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Financing higher student performance standards: the case of New York State

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Abstract

Many states have made performance standards the centerpiece of educational reform. Unfortunately, school aid systems have not kept up. Most aid systems ensure minimum spending per pupil instead of minimum student performance; that is, they fail to recognize that the cost of achieving a performance standard varies across school districts. This paper derives an educational cost index and incorporates it into an aid formula designed to bring all districts up to a performance standard. A district's performance can be moved toward a standard through a property tax rate increase, an efficiency increase, or increased state aid. In New York State, boosting efficiency to the current "best-practice" level would not bring large city districts even up to a minimal performance standard. In fact, these districts cannot achieve such a standard without large increases in state aid and local tax rates, accompanied by reforms that improve the productivity of teachers and administrators. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Introduction

The 709 public school districts in New York State, which served about 2.8 million students in 1995, range from the huge and varied New York City district to the three large upstate city districts to rich suburban districts on Long Island to small rural districts with fewer than 100 pupils. Despite local property tax rates that are, on average, among the highest in the country, significant variation across school districts in per pupil property wealth, in property tax effort, and in the composition of the student body ensures that educational outcomes differ widely from one district to the next. Some districts receive national acclaim for their students' performance,

while others struggle to bring their students up to minimal standards.

The poor educational performance of many districts, especially the large central cities, has been a cause of concern for many years, and New York State has made a concerted effort to raise student performance. Teacher's salaries are among the highest in the nation, basic operating aid in the state is distributed towards less wealthy districts, and New York has taken the lead in developing a series of student achievement tests, particularly the Regents exams run by the State Board of Regents, an independent agency that oversees the State's educational system. Despite these efforts, performance in central cities remains woefully inadequate. In New York City, for example, 41 percent of the 3rd grade students and 35 percent of the 6th grade students do not reach even minimal reading levels, compared to 20 percent not reaching these levels statewide. Only 19 percent of New York City high school graduates receive the more demanding Regents Diploma, compared to 39 percent for all districts in the state.

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In an effort to bridge this performance gap, New York State, by early in the new millennium, will require all students to pass a set of more demanding Regents exams before graduating from high school. New York is not alone in this approach, as many other states are making performance standards for students the centerpiece of their education reforms.

Unfortunately, however, state aid programs for local schools have not kept pace with the new emphasis on student performance. Present aid systems focus on fiscal capacity differences by attempting to compensate low-wealth districts. An aid system based on performance standards must take another step by recognizing that the cost of achieving a given performance standard varies across districts.

In this paper, we explain one method for developing a comprehensive educational cost index, and show how to incorporate it into a performance-based foundation aid system. While analyzing educational costs has long been a topic of interest in education research (Brazer, 1974; Chambers, 1978; Kenny, Denslow & Goffman, 1975), costs adjustments made by most states are typically ad hoc “weighted pupil” measures that only partially correct for cost differences across districts. Only recently have scholars shown how to incorporate cost indices in aid formulas designed to achieve outcome equity objectives (Ladd & Yinger, 1994). Expenditure-based aid formulas will not and indeed cannot achieve performance standards in high-cost districts (Duncombe & Yinger, 1998).

Large increases in state aid to needy districts not only raise their performance, but also have two undesirable consequences, namely increased school district inefficiency and a reduction of local tax effort. Our simulations for New York state allow us to predict the impact of aid increases on school district efficiency and on the local property tax rate. The interrelationships between aid, tax effort and inefficiency suggest that dramatically improving performance in large central cities will require a combination of approaches: significant increases in state aid, rules to require minimum local tax effort, and implementation of management reforms aimed at improving school district efficiency.

This paper is organized into three main sections. We first build the analytic framework for our case study of New York by discussing our measures, models, and simulation methodology. We then present a performance-based foundation aid system that is consistent with the achievement of minimum performance standards, and simulate its impact of performance levels in New York state school districts. Our simulations also allow us to project the impact of different aid systems on school district spending, tax rates, and efficiency. We conclude the paper with several lessons concerning the design of school finance systems to achieve higher student performance.

2. The analytical framework

The analytical framework of this paper is based on three equations: a cost equation, a demand equation, and an efficiency equation. This section explains our approach to measuring performance, provides an intuitive explanation of each equation, and discusses our method for simulating alternative educational policy reforms. We expand on previous research on state aid distribution by bringing costs into aid formula design and by simulating the impacts of aid on the demand for educational performance and on school district inefficiency.

2.1. Measuring performance

The performance of a school district can be measured in many ways, each of which has limitations. Most scholars measure performance by selecting, on a priori grounds, a single performance indicator, such as an average test score. Our approach attempts to capture a broader range of school activities by determining which performance indicators are valued by voters, as indicated by their correlation with property values and school spending. Our approach, which is explained in detail in Duncombe, Ruggiero and Yinger (1996) and Duncombe and Yinger (1997), results in an index of educational performance. This index is a weighted average of the performance indicators that are found to be statistically significant, where the weights reflect the value voters place on each indicator.¹

When applied to data for New York state, this approach results in an educational performance index based on three performance indicators: the average share of students above the standard reference point on the third- and sixth-grade PEP tests for math and reading, the share of students who receive a more demanding Regents diploma (which requires passing a series of exams), and the graduation rate. These indicators cover a wide range of school district activities, including both elementary and secondary education programs and programs that focus on both retention and academic performance. Although we use an objective, statistically based pro-

¹ Strictly speaking, this interpretation of the weights depends on the assumption that educational performance is provided at constant cost. See Duncombe and Yinger (1997). This assumption is employed in virtually all the educational finance literature, although it has not been adequately tested. The outcomes we selected had an adjusted *R*-squared of at least 0.10 with variables typically found in an education demand equation, including income and tax share. In addition, we ran a factor analysis on an array of outcome measures and the scree plot indicated three distinct outcome measures which grouped around the three measures we used. For a more detailed explanation of our procedure, see Duncombe and Yinger (1997, 1998).

cedure to select these indicators, they do not, of course, summarize all educational activities by a school district. The reader should be aware that all the analysis in this paper is based on this performance index and therefore ignores school districts' performance using other indicators. The general principles we illuminate would, we believe, still hold for many other sets of indicators, but all of our specific conclusions depend on the specific performance index we employ. Perhaps the key point for policy makers to keep in mind is that they cannot measure performance or design programs to promote it without selecting specific performance indicators. Our approach is by no means the only way to make this selection, but one cannot avoid the selection process.

2.2. The cost equation

One of the central ideas in the educational finance literature is that the cost of providing education depends not only on the cost of inputs, such as teachers, but also on the environment in which education must be provided (see, for example, Bradford, Malt & Oates, 1969; Ratcliffe, Riddle & Yinger, 1990; Downes & Pogue, 1994; Duncombe et al., 1996). A harsher environment, characterized by high rates of poverty and single-parent families, for example, results in a higher cost to obtain any given performance level. Just as the harsh weather "environment" in upstate New York ensures that people who live there must pay more during the winter time than do people in southern states to maintain their houses at a comfortable temperature, the harsh educational "environment" in some school districts, particularly in big cities, ensures that those districts must pay more than other districts to obtain the same educational performance from their students.

The concept of a harsh environment is clearly recognized in the State Education Department's report on the status of the state's schools (The University of the State of New York, 1997, p. 3), which says "Five indicators, each associated with poor school performance, are useful for identifying students at risk of educational disadvantage: minority racial/ethnic group identity, living in a poverty household, having a poorly educated mother, and having a non-English language background". A hint about the powerful role played by poverty also appears in this report in a table (Table 5.16, p. 128) indicating how one key performance measure, the percentage of third-graders above a standard reference point on the State's reading exam, falls as the poverty concentration in a school rises. Specifically, 90.5 percent of the students score above this point in schools with a poverty rate below 20 percent, but only 58.9 percent of students do so when the school poverty rate is above 80 percent. Despite this recognition of the importance of the cost environment, New York State currently makes no attempt to identify all important environmental cost fac-

tors or systematically estimate their effects, and current state aid formulas account for such factors only in an ad hoc manner.

Our approach identifies important input and environmental cost factors and estimates their impact on educational costs. We estimate a cost function of the general form:

$$E = g(S, P, N, F, D, \epsilon) \quad (1)$$

where E represents per pupil spending; S is an array of student performance measures; P is the price districts pay for inputs, such as teachers; N is the number of pupils in the district; F represents students' family backgrounds; D represents other student characteristics; and ϵ represents unobserved district characteristics. In short, the spending required to provide a given level of student achievement is a function of factor prices, environmental factors, and district characteristics that cannot be observed. A district's relative cost is defined as the extent to which input prices and environmental factors require it to pay more than other districts to receive the same level of S . One of the crucial unobserved factors in most cost models is the level of district efficiency. As discussed below, we calculate an efficiency index, and this index is also included in the cost model. In addition, we include several dummy variables in the cost model to identify different types of districts and thereby to control for unobservable factors that may affect expenditure levels.² We interpret these variables as indicators of unobserved differences in district performance; if they also pick up unobserved elements of educational costs, then our approach probably understates variation in educational costs across districts.

We estimate this model for 631 school districts in New York state in 1991; the detailed results are presented in Appendix A, Table 10.³ In particular, we find that edu-

² Another approach to controlling for omitted variables is to use multiple years of data to difference out unobserved fixed district effects, that is, effects that do not vary over time. Downes and Pogue (1994) use a fixed-effects model to estimate educational costs in Arizona. However, given that many environmental cost factors change slowly over time, and indeed may not change at all in available data sets, fixed effects models may dramatically underestimate the influence of environmental factors on costs. In essence, the fixed-effect approach is conservative in its estimate of cost differences across districts, because some cost variation is captured by the district fixed effects, which are not considered cost variables. To avoid this problem, we use data for a single year and incorporate several new variables, including dummy variables for type of school district and an efficiency index, to control for unobserved factors.

³ For a more detailed explanation of our procedures, see Duncombe and Yinger (1997, 1998). We estimate our education cost model in log-linear form, with the outcome measures, the efficiency index, and the price of labor treated as endogenous.

cational costs in New York state are influenced by the cost of the main input, namely teachers, and by five environmental cost factors: district enrollment, the percentage of children in poverty, the percentage of households headed by a single female, the percentage of students with limited English proficiency, and the percent of students with severe disabilities.⁴ The estimated cost impact of teachers salaries recognizes that these salaries reflect not only labor market conditions, over which a school district has no control, but also a district's generosity in wage setting. Thus, we use an estimating procedure that limits the impact of salaries to the variation associated with underlying labor market conditions.⁵ The estimated impact of district enrollment is nonlinear. Following many previous studies, we find that the relationship between cost per pupil and enrollment is U-shaped, with relatively high costs in both the smallest and the largest districts.⁶

On the basis of our regression results, we combine these input and environmental cost factors into a cost index, which indicates how much a district must spend to achieve the same performance (as measured by our index) as a district with average costs (see Duncombe & Yinger, 1997). Specifically, we hold outcomes, efficiency and regional dummy variables constant at the state average so that the index reflects variation in teacher salaries and environmental factors only. An index value of 100 indicates average cost, for example, whereas an index value of 200 indicates that a district must spend twice the average amount to obtain any given performance result. Cost indexes by type of district are

Instruments for the outcome variables come from the demand equation, and instruments for the efficiency index come from the efficiency equation. While recent research in education cost functions have employed more flexible functional forms (Callan & Santerre, 1990, and Gyimah-Brempong & Gyapong, 1992), we believe such models would add complexity without significant insight.

⁴ Other measures of disability, such as the percentage of students with any form of disability, are available but we do not use them because they are influenced by school district policies regarding the identification of disabilities. See Lankford and Wyckoff (1996).

⁵ Specifically, three steps were taken. The teacher salary index is based on teachers with only 1 to 5 years of experience which hopefully reflect more closely market wages. Second, differences in average experience, gender, tenure and education of teachers across districts was held constant. Finally, the salary index was treated as endogenous in the wage equation with the county manufacturing wage and the county population in 1990 used as instruments.

⁶ As indicated in Appendix A, Table 10, we actually estimate a cubic relationship, which allows the U-shape to flatten out at the highest enrollment levels. This was done to accommodate New York City which has over 20 times the enrollment of the next largest district (Buffalo).

presented in Table 1. Upstate suburbs have the lowest average cost index at 91.6, and New York City has the highest cost index, namely 306.2. The three large upstate cities also have high costs, with an average index of 182.

It should be pointed out that these indexes are not driven by New York City. A regression analysis that excludes New York City results in cost indexes, both for the City and for other districts, that are similar to the indexes in Table 1. In fact, such a regression actually results in a somewhat higher index for the City. The plain fact is that, as shown in Table 1, the City faces both high labor costs and the harshest educational environment in the state; its costs are relatively high no matter which sample is used for the regression analysis.⁷

2.3. *The demand equation*

A crucial step in understanding the impact of school aid systems on student performance, is estimating the response of voters and school districts to changes in factors such as aid and community income. Voters can respond to an aid increase by asking for an improvement in educational performance or a reduction in school taxes. School officials may react to increased aid by being less diligent in their use of school funds, thus increasing inefficiency. While understanding the behavioral response to school aid is crucial to accurate predictions of its effects, the capacity for such simulations is often lacking among education analysts in state government.⁸

In constructing our behavioral model, we draw on the large literature on the demand for educational outcomes (see Inman, 1979; Rubinfeld, 1987; Ladd & Yinger, 1991). In particular, we employ the well-known median voter model, in which a district's demand for educational

⁷ An alternative method of estimating educational cost indices is to focus on exogenous factors that affect the compensation which has to be paid to recruit equal quality teachers, or what are commonly called, compensating wage differentials. Chambers (1995) has estimated teacher cost indices for most school districts in the country using data from the NCES. While these indices reflect the higher teacher salaries required in large cities, they significantly underestimate cost variation because they do not reflect the additional teachers and other resources required to bring student performance up to a given standard when the educational environment is harsh. For example, the teacher salary index for New York City in 1990 using the Chambers estimates (where the state average for New York is set equal to 100) is 130. This compares to our index of 306 for New York City using a more comprehensive definition of education costs.

⁸ In New York state, for example, the state Department of Education has the capacity to do detailed estimates of the aid received by districts under various aid formulas; however, there is no institutional capacity to simulate the response of school districts to the aid they receive.

Table 1
Average characteristics of school districts by region and type, New York school districts, 1991^a

Characteristic	Downstate						Upstate					
	State average	New York City	Yonkers	Small cities	Suburbs	Large cities	Rural	Small cities	Suburbs	Large cities	Suburbs	
Per pupil expenditure												
Unadjusted:												
Total expenditures	\$8,399	\$7,501	\$10,001	\$12,135	\$11,874	\$8,245	\$7,472	\$7,312	\$7,402	\$8,245	\$7,402	\$7,402
Operating expenditures	\$6,058	\$6,082	\$6,781	\$8,741	\$9,016	\$5,186	\$5,145	\$5,194	\$5,333	\$5,186	\$5,333	\$5,333
Adjusted for cost:												
Total expenditures	\$8,399	\$2,450	\$5,340	\$9,202	\$10,829	\$4,529	\$7,639	\$6,686	\$8,084	\$4,529	\$8,084	\$8,084
Operating expenditures	\$6,058	\$1,986	\$3,620	\$6,629	\$8,222	\$2,849	\$5,260	\$4,749	\$5,824	\$2,849	\$5,824	\$5,824
Fiscal capacity												
Per pupil property value	\$367,160	\$380,467	\$460,621	\$676,798	\$798,868	\$161,681	\$243,810	\$215,089	\$261,175	\$161,681	\$261,175	\$261,175
Median family income	\$40,438	\$34,360	\$43,305	\$54,635	\$61,635	\$26,527	\$30,474	\$32,518	\$39,029	\$26,527	\$39,029	\$39,029
Local school property tax rate ^b	2	1.5	1.9	1.8	1.9	2.2	2.0	2.1	2.1	2.2	2.1	2.1
Cost and other factors												
Cost index	100.0	306.2	187.3	131.9	109.7	182.0	97.8	109.4	91.6	182.0	91.6	91.6
Teacher salaries ^c	\$24,722	\$27,227	\$26,707	\$28,714	\$28,004	\$25,753	\$23,933	\$23,370	\$23,721	\$25,753	\$23,721	\$23,721
Enrollment	3,878	931,211	18,244	4,592	3,277	33,054	1,060	4,134	2,273	33,054	4,134	2,273
Percent of children in poverty	11.6	29.6	19.9	10.9	5.2	36.5	16.0	19.3	9.2	36.5	19.3	9.2
Percent female-headed households	8.8	18.1	15.7	12.3	9.3	19.1	8.2	11.7	8.2	19.1	11.7	8.2
Percent students with severe handicaps	4.5	6.3	10.0	7.1	5.3	7.8	4.1	5.6	4.0	7.8	5.6	4.0
Percent students with limited English	1.0	9.8	5.8	4.3	2.2	2.1	0.6	1.0	0.6	2.1	1.0	0.6
Population density	1,167.1	38,138.4	10,612.3	7,053.9	3,061.7	6,268.3	64.8	1,825.8	532.9	6,268.3	1,825.8	532.9

^a The same sample of 631 districts was used in these calculations as in the other tables.

^b The local school tax rate equals total property tax revenue in a district divided by full property value of a district.

^c Estimates of the salary of teachers with 1 to 5 years of experience with same gender, tenure status and education.

outcomes, as determined through voting, is a function of the median voter's income, Y ; the aid received by the district, A , the decisive voter's tax price, TP ; an efficiency index, e ; and various preference variables, represented by R .

$$S=f(Y, A, TP, e, R). \quad (2)$$

Our demand model uses an index of the three outcomes discussed previously as the dependent variable.⁹ Preference variables include community characteristics, such as the percentage of adults who graduated from college and the percentage of households living in owner-occupied housing, that might affect voting outcomes.¹⁰

Following the literature (especially Ladd & Yinger, 1991), we define the tax price, TP , as the tax share multiplied by the marginal expenditure for educational services. We measure the tax share with the ratio of median housing value to total property value per pupil. Marginal expenditure equals marginal cost divided by the efficiency index to reflect wasted spending. Assuming constant returns to scale with respect to S , an assumption used by virtually all education cost studies, average cost equals marginal cost, and the education cost index from the cost model can be used as a measure of marginal cost. In estimating the demand model, we split marginal expenditure into two pieces. The first piece is the tax share multiplied by the cost index and the second is the efficiency index. This procedure recognizes that voters may have different perceptions about, and hence different responses to, inefficiency and the tax share.

In addition, voter demand for educational performance depends on state aid; the higher the aid, the greater the

desired performance and spending.¹¹ Although an increase in aid is similar to an increase in income, many studies have established that aid increases have a greater impact on district spending than do comparable increases in income. This is known as the flypaper effect; money "sticks where it hits". We utilize the state aid variable in the demand equation to simulate how different types of aid systems affect voter demand for outcomes, spending and tax rates.

The estimates of the demand model are consistent with findings of past studies of education demand (see Appendix A, Table 10).¹² The income elasticity for education is estimated to be somewhat below unity, 0.87, which is somewhat higher than that found in most past research (see Inman, 1979). This result may reflect the fact that, unlike previous studies, we control for costs and efficiency.¹³ The coefficient for the operating aid is statistically significant and is consistent with the so called "fly-paper" effect. The price elasticity for education, μ , is estimated to be -0.38 , which is in line with past research on education (see Inman, 1979). In addition, the coefficient of the "efficiency" index is positive and statistically significant; as expected, higher efficiency lowers the effective price facing the median voter and increases demand for S . Of the preference variables we have included, only the percent owner-occupied housing has a significant positive relationship with educational outcomes.

2.4. The efficiency equation

The third equation examines the determinants of school district efficiency, as measured using a "best-practice" technique. With this technique, a district is said to be inefficient if it spends more on education than other districts with the same performance and the same educational costs. The degree of inefficiency is measured by the extent of this excess spending. Although the "best-practice" technique we use, called data envelopment

⁹ An alternative approach to estimating voter demand for education is to estimate a system of demand equations for each individual performance indicator. This approach does not eliminate the need to reduce the number of performance measures in the cost equation, nor does it provide much guidance on which outcomes measures to include. While the use of a simultaneous system of equations has been used for production functions (Boardman, Davis & Sanday, 1977), to the best of our knowledge, it has not been used to estimate education demand equations. In theory it is possible to estimate a series of demand equations by the decisive voter for different educational performance measures (see Goldberger, 1987, for a review of demand system functional forms). However, such demand systems would require measures of tax prices for each educational outcome. It may be possible to construct tax prices for broad classes of public services (Blackley & DeBoer, 1987), but this is not feasible for education.

¹⁰ Because of a high correlation between the percent of college graduates and median income, we used the residual from a regression of percent college on median income as the college variable.

¹¹ The actual state aid variable included in the demand model is the aid per pupil divided by median income and multiplied by the tax share. Aid is multiplied by the tax share to reflect the reduction in taxes on the median voter from an additional dollar of state aid. The term is divided by median income to reflect the actual budget constraint facing this voter (see Duncombe & Yinger, 1998).

¹² We estimate our demand model in log-linear form using 2SLS, with efficiency treated as endogenous. Instruments are derived from the efficiency equation. The aid variables and the preference factors are not expressed as logarithms.

¹³ When we estimate a median voter model without the cost index or the efficiency index, the income elasticity drops to 0.5. This result is consistent with the predictions of Schwab and Zampelli (1987) who highlight the potential downward bias in the income elasticity when costs are omitted from the tax price.

analysis or DEA, is well known, we are the first to use it in a comprehensive analysis of school district responses to educational policy reforms. As a result, this is the most exploratory part our analytical framework.

To keep our efficiency results in perspective, it is worth emphasizing that they depend both on our method for estimating efficiency and on our definition of performance. In other words, we explore the impact of various policy changes on best-practice efficiency in delivering educational performance as measured by our index. So far, scholars have not identified any other approach to estimating efficiency that can be employed in an analysis of school district behavior, but our approach is not without limitations (see Duncombe & Yinger, 1997), so further research on this topic clearly is warranted. Moreover, other scholars might prefer to apply our approach to efficiency to a different performance index.

The literature on managerial efficiency and public bureaucracies suggests three broad factors that might be related to productive inefficiency: fiscal capacity, competition, and factors affecting voter involvement in monitoring government (see especially Leibenstein, 1966; Niskanen, 1971; Wyckoff, 1990; Duncombe, Miner & Ruggiero, 1997). First, the pressure put on school boards and school officials is influenced by the tightness of the budget constraint. Districts with higher income or property values tend to face less pressure to perform and hence have lower efficiency. Of particular importance for our simulation is the influence of state aid on efficiency. In particular, districts are more efficient if (a) they receive less aid per pupil than other districts in their enrollment/property value class or (b) if they are in an enrollment/property value class that receives a relatively low amount of aid per pupil.¹⁴ Thus, districts make extra efforts to keep up with comparable districts that are receiving more aid and classes of district receiving the least aid are forced to find additional ways to cut their expenses without sacrificing performance. Using a tobit regression model, we find that all of these variables have the expected sign and most are statistically significant (see Appendix A, Table 11).¹⁵

¹⁴ The within class aid variable is mediated by the distance a district's enrollment is from the mean enrollment of a class.

¹⁵ The Tobit regression results are adjusted using the method recommended by McDonald and Moffitt (1980) for values above the limit for use in the efficiency simulation. (Table 11 includes the adjusted beta coefficients.) Besides including efficiency variables, we have included other factors that could influence the DEA efficiency index. Since the DEA index, which compares per pupil expenditures and outcome measures, can be influenced by the environment in which education is provided, we control for the environmental factors in the cost model. Also, our measure of efficiency is based on the assumption that only the outcomes we look at are of value to voters.

Second, public choice scholars emphasize that competition in the delivery of a public service is likely to put external pressure on managers to be more efficient. Competition can come in the form of competition from public and private schools, as well as voter referendums on district budgets. We have included measures of private school competition (percent of county students in private schools), public school competition (measure of public school concentration in a county), and the lack of a voter referendum (in city school districts).¹⁶ None of the competition variables are statistically significant. This result contrasts with some other recent research indicating that competition improves performance (Hoxby, 1994a,b).

Finally, various characteristics of a school district may affect how much parents are willing and able to monitor the performance of their schools. We expect that in districts with more college educated parents and smaller geographic size parents will be more involved in public education and efficiency will be higher. While the variable for college educated adults is positive and significant, the coefficient on geographic area goes against expectations (although not significant at conventional levels). In addition, we hypothesize that efficiency is influenced by the share of any additional dollar of revenue that must be contributed by voters, which, as noted earlier, is called the tax share. The larger the tax share, the greater the bite that any tax increase takes out of voters' pocketbooks, the more voter vigilance, and therefore the higher the efficiency on the part of school administrators. Our empirical results in Table 11 strongly confirm this hypothesis.

2.5. Simulation methodology

These three equations allow us to simulate the impact of many different educational policies on educational performance, local tax rates, and school district

Since there may be variation in the outcome objectives across districts, we include a number of other outcome measures in the regression model. Finally, to control for possible omitted variables which may be correlated with the distinction between districts in upstate or downstate New York, we have included a dummy variable for downstate suburbs and small cities. This variable may be picking up omitted cost or outcome measures. These omitted outcomes and cost factors are held constant in constructing our estimates of the efficiency index in Table 9.

¹⁶ To measure concentration, we constructed a Herfindahl index of school concentration in the county a district is located in. The Herfindahl index is the sum of the squared school shares for each district (the district's total schools over the total county public schools). A highly concentrated district will have a Herfindahl index close to 1, and a highly decentralized district will have a index closer to 0. We also used an enrollment concentration index (similar to Hoxby, 1994a), and found similar insignificant results.

efficiency. The cost equation is used to construct a cost index. As discussed more fully below, this cost index is a key element in the design of performance-based school aid systems. Changes in school aid influence educational performance both directly (through the aid effect) and indirectly (through their impact on efficiency). We use the efficiency equation to estimate this efficiency effect. Because aid variables and efficiency are factors in the voter demand model, we use this model to simulate how changes in aid influence the amount of educational performance voters demand. Using the cost index, the efficiency index, and the district property tax base, we estimate the spending level and property tax rates required to achieve the desired outcome level. Except where noted, our simulations also are budget neutral, in the sense that they simply redistribute the existing state aid budget.¹⁷

3. An analysis of performance standards

Educational performance standards are now under active discussion at both the national and the state level. New York State has long been a leader in this debate because of its Regents exams, which set implicit standards for success in high school. Moreover, the recent implementation of district report cards in New York highlights each district's performance and facilitates a discussion of the standards that each district should be expected to reach. The Regents have been exploring the possibility of issuing more explicit performance standards, but have not yet determined whether to take this step, how to set these standards, or how to ensure that districts meet them.

The academic literature on standards is limited. One scholar, Bishop (1994), argues that clearly articulated standards can boost performance. In fact, on the basis of a statistical analysis of SAT scores in the United States, Bishop argues that the relatively high performance on SATs of students in New York state can be attributed in part to the existence of Regents exams.¹⁸

A full analysis of performance must consider many issues. How can a system of standards avoid encouraging schools to "teach to the test"? Will a standard imposed on one performance indicator, such as Regents diplomas, lead to poorer performance on competing indicators,

such as the graduation rate, or to accompanying performance increases on complementary indicators, such as scores on elementary school tests. (In New York, the principal tests taken in elementary schools are the PEP tests for reading and math in 3rd and 6th grades.) This type of full analysis is beyond the scope of this paper. Instead, we will use our analytical framework to explore the magnitude of the task facing school districts and state policy makers if they want to bring low-performing districts up to a higher standard.

3.1. How can a district meet a performance standard?

Acting on its own, the only ways for a low-performing school district to reach a performance standard are (1) to raise its property tax rate and use the funds to purchase better performance, (2) to improve the efficiency with which it uses its resources, or (3) some combination of the two. Our analytical framework does not allow us to determine how districts can find the political resources needed to raise their tax rates, nor does it show how they can improve their management practices so as to be more efficient. However, this framework does reveal the extent of the tax-rate or efficiency changes that would be necessary to meet a general performance standard.

We focus on operating spending, not total spending, and define the "local contribution rate" as the tax rate levied by a district in support of its operating budget. We then examine the increase in this tax rate required to bring each district up to three given standards, namely the 25th, 50th, and 75th percentiles of the current performance distribution, as measured by our performance index. Recall that this index is based on elementary test scores, Regents diplomas, and graduation rates. Obviously, districts with higher costs (or higher inefficiency) will have to spend more to obtain any given increase in performance, districts that are far from the standard will have to spend more to reach it than other districts, and districts with relatively small property tax bases will have to raise their tax rates more than districts with relatively large bases.

Our results are presented in the first three columns of Table 2. The first panel of this table applies to a standard set at the 25th percentile of the performance distribution in 1991. Most districts meet this standard, of course, but some districts in virtually every class do not. The second column indicates the average tax rate in each class of district if every district in the class raised enough money to meet the standard; the third column indicates the percent change in tax rates over actual 1991 rates (which are in column 1). Small-city, suburban, and rural districts would face relatively small tax increases, on average, but large cities would have to at least double their tax rate to have enough revenue to meet the standard. Even to meet this minimal standard, New York City would have to increase its property tax rate by 275 percent, and the

¹⁷ Our simulations are based on the 1991 state aid budget. We include the following programs, which had a total cost of \$5.7 billion: Operating Aid, Attendance Improvement–Dropout Prevention Aid, High Tax Aid, Limited English Proficiency Aid, Compensatory Education Needs Aid, Compensatory Education Needs Aid–Small Cities, Small City Aid, Educationally Related Support Services Aid, and Supplemental Support Aid.

¹⁸ See also Costrell (1994), and Kang (1985).

Table 2

Comparison of local contribution rate and efficiency rate required to achieve an outcome standard with the 1991 aid distribution. Averages by region for New York school districts, 1991^a

Region of state	Local contribution rate ^b				Percent of standard achieved at ^c		
	1991 Rate	Rate to achieve standard	Percent increase	Increase in revenue as percent of median income	1991 est. efficiency rate	Full efficiency	Percent increase
Standard imposed–25th percentile^d							
Downstate							
Small cities	0.94%	1.12%	18.23%	1.39%	112.26%	229.24%	104.20%
Suburbs	1.11%	1.21%	8.89%	0.60%	151.48%	289.09%	90.84%
New York City	1.01%	3.79%	274.48%	30.73%	33.41%	53.72%	60.79%
Yonkers	1.29%	2.41%	86.74%	11.92%	37.63%	51.63%	37.20%
Upstate							
Large cities	1.51%	3.88%	156.55%	14.91%	52.27%	71.01%	35.87%
Rural	1.08%	1.23%	14.01%	0.89%	115.42%	166.92%	44.61%
Small cities	1.19%	1.69%	42.66%	2.87%	94.82%	139.29%	46.91%
Suburbs	1.20%	1.24%	3.70%	0.28%	130.49%	197.28%	51.18%
Standard imposed–50th percentile^d							
Downstate							
Small cities	0.94%	1.37%	45.61%	3.74%	90.55%	184.91%	104.20%
Suburbs	1.11%	1.30%	17.61%	1.38%	122.19%	233.19%	90.84%
New York City	1.01%	4.78%	373.28%	41.79%	26.95%	43.33%	60.79%
Yonkers	1.29%	2.84%	120.08%	16.50%	30.35%	41.65%	37.20%
Upstate							
Large cities	1.51%	5.13%	238.81%	22.27%	42.16%	57.28%	35.87%
Rural	1.08%	1.58%	46.36%	2.71%	93.11%	134.64%	44.61%
Small cities	1.19%	2.26%	90.80%	6.12%	76.48%	112.36%	46.91%
Suburbs	1.20%	1.42%	19.04%	1.26%	105.26%	159.14%	51.18%
Standard imposed–75th percentile^d							
Downstate							
Small cities	0.94%	1.75%	85.68%	7.40%	73.48%	150.05%	104.20%
Suburbs	1.11%	1.48%	33.41%	2.87%	99.16%	189.23%	90.84%
New York City	1.01%	5.98%	491.98%	55.07%	21.87%	35.16%	60.79%
Yonkers	1.29%	3.36%	160.13%	22.00%	24.63%	33.80%	37.20%
Upstate							
Large cities	1.51%	6.63%	337.64%	31.11%	34.21%	46.49%	35.87%
Rural	1.08%	2.23%	106.79%	6.08%	75.55%	109.26%	44.61%
Small cities	1.19%	3.06%	158.01%	10.59%	62.06%	91.18%	46.91%
Suburbs	1.20%	1.86%	55.91%	3.57%	85.42%	129.14%	51.18%

^a The number of districts used in these calculations is 631. Missing data existed for the other districts which were predominantly small school districts.

^b The local contribution rate is calculated by subtracting per pupil lump-sum aid from operating expenditures and dividing by per pupil property values.

^c The fifth column is calculated by taking the ratio of actual performance under the present aid system and the performance level associated with each standard. The sixth column is the ratio of estimated performance with no relative inefficiency compared to the standard.

^d Percentiles refer to the 1991 distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

upstate large city districts would have to raise rates 157 percent. The fourth column of Table 2 reveals that the required tax increases in large cities also would be relatively high if expressed as a percentage of a district's median income. For example, New York City would need to raise taxes per pupil equivalent to 31 percent of the median family income. This compares to tax burdens of less than 2 percent of income in most other districts.¹⁹

The next two panels examine higher standards. In the last panel, which refers to a standard set at the 75th percentile of the 1991 performance distribution, all districts except suburbs and downstate small cities would have to at least double their tax rates to meet the standard, and New York City would have to increase its rate by 492 percent. As before the required tax increases also are a relatively high percentage of income in large cities; indeed, expressed this way the increase is almost 15 times as high in New York City as in its suburbs. The required tax rate increase in New York City would have to be impossibly high, 55 percent of median family income.

The second possibility mentioned above is for districts to become more efficient. We address this issue by raising the efficiency of all low-performing districts up to the highest level observed in current practice. It is theoretically possible for efficiency improvements beyond this point to be obtained, but since they would be outside the experience of any district in the state, we do not examine them. The results are presented in the last three columns of Table 2. Small, downstate cities, for example, now average 112.3 percent of the first performance target. If these districts were all "perfectly" efficient, they would exceed the 25th percentile performance target by over two times, on average. All types of districts except large cities exceed the standard with present efficiency, and would be more than 40 percent above the standard with full efficiency. In contrast, New York City and Yonkers now reach about 30 percent of this minimal performance standard, but would just reach half of this standard if they were as efficient as current practice allows. Similar efficiency improvements would bring the large upstate cities only up to 70 percent of the standard. The next two panels of this table reveal that efficiency changes alone continue to bring most districts up to the higher performance standards except for the large cities. For example, best-practice efficiency would not bring New York City and Yonkers even up to 36 percent of the highest standard.

Table 3 presents estimates of the required tax rates and expenditure levels to achieve a given standard if a district is assumed to be fully efficient. With full efficiency the tax increase required to reach a standard in the large cities is sixty to seventy percent of what it is at present efficiency levels. For New York City to reach the 25th percentile, for example, would require an increase in the local contribution rate of 119 percent compared to 274 percent under present efficiency levels (refer to column 3 in Table 2 and Table 3). The last three columns of this table present the spending levels required to reach the standard under full efficiency. For New York City to achieve the 25th percentile of the 1991 performance distribution would require a 75 percent increase in expenditures, and to reach the 75th percentile would require expenditure increase of more than 2.5 times. To keep these spending increases in perspective, note that they result in performance increases of 3 and 4.5 times, respectively, over 1991 levels.

3.2. Can a revised state aid program help districts meet a performance standard?

3.2.1. Aid system design

A performance standard might induce low-performing districts to boost their performance by raising their taxes or improving their efficiency, but given the magnitude of the required changes, it seems unlikely that such efforts would be sufficient to reach the standards. An alternative, to which we now turn, is to combine a performance standard with aid changes designed to ensure that every district has the resources needed to meet it.

The type of aid program we consider is called a foundation plan and is used by 80 percent of the states, including New York.²⁰ However, our foundation plan, unlike the actual plan in any state, systematically accounts for cost differences across districts. Existing plans, including New York's, are designed to bring all districts up to a minimum spending level per pupil. Let V_i stand for the property tax base in district i , then an **expenditure-based** foundation grant per pupil is defined by

$$A_i = E^* - t^* V_i = E^*(1 - v_i), \quad (3)$$

where E^* is the expenditure standard, t^* is the state set minimum tax rate, $V^* = E^*/t^*$ is the property value above which a district receives no aid and v_i is a property value

¹⁹ Some might prefer this alternative method for calculating the burden because, unlike the percentage increase in the property tax rate, it is not affected by the types of taxes a district uses—or shares with other governmental activities. It is not affected, for example, by the income tax in New York City.

²⁰ Historically, New York has used a modified foundation formula, but the current formula mixes elements of a foundation formula and a power-equalizing formula. In effect, the current formula appears to act as a power-equalizing formula for districts with spending levels in the middle of the spending distribution. The state aid formulas are described in The University of the State of New York (1996).

Table 3

Comparison of local contribution rate and per pupil operating expenditures required to achieve an outcome standard with the 1991 aid distribution. Averages by region for New York school districts, 1991^a

Region of state	Local contribution rate ^b			Per pupil expenditures ^c		
	1991 Rate	Rate to achieve standard with full efficiency	Percent increase	1991 expenditures	Expenditures to achieve standard—full efficiency	Percent increase
Standard imposed—25th percentile^d						
Downstate						
Small cities	0.94%	0.78%	−17.00%	\$8,741	\$7,677	−12.17%
Suburbs	1.11%	1.08%	−2.22%	\$9,016	\$8,820	−2.18%
New York City	1.01%	2.21%	118.64%	\$6,082	\$10,645	75.04%
Yonkers	1.29%	1.92%	49.03%	\$6,781	\$9,698	43.02%
Upstate						
Large cities	1.51%	2.50%	65.09%	\$5,186	\$6,955	34.11%
Rural	1.08%	0.94%	−12.49%	\$5,049	\$4,823	−4.49%
Small cities	1.19%	1.01%	−15.15%	\$5,194	\$4,789	−7.80%
Suburbs	1.20%	1.10%	−7.88%	\$5,333	\$5,120	−3.99%
Standard imposed—50th percentile^d						
Downstate						
Small cities	0.94%	0.70%	−25.79%	\$8,741	\$7,182	−17.83%
Suburbs	1.11%	1.05%	−5.17%	\$9,016	\$8,461	−6.16%
New York City	1.01%	2.83%	180.09%	\$6,082	\$13,009	113.90%
Yonkers	1.29%	2.24%	73.33%	\$6,781	\$11,143	64.34%
Upstate						
Large cities	1.51%	3.41%	125.43%	\$5,186	\$8,360	61.20%
Rural	1.08%	0.91%	−15.88%	\$5,049	\$4,710	−6.72%
Small cities	1.19%	1.21%	1.63%	\$5,194	\$5,123	−1.36%
Suburbs	1.20%	0.96%	−19.62%	\$5,333	\$4,856	−8.93%
Standard imposed—75th percentile^d						
Downstate						
Small cities	0.94%	0.81%	−13.79%	\$8,741	\$7,246	−17.11%
Suburbs	1.11%	1.00%	−9.81%	\$9,016	\$7,949	−11.84%
New York City	1.01%	3.58%	253.91%	\$6,082	\$15,848	160.59%
Yonkers	1.29%	2.62%	102.52%	\$6,781	\$12,880	89.96%
Upstate						
Large cities	1.51%	4.51%	197.92%	\$5,186	\$10,048	93.75%
Rural	1.08%	1.10%	2.32%	\$5,049	\$4,921	−2.54%
Small cities	1.19%	1.65%	39.44%	\$5,194	\$5,880	13.22%
Suburbs	1.20%	0.95%	−20.98%	\$5,333	\$4,697	−11.92%

^a The number of districts used in these calculations is 631. Missing data existed for the other districts which were predominantly small school districts.

^b The local contribution rate is calculated by subtracting per pupil lump-sum aid from operating expenditures and dividing by per pupil property values.

^c Expenditures are based on approved operating expenditures.

^d Percentiles refer to the 1991 distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

index. A foundation aid program is designed to provide every district with enough resources to provide the foundation level of spending per pupil at a tax rate t^* specified by policy makers. Districts that are wealthy enough to raise the required revenue by themselves simply by

setting this specified tax rate receive no aid from the state. If taken literally, Eq. (3) implies that districts with tax bases above V^* actually receive negative aid (i.e., property tax revenue would be “recaptured” by the state and redistributed to low wealth districts). This formula

is usually modified in practice, through minimum aid amounts or hold-harmless clauses, so that all districts receive some aid, thereby reducing the equalizing power of the formula. Moreover, a foundation grant usually is accompanied by a requirement that each district levy a tax rate of at least t^* ; otherwise, some districts might not provide the minimum acceptable spending level, E^* . New York and Illinois are notable exceptions; see Miner (1991) and Downes and McGuire (1994).

Because they do not systematically account for cost differences across districts, these plans do not bring all districts up to a minimum performance level (Duncombe & Yinger, 1997). Moreover, many existing foundation plans, again including New York's, have hold-harmless provisions or minimum aid amounts that limit their ability to bring all districts up to an adequate spending level per pupil, let alone adequate performance. Our aid programs do not contain any such provisions. We make the switch from spending to performance by bringing in the cost index derived from our estimated cost equation into the aid formula. This index allows us to determine how much a district with a certain cost level would have to spend to achieve a performance target. To bring all districts up to a performance standard, denoted by S^* , at an acceptable tax burden on their residents, the **outcome-based** foundation formula should be

$$A_i = S^* C_i - t^* V_i = E^*(c_i - v_i), \quad (4)$$

where C_i is the amount the district must spend to obtain one unit of S (per unit cost), and c_i and v_i are cost and property value indices (Ladd & Yinger, 1994). The amount of aid this district receives equals the spending level required to reach S^* minus the amount of revenue it can raise at the specified tax rate t^* . As with Eq. (3), raising S^* to an extremely high level would, at great cost, result in an equal educational output in every district, and allowing negative grants would boost the equalizing impact of the grant.

The 1996 New York State aid programs include several provisions that could be interpreted as ad hoc cost adjustments. The first is that operating aid, which provides 53 percent of the total aid paid to school districts, is based on the number of "weighted" pupils in a district. Pupils with extra weights include pupils in secondary school and pupils with "special education needs", defined as students who score below the minimum competency level on the third and sixth grade reading or math PEP tests.²¹ The first of these weighting factors is supported by some studies of school spending in other states (see, for example, Ratcliffe et al., 1990), which

²¹ The other two weighting factors bring in students not counted in average daily attendance, namely students in half-day kindergarten (with a weight of 0.5) and students in summer school (with a weight of 0.12).

find a higher cost for high school than for elementary school students. However, it is not supported by our analysis of data for New York state, which finds no cost differences by grade. The second factor is undoubtedly correlated with cost variables, but we believe it is inappropriate to include a performance measure based on PEP scores in an aid formula. This approach rewards districts for poor performance and gives them an incentive to perform poorly in the future. Aid formulas should be based on factors outside a district's control, such as concentrated poverty, that make it difficult for the district to reach a high performance standard, not on performance indicators that are influenced by the district's actions. New York also has a relatively new program, called Extraordinary Needs Aid, which gives more aid to districts with lower incomes and higher poverty concentrations. The program provides less than 5 percent of the total aid budget, and the formula is ad hoc, that is, it is not based on any estimate of the relationship between educational costs and poverty. Overall, therefore, these programs do a poor job accounting for cost differences across districts.²²

Even with an aid program that accurately accounts for cost factors, a district can fall short of the foundation level of spending or performance either because it is inefficient or because it sets a tax rate that is below the specified rate. Because virtually all districts fall short of the best-practice efficiency level, we design our foundation formula so that every district will have enough revenue to achieve the foundation performance level if it at least reaches the 75th percentile of the current efficiency distribution across districts, which we call the baseline efficiency level. If it falls short of this level, it will not achieve the foundation level of performance unless its tax rate is above the specified rate.

3.2.2. Aid simulations

Using data on New York school districts in 1991, we simulate the effect of different aid systems on student outcomes, district expenditures, tax rates and efficiency. We examine aid programs without negative aid and with three different performance standards, namely the 25th, 50th, and 75th percentiles of the 1991 performance distribution in New York, as measured by our outcome

²² New York State also provides aid for transportation and for students with disabilities, both of which raise other cost issues. We have no measures of the underlying cost factors (transportation needs, rates of disability in the population, and so on), so we do not alter these programs and we do not include transportation costs in our measures of operating spending. Our approach is consistent with the assumption that these programs correct for cost differences across districts in transportation services and services for students with disabilities, but we have no way to test this assumption.

index. As we illustrate below, the impact of these aid programs depends primarily on four key issues:

First, additional aid makes it possible for a district to maintain its current service level while cutting back on local property taxes. Foundation plans are supposed to be accompanied by a required minimum local tax rate to prevent such a cut back. Without a minimum-tax-rate provision, as is the case in New York, the stimulative impact of state aid is minimal. We examine aid programs with and without a minimum-tax-rate provision. Our version of the minimum-tax-rate provision has two parts. (a) All districts that receive foundation aid must set their tax rate at or above the rate specified in the foundation formula. (b) All districts that are too wealthy to receive foundation aid must set their tax rate at or above the rate required for them to reach the foundation level of performance at the baseline level of efficiency. This minimum rate will be below the rate imposed on districts that actually receive foundation aid.

Second, performance is influenced by the generosity of the state aid program. As explained earlier, aid raises voters' desired performance level and hence raises school district performance. However, additional aid does not simply go into higher performance, it also leads to local tax reductions, so the impact of aid on performance may not be large. We examine aid programs using the 1990–91 New York State aid budget and twice this amount. Note that these first two issues interact because the generosity of the state aid program determines the property tax rate needed to reach any performance target; the more generous the aid, the lower the required rate.

Third, as explained earlier, aid programs influence school district efficiency. In general, the more aid a district receives, the less efficient it will be. Thus, a policy to improve the performance of low-performing school districts with more state aid is analogous to a leaky bucket; some of the aid these districts receives is lost in the form of higher managerial inefficiency. This principle applies not only to a redistribution of aid toward needier districts, which makes those districts less efficient, but also to an increase in the state aid budget with a given formula, which makes all districts less efficient. We are not, of course, the first scholars to point to the leaks in the aid bucket, and in fact some scholars think that it is much leakier than we do (see Hanushek, 1996).

Fourth, the impact of any aid program in New York state is heavily influenced by the situation in New York City. Because New York City is such a needy district, with both the highest costs in the state and relatively low property value per pupil, any redistribution toward the neediest districts will increase New York City's aid per pupil. Moreover, because New York City has such a high enrollment, any increase in its aid per pupil will consume a large share of the state aid budget. At the current time, New York State deals with this issue by giving New

York City significantly less aid per pupil than it gives the average district (\$2,747 compared to \$3,623 in 1995–96; see The University of the State of New York, 1997). In contrast, our aid systems are driven by the principle that all districts should be brought up to a minimum performance standard, so New York City's aid per pupil is above average and less is left over for other districts. This effect may arise for large cities in other states, but undoubtedly not to the same degree.

Table 4 presents our predicted performance for each type of school district under various aid plans. The columns refer to the two different state budget levels and to plans with and without a minimum-tax-rate requirement. The three panels refer to the three different standards. Outcomes in 1991, based on our index, are given in the first column.

A comparison of the first and second columns indicates that changing from the current aid formula to a performance-based foundation plan with no minimum tax rate would actually lower outcomes in all types of districts except New York City and the upstate large cities. This result reflects the facts that a performance-based aid program, unlike the current one, recognizes the high costs and low capacity of New York City and that raising the aid per pupil to the City uses up a large share of the state aid budget. In fact, as shown in Table 5, aid per pupil declines in all classes of district except for these large cities, and indeed declines to zero in many districts. For example, 14 percent of the downstate small cities and only 5 percent of the downstate suburban districts would receive operating aid.

Imposing a minimum tax rate, in the third column of Table 4, enlists each school district in the effort to reach the performance standard. Because the state aid budget is relatively ungenerous and so much money flows to New York City, the required local contribution is very large. Table 6 shows that a minimum-tax-rate requirement results in a higher local tax rate, on average, in every class of district. Not surprisingly, low-performing districts, such as the big cities, face particularly large rate increases. In fact, New York City and most of the upstate big cities are pushed all the way to the minimum tax rate in the foundation formula, which, for the highest standard, is over four times the current New York City tax rate.

These large local contributions result in performance increases compared to actual 1991 outcomes in the large cities, and only small performance declines in other classes of districts (see Table 4). The resulting performance levels fall short of the standard in the big cities, however, because efficiency in the big cities falls short of the baseline efficiency in the formula. The large upstate cities reach a performance that is about 81 percent of the standard, but the higher inefficiency in New York City keeps student performance farther below the standard. With the minimum tax rate and aid required for

Table 4

Comparison of predicted outcomes with different budget levels and aid systems. 1991 aid system compared to performance-based foundation aid formula (with minimum aid level set at zero). Averages by region for New York school districts, 1991

Region of state	1991 outcomes	Outcomes with performance-based aid system			
		Current budget ^a		Double the current budget ^a	
		No minimum tax rate	Minimum tax rate imposed	No minimum tax rate	Minimum tax rate imposed
Standard imposed–25th percentile (3,217) ^b					
Downstate					
Small cities	3612	3287	3597	3433	3467
Suburbs	4873	4616	4659	4682	4689
New York City	1075	1368	2369	1994	2082
Yonkers	1211	1157	1818	1385	1662
Upstate					
Large cities	1682	1916	2611	2164	2468
Rural	3713	3297	3613	3574	3644
Small cities	3050	2678	3047	2980	3029
Suburbs	4198	3723	3894	4000	4024
Standard imposed–50th percentile (3,988) ^b					
Downstate					
Small cities	3612	3271	3846	3398	3688
Suburbs	4873	4617	4749	4658	4729
New York City	1075	1359	2955	2058	2580
Yonkers	1211	1158	2606	1275	2489
Upstate					
Large cities	1682	2011	3250	2296	3046
Rural	3713	3299	4265	3562	4117
Small cities	3050	2667	3768	2936	3547
Suburbs	4198	3714	4387	3934	4274
Standard imposed–75th percentile (4,915) ^b					
Downstate					
Small cities	3612	3271	4305	3354	4175
Suburbs	4873	4618	4923	4648	4900
New York City	1075	1348	3652	2092	3182
Yonkers	1211	1158	3555	1161	3569
Upstate					
Large cities	1682	2134	3983	2451	3715
Rural	3713	3308	5155	3553	4972
Small cities	3050	2664	4688	2894	4448
Suburbs	4198	3711	5196	3886	5080

^a The aid budget includes eight forms of aid besides operating aid (see note 17 in the text). The state aid budget for the 631 districts in our sample was \$5.7 billion in 1991.

^b Percentiles refer to the 1991 distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

the 50 percentile standard, New York City almost reaches the 25th percentile standard, which is three times the City's actual performance in 1991.

A performance-based foundation aid plan with the 1991 state aid budget and no required minimum tax rate would also lower spending for all classes of districts, except for New York City and the large upstate cities

(columns 1 and 2 in Table 7).²³ Doubling the state aid budget would lead to expenditure increases in large cities, but expenditures would remain below 1991 levels in most other districts because the performance-based aid

²³ With a standard set at the 25th percentile of the 1991 per-

Table 5

Comparison of aid per pupil under different budget levels and aid systems. 1991 aid system compared to performance-based foundation aid formula (with minimum aid level set at zero). Averages by region for New York school districts (1991 dollars)

Region of state	1991 aid system ^a	1997 Aid system ^a (1991 dollars)	Performance-based aid system			
			Current budget ^a	Percent of districts receiving aid	Double the current budget ^a	Percent of districts receiving aid
Standard imposed–25th percentile^b						
Downstate						
Small cities	\$2,384	\$1,617	\$112	14.3%	\$1,004	28.6%
Suburbs	\$1,660	\$1,116	\$162	4.6%	\$497	23.1%
New York City	\$2,235	\$1,912	\$4,976	100.0%	\$9,274	100.0%
Yonkers	\$831	\$586	\$0	0.0%	\$3,180	100.0%
Upstate						
Large cities	\$2,736	\$2,534	\$4,392	100.0%	\$6,218	100.0%
Rural	\$2,846	\$2,546	\$920	63.0%	\$2,125	86.3%
Small cities	\$2,820	\$2,440	\$886	63.8%	\$2,580	95.7%
Suburbs	\$2,487	\$2,066	\$403	37.7%	\$1,549	84.8%
Standard imposed–50th percentile^b						
Downstate						
Small cities	\$2,384	\$1,617	\$0	0.0%	\$812	28.6%
Suburbs	\$1,660	\$1,116	\$170	4.6%	\$374	12.3%
New York City	\$2,235	\$1,912	\$4,942	100.0%	\$9,644	100.0%
Yonkers	\$831	\$586	\$0	0.0%	\$1,699	100.0%
Upstate						
Large cities	\$2,736	\$2,534	\$4,923	100.0%	\$6,921	100.0%
Rural	\$2,846	\$2,546	\$903	56.9%	\$2,005	79.1%
Small cities	\$2,820	\$2,440	\$819	53.2%	\$2,338	89.4%
Suburbs	\$2,487	\$2,066	\$358	29.0%	\$1,220	65.8%
Standard imposed–75th percentile^b						
Downstate						
Small cities	\$2,384	\$1,617	\$0	0.0%	\$525	28.6%
Suburbs	\$1,660	\$1,116	\$179	4.6%	\$333	8.5%
New York City	\$2,235	\$1,912	\$4,891	100.0%	\$9,844	100.0%
Yonkers	\$831	\$586	\$0	0.0%	\$0	0.0%
Upstate						
Large cities	\$2,736	\$2,534	\$5,557	100.0%	\$7,662	100.0%
Rural	\$2,846	\$2,546	\$914	49.8%	\$1,913	69.2%
Small cities	\$2,820	\$2,440	\$791	44.7%	\$2,086	80.9%
Suburbs	\$2,487	\$2,066	\$340	23.8%	\$998	53.2%

^a The aid budget includes eight forms of aid besides operating aid (see note 17 in the text). The state aid budget for the 631 districts in our sample was \$5.7 billion in 1991 dollars.

^b Percentiles refer to the 1991 distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

formance distribution, outcomes and expenditures for New York City increase approximately 2.2 times. In fact, the outcome elasticity is one; a one percent increase in expenditures leads to a one percent increase in outcomes.

would be significantly below the actual aid received in 1991. Imposing a minimum tax rate leads to large expenditure increases in large city districts because they would be forced into dramatic tax rate increases. For most other districts, the imposition of a minimum standard does not affect them and their chosen level of spending because they are already above the standard. When the standard

Table 6

Comparison of local contribution rates to operating expenditures under different budget levels and aid systems.^a 1991 aid system compared to performance-based foundation aid formula (with minimum aid level set at zero). Averages by region for New York school districts, 1991

Region of state	1991 rates	Rates with performance-based aid system			
		Current budget ^b		Double the current budget ^b	
		No minimum tax rate	Minimum tax rate imposed	No minimum tax rate	Minimum tax rate imposed
Standard imposed–25th percentile^c					
Downstate					
Small cities	0.94%	1.16%	1.37%	1.05%	1.08%
Suburbs	1.11%	1.27%	1.31%	1.23%	1.24%
New York City	1.01%	0.82%	2.22%	0.95%	1.09%
Yonkers	1.29%	1.42%	1.78%	0.93%	1.09%
Upstate					
Large cities	1.51%	1.07%	2.22%	0.62%	1.11%
Rural	1.08%	1.71%	1.98%	1.26%	1.32%
Small cities	1.19%	1.75%	2.07%	1.22%	1.27%
Suburbs	1.20%	1.78%	1.91%	1.41%	1.43%
Standard imposed–50th percentile^c					
Downstate					
Small cities	0.94%	1.17%	1.55%	1.07%	1.29%
Suburbs	1.11%	1.27%	1.39%	1.26%	1.31%
New York City	1.01%	0.83%	3.08%	1.00%	1.84%
Yonkers	1.29%	1.42%	2.21%	1.15%	1.84%
Upstate					
Large cities	1.51%	1.00%	3.08%	0.58%	1.84%
Rural	1.08%	1.73%	2.55%	1.29%	1.75%
Small cities	1.19%	1.76%	2.71%	1.26%	1.80%
Suburbs	1.20%	1.79%	2.30%	1.49%	1.74%
Standard imposed–75th percentile^c					
Downstate					
Small cities	0.94%	1.17%	1.80%	1.10%	1.63%
Suburbs	1.11%	1.28%	1.51%	1.28%	1.44%
New York City	1.01%	0.84%	4.11%	1.03%	2.81%
Yonkers	1.29%	1.42%	2.73%	1.42%	2.73%
Upstate					
Large cities	1.51%	0.97%	4.11%	0.62%	2.81%
Rural	1.08%	1.74%	3.30%	1.34%	2.52%
Small cities	1.19%	1.76%	3.48%	1.31%	2.66%
Suburbs	1.20%	1.80%	2.87%	1.56%	2.39%

^a The local contribution rate is calculated by subtracting per pupil lump-sum aid from operating expenditures and dividing by per pupil property values.

^b The aid budget includes eight forms of aid besides operating aid (see note 17 in the text). The state aid budget for the 631 districts in our sample was \$5.7 billion in 1991.

^c Percentiles refer to the 1991 distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

is raised to the 75th percentile of 1991 outcomes, most districts would be forced to raise their tax rates compared to 1991, and, thus, their spending levels would generally equal or exceed 1991 levels, despite significant reductions in their state aid.

Under the 1991 aid budget (\$5.7 billion), the 242 districts below the lowest performance standard would have to raise \$5 billion in additional local taxes to approach this standard (with some gaps remaining because some districts do not meet the baseline efficiency built into the

Table 7

Comparison of predicted operating expenditures per pupil with different budget levels and aid systems. 1991 aid system compared to performance-based foundation aid formula (with minimum aid level set at zero). Averages by region for New York school districts, 1991

Region of state	1991 expenditures	Expenditures with performance-based aid system			
		Current budget ^a		Double the current budget ^a	
		No minimum tax rate	Minimum tax rate imposed	No minimum tax rate	Minimum tax rate imposed
Standard imposed–25th percentile^b					
Downstate					
Small cities	\$8,741	\$7,467	\$8,122	\$8,034	\$8,119
Suburbs	\$9,016	\$8,335	\$8,434	\$8,555	\$8,571
New York City	\$6,082	\$8,090	\$13,434	\$12,901	\$13,434
Yonkers	\$6,781	\$6,564	\$8,217	\$7,459	\$8,217
Upstate					
Large cities	\$5,186	\$6,101	\$7,986	\$7,081	\$7,999
Rural	\$5,049	\$4,251	\$4,621	\$4,770	\$4,853
Small cities	\$5,194	\$4,364	\$4,918	\$5,099	\$5,188
Suburbs	\$5,333	\$4,428	\$4,624	\$4,933	\$4,961
Standard imposed–50th percentile^b					
Downstate					
Small cities	\$8,741	\$7,411	\$8,596	\$7,902	\$8,596
Suburbs	\$9,016	\$8,349	\$8,643	\$8,516	\$8,671
New York City	\$6,082	\$8,085	\$16,655	\$13,448	\$16,655
Yonkers	\$6,781	\$6,563	\$10,187	\$7,008	\$10,187
Upstate					
Large cities	\$5,186	\$6,496	\$9,900	\$7,660	\$9,900
Rural	\$5,049	\$4,261	\$5,435	\$4,752	\$5,456
Small cities	\$5,194	\$4,341	\$5,973	\$5,007	\$5,981
Suburbs	\$5,333	\$4,414	\$5,205	\$4,805	\$5,216
Standard imposed–75th percentile^b					
Downstate					
Small cities	\$8,741	\$7,412	\$9,599	\$7,714	\$9,599
Suburbs	\$9,016	\$8,369	\$9,016	\$8,522	\$9,030
New York City	\$6,082	\$8,070	\$20,524	\$13,765	\$20,524
Yonkers	\$6,781	\$6,562	\$12,553	\$6,556	\$12,553
Upstate					
Large cities	\$5,186	\$7,028	\$12,200	\$8,377	\$12,200
Rural	\$5,049	\$4,289	\$6,573	\$4,751	\$6,582
Small cities	\$5,194	\$4,333	\$7,330	\$4,908	\$7,330
Suburbs	\$5,333	\$4,410	\$6,199	\$4,717	\$6,199

^a The aid budget includes eight forms of aid besides operating aid (see note 17 in the text). The state aid budget for the 631 districts in our sample was \$5.7 billion in 1991.

^b Percentiles refer to the distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

formula). Similarly, it would cost taxpayers in the 399 districts below the median of the 1991 performance distribution about \$10 billion in additional local taxes to bring all districts near the middle performance standard, and about \$15 billion in additional revenues to bring up the 541 districts falling below the highest performance

standard. These revenues would be on top of the nearly \$10 billion that was already raised in local taxes in 1991. Policy makers in New York state should be aware that performance standards cannot be achieved without tax or aid increases of this magnitude-unless major improvements in district efficiency are obtained, or parents and

students respond to higher standards by expanding their effort and investment in education at home.

Doubling the state aid budget shifts the burden of financing the standard away from the local governments toward the state. Thus, aid increases to every class of district compared to aid with this formula and the present budget (Table 5, 5th column compared to 3rd column), and the resulting aid is higher than current aid for the large cities (5th column compared to 1st column). Moreover, doubling the state aid budget results in lower local tax rates without a minimum-tax-rate requirement for most districts, except New York City (Table 6, 4th column compared to 2nd column). When a minimum-tax-rate requirement is imposed, doubling the aid budget will lower the predicted local tax rates in all classes of districts (5th column compared to 3rd column). In addition, doubling state aid significantly lowers the minimum tax rate in the foundation formula, which can be seen by comparing the results for New York City in the 5th and 3rd columns of Table 6.

The net impact of a higher state budget on the local share of educational spending is documented in Table 8. With the 1991 state aid system, the local share is above 70 percent in most downstate districts and less than 50 percent in most upstate districts. With the introduction of our performance-based aid system under the 1991 aid budget and the low standard, the local share of operating expenditures rises dramatically in all classes of districts except the large cities (without Yonkers), due to the redistribution of operating aid to the city districts. In three classes of districts, plus Yonkers, the local share reaches 90 percent (panel 1, 2nd column of Table 8). The financing share for New York City is cut in by over 60 percent from 63 percent to 39 percent when no minimum tax rate is imposed. However, the share will be approximately 63 percent under our aid system with a minimum tax rate (3rd column). When the state aid budget doubles, the local share drops below 90 percent in most districts except the downstate suburbs (4th column). The local share without a minimum tax rate falls to 28 percent in New York City and 12 percent in the large upstate cities. Even with a minimum tax rate the large cities' local shares are well below current levels (compare columns 1 and 5 in Table 8).

Without a minimum tax rate, doubling the state aid budget results in an increase in performance in every class of district compared to a performance-based foundation with the original aid budget, as the aid dollars are used to boost recipients' performance. See Table 4 (4th column compared to 2nd column). Some of the aid increases also go to tax relief, however, and the higher aid also results in lower district efficiency. As a result, the net performance increases are not nearly sufficient to bring low-performing districts up to the foundation level.

The efficiency effects of aid are summarized in Table

9. Under the 1991 aid system, the downstate suburbs and small cities had the lowest efficiency. New York City's efficiency rate was slightly below the state average of 66 percent, and below that in most upstate districts. The upstate large cities and Yonkers, had some of the highest efficiency rates in the state. With our performance-based foundation aid system, efficiency rates improve in all classes of districts except New York City and the large upstate cities, because of the decreases in state aid in most districts. In contrast, we estimate that New York City's efficiency rate drops as low as the rate of the downstate suburbs and small cities.

Because it raises aid in every class of district, doubling the state aid budget increases inefficiency in every class of district compared to a performance-based aid system with the 1991 aid budget. With a large infusion of aid, efficiency would drop 20 percent in New York City and 13 percent in the large upstate cities compared to estimated rates in 1991 (compare columns 1 and 4 in Table 9). The efficiency rate in New York City would be among the lowest in the state. Under a more equitable aid system in New York State (based on an adequacy standard), significant aid will "leak out of the bucket" for city districts that are the principal recipients of this aid. A key lesson from this study is that management reforms and other programs to improve teacher and administrator performance should accompany major increases in school aid or major changes in the aid distribution formula.²⁴

4. Conclusions

Performance standards are designed to encourage improved school district performance, especially in the districts that are currently at the bottom of the performance distribution. A school district's performance can be moved toward a standard in one of three ways: improving the district's efficiency, increasing the district's property tax rate, and increasing the district's state aid.

However, these changes face severe limits in their ability to help students in low-performing school districts in New York state. Raising efficiency up to the current

²⁴ Our estimates of the increased inefficiency in school districts receiving significant state aid may be overestimates for several reasons. First, Bishop (1994) finds for Canada, that imposing a high standard improves the preparation and effort of students and schools, thus, resulting in higher student performance. Second, the large city districts receiving significant aid increases will also most likely be forced to raise their tax rate above that preferred by the decisive voter. The fact that a district is spending far more than its voters prefer may lead voters to increase their vigilance over the actions of teachers and school administrators—and thereby increase school efficiency. No research has yet addressed this issue, however.

Table 8

Comparison of local share of operating expenditures under different budget levels and aid systems^a. 1991 aid system compared to performance-based foundation aid formula (with minimum aid level set at zero). Averages by region for New York school districts, 1991

Region of state	1991 local shares	Local shares with performance-based aid system			
		Current budget ^b		Double the current budget ^b	
		No minimum tax rate	Minimum tax rate imposed	No minimum tax rate	Minimum tax rate imposed
Standard imposed–25th percentile^c					
Downstate					
Small cities	70.10%	97.77%	98.55%	85.01%	85.66%
Suburbs	79.66%	97.61%	98.09%	93.39%	93.47%
New York City	63.25%	38.50%	62.96%	28.12%	30.97%
Yonkers	87.75%	100.00%	100.00%	57.37%	61.30%
Upstate					
Large cities	46.76%	28.98%	45.36%	12.12%	22.45%
Rural	40.84%	76.38%	79.10%	52.84%	54.10%
Small cities	44.58%	79.91%	82.25%	48.87%	49.92%
Suburbs	51.09%	89.40%	90.56%	66.43%	66.74%
Standard imposed–50th percentile^c					
Downstate					
Small cities	70.10%	100.00%	100.00%	87.16%	90.78%
Suburbs	79.66%	97.67%	98.41%	95.47%	96.03%
New York City	63.25%	38.87%	70.33%	28.29%	42.10%
Yonkers	87.75%	100.00%	100.00%	75.76%	83.32%
Upstate					
Large cities	46.76%	25.51%	50.66%	9.08%	30.33%
Rural	40.84%	77.46%	83.33%	56.09%	62.49%
Small cities	44.58%	81.86%	86.86%	53.62%	61.33%
Suburbs	51.09%	90.72%	93.21%	73.05%	76.13%
Standard imposed–75th percentile^c					
Downstate					
Small cities	70.10%	100.00%	100.00%	91.24%	95.35%
Suburbs	79.66%	97.75%	98.66%	96.48%	97.35%
New York City	63.25%	39.40%	76.17%	28.49%	52.04%
Yonkers	87.75%	100.00%	100.00%	100.00%	100.00%
Upstate					
Large cities	46.76%	22.28%	54.88%	7.01%	37.49%
Rural	40.84%	78.10%	86.42%	59.14%	70.98%
Small cities	44.58%	83.09%	89.75%	59.08%	72.11%
Suburbs	51.09%	91.37%	94.80%	77.95%	84.21%

^a The local share is calculated by subtracting lump-sum aid from operating expenditures.

^b The aid budget includes eight forms of aid besides operating aid (see note 17 in the text). The state aid budget for the 631 districts in our sample was \$5.7 billion in 1991.

^c Percentiles refer to the distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

“best-practice” level would not be sufficient to bring large city districts up to even minimal performance standards. Even if the large central cities could become this efficient, their performance would still fall more than 40 percent below the current median performance in the

state. Without increases in aid or efficiency, these districts could not reach performance standards without a dramatic increase in their tax rate. In fact, tax rates would have to increase by more than 50 percent in the large upstate cities and almost quadruple in New York

Table 9

Comparison of predicted relative efficiency rates under different budgets and foundation aid systems (minimum aid is zero).^a 1991 aid system compared to performance-based foundation aid formula. Averages by region for New York school districts, 1991

Region of state	1991 aid system	Performance-based aid system	
		Current budget ^b	Double the current budget ^b
Standard imposed–25th percentile^c			
Downstate			
Small cities	51.9%	56.8%	53.5%
Suburbs	54.8%	56.2%	55.5%
New York City	62.2%	57.4%	50.4%
Yonkers	72.9%	74.9%	68.5%
Upstate			
Large cities	72.5%	68.1%	64.2%
Rural	70.7%	75.1%	72.0%
Small cities	68.2%	72.8%	68.1%
Suburbs	67.4%	72.0%	69.3%
Standard imposed–50th percentile^c			
Downstate			
Small cities	51.9%	57.4%	54.1%
Suburbs	54.8%	56.1%	55.6%
New York City	62.2%	57.1%	49.8%
Yonkers	72.9%	74.9%	71.6%
Upstate			
Large cities	72.5%	66.7%	62.4%
Rural	70.7%	75.0%	72.1%
Small cities	68.2%	73.1%	68.6%
Suburbs	67.4%	72.1%	69.9%
Standard imposed–75th percentile^c			
Downstate			
Small cities	51.9%	57.4%	55.2%
Suburbs	54.8%	56.1%	55.7%
New York City	62.2%	56.7%	49.4%
Yonkers	72.9%	75.0%	75.3%
Upstate			
Large cities	72.5%	65.0%	60.6%
Rural	70.7%	75.0%	72.2%
Small cities	68.2%	73.2%	69.4%
Suburbs	67.4%	72.2%	70.4%

^a This table presents estimates of relative efficiency rates. All cost factors and additional outcomes are held constant at the mean and the aid and other efficiency factors are allowed to vary.

^b The aid budget includes eight forms of aid besides operating aid (see note 17 in the text). The state aid budget for the 631 districts in our sample was \$5.7 billion in 1991.

^c Percentiles refer to the distribution for outcomes based on a composite index of three outcomes: percent of students receiving a Regents Diploma, percent of students not dropping out, and average percent of students above the state set standard reference point for 3rd and 6th grade PEP tests.

City for these districts to reach the current median performance level.

In principle, a performance-based foundation aid system could help low-performing districts reach a standard. However, such a system would involve a significant change in the distribution of aid in the state, and in particular a significant change in the aid to New York City.

Because the City has relatively high educational costs and low wealth per pupil, a performance-based aid system would give it far-above-average aid per pupil, not below-average aid as in the current system. Because New York City has so many students, this change would consume a large share of the state aid budget and, at current funding levels, would leave little money for assisting

other districts. Indeed, without a significant increase in the state aid budget, shifting to a performance-based foundation aid system would result in a significant decline in aid in all but the neediest districts.

The ability of aid increases to boost performance in large cities is limited because it would induce districts to cut their own tax effort and to become less efficient. Increasing aid to New York City by 2.2 times, for example, would result in a 22 percent drop in its tax effort and an almost 10 percent drop in its efficiency, so that its performance would go up by only about 30 percent. Declines in tax effort can be prevented through

minimum-tax-rate provisions, but, with the current state aid budget, significant performance improvements in large cities would require large increases in local property tax rates. Even with a performance-based foundation aid program, for example, New York City would have to increase its tax rate by over four times to reach the state's current median performance level. The resulting high school tax rates might compromise the ability of large cities to provide other essential services.

Any effort to achieve a minimum performance standard in all districts therefore faces a tradeoff between the equity gains and efficiency losses associated with

Table 10
Education cost and demand equations, New York school districts, 1991^a

Variables	Coefficient	<i>t</i> -statistic
Cost equation^a		
Intercept	-7.8410	-1.85
Third- and Sixth-Grade PEP Scores (Average % above Standard Reference Point) ^b	3.7637	1.55
Percent non-dropouts ^b	9.0461	2.71
Percent receiving Regents diploma ^b	0.8793	2.24
Efficiency index (percent) ^b	-1.0664	-4.61
Log of teacher salaries ^b	0.7451	1.79
Log of enrollment	-1.0744	-2.53
Square of log of enrollment	0.1099	2.29
Cubic of log of enrollment	-0.0034	-1.93
Percent of children in poverty	0.8165	2.96
Percent female-headed households	2.0833	3.54
Percent of students with severe handicap	1.1254	1.81
Percent of students with limited English proficiency	3.4684	2.03
Upstate suburbs (yes=1)	-0.1122	-1.89
Upstate rural (yes=1)	-0.1107	-1.86
Downstate suburbs and small cities (yes=1)	-0.1426	-1.72
SSE		28.55
Adj. <i>R</i> -square		0.43
Number of observations		631
Demand equation^a		
Intercept	-1.4504	-1.61
Log of median family income	0.8740	9.35
Ratio of operating aid to median income	5.6372	5.49
Ratio of matching aid to median income	-11.0158	-1.67
Log of tax share	-0.3814	-6.79
Log of efficiency index ^b	0.5113	3.14
Percent owner-occupied housing	0.3086	1.95
Relative percent of adults with college education	0.0827	0.36
SSE		30.24
Adj. <i>R</i> -square		0.52
Number of observations		631

^a The cost and demand models are estimated with linear 2SLS regression. The dependent variables are the logarithms of per pupil operating expenditures for the cost model and of the outcome index for the demand model.

^b These variables are treated as endogenous. See Duncombe and Yinger (1997) for discussion of the instruments used in this procedure.

Table 11
Determinants of school district efficiency, New York school districts, 1991^a

Variables	Coefficient	Chi-square	Probability of Chi-square
Intercept	1.7679	1.8427	0.1746
Aid variables^b			
Within-class variation	-4.1712	12.4734	0.0004
Between-class variation	-2.0791	3.5345	0.0601
Other efficiency factors			
Log of per pupil property value	-0.1329	16.1489	0.0001
Log of median family income	-0.2642	7.7888	0.0053
Ratio of matching aid to median income	-0.0512	3.5323	0.0602
Log of tax share	0.4299	10.5260	0.0012
City district (1=yes)	-0.0125	0.1868	0.6656
Log of area in square miles	0.0109	1.4530	0.2280
Herfindahl measure of public school concentration	-0.0819	0.6958	0.4042
Percent of county students in private schools	-0.1622	1.1294	0.2879
Percent of adults with college education	0.2732	3.3897	0.0656
Omitted outcome measures			
Downstate suburbs and small cities (yes=1)	-0.1232	12.7375	0.0004
Percent of grade taking Regents exams in:			
English	0.0006	1.3304	0.2487
Earth science	0.0013	11.5438	0.0007
Global studies	0.0001	0.0157	0.9003
History	0.0001	0.0547	0.8150
Math I	-0.0002	0.2748	0.6001
Math II	0.0001	0.0360	0.8496
Math III	0.0022	9.5301	0.0020
Biology	0.0012	4.1041	0.0428
Chemistry	0.0011	3.5923	0.0580
Physics	0.0003	0.2823	0.5952
Per pupil art and music facilities	-2.2506	2.8197	0.0931
Per pupil video equipment	-0.1034	0.5762	0.4478
Per pupil personal computers	-0.7875	3.1932	0.0739
Per pupil network facilities	-10.9073	1.6873	0.1940
Cost factors			
Log of teacher salaries	-0.0466	0.4131	0.5204
Log of enrollment	0.9061	9.5770	0.0020
Square of log of enrollment	-0.1095	10.1817	0.0014
Cubic of log of enrollment	0.0042	10.2865	0.0013
Percent of children in poverty	-0.0770	0.1929	0.6605
Percent female-headed households	0.3209	0.7772	0.3780
Percent of students with severe handicap	-0.0528	0.0116	0.9141
Percent of students with limited English	-1.1557	2.6683	0.1024
Percent of students in high school	-0.2312	1.3107	0.2523
Weighted pupil index	0.1764	5.7026	0.0169
Number of observations	631		

^a Estimated with a Tobit regression; OLS results are similar. The dependent variable is the logarithm of the efficiency index. Tobit coefficients are adjusted for the simulation using the procedure in McDonald and Moffitt (1980).

^b Districts are divided into 16 classes based on per pupil property value and enrollment, and the aid variable is from the demand model (all lump-sum aid divided by income). The “between-class” variable is the average aid in its class. The “within-class” is the difference between a district’s aid and the average aid in its class divided by the absolute percent difference between the enrollment in that district and the average in that class.

increased state financing. The burden of financing the states educational system is distributed more equitably across school districts if the state, with its broad tax bases, provides more of the revenue; however, an increase in state revenue is likely to lower the efficiency with which educational performance is delivered. In New York, the current state share is probably too low on fairness grounds, but any increase in state funding should be accompanied by management assistance or monitoring to minimize efficiency losses.

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Appendix A

Tables 10 and 11

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