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Estimating the Cost of an Adequate Education in New York

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Abstract

The New York State Board of Regents and Commissioner of Education have identified a set of clear performance standards for students in New York State that matches the knowledge and skills they will need to function successfully as productive citizens in the 21st century. To match these standards, the New York State Department of Education has developed new Regents Examinations, which all students will be required to pass to graduate from high school, and new examinations in 4th and 8th grades that serve as important intermediate checkpoints in assessing student progress. Justice Leland DeGrasse wrote in *Campaign for Fiscal Equity v. State of New York* (719 N.Y.S.2d 475, 150 Ed. Law Rep. 834, January 9, 2001) that, "[T]he court holds that the education provided New York City students is so deficient that it falls below the constitutional floor set by the Education Article of the New York Constitution." (P. 4) He continuted, "In the course of reforming the school finance system, a threshold task that must be performed by defendants is ascertaining, to the extent possible, the actual costs of providing a sound basic education in districts around the State." (P. 115)

The objective of this study is to develop estimates of the costs of financing the achievement of higher standards. The key tools employed to estimate the cost of adequacy are education cost functions and cost of education indexes. The cost function approach uses statistical methods to extract from actual data the relationship between characteristics of students, the cost of living in an area, and the spending required to meet different performance standards. As long as recent history is a good predictor of the near future, the cost function approach should provide reasonably accurate estimates of the cost of adequacy.

Executive Summary

The New York State Board of Regents and Commissioner of Education have identified a set of clear performance standards for students in New York State that matches the knowledge and skills they will need to function successfully as productive citizens in the 21st century. To match these standards the New York State Department of Education has developed new Regents Examinations, which all students will be required to pass to graduate from high school, and new examinations in 4th and 8th grades that serve as important intermediate check points in assessing student progress.

In addition, Justice Leland DeGrasse wrote in *Campaign for Fiscal Equity v. State of New York* (719 N.Y.S.2d 475, 150 Ed. Law Rep. 834, January 9, 2001) that, "[T]he court holds that the education provided New York City students is so deficient that it falls below the constitutional floor set by the Education Article of the New York Constitution." (P. 4). He made it clear that the finance system should provide children the opportunity to become productive citizens able to understand complex issues as jurors and voters, and to obtain "productive employment or pursue higher education." (p. 15). "In the course of reforming the school finance system, a threshold task that must be performed by defendants is ascertaining, to the extent possible, the actual costs of providing a sound basic education in districts around the State..." (P. 115)

The objective of this study is to develop estimates of the costs of financing the achievement of higher standards. The key tool that employed to estimate the cost of adequacy are education cost functions and cost of education indexes. The cost function approach uses statistical methods to extract from actual data the relationship between characteristics of students, and the cost-of-living in an area and the spending required to meet different performance standards. As long as recent history is a good predictor of the near future, the cost function approach should provide reasonably accurate estimates of the cost of adequacy. The major findings from this study are the following:

Cost of Education

- The greater needs of students and the higher salaries required to recruit good teachers both significantly raise the cost of education in New York's large cities. The combination of these factors raises the cost of education in New York City by almost 83 percent, by 58 percent in the Big Four (Buffalo, Rochester, Syracuse , and Yonkers), and by 21 percent in other high-need urban/suburban districts.

- In New York City, over 70 percent of the students are eligible for free lunch and 35 percent of school-age children are estimated to live in poverty. Poverty rates in the Big Four are comparable. These students are estimated to require almost twice the resources as the average student. Poverty and the problems associated with concentrated poverty raise the cost of education in the Big Five by 20 to 30 percent, by 14 percent in the other high need urban/suburban districts, and by 10 percent, on average, in high-need rural districts.

- New York's large cities, and particularly New York City, have traditionally attracted new immigrants into the United States. Children of recent immigrants often face significant challenges adjusting to both a new language and culture. On average, students with limited English proficiency (LEP) require two times the resources as the average student to reach the same performance standards. LEP students are estimated to raise the cost of education in the Big Five by approximately 10 percent over districts without any LEP students.

- The cost of living varies significantly within New York State. Higher costs of living affect school districts primarily by raising the salaries they must pay their staff. In addition, the more challenging working conditions faced by many teachers in large central cities make recruiting good teachers more difficult. Both of these factors raise costs of education in New York City by over 50 percent, in the Big Four by over 30 percent, and in the other high need urban/suburban districts by 14 percent.

- In general, the enrollment size of a district has relatively little impact on costs. The one exception are districts with enrollments below 1,000 students. I estimate that these districts face costs that are almost 10 percent higher than districts with enrollments between 1,000 and 15,000 students.

The Cost of Adequacy

- Estimating the cost of adequacy requires developing a composite student performance measure. I developed, in conjunction with SED staff, a weighted average of performance on math and reading tests in 4^{th} grade, 8^{th} grade, and Regents Examinations. Twice the weight was place on the Regents Examinations than tests in earlier grades, because passage of these tests is required for graduation from high school. The performance index ranges from 0 to 200, with the average district in the year 2000 receiving a score of 159.5.

