighted by pupils) for the year *2000* are presented in table 1. These statistics are averages across schools and do not take into account differences in school size. Thus, statistics based on students would differ from these.

All test score data are reported as standardized *z*-scores. Data for third and fifth grades come from the CTB/McGraw Hill Test of Basic Skills (CTB) in reading and the California Achievement Test (CAT) in mathematics, while fourth-grade data for 1998–99 and 1999–2000 are from state English Language Arts (ELA) reading and mathematics tests. For comparability, the tests are normalized to citywide averages.[23]

Total expenditure per pupil includes direct services to schools and district and systemwide costs (instructional, administrative, and other). Non-classroom teacher expenditure includes all of these items except classroom instruction.[24] Other direct services encompass instructional support services (counseling and other outreach services, drug prevention programs, after-school activities, parent involvement), school leadership (and their support staff and supplies), ancillary support services (food, transportation, safety, and computer system support), building services (custodial, maintenance, leases, and energy), and district support.

New York City educated about 483,000 students in the 602 sample schools in the 1999–2000 school year. The vast majority of these schools are elementary schools, with almost two-thirds of the schools serving up to grade 5 and almost a third serving up to grade 6. The remaining 9 percent serve grades 7 and 8, as well. The

[20] The figures in this section may be found on the New York City Department of Education website at http://www.ncyenet.edu/Offices/stats/default.htm.

[21] For greater detail on the data, see Schwartz and Zabel (2003) and Schwartz, Stiefel, and Bel Hadj Amor (2003).

[22] Note that descriptions of the Advocates for Children, Chancellor's, NCLB, and SURR schools are limited to such schools for which data are reported by the New York City Department of Education. A count is available from the authors.

[23] Greater detail on the normalizing procedure is available in Stiefel, Schwartz, Bel Hadj Amor, and Kim (2003).

[24] Classroom instruction includes teachers and other educational and classroom staff, textbooks, librarians and library books, instructional supplies, curriculum development, contracted instructional services, and summer and evening school.

Table 1. Descriptive statistics (unweighted) for New York City elementary schools: 1999–2000

N = 602	Mean	Minimum	Maximum
Student characteristics			
Grade 5 mean reading *z*-scores	0.03	–0.85	1.53
Grade 5 mean math *z*-scores	0.04	–1.08	1.35
Grade 5 mean reading and math *z*-scores for poor students	–0.04	–0.93	1.08
Grade 5 mean reading and math *z*-scores for the non-poor	0.41	–2.14	1.78
Grade 5 mean reading and math *z*-scores for Black students	–0.10	–1.54	1.31
Grade 5 mean reading and math *z*-scores for Hispanics	–0.08	–1.47	1.18
Grade 5 mean reading and math *z*-scores for Asian and other	0.39	–1.94	2.22
Percent female students	48.85	41.30	58.20
Percent free lunch students	73.75	6.70	100.00
Percent Black students	35.22	0.10	97.30
Percent Hispanic students	35.30	1.30	98.00
Percent Asian and other students	11.63	0.00	92.50
Percent LEP students	13.56	0.00	57.40
Percent recent immigrant students	6.95	0.00	26.70
Percent students in special education	4.86	0.00	18.40
Percent students in resource room	6.34	1.30	16.90
School characteristics			
Total expenditure per pupil (in dollars)	9,798	5,970	21,893
Non-classroom teacher expenditure (in dollars)	5,653	2,823	17,302
Pupil-teacher ratio	13.76	7.71	20.34
Percent teachers licensed/permanently assigned	81.70	0.00	100.00
Percent teachers with over 5 years' experience	57.66	0.00	93.90
Percent teachers with master's degree	77.27	0.00	100.00
Percent teachers with over 2 years in same school	64.11	0.00	89.70
Enrollment	803	100	2,200
School serves up to grade 5	0.62	0.00	1.00
School serves up to grade 6	0.29	0.00	1.00
School serves up to grade 7	0.00	0.00	1.00
School serves up to grade 8	0.09	0.00	1.00
SURR school	0.03	0.00	1.00
NCLB school	0.22	0.00	1.00
Chancellor's school	0.22	0.00	1.00
AFC school	0.15	0.00	1.00

NOTE: N is smaller for subgroup performance variables because not all schools have students in every subgroup. Here, N for non-poor is 500, for Black, 581, for Hispanic, 598, and for Asian and others, 475.

SOURCE: Authors' calculations based upon data provided by the New York City Department of Education. The list of SURR schools is from the New York State Education Department website. The lists of NCLB and Chancellor's schools are from the New York City Department of Education website. The list of AFC schools is from Hemphill (1999, 2002).

average school enrolls about 800 students; included are some small schools (as low as 100 students) and some very large ones (over 2,000 students).

In 1999–2000, New York City schools spent a little under $10,000 on average on each elementary school student, but there is a wide range across schools, from a low of almost $6,000 to a high of close to $22,000.[25] On average, a little less than half of per pupil spending goes to the classroom. There is a wide range of teacher characteristics across schools, and the average school has over three-quarters of its teachers who are licensed and who hold M.A. degrees, over two-thirds who have been in the same school for at least 2 years, and more than half who have more than 5 years of experience. The range in the number of pupils per teacher is quite wide as well: there can be as few as 8 students per teacher and as many as 20. The average is about 14.

[25] The school with the second highest number spends $16,677 per pupil.

Accordingly, the range of performance is wide. While some schools have average *z*-scores of almost –1, others are as high as 1.44. The average is 0.04. This average masks wide variations across subgroups of students, however. The average *z*-score for poor students (i.e., free lunch students) is –0.04, while that for non-poor students is 0.41. The average *z*-scores for Black and Hispanic students are lower than the whole-school averages (–0.10 and –0.08, respectively) while that for Asian and other non-White students is higher (0.39).[26,27]

There is a wide variation in the representation of poor and minority students in New York City schools. While there are anywhere between 7 and 100 percent poor students, there are no minority students in some schools and close to 100 percent in others. Almost three-quarters of the students are poor and about 82 percent are non-White in the average school. Over 80 percent of the non-White students are divided fairly evenly between Black and Hispanic. On average, seven percent of the students are immigrant students and about 14 percent have limited English proficiency. The representation of students in resource room (that is, receiving part-time special education services) and students in special education is about the same (6 percent and 5 percent, respectively) and their representation is always below 20 percent. About one-half of the students are female.

While there are anywhere between 7 and 100 percent poor students in New York City schools, there are no minority students in some and close to 100 percent in others.

V. Comparing Best and Worst Schools

A. Is Good in the Eye of the Beholder? Advocates for Children Schools Versus Chancellor's Schools

Table 2 compares the best schools that are in our sample to the rest of the city schools. Column (1) presents descriptive statistics for the AFC schools that are not on the Chancellor's list, column (2) for the schools that are on both the AFC and Chancellor's lists, column (3) for the Chancellor's schools that are not on the AFC list, and column (4) for the rest of the city schools.[28] There is a fair amount of agreement regarding which are the best schools when the best schools are compared to the rest of the schools. Clearly, the best schools perform much better than the rest (the average *z*-score is 0.36 to 0.69, compared to –0.14 for the rest). Subgroup *z*-scores show that schools with higher shares of disadvantaged (advantaged) children have lower (higher) average *z*-scores than average.

The best schools are also schools with somewhat more advantaged populations: they have many fewer poor (41 percent to 56 percent), Black (9 percent to 26 percent), and Hispanic students (17 percent to 30 percent) than the rest of the schools (82 percent, 43 percent, and 40 percent, respectively); in 2 out of 3 cases they have fewer LEP students and slightly fewer students in special education. In 2 out of 3 cases, the best schools do, however, have more immigrant students than the rest of the city schools and slightly more students in resource room. The best schools spend slightly less (under $9,600) than the rest of the schools (a little over $10,000) per pupil, yet they tend to have more experienced and educated teachers. They are also smaller than the rest of the schools (722 to 768 students, on average, vs. 824 students in the other schools). The geographical distribution of the schools varies slightly across the subsamples with, generally, more of the best schools in Manhattan, Queens, and Staten Island, and fewer of the best schools in the Bronx and Brooklyn.

While there is a fair amount of agreement regarding which are the best schools when the best schools are compared to the rest of the city schools, the AFC and Chancellor's lists disagree somewhat on which schools are the best schools: of the 92 AFC schools in our sample, 67 are also on the Chancellor's list,

[26] Note that this is close to the average for White students, which is 0.34.

[27] These differences are much greater across students rather than across schools.

[28] A comparison table of all the AFC schools to the rest of the city and all the Chancellor's schools to the rest of the city is available from the authors.

Table 2. Comparisons across best schools (unweighted)

	(1) AFC only N = 25	(2) Overlap AFC+ Chancellor's N = 67	(3) Chancellor's only N = 66	(4) The rest N = 444
Student characteristics				
Average reading and math *z*-score	0.36	0.69	0.44	–0.14
Average reading and math gain	–0.02	–0.07	–0.01	0.02
Average *z*-score for poor students	0.20	0.45	0.33	–0.18
Average *z*-score for non-poor students	0.66	0.92	0.66	0.24
Average *z*-score for Black students	0.20	0.32	0.10	–0.21
Average *z*-score for Hispanic students	0.15	0.41	0.20	–0.22
Average *z*-score for Asian and other students	0.62	0.85	0.68	0.23
Percent free lunch eligible	55.90	41.15	57.24	82.13
Percent Black	25.66	13.32	8.46	43.04
Percent Hispanic	29.66	17.24	24.19	40.00
Percent Asian and others	13.22	23.25	28.95	7.21
Percent LEP	7.50	10.80	16.69	13.85
Percent recent immigrants	5.73	8.72	11.16	6.13
Percent special education	3.75	3.91	4.38	5.14
Percent resource room	6.80	6.52	6.65	6.24
School characteristics				
Total expenditure per pupil (in dollars)	9,506	8,932	8,933	10,074
Non-classroom teacher expenditure (in dollars)	5,517	5,073	4,978	5,849
Pupil-teacher ratio	14.20	15.37	15.07	13.30
Percent teachers licensed/permanently assigned	78.44	90.76	92.70	78.88
Percent teachers with master's degree	75.66	85.10	86.28	74.85
Enrollment	734	722	768	824
Manhattan	0.28	0.21	0.09	0.16
Bronx	0.12	0.01	0.02	0.21
Brooklyn	0.32	0.34	0.30	0.37
Queens	0.20	0.39	0.42	0.21
Staten Island	0.08	0.04	0.17	0.05

NOTE: Again, N is smaller for subgroup performance variables. N ranges from 21 to 25 in column (1), 61 to 67 in column (2), 55 to 66 in column (3), and 299 to 444 in column (4).

SOURCE: Authors' calculations based upon data provided by the New York City Department of Education. The list of SURR schools is from the New York State Education Department website. The lists of NCLB and Chancellor's schools are from the New York City Department of Education website. The list of AFC schools is from Hemphill (1999, 2002).

and 25 are not. Of the 133 Chancellor's schools in our sample, about half (66) are not on the AFC's list. Overlapping schools perform at the highest level (0.69) and the AFC-only schools perform at the lowest (0.36). Interestingly, the AFC-only schools have the highest spending of the three groups (about $9,500 per pupil vs. $8,900 in the others) and the lowest teacher quality, while the Chancellor's-only schools have the highest teacher quality. The proportions of at-risk students vary across the three groups, as does geographical location (with, notably, a low representation of Chancellor's-only schools in Manhattan).

B. Is Bad in the Eye of the Beholder? NCLB Schools vs. SURR Schools

Table 3 presents descriptive statistics for NCLB schools that are not SURR schools (column [1]), schools that are both NCLB and SURR schools (column [2]), SURR schools that are not NCLB schools (column [3]), and the rest of the city schools (column [4]).[29] The worst schools have lower average *z*-scores (–0.24 to –0.59) than the other schools have (0.13). Non-poor students do better than average, as do Asian students (except for those in SURR schools). Poor and Black students do worse than

[29] A comparison table of all NCLB schools to the rest of the city and all the SURR schools to the rest of the city is available from the authors upon request.

average, but Hispanics in SURR or NCLB + SURR schools do not. Not surprisingly, the worst schools have more poor (89 percent to 93 percent), Black (39 percent to 51 percent), Hispanic (48 percent to 58 percent), and LEP (16 percent to 18 percent) students than the rest of the schools (69 percent, 32 percent, 31 percent, and 13 percent, respectively). They also have slightly more students in special education and students in resource room in 2 out of 3 cases. They do have fewer immigrant students (3 percent to 6 percent vs. 8 percent in the rest of the schools). The worst schools spend more per pupil ($10,000 to $12,000) than the other schools (under $10,000) and they have less desirable teacher characteristics. They are larger than the other schools (837 to 966 vs. 784 students, on average). More worst schools than other schools are located in the Bronx and fewer worst schools are in Brooklyn and Queens.

There are differences across the worst schools. Eight of the 130 NCLB schools in our sample are also SURR schools; the other 122 are not. Roughly the other half of the SURR schools (10) are not NCLB schools. All of the worst schools have lower performance levels than the other schools have, and the NCLB schools have the highest performance levels of the worst schools. The SURR schools are the highest spenders among the worst schools, with $12,000 per pupil on average vs. $11,000 in the overlapping schools and $10,000 in the NCLB schools. The latter also have more advantageous teacher characteristics and the lowest proportion of at-risk students in most categories. The overlapping schools are largest (966 students on average) and the SURR schools are smallest (837 students). The distribution of worst schools across boroughs is very different in each group, with the NCLB schools being the most evenly distributed.

All of the worst schools have lower performance levels than the other schools have, and the NCLB schools have the highest performance levels of the worst schools.

VI. An Economic Approach Based on Efficiency

A. Education Production Functions

This section describes one quantitative technique that we have developed to rank schools according to their performance and resources, education production functions (EPFs).[30] This method provides a measure of efficiency that is used to identify the best and worst schools. These lists of schools can then be compared to the others, such as AFC schools, Chancellor's schools, NCLB schools, and SURR schools. This technique adjusts for features of the environment and resource availability. It relies on much stronger theoretical underpinnings than the methodologies used to put together the aforementioned lists, and it uses more data, in addition to having a different conceptual base.

EPFs have their roots in economic input-output theory, according to which a school (much like a firm) combines inputs to produce maximum educational output. Accordingly, this method takes into account the inputs that produce education (students and resources, primarily) and thus controls for differences in these inputs across schools. More specifically, it is generally agreed that schools should not be held accountable for resources that are not under their control and school efficiency should not reflect the level of the inputs, but rather the work the schools are doing with these resources.[31]

An EPF is a regression-based technique with a measure of output as the dependent variable and inputs as the independent variables. Theory dictates the choice of inputs and functional form, which may call for the use of nonlinearity and other options.[32] Levels, changes, or

[30] Three other research-based methods that can be used are adjusted-performance measures (APMs), cost functions, and Data Envelopment Analysis (DEA). For more on comparisons of classifications across the four analytical methods, see Rubenstein, Stiefel, Schwartz, and Bel Hadj Amor (2003). The *New York Times* published a version of school-level performance measures based on regression equations for several years. See, for example, Josh Barbanel (1999a, 1999b, 1999c, 2000), who used test scores as outcome measures with statistical controls for income and sometimes English proficiency. Each school was compared to other schools with a similar mix of students.

[31] See Levin (1975) for an early study using this framework.

[32] For more information on EPFs, see Hanushek (1986, 1996), Ferguson and Ladd (1996), and Schwartz and Zabel (2003).

Table 3. Comparisons across worst schools (unweighted)

	(1) NCLB only N = 122	(2) Overlap NCLB + SURR N = 8	(3) SURR only N = 10	(4) The rest N = 462
Student characteristics				
Average reading and math z-score	–0.24	–0.59	–0.58	0.13
Average reading and math gain	0.00	0.03	0.06	0.00
Average z-score for poor students	–0.25	–0.59	–0.59	0.04
Average z-score for non-poor students	0.11	–0.09	0.39	0.48
Average z-score for Black students	–0.25	–0.59	–0.62	–0.04
Average z-score for Hispanic students	–0.31	–0.55	–0.52	–0.01
Average z-score for Asian and other students	0.18	–0.45	–0.66	0.47
Percent free lunch eligible	89.27	93.36	89.94	68.96
Percent Black	44.94	38.84	50.51	32.26
Percent Hispanic	48.17	57.96	47.58	31.25
Percent Asian and others	4.01	1.65	1.26	14.03
Percent LEP	15.78	17.98	17.82	12.80
Percent recent immigrants	5.66	3.48	2.69	7.45
Percent special education	5.54	4.85	5.49	4.67
Percent resource room	6.38	6.48	5.71	6.34
School characteristics				
Total expenditure per pupil (in dollars)	10,208	10,559	11,836	9,633
Non-classroom teacher expenditure (in dollars)	5,985	6,314	7,074	5,523
Pupil-teacher ratio	13.13	12.01	11.66	14.00
Percent teachers licensed/permanently assigned	76.68	70.85	66.17	83.54
Percent teachers with master's degree	73.96	66.30	70.59	78.48
Enrollment	860	966	837	784
Manhattan	0.18	0.00	0.20	0.16
Bronx	0.30	0.75	0.60	0.11
Brooklyn	0.30	0.00	0.20	0.38
Queens	0.19	0.13	0.00	0.28
Staten Island	0.03	0.13	0.00	0.07

NOTE: For the subgroup performance variables, N ranges from 76 to 122 in column (1), 4 to 8 in column (2), 3 to 10 in column (3), and 364 to 462 in column (4).

SOURCE: Authors' calculations based upon data provided by the New York City Department of Education. The list of SURR schools is from the New York State Education Department website. The lists of NCLB and Chancellor's schools are from the New York City Department of Education website. The list of AFC schools is from Hemphill (1999, 2002).

gains may be used, with the change or gain as the dependent variable or the level as the dependent variable and an option to include a measure of prior performance as an independent variable.

Ideally, an EPF is estimated with a panel of data, rather than a cross-section, so that the efficiency measure is the coefficient on a school fixed effect. In other words, a series of dummy variables (fixed effects), one for each school, are included in the model and the coefficients on these variables measure the difference in performance between each school and the reference school. The larger the fixed effect coefficient, the greater the efficiency. Fixed effects reduce omitted variable bias by controlling for time-invariant factors specific to each school. It is important to note, however, that fixed effects reduce and do not eliminate omitted variable bias, such that each measure of efficiency still includes some other school factors.[33] A typical EPF may look as follows:

[33] It is possible to "purge" the fixed effects of some time-invariant characteristics, such as location, by running a second regression, where the fixed effects are the dependent variable (see Schwartz and Zabel 2003).

$$Y_{gst} = \beta_0 + \beta_1 Y_{g-1,s,t-1} + \beta_{2i}\sum_i student\_characteristics_{jgst} + \beta_{3j}\sum_j school\_characteristics_{jgst} + efficiency_s + e_{gst}$$

where Y is a measure of output, e is an error term with the usual properties, and g indicates grade, s school, and t time.

How do the lists of best and worst schools, Advocates for Children, Chancellor's, NCLB, and SURR schools, compare to the EPF lists?[34] The EPFs are estimated using a balanced panel of 602 elementary schools for the years 1995–96 through 2000–01. More specifically, they are computed using fifth-grade reading performance; enrollment and student characteristics are for the fifth grade as well.[35] The other variables are measured at the school level. There are 158 schools that are Chancellor's and/or Advocates for Children and 140 schools that are NCLB and/or SURR. For comparison purposes, we divide the New York City schools into three comparison groups: the 160 schools that are ranked lowest; the 160 ranked highest, according to the EPFs; and the schools that are in between.

There is some agreement between best and efficient schools. Indeed, table 4 indicates that few of the best schools are highly inefficient (top panel, row C). Yet, being one of the best schools in the city does not necessarily imply being one of the most efficient, and the extent of the overlap between "bestness" and efficiency varies by subgroup. More specifically, setting aside the few least efficient schools, over two-thirds of the remaining overlapping best schools are highly efficient (row A) while about one-third are not (row B); a little under half of the Advocates for Children schools are highly efficient (row A), while the majority of the Chancellor's schools are not (row B).

While there is some agreement between worst and inefficient schools, some of the worst schools are not* highly *inefficient.

Similarly, while there is some agreement between worst and inefficient schools, some of the worst schools are not *highly* inefficient. Indeed, table 4 indicates that few of the worst schools are highly efficient (bottom panel, row D).[36] While most overlapping and SURR schools are highly inefficient (6 out of 8, and 7 out of 10, respectively [row F]), there are fewer highly inefficient NCLB schools (37 [row F]) than there are non-highly inefficient NCLB schools (59 [row E]).

B. The Best Schools

Why were some of the city's most efficient schools not "good enough" for the Advocates for Children and Chancellor's lists? In table 5, the most efficient best schools (column [1]) are compared to the rest of the most efficient schools (column [2]). Almost half of the 160 most efficient schools (71) are among the best New York City schools, leaving 89 schools that are highly efficient and yet did not meet the Advocates for Children nor the Chancellor's criteria. How do these schools differ? The schools that were left out of the best lists do not perform as well as the other schools (0.02 vs. 0.61), although they have improved (the average gain is 0.05 vs. –0.04). And while it costs them $120 more per pupil to achieve this performance, they obtain it with more disadvantaged student populations (significantly more poor, Black, Hispanic, and LEP students) and lower teacher quality in larger schools.[37] Performance levels in the non-best schools are lower than in the other schools for all subgroups of students.[38] Thus, the efficient schools

[34] Information on Adjusted Performance Measures is available from the authors.

[35] Descriptive statistics for the fifth grade are available upon request.

[36] In fact, none of the SURR schools (whether or not they are NCLB) are highly efficient (row D).

[37] A version of table 5 that breaks down the best schools into AFC-only, overlapping, and Chancellor's-only schools is available from the authors. Overall conclusions remain consistent, except that the AFC schools have higher spending and lower teacher quality than all other highly efficient schools (best or not) and they achieve the highest gain.

[38] Only 10 of the city's best schools are among the least efficient schools. These are schools that perform better than the other least efficient schools on both performance measures and achieve this performance with more advantaged student populations (the difference in the representation of Black students is striking, 11 percent in the best schools vs. 55 percent in the other schools). They are relatively small schools (417 vs. 659 students on average) that spend less than the rest ($10,551 per pupil vs. $11,312), yet have higher teacher quality (results available upon request, including for the Advocates For Children/Chancellor's breakdown).

Table 4. Cross tabs of best and worst schools and efficiency

	The best				
	AFC only	Overlap AFC + Chancellor's	Chancellor's only	The rest	Total
A Most efficient					
Frequency	10	45	16	89	160
Percent	1.66	7.48	2.66	14.78	26.58
Row percent	6.25	28.13	10.00	55.63	
Column percent	40.00	67.16	24.24	20.05	
B In between					
Frequency	13	21	43	205	282
Percent	2.16	3.49	7.14	34.05	46.84
Row percent	4.61	7.45	15.25	72.70	
Column percent	52.00	31.34	65.15	46.17	
C Least efficient					
Frequency	2	1	7	150	160
Percent	0.33	0.17	1.16	24.92	26.58
Row percent	1.25	0.63	4.38	93.75	
Column percent	8.00	1.49	10.61	33.78	
Total					
Frequency	25	67	66	444	602
Percent	4.15	11.13	10.96	73.75	100.00

	The worst				
	NCLB only	Overlap NCLB + SURR	SURR only	The rest	Total
D Most efficient					
Frequency	26	0	0	134	160
Percent	4.32	0.00	0.00	22.26	26.58
Row percent	16.25	0.00	0.00	83.75	
Column percent	21.31	0.00	0.00	29.00	
E In between					
Frequency	59	2	3	218	282
Percent	9.80	0.33	0.50	36.21	46.84
Row percent	20.92	0.71	1.06	77.30	
Column percent	48.36	25.00	30.00	47.19	
F Least efficient					
Frequency	37	6	7	110	160
Percent	6.15	1.00	1.16	18.27	26.58
Row percent	23.13	3.75	4.38	68.75	
Column percent	30.33	75.00	70.00	23.81	
Total					
Frequency	122	8	10	462	602
Percent	20.27	1.33	1.66	76.74	100.00

SOURCE: Authors' calculations based upon data provided by the New York City Department of Education. The list of SURR schools is from the New York State Education Department website. The lists of NCLB and Chancellor's schools are from the New York City Department of Education website. The list of AFC schools is from Hemphill (1999, 2002).

Table 5. Most efficient schools: The best versus the rest (unweighted)

	(1) The best N = 71	(2) The rest N = 89
Student characteristics		
Average reading and math z-score	0.61	0.02
Average reading and math gain	–0.04	0.05
Average *z*-score for poor students	0.38	–0.03
Average *z*-score for non-poor students	0.91	0.39
Average *z*-score for Black students	0.25	–0.03
Average *z*-score for Hispanic students	0.33	–0.07
Average *z*-score for Asian and other students	0.82	0.35
Percent free lunch eligible	49.69	80.54
Percent Black	16.35	29.50
Percent Hispanic	26.53	54.36
Percent Asian and others	23.22	8.73
Percent LEP	12.53	20.29
Percent recent immigrants	8.84	7.83
Percent special education	4.01	4.15
Percent resource room	6.40	5.73
School characteristics		
Total expenditure per pupil (in dollars)	8,717	8,837
Non-classroom teacher expenditure (in dollars)	4,893	4,976
Pupil-teacher ratio	15.41	14.50
Percent teachers licensed/permanently assigned	88.25	79.73
Percent teachers with master's degree	83.00	75.45
Enrollment	792	1,057

NOTE: For the subgroup performance variables, N ranges from 67 to 71 in column (1) and 67 to 89 in column (2).

SOURCE: Authors' calculations based upon data provided by the New York City Department of Education.

that do not make the Advocates for Children or Chancellor's lists do well with their clientele, but on an absolute level, not as well as schools with an easier clientele.

C. The Worst Schools

Just as some highly efficient schools were not good enough to make the AFC or Chancellor's lists, some highly inefficient schools were not considered "bad enough" to be included in the NCLB or SURR lists. What distinguishes these schools from the other inefficient schools? In order to address this question, the least efficient, worst schools (table 6, column [1]) are compared to the other least efficient schools (column [2]). About a third of the 160 least efficient schools are among the worst New York City schools. These schools have lower performance in levels and in gains than the other least efficient schools (–0.43 and –0.04 vs. –0.25 and –0.01, respectively). The lower performance level holds for most subgroups. These schools educate more poor (90 percent), Black (63 percent), and Hispanic (33 percent) students than the other inefficient schools do (80 percent, 48 percent, and 31 percent, respectively) with higher spending, per pupil (by about $200) and lower teacher quality. [39,40]

Thus, interestingly, whenever two groups of schools are compared, the "worst" of the two sets tends to have lower

[39] A version of table 6 that breaks down the least efficient worst schools into NCLB-only, overlapping, and SURR-only schools is available from the authors upon request. Once again, conclusions are about the same. Notably, the overlapping and SURR schools achieve higher gains and the Advocates for Children schools much lower gains than the rest of the City's least efficient schools.

[40] Twenty-six of the 160 most efficient schools in the sample are among the City's worst schools, and they are all NCLB-only schools. Compared to the rest of the highly efficient schools, they have lower performance in levels (–0.18 vs. 0.37, and this is true of subgroups as well) although not in gains; more poor, Hispanic, and LEP students (92 percent, 75 percent, and 27 percent vs. 62 percent, 36 percent, and 15 percent, respectively, in the other schools); and lower teacher quality in spite of higher spending ($9,126 vs. $8,717). Notably, they have a lower share of Black students than the other schools (19 percent vs. 25 percent). Results are available from the authors.

Table 6. Least efficient schools: The worst versus the rest (unweighted)

	(1) The worst N = 71	(2) The rest N = 89
Student characteristics		
Average reading and math *z*-score	–0.43	–0.25
Average reading and math gain	–0.04	–0.01
Average *z*-score for poor students	–0.44	–0.30
Average *z*-score for non-poor students	0.04	0.10
Average *z*-score for Black students	–0.45	–0.33
Average *z*-score for Hispanic students	–0.46	–0.32
Average *z*-score for Asian and other students	–0.05	0.15
Percent free lunch eligible	89.70	80.24
Percent Black	62.60	47.63
Percent Hispanic	32.70	30.74
Percent Asian and others	2.49	5.21
Percent LEP	9.45	10.29
Percent recent immigrants	3.17	4.42
Percent special education	5.56	5.46
Percent resource room	6.28	6.72
School characteristics		
Total expenditure per pupil (in dollars)	11,400	11,202
Non-classroom teacher expenditure (in dollars)	6,841	6,637
Pupil-teacher ratio	11.89	12.10
Percent teachers licensed/permanently assigned	73.82	76.19
Percent teachers with master's degree	71.48	71.74
Enrollment	706	615

NOTE: For the subgroup performance variables, N ranges from 24 to 50 in column (1) and 59 to 110 in column (2).
SOURCE: Authors' calculations based upon data provided by the New York City Department of Education.

performance, more disadvantaged student populations, higher spending, and lower teacher quality.

VII. Discussion and Implications for Policymakers

Several factors explain the differences we see in these lists. First, the various lists of best and worst schools were put together in different years (2003 for the NCLB and Chancellor's schools, 1999 and 2002 for the Advocates for Children schools) while the most recent year of data for the efficiency measures is 2000. In addition, each list of best and worst schools is put together for a specific year, while the EPFs require the use of several years of data. This can cause differences, even though averages of variables over those years are not significantly different from their values for each year.

Second, the efficiency measures control explicitly for exogenous factors and resources, which the other methodologies used to identify best and worst schools do not, at least not explicitly. In addition, the other methodologies take different factors into account. Most significantly, the Advocates for Children list takes into account an array of variables other than performance, including school atmosphere (stress, competition, safety); the number, quality and teaching methods of the teachers; the condition of the school building; and ethnic diversity.

Indeed, beyond such technical discrepancies as the year or number of years of data lies a more fundamental source of differences among the lists. All lists, except for the research-based ones, are based on the *performance* of schools, while the research-based ones aim at capturing school *efficiency*—they take into account clientele and resources. It seems clear that these two concepts are distinct, even though the other lists attempt to take into consideration a number of factors that affect school efficiency. Still, comparing subgroups of schools based on these factors is not equivalent to systematically taking into account factors that, as theory dictates, raise or lower the efficiency of a school.

Efficiency in public goods is in the public interest, but it is not necessarily in the interest of each individual or, as

it pertains to education, of each parent. A perfect illustration of this point manifested itself in March in an East Harlem, NY, school, which proved successful enough to prompt the City to suggest that it enroll more students. This suggestion was vehemently opposed by the students' parents, as well as the teachers and the principal, who were satisfied by the children's performance and did not want to jeopardize it by attempting to provide this opportunity to other children (Gootman 2004).[41]

Efficiency is a public concern. Yet because of the way the New York City school system is organized and funded, typical pressure for efficiency from taxpayers and competition between local governments does not really apply, although there are now demands from various levels of government to raise performance. The four lists of best and worst schools this paper discusses before going into the research-based one represent three levels of government—federal (NCLB), state (SURR), and city (Chancellor's)—as well as the not-for-profit sector (Advocates for Children), and while economists and policy planners advocate the importance of efficiency, none of these methods takes it into account. While they may still be used by parents looking to choose schools for their children, it is surprising that no public entity has made an effort to publicize other numbers, such as measures of efficiency. Who then can promote efficiency? Systems are being put in place to identify the best and worst schools and provide support for the improvement of the schools that need it, but there is a need for a mechanism that can assess and promote efficiency in public schools and districts. While efficiency may not yet be well enough defined and assessed to be a solid basis for accountability systems, there may be things that state policymakers can begin to do to reach that stage: data collection, training, research, policy evaluation, assessing funding requirements, etc. (Camphire 2004).

Perhaps the absence of such a mechanism is primarily a concern for large cities. Indeed, in a small school system, pressure from the voters to lower property taxes may act as an incentive for efficiency. In a large school system such as New York City, school funding comes from a large pool of money, and there may be more of a disconnection between the sources of funding, the funding itself, and its uses and users. As such, small school districts may provide a good model for the search for efficiency.

We find that efficiency groupings differ from the best or worst groupings; there is some overlap, but it is not complete. Once a satisfactory way to measure efficiency is found, it would be helpful for policymakers who are deciding whether to punish or assist schools to know if low-performing schools are also inefficient or if high-performing schools are efficient. Low-performing inefficient schools might require reorganization, while low-performing, efficient schools might benefit from increased resources. On the other hand, high-performing schools may be in need of intervention. High-performing *efficient* schools could be left alone, but high-performing inefficient schools could be required to choose between doing more for their students or operating with fewer resources. This is one way policymakers could take advantage of the two criteria—performance and efficiency—at their disposal to evaluate and improve schools.

[41] Gootman, Elissa. (2004, March 3). Many at Successful Middle School Oppose Its Expansion. *The New York Times*.

References

Barbanel, J. (1999a, March 21). Testing, Testing: How the City's Third-Graders Performed in 1998. *The New York Times*, p. 8.

Barbanel, J. (1999b, March 28). Report Cards Point to Struggles for Middle and High Schools. *The New York Times*, p. 10.

Barbanel, J. (1999c, April 11). How the County's Third-Graders Are Reading. *The New York Times*, p. 12.

Barbanel, J. (2000, March 19). The Report Card for Middle and High Schools. *The New York Times*, p. 12.

Bessent, A.M., and Bessent, E.W. (1980). Determining the Comparative Efficiency of Schools Through Data Envelopment Analysis, *Educational Administration Quarterly*, *16*(2): 57–75.

Camphire, G. (2004). Delivering Efficiency, Focus on Bolstering School Finance and Accountability. *Southwest Educational Development Laboratory Letter, 16*(1): 9–11.

Charnes, A., Cooper, W.W., Lewin, A.Y., and Seiford, L.M. (1994). The DEA Process, Usages and Interpretations. In A. Charnes, W.W. Cooper, A.Y. Lewin, and L.M. Seiford, (Eds.), *Data Envelopment Analysis: Theory, Methodology and Application* (pp. 425–435). Boston: Kluwer Academic.

Charnes, A., Cooper, W.W., and Rhodes, E. (1978). Measuring the Efficiency of Decision-Making Units, *European Journal of Operational Research*, *2:* 429–444.

Clotfelter, C.T., and Ladd, H.F. (1996). Recognizing and Rewarding Success in Public Schools. In Ladd, H.F. (Ed.), *Holding Schools Accountable, Performance-Based Reform in Education* (pp. 23–63). Washington, DC: The Brookings Institution.

Coleman, J., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weinfeld, F.D., and York, R. (1966). *Equality of Educational Opportunity*. Washington, DC: U.S. Government Printing Office.

Dill, D.D., and Soo, M. (2003, November). *Is There a Global Definition of Academic Quality?: A Cross-National Analysis of University Ranking Systems.* Paper prepared for the Annual Conference of the Association of Public Policy and Management, Washington, DC.

Downes, T.A., and Pogue, T.F. (1994). Adjusting School Aid Formulas for the Higher Cost of Educating Disadvantaged Students. *The National Tax Journal*, *47*(1): 89–110.

Duncombe, W., and Yinger, J. (1997). Why Is It So Hard to Help Central City Schools? *Journal of Policy Analysis and Management, 16*(1): 85–113.

Duncombe, W., and Yinger, J. (1998). School Finance Reform: Aid Formulas and Equity Objectives. *The National Tax Journal, 51*(2): 239–262.

Duncombe, W., and Yinger, J. (1999). Performance Standards and Educational Cost Indexes: You Can't Have One Without the Other. In H.F. Ladd, R. Chalk, and J.S. Hansen (Eds.), *Equity and Adequacy in Education Finance* (pp. 260–297).Washington, DC: National Academy Press.

Edmonds, R.R. (1979). Effective Schools for the Urban Poor. *Educational Leadership*, *37*(1): 15–24.

Edmonds, R.R. (1982). Programs of School Improvement: An Overview. *Educational Leadership, 40*(3): 4–11.

Färe, R., and Lovell K. (1978). Measuring the Technical Efficiency of Production. *Journal of Economic Theory*, *19*: 150–162.

Farrell, M.J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society*, *120*(3): 253–281.

Ferguson, R.F., and Ladd, H.F. (1996). How and Why Money Matters: An Analysis of Alabama Schools. In H.F. Ladd (Ed.), *Holding Schools Accountable* (pp. 265–298). Washington, DC: The Brookings Institution.

Fiske, E.B. (2002). *The Fiske Guide to Colleges 2003.* Naperville, IL: Sourcebooks.

Gootman, E. (2004, March 3). Many at Successful Middle School Oppose Its Expansion. *The New York Times,* p. 6.

Gormley, W.T., Jr., and Weimer, D.L. (1999). *Organizational Report Cards*. Cambridge, MA: Harvard University Press.

Hanushek, E.A. (1986). The Economics of Schooling: Production and Efficiency in Public Schools. *Journal of Economic Literature, 24*(3): 1141–1177.

Hanushek, E.A. (1996). *Assessing the Effects of School Resources on Student Performance: An Update* (Working Paper No. 424). Rochester Center for Economic Research.

Hanushek, E.A., and Raymond, M.E. (2002). The Confusing World of Educational Accountability. *National Tax Journal*, *54*(2): 365–384.

Hemphill, C. (1999). *Public Middle Schools: New York City's Best.* New York, NY: Soho Press.

Hemphill, C. (2002). *New York City's Best Public Elementary Schools: A Parents' Guide.* New York, NY: Teachers College Press.

Kadamus, J.A. (2000, January 26). *Status Report on Schools Under Registration Review (SURR).* Memo to Board of Regents. Available: http://www.emsc.nysed.gov/nyc/regrev.html#SURRList/RgntJa00.pdf.

Kane, T.J., and Staiger, D.O. (2002). The Promise and Pitfalls of Using Imprecise School Accountability Measures. *Journal of Economic Perspectives*, *16*(4): 91–114.

Ladd, H.F. (1999). The Dallas School Accountability and Incentive Program: An Evaluation of Its Impacts on Student Outcomes. *Economics of Education Review, 18*(1): 1–16.

Ladd, H.F. (2002). School-Based Educational Accountability Systems: The Promise and the Pitfalls. *National Tax Journal*, *54*(2): 385–400.

Ladd, H.F., and Walsh, R.P. (2002). Implementing Value-Added Measures of School Effectiveness: Getting the Incentives Right. *Economics of Education Review, 21*(1): 1–17.

Levin, H.M. (1975). Cost-Effectiveness in Evaluation Research. In M. Guttentag and E.L. Struening (Eds.), *Handbook of Evaluation Research* (vol. 2) (pp. 89–122). Beverly Hills, CA: Sage.

Linn, R.L., and Haug, C. (2002). Stability of School-Building Accountability Scores and Gains. *Educational Evaluation and Policy Analysis*, *24*(1): 29–36.

The New York State Education Department Office of Elementary, Middle, Secondary and Continuing Education. (1998, September). *The Registration Review Process.* Retrieved May 20, 2004, from http://www.emsc.nysed.gov/nyc/regrev.html#SURRList/rrproca.pdf.

Reschovsky, A., and Imazeki, J. (2001). Achieving Educational Adequacy Through School Finance Reform. *The National Tax Journal*, *26*(2): 373–396.

Roderick, M., Jacob, B.A., and Bryk, A.S. (2002). The Impact of High-Stakes Testing in Chicago on Student Achievement in Promotional Gate Grades. *Educational Evaluation and Policy Analysis, 24* (4): 333–357.

Rubenstein, R.H., Stiefel, L., and Schwartz, A.E. (2003). Better Than Raw: A Guide to Measuring Organizational Performance With Adjusted Performance Measures. *Public Administration Review*, *63*(5): 607–615.

Schwartz, A.E., and Zabel, J. (2005). The Good, the Bad, and the Ugly: Measuring School Efficiency Using School Production Functions. In L. Stiefel, A.E. Schwartz, R. Rubenstein, and J. Zabel (Eds.), *Measuring School Performance and Efficiency: Implications for Practice and Research* (pp. 37–66). Larchmont, NY: Eye on Education.

Schwartz, A.E., Stiefel, L., and Bel Hadj Amor, H. (2005). Measuring School Performance Using Cost Functions. In L. Stiefel, A.E. Schwartz, R. Rubenstein, and J. Zabel (Eds.), *Measuring School Performance and Efficiency: Implications for Practice and Research* (pp. 69–72). Larchmont, NY: Eye on Education.

Stiefel, L., Rubenstein, R.H., and Schwartz, A.E. (1999). Measuring School Efficiency Using School-Level Data: Theory and Practice. In A. Odden and M.E. Goertz (Eds.), *School-Based Financing* (pp. 67–87). Thousand Oaks, CA: Corwin Press.

Stiefel, L., Schwartz, A.E., Bel Hadj Amor, H., and Kim, D.Y. (2005). Adjusted Measures of School Performance: A Cross-State Perspective. In L. Stiefel, A.E. Schwartz, R. Rubenstein, and J. Zabel (Eds.), *Measuring School Performance and Efficiency: Implications for Practice and Research* (pp. 17–36). Larchmont, NY: Eye on Education.

Yan, E. (2003, February 14). 208 Schools Make the Grade: Some Educators Grumble List Is Artificial Benchmark. *New York Newsday.* Available: http://www.nynewsday.com/news/education/nyc-skul0215,0,466799.story?coll=nyc%2Deducation%2Dutility.