- In 2000, the average performance index in the Big Five was approximately 100. To raise student performance to the 2001 standard of 140 require estimated per pupil spending of almost $15,000 in New York City, $13,000 in the Big Four, and $11,400 in other high need urban/suburban districts. (This does not include spending on transportation, buildings, and tuition for students in private placements.)

- The additional spending required by these districts to reach the 140 standard compared to their 1999-2000 spending is $6.6 billion in New York City, $400 million in the Big Four, and $135 million in the other high need urban/suburban districts. The total spending increase statewide to reach this standard is estimated to be $7.2 billion.

- For these high-need urban districts to reach the performance level of 160 will require per pupil spending of $17,400 in New York City, $14,900 in the Big Four, and $12,000 in the other high need urban/suburban districts.

- The additional spending required by these districts to reach the 160 standard compared to their 1999-2000 spending is $9.2 billion in New York City, $600 million in the Big Four, and $427 million in the other high need urban/suburban districts. The total spending increase statewide to reach this standard is estimated to be $10.7 billion.

- To reach the 140 standard, New York City will require 92 percent of the additional spending. To reach the higher 160 standard, only 86 percent of the additional spending will be required in New York City.

An Operating Aid Formula Designed to Finance Adequacy

- New York's present system of school aid programs is not well suited to reaching the student performance objectives set by the New York Board of Regents. It is made up of a number of aid programs with different and often complex aid formulas, and adapting these formulas to finance an adequate education will be very difficult.

- Past research has demonstrated that the best operating aid formula to finance higher student standards is a modified version of a traditional foundation formula. In a traditional foundation formula, a district's aid is calculated by taking the difference between a state-set minimum spending level and the amount the district itself could provide at a state-set minimum local contribution rate. A *performance foundation formula* modifies the traditional foundation formula by substituting the spending required in a specific district to meet an adequacy standard for the state-set minimum spending level. The spending required to meet adequacy in a district accounts for differences in student needs and cost of living across districts.

- Assuming a local contribution rate of $20 per $1,000 of market value, meeting the standard of 140 will require more than doubling the per pupil aid provided to New York City, compared to 2000-01 aid, and require a 55 percent increase in aid to the Big Four. By contrast, aid to high-need rural districts would be reduced, aid to average-need districts would be cut by 40 percent, and aid to low-need districts would be virtually eliminated. The total cost to the state government of additional state aid would be $3.5 billion.

- If the standard were set at 160 (and local contribution remained $20 per $1000), required per pupil aid to New York City would increase 1.85 times, aid to the Big Four would double, and aid to other high-need urban/suburban districts would increase over 20 percent. Aid to high-need rural districts and average need districts would decline slightly, and aid to low-need districts would drop far below present aid levels. The total cost to the state government of additional state aid would be $8.2 billion.

- In addition to these state aid increases, requiring districts whose performance is below the standard to impose a minimum tax rate of at least $20 per $1,000 would lead to

increases in local tax effort of 20 percent. Significant tax increases would be required in most types of districts.

- Use of this performance foundation grant would dramatically change the state share of education finance in New York City from 44 percent to over 60 percent. In contrast, the state share for low-need districts would drop to 1 percent.

Policy Choices in Financing an Adequate Education

Developing an adequacy-based finance system involves three components:

- *A better-designed aid system*, built specifically to finance an adequate education and to effectively target aid to the highest-need districts. Assuming that local contribution rates remain reasonable, the state will have to invest in a significant increase in state school aid.

- *A required minimum level of local contribution*, from all districts in order to receive state school aid. It is important that the state aid system include a maintenance-of-effort provision. Otherwise, financially strapped districts, such as large cities, will be tempted to cut school tax rates when their state education aid is increased significantly.

- *Improved use of existing resources* in school districts through better management practices and innovative education programs. The New York State Education Department could play a crucial role in improving district efficiency and effectiveness by expanding technical assistance to districts. Potential areas of expanded technical assistance include teacher recruitment, retention, and mentoring programs; program evaluation, training, and support; and financial management practices.

Introduction

The New York State Board of Regents and Commissioner of Education have identified a set of clear performance standards for students in New York State to match the knowledge and skills they will need to function successfully as productive citizens in the 21st century. To match these standards, the New York State Department of Education has developed new Regents Examinations, which all students will be required to pass to graduate from high school, and new examinations in 4th and 8th grades that serve as important intermediate checkpoints in assessing student progress.

New York is not alone in setting higher standards for its students and requiring passage of "high-stakes" examinations for high school graduation. States have moved aggressively in the last decade to implement higher standards, and almost half the states will require passage of exit exams for student graduation by 2004. Increasingly, state courts are interpreting the education clause in their state constitution as requiring the state to provide an opportunity for all children to reach an adequate level of content knowledge and skills.[1]

Justice Leland DeGrasse presiding over the New York State Supreme Court in New York County concluded in *Campaign for Fiscal Equity v. State of New York* (719 N.Y.S2d 475, 150 Ed. Law Rep. 834, January 9, 2001) that, "[T]he court holds that the education provided New York City Students is so deficient that it falls below the constitutional floor set by the Education Article of the New York Constitution." (p. 4)[2]. He made it clear that the finance system should provide children the opportunity to become productive citizens able to understand complex issues as jurors and voters, and to obtain "productive employment or pursue higher education..." (P. 15) In addition, "the State is ultimately responsible for the provision of a sound basic education…." (P. 114). "In the course of reforming the school finance system, a threshold task that must be performed by defendants is ascertaining, to the extent possible, the actual costs of providing a sound basic education in districts around the state." (P. 115)

Despite the clear trend toward state promotion of adequacy standards in education, states have been much less successful in implementing funding systems designed specifically to assist students (and schools) reach these standards.[3] The objective of this study is to provide tools to assist the New York State Board of Regents and New York State Education Department developing a school finance system designed specifically to help students and districts reach higher standards. The development of an adequacy-based finance system involves three components. First, measures of student performance must be selected that can be used to identify adequate and inadequate performance. While these measures can be controversial, this choice is unavoidable in the development of an adequacy-based finance system. As discussed below, the measures used in this report have been developed by the New York State Education Department.

Second, estimates must be made of the cost of reaching a given performance standard in each district. The approach used in this study, discussed in the following section, relies on statistical methods to extract from actual data the relationships between spending required to reach a particular standard and student needs, resource prices, and enrollment size. The major focus of this report is to discuss how this approach has been applied in New York and to present results. Finally, a school aid formula should be developed, which is specifically designed to provide school districts the resources they need to reach a particular adequacy standard. In the last part of this report, a "performance" foundation aid formula will be presented, which uses directly the estimates of the cost of adequacy. Accompanying the summary report are two appendices, which explain in detail about data sources and measures (Appendix A) and the statistical models and methods employed in my analysis (Appendix B).

Approaches to Estimating the Cost of Adequacy

The heart of any adequacy-based finance system is estimates for individual school districts of the costs or spending required for them to reach a particular performance standard. Essentially, estimating the cost of adequacy is a forecast about what could happen to student performance if additional resources were provided to school districts. Estimating the cost of adequacy requires three steps: 1) selecting of measures of student performance; 2) identifying the required spending for adequacy in at least one "benchmark" school district; and 3) adjusting this adequate spending level to reflect different characteristics in other school districts. Not surprisingly, given the recent interest in adequacy standards, several methods have been developed to estimate the cost of adequacy. In this section, I briefly compare these approaches and I discuss the method used in this study, which is based on the use of cost functions.[4]

Empirical Identification Approach

One obvious approach to estimating the cost of adequacy is to find districts that are presently meeting the standard, and to measure how much they are spending. This method, which is most frequently associated with John Augenblick, involves four steps.[5] First, select the performance standard. Second, identify all districts reaching this standard. Third, select the spending categories included in the analysis, and calculate the average per pupil spending in these districts. Trim off districts with particularly high per pupil property values or income. Finally, adjust this estimate for differences in the cost of doing business or higher need students. The strength of this approach is clearly in the second step of the process—linking spending and a benchmark set of districts that are achieving adequacy.

Unfortunately, almost by definition these districts are not “typical” districts, especially if a high standard is selected. The empirical identification approach provides very little guidance on the third step—how to adjust the cost of adequacy in benchmark districts to reflect the

characteristics of districts not meeting the standard. In application, a regional cost adjustment is usually made and a set of pupil cost weights is used to reflect student need differences.[6] The higher the adequacy standard gets, the more serious the lack of careful cost adjustment becomes. With high student performance standards, the set of successful districts will include primarily wealthy and higher income districts with relatively few high-need students. A fair question is what relevance does the spending in these districts have for understanding the required spending in poor districts with large numbers of at-risk students? With crude cost adjustments, the empirical identification approach is likely to be particularly inaccurate in states with large urban areas, especially when the adequacy standard is set significantly above the performance levels in these central cities.

Resource Cost Model Approach

Another intuitive approach to estimating adequacy is to go out and ask professional educators what resources they think are required for districts to achieve an adequacy standard. Commonly called the "resource cost model" (RCM) this is a "bottom-up" approach to estimating the cost of adequacy.[7] The RCM method involves designing prototypical classrooms, schools, and districts by asking professional educators what resources are required for a school to meet a particular standard. The resulting estimates include a wealth of details on the types and numbers of classrooms, teachers, other staff, and non-personnel resources required for a school to be successful. The RCM approach is often accompanied by estimates of geographic cost differences for resources such as teachers' salaries, energy, and capital construction. The RCM method is designed primarily to address the second step in the process—estimating the cost of adequacy in a benchmark district. The estimates of required spending in the prototypical school are then adjusted for these input cost differences, to determine the required resource costs for adequacy.

Much less attention is paid under the RCM approach to additional resources required to address different student needs. While it is possible to ask educators what additional resources

will be required to help at-risk students reach the adequacy standards, these are just educated guesses, because there are few actual examples of "successful" high-need urban schools. Simplistic methods of adjusting for needs, such as pricing the extra costs associated with all high-need schools adopting a whole school reform, are particularly questionable. What limited evaluation research exists on these programs suggests the need to invest in more qualified teachers and support staff than recommended by program sponsors.[8] The further the characteristics of students in the prototype district diverge from those in high-need districts in a state, the more important accurate cost adjustment becomes.

Cost Function Approach

The third approach to estimating the cost of adequacy concentrates on the third step in the process—developing accurate adjustments for student needs and resource price differences. As discussed more fully below, the approach involves estimating "cost functions" using statistical methods. A cost function relates data on actual spending in a district to student performance, resources prices, student needs, and other relevant characteristics of districts.[9] The resulting estimates are used to construct education cost indices, which measure how factors outside a district's control affect the spending required to reach a given student performance level. For the second stage of the process—estimating required spending to reach adequacy in a benchmark district—the cost function approach relies on the statistical results for the student performance measure(s) to estimate the required spending in a district with average resource prices and average student needs.

The strengths of the cost function approach include: 1) concentration on the third step in the process by estimating the variation in required spending across districts, which is particularly important in states with large urban areas; and 2) the use of actual data on factors affecting spending to develop estimates of the costs of adequacy. However, these benefits are contingent on the quality of the data used in statistical analysis and the accuracy of the statistical results. If

the data do not capture well the underlying cost characteristics of a district, then as the saying goes, "garbage in, garbage out." In developing measures used in the study, which are reviewed in detail in Appendix A, I have relied primarily on published data produced by the New York State Education Department.

A number of choices confront a researcher attempting to estimate an education cost model. Each of these choices may affect the statistical results, in some cases significantly, and some of these choices are not "transparent" to policymakers and educators. The cost function approach has been criticized, and ultimately rejected by some researchers, because its technical complexity makes it difficult to explain to "reasonably well-educated policymakers"[10] In my view, this is an inappropriate criterion for rejecting a method for estimating the cost of adequacy, because simple approaches, which are easy to explain, may be grossly inaccurate. The main criterion in selecting a method should be accuracy, not transparency. However, the onus is on the researcher using the cost function approach to explain the method in an intuitive fashion, and to convince policymakers and other policy analysts that the statistical decisions he or she made are reasonable.

Another criticism of the cost function approach is that it is a "black box," which reveals few specifics about how the resources given a school district should be spent. The results from this method provide an estimate of how many resources will be required by a district to reach a given standard using present technology and given some level of efficiency. The cost function approach does not prescribe what districts should do to reach adequacy, but instead predicts required spending based on historical relationships.

Education Cost Models and Cost Index Results

As discussed above, the cost of adequacy estimates in this report are based on estimating an education cost function employing statistical methods. There have been two approaches to estimating education cost adjustments. The most common approach involves estimating a teacher wage model, which is used to construct a teacher wage index. As discussed below, a teacher wage index can be used as a proxy for differences in the cost of doing business across school districts. The second approach uses a full education cost model to adjust for differences in resource costs, and the additional resources required in very small districts or those with significant at-risk children. This section begins with a brief explanation of the process of estimating a teacher wage model and presents teacher wage index results. I then turn to the estimation of full education cost and provide cost index results for New York school districts.

Estimating a Teacher Wage Model and a Competitive Teacher Wage Index

If the adequacy standard required by a state implies that the state must assure that all districts receive a minimum level of resources, then some adjustment needs to be made for the higher cost of business in some school districts than in others. Given that the primary resource used by school districts are teachers and other professional staff, differences in the cost of hiring teachers would be particularly important to adjust for. Some districts may have to pay significantly more to recruit teachers of equal quality, because of a higher cost of living in the area, strong competition from the private sector for similar service-sector occupations, or more difficult working conditions facing teachers. What teachers consider difficult working conditions will clearly vary, but discipline problems, violence, and general lack of student motivation are likely to make a teaching job less attractive to most teachers. In addition, cost differences can also be calculated for other inputs, such as transportation, energy, and facilities.[11]

Using information on individual teacher salaries and teacher characteristics in 2000, and school and district factors, I have estimated a teacher wage model. See Appendix B for a discussion of the development of this model and presentation of the results (Table B-2). In developing a teacher wage index it is important to distinguish between discretionary factors that a district can control, and those labor market or working condition factors that are outside district control.[12] Factors that a district can influence include the experience and education of its teaching force, the certification level of its staff, the size of schools and class sizes, average student performance, and the general level of efficiency in the district. Factors outside a district's control include labor market factors, such as private sector salaries and unemployment rates, and factors related to working conditions, such as high-need students, juvenile crime rates, and pupil density.

To develop a measure of competitive salaries, I use the average for the discretionary factors, and the actual district levels for the factors outside their control. Competitive salaries are defined as what a district would have to pay to recruit a teacher with average characteristics and in a district with average efficiency, and in a school and class of average size, compared to other districts in New York. Finally, to develop a teacher wage index, the predicted competitive salary in a district is divided by the state average salary and multiplied by 100.

Figure 1 presents a competitive teacher cost index from one teacher wage model estimated for this study (Model B reported in Table B-2 in Appendix B). In this model New York City and Yonkers will have to pay teacher salaries over 50 percent higher than the average district to attract teachers of average education and experience. Both the higher cost of living downstate and the challenging working environment in both cities are major factors affecting competitive salary levels. Even though the other large cities, commonly called the Big Three, are located in upstate New York, they still will have to pay salaries 25 percent above average salaries to recruit good teachers, because of more difficult working conditions. Somewhat

surprisingly, low-need districts have competitive salaries 11 percent above the state average. Most of these districts are suburbs of New York City, and higher wages are due entirely to the higher cost of living in downstate New York.

Estimating Cost Functions and Cost Indexes

If the adequacy standard required by a state is that all districts should be given the opportunity to raise their students to an adequate level of student performance, then adjustments need to be made for both resource cost differences and the higher level of resources required in some districts. More resources might be required because a district is very small (economies of size) or has a large share of at-risk students. An education cost function relates per pupil spending in a school district to factors that are outside a district's control and other factors that a district can influence (Figure 2). Beginning with the latter, spending levels in a district are clearly affected by the level of student performance that school officials and, ultimately, taxpayers want to support. Assuming that additional resources are required to raise student performance, we would expect a positive relationship between the level of student performance and spending, holding other factors constant. This relationship has to be tempered by the possibility of inefficiency in the use of resources. Some school districts may have high spending relative to their level of student achievement, not because of higher costs, but because of inefficient use of resources. It is particularly important in estimating cost models to adequately control for efficiency differences across districts, because the cost function results can be sensitive to what efficiency factors are included. The efficiency controls used in this study are discussed in detail in Appendix B.

The other side of a cost function is those factors that are typically outside of a district's control (Figure 2). These cost factors can be roughly divided into three categories: resource prices, student needs, and physical characteristics of a district. As discussed above, some districts may have to pay significantly more to recruit teachers of equal quality. Factors affecting school

readiness of students, their motivation, and their behavior not only influence the working conditions facing a teacher, and hence competitive salaries, but the quantity of resources that are required to help these students reach a particular performance standard. For example, we would expect that students whose native language is not English will require additional resources in the form of bilingual education classes and other support to help them obtain mastery of English as well as stay on track in the curriculum. The cost function used in this study includes two student need factors—the share of enrollment that is limited English proficiency (LEP) students, and the percent of children between 5 and 17 years old living under the poverty line.[13] Finally, costs may be affected by certain physical characteristics of a district, including enrollment size and physical terrain. I have included in the cost model variables measuring the enrollment levels in the district to reflect the fact that costs are likely to be higher in very small school districts.[14]

Once the variables in a cost model have been identified, they are estimated using a method called multiple regression, which is designed to determine the impact of a particular "independent" variable on the "dependent" variable, controlling for other factors that affect the dependent variable. In this case, the dependent variable is actual spending per pupil by school districts, and the independent variables are the factors in the cost model listed in Figure 2. The numbers next to these factors indicates their relative importance in determining school district spending (the higher the number, the more important).[15] One of the most important factors in this model affecting spending levels in districts is the student performance level, indicating that raising student performance will require increased levels of funding. The result of the student performance measure is used directly in estimating the cost of reaching a particular adequacy standard. Among factors outside district control, teacher salary level and the share of free lunch students in a district are also important determinants of spending differences. Of lesser relative importance are the enrollment level of a district and the share of LEP students; however, these factors can be important determinants of spending in certain districts. Finally, I found that some

inefficiency factors are important determinants of spending, and that excluding efficiency variables in the cost model does significantly affect the results for other variables.

Once an education cost function has been estimated, developing education cost indices involves several simple steps. For factors that a district can influence, the results of the cost model are multiplied by some constant level for these variables, usually the state average. This effectively holds these factors constant across school districts. For factors that are outside a district's control, the results of the cost model are multiplied by the actual value for these variables in each district. When all of these terms are added up and adjusted, the result is the predicted per pupil spending in a school district to reach a particular student performance standard, assuming an average level of efficiency.[16] To find the cost of reaching different adequacy standards, we use this standard as the constant student performance measure, and we calculate for each school district the predicted spending required to reach this standard (see Appendix B). To estimate a cost index, the predicted spending level in each district is divided by the predicted spending level in the district with average characteristics and then multiplied by 100. An index value of 150 indicates that this district will have to spend 50 percent more than a district with average characteristics to reach any given performance standard. Averages for the key cost factors used in the cost model are presented in Table 1.

Cost Index Results

Using the cost model discussed above (and presented in more detail in Appendix B), I have estimated education cost indexes for New York school districts, which are presented in Figure 3 and Table 2. Cost indexes are calculated for all cost factors presented in Figure 2, as well as subsets of these factors. The cost index results are presented by the need/resource capacity categories developed by the State Education Department. (Table 2 also includes cost indices broken down by regions in New York.)

Greater student needs and higher salaries both act to raise costs in New York's large cities. The full cost index (including all factors outside district control) for New York City is 183, indicating that New York City will have to spending 83 percent more than a district with average cost characteristics to reach the same level of student performance. Higher child poverty and limited English proficiency levels in New York City will raise the costs of achieving adequacy by 36 percent compared to a district with average poverty and LEP rates. In addition, New York City will have to pay teachers more to attract teachers of equal quality, resulting in an increase in costs of almost 20 percent. Higher enrollment levels in New York City are predicted to raise costs by 12 percent compared to the average district.

Yonkers is also estimated to have to spend close to 80 percent more than the average district, driven by the same factors as New York City. The large upstate cities, commonly called the Big Three, are estimated to have to spend 51 percent more per pupil than the average district to reach the same student performance level. Student needs, in particular, raise the required spending by over 40 percent. The only other districts with costs significantly above average are the "high-need urban/suburban" districts. These are primarily small city districts, located both upstate and downstate. The estimated costs of bringing students in these districts up to a given performance standard are 21 percent above the average district, driven primarily by higher student needs in the upstate cities and higher salaries in downstate districts. High-need rural districts do not have, on average, high costs. While the higher poverty rates in these districts raise their costs, this is offset by below average cost of living and smaller LEP populations.

The significantly higher costs in the high-need districts become apparent when we examine the distribution of student characteristics and predicted salary levels across types of districts (Table 1). Over 70 percent of students in the Big Five are eligible for free lunch and over 30 percent of their school-age children are estimated to live in poverty; by comparison, poverty rates are 6 percent in the low-need districts. LEP percentages are particularly high in the

large cities, especially considering that over half the districts have no LEP students. Predicted teacher salaries are also generally higher in high-need districts.

Estimating Pupil Cost Weights

The typical approach for including an adjustment for student needs in aid formulas is to weight some students more heavily than others in the distribution of aid. If aid is distributed on a per pupil basis, then counting some students twice, for example, will assure that more resources will go to districts with these types of students. While most states use the weighted pupil approach to adjusting for student needs, the origins of most of these weights remain obscure. It appears that most are based, at best, on professional judgments about the extra costs associated with certain types of students. Rarely are pupil weights the result of careful analysis of the actual relationship between student characteristics and costs. The results of the cost model estimated in this study can also be used to develop pupil cost weights for both children in poverty and LEP students. (See Appendix B for a description of the method used to construct these weights.)

The first and third columns of Table 3 provide estimates of extra costs associated with a student of a certain type in different types of districts. I find that school-age children in poverty will generally required between $7,000 and $9,000 per student in additional resources to bring them up to the average performance in the state. For LEP students the extra costs are even higher, in excess of $10,000 per student. Pupil weights are calculated by dividing these additional costs by spending required to bring non-LEP and poverty students up to average student performance (second and fourth columns). For both types of students the weights are approximately equal to one. A weight of one can be interpreted as indicating that a student of this type is twice as expensive to bring up to any given performance level as other students. While no definitive list of pupil weights used by states exists, the limited evidence that I could find suggests that weights of 0.5 or lower for at-risk students are the norm in most states.[17] These

results would suggest that most states are significantly underestimating the additional resources that are required to support at-risk students achieving higher standards.

Estimating the Cost of Adequacy

The bottom line in developing a school finance system to support adequacy is determining what it will cost in each school district to provide students the opportunity to reach the higher standards. As discussed earlier, estimating the cost of adequacy is a three-step process.

Student Performance Measure

In setting an adequacy standard, the first step is determining whether the standard applies to guaranteeing some minimum level of resources, or the opportunity to reach a minimum level of student performance. In New York, both the Board of Regents and Commissioner of Education have identified a clear set of performance standards for students to graduate from high school. In addition, Justice DeGrasse in the CFE decision interprets the Education Article in the New York Constitution as requiring education adequate to produce productive citizenship. "A capable and productive citizen…is capable of serving impartially on trials that may require learning unfamiliar facts and concepts and…decide complex matters that require...verbal, reasoning, math, science, and socialization skills…"[18] In both cases, the underlying adequacy standard is providing the opportunity for students to achieve a minimum level of competence.

In selecting a measure of performance to use in estimating the cost of adequacy, I have drawn from the measures developed by State Education Department in their proposed school accountability system. Specifically, the measure used in this study is based on a weighted average of 4th and 8th grade math and English tests, and high school Regents Exams in math and English. Regents Exams were weighted twice as heavily as 4th and 8th grade exams to reflect the

fact that students are now required to pass these exams for high school graduation (see Appendix A).

As indicated in Figure 4, there are wide disparities presently in student achievement, and they are tied closely to the need and resource capacities of school districts. The Big Five school districts have performance levels of approximately 100 (out of 200), which is well below the performance level reached even in other high-need urban/suburban districts. The target performance standard in 2000-01 in the school accountability system was 140, which is 40 percent higher than the level of performance in these large cities. In contrast, high-need rural districts, average-need districts, and low-need districts exceed, on average, the 140 standard. Besides estimating the cost of reaching the 140 standard, I will estimate the required spending to reach standards of 150 and 160.

Estimating the Cost of Adequacy in a Benchmark District

The second step in developing estimates of the cost of adequacy is to determine the required spending level to reach a performance standard in a benchmark school district. The benchmark I use is a hypothetical district with average student needs, average predicted teacher salaries, average enrollment, and average efficiency. The estimated per pupil spending levels to reach different adequacy standards are reported in the first line of Table 4. For a district with average characteristics, a spending level of $8,201 is estimated to be adequate to reach a performance level of 140. An additional $640 per pupil is required to reach a standard of 150 and an additional $1,330 to reach a standard of 160 (compared to 140).

For comparison purposes, I calculated a similar spending number using the "empirical identification approach." Specifically, I determined the number of districts meeting or above a particular adequacy standard, and trimmed the top 10 percent and bottom 10 percent with regard to both per pupil income and per pupil property values. Table 4 presents the mean and median adjusted spending levels for these districts. The results are reported in the second and third lines

of Table 4. Both the mean ($9,075) and median ($8,579) spending levels when the standard is 140 are higher than using the cost function method. As expected, the costs to reach adequacy go up as the standard increases, but at a much slower rate than with the cost function approach. At the standard of 160, the mean spending level is the same and the median spending level is over $600 per pupil below the level using a cost function method. The fact that spending increases only slightly when performance standards are raised reflects the fact that the characteristics of the districts used to calculate this benchmark change significantly as the standard gets higher. The higher the standard the wealthier the school district, and the lower the share of high need students.

Estimating the Cost of Adequacy in All Districts

The final step in estimating the cost of adequacy is adjusting the adequacy cost in the benchmark district to reflect the unique characteristics of other school districts. The cost function approach is particularly well suited for this stage, because one output of this method is a cost index. To estimate the cost of adequacy in a particular school district, simply multiply the required per pupil spending in the average (benchmark) school district for a particular adequacy standard by the cost index (divided by 100) for that district. For example, to estimate the cost of adequacy in New York City for a standard of 140, simply multiply 1.8271 (182.71/100) by $8,201 per pupil, which equals $14,983 (top panel, last column of Table 5). To estimate the total required spending for an adequacy standard, multiply per pupil required spending by the combined adjusted average daily membership (CAADM).[19] For New York City, $14,983 times 1,069,141 equals $16.019 billion (top panel, third column of Table 5). This is the estimate of the total required spending (exclusive of debt service, transportation, and tuition payments) to provide students in New York City the opportunity to reach the 140 standard.

Table 5 and Figure 5 provide estimates of the required per pupil and total spending to reach different adequacy standards for school districts that do not presently meet these standards.

The overall spending level to reach a standard of 140 is over $20 billion, which compares to spending $13.2 billion in 1999-2000 in these districts. Of the required $7.1 billion increase in spending, 92 percent of it would be in New York City, and 5 percent of it would be in the Big Four (Figure 6). Required per pupil spending to reach the 140 standard is estimated to be over $15,000 per pupil in New York City, 70 percent above present spending levels, and $13,000 per pupil in the Big Four, 30 percent above present spending. The predicted spending increases in the other high-need urban/suburban districts are over $1,000 per pupil.[20]

If the standard were raised to 160, close to the present state average, the required spending levels would approach $29 billion in the 332 districts that presently do not meet the 160 standard, compared to their present spending level of $18 billion. Thus, spending in these districts is projected to increase by 60 percent to reach the standard. The share of the additional funding going to New York City remains very high, 86 percent. When this is combined with the additional funding to the Big Four and the other high-need districts in the state, all but 4 percent of the spending increase is accounted for.

Figure 7 highlights the dramatic increase in per pupil spending in some school districts that is estimated to be required for all students to have an opportunity to reach the standard. Required spending per pupil in New York City would have to rise between $6,000 and $8,500 per year (70 percent to 100 percent). Required spending in the Big Four would have to rise between $3,000 and $5,000 per pupil, would depending on the standard. Compared to the Big Five, other increases in required spending will be modest even when the standard were set at 160. The fact that the largest increases in spending are concentrated in high-need urban areas is consistent with national findings about the importance of urban poverty.

State Aid Formulas to Fund Adequacy

Basic operating aid formulas should be designed primarily to assist state governments in accomplishing their educational equity objectives. The significant differences that exist across school districts in most states in property wealth, income, resource prices, and student needs can lead to equally large differences in student performance. Most states have recognized for years the important role that variation in fiscal capacity can play in creating large disparities in spending levels across districts. Receiving much less attention has been the equally significant impact of resource cost and student need differences on disparities in student performance. Educational cost indexes are important largely because they make it possible to design school aid formulas that effectively target resources to districts with the highest costs and greatest student needs. This section will illustrate how a cost index can be used in conjunction with fiscal capacity measures to develop simple but effective operating aid formulas for funding adequacy standards. [21]

Designing a Performance Foundation Formula

About 80 percent of states use some form of a foundation grant system, which is designed to ensure that all districts meet some minimal performance standard.[22] For the most part, however, these systems use spending as a measure of "performance" and therefore do not bring the most disadvantaged districts up to reasonable performance adequacy standards. In designing a *traditional foundation formula*, a state government needs to set a statewide minimum level of spending and a minimum amount of local effort. The latter is often defined in terms of a state determined minimum local property tax rate multiplied by the actual property values in a school district. Once these are defined, the aid formula is simply the difference between the minimum spending level, the minimum level of local tax effort, and any federal aid received by the district.

Traditional Foundation Formula:

Aid per pupil = Minimum spending per pupil (same in all districts) — Minimum local tax effort per pupil in this district — Federal aid

Minimum local effort = State-set property tax rate multiplied by actual per pupil property values

While the minimum spending level is constant statewide, the minimum level of local effort will vary across districts in direct proportion to their fiscal capacity. Wealthier districts will be expected to contribute more taxes per pupil than will poorer districts. Fiscal capacity can be measured in terms of property values, income, or some combination. *If the traditional foundation formula is to successfully bring districts up to the minimum spending level, then a minimum level of local effort must be enforced.*

A traditional foundation with maintenance-of-effort provisions should be successful in bringing spending in all districts up to the minimum level. However, the same minimum spending in some districts will be much more successful in raising student performance than in other districts, due in part to factors outside a district's control. Thus, a traditional foundation formula will generally not be successful in raising student performance in all districts up to an adequate level unless the minimum spending level is set very high or the adequacy standard is set very low.

To convert a traditional foundation into a *performance foundation formula* requires the basic tools that have been developed in this study. First, the state must select, not a minimum spending level, but a minimum level of student performance; in other words, an adequacy standard. Second, the adequacy standard needs to be converted into the spending required to meet the adequacy standard. The approach used in this study for estimating the cost of adequacy is to multiply spending required in the district with average cost characteristics by an educational

cost index. The cost index captures both variation in the salaries required to attract good teachers in every district (due to both cost-of-living and working condition differences) and the greater quantity of inputs required in some districts because of higher student needs. Aid per pupil is simply the difference between the required spending per pupil in a district to reach the adequacy standard and the minimum local tax effort in this district plus federal aid. Taken literally, this formula could lead to "negative aid" or "recapture" by the state of local property taxes in wealthy districts. In practice, the minimum aid amount would probably be set at zero, and this is the assumption used for this analysis.

Performance Foundation Formula:

Aid per pupil = Required spending per pupil in this district to meet adequacy standard — Minimum local tax effort per pupil in this district — Federal aid

Required spending to achieve adequacy standard = Required spending in district with average resource costs and needs multiplied by education cost index

The simplicity of a performance foundation formula would make the operating aid system much more transparent to most school personnel and to the average voter. This simplicity belies the effectiveness of this formula. John Yinger and I have tested a number of aid formulas using New York data to determine which are the most effective in accomplishing specific educational equity objectives.

> Our simulations of the impacts of…outcome-based [foundation] plans indicate that such plans can be an effective tool for promoting educational adequacy, at least when they include a required minimum tax rate. Indeed, by requiring contributions from local taxpayers, these plans can bring the vast majority of districts up to any standard policymakers select. The districts that remain below the standard are relatively inefficient.[23]

As with traditional foundation formulas, the success of this aid system in significantly raising resources and student performance will depend on enforcing a local maintenance-of-effort

provision, and on the efficiency with which needy school districts use the additional resources. I will turn to both of these issues in the final section.

Example of Aid Distribution under a Performance Foundation System

To illustrate a performance foundation formula, I have used the estimates of required spending to reach particular adequacy standards in Table 5. With regard to the minimum local tax effort, I have chosen a minimum local property tax rate of $20 per $1,000 of market value, which is above the 1999-2000 state average of $15. For comparative purposes I have also looked at rates of $15 and $25. The minimum local tax rate is used to establish a level of local revenue contribution for education from any source, not just the property tax.

A performance foundation will by design target aid to districts that are falling the furthest below the standard. As is clear from Figure 7, New York City and the Big Four would be the primary recipients of aid increases. Per pupil aid in New York City would more than double to $9,467 two meet a standard of 140, and would almost triple to $12,067 to meet a standard of 160. For the Big Four, aid would need to increase by 55 percent to help these districts meet a standard of 140, and would almost double to meet a standard of 160. Other high-need urban/suburban districts would experience aid increases ranging from 5 percent to 35 percent depending on the standard.

The significant aid increases in high-need districts could be financed from two sources; an expanded state school aid budget, and redistribution of aid from average- and low-need districts. For low-need districts, their aid budget would shrink dramatically. Given that these districts have average education costs and property wealth that averages over $1 million per pupil, removing state aid from these districts is entirely appropriate. With the minimum local tax rate of $20 per $1,000 they can finance spending of over $20,000 per pupil. For districts with average needs, their property values per pupil are only 30 percent of the low-need districts, but still exceed those in any other group of districts. These districts in general have below average

costs. Their state aid would be reduced under this performance foundation formula by 6 percent to 40 percent, depending on the standard. High-need rural districts would also experience decreases in aid under this system. While their property values are generally low, they have costs that are also below average.

Besides the redistribution of aid across types of districts, state aid budgets would also have to increase significantly with the minimum local tax effort specified above. Total spending under this performance foundation aid, which includes all but building aid and transportation aid, would range from $14.6 billion to $19.3 billion, depending on the adequacy standard. With comparable formula aid in 2000-01 costing $11 billion, aid budgets would have to increase by $3.6 billion to $8.2 billion to meet the adequacy objectives with this level of local effort. Sixty-four percent of the aid would go to New York City, 8 percent to the Big Four, and 8 percent to other high-need urban districts (Figure 9). By comparison, with 2000-2001 formula aid, 38 percent goes to New York City, 6 percent goes to the Big Four, and 9 percent goes to other high-need urban districts.

If the local effort rate were increased to $25 per $1,000, the required state budget with a standard of 140 would drop to $11.7 billion, which is only slightly above present aid levels (Table 7). If the local contribution rate were set at $15 per $1,000, required aid would increase by 23 percent to $17.9 billion (with a standard of 140).

Local Effort and State-Local Share

Clearly, one of the difficult decisions that will have to be made in developing a school finance system to finance higher student performance standards is what share of total spending local governments should finance. Significant local financing of education can substantially raise property tax burdens on local residents, which may be particularly difficult for low-income households. In addition, large cities, in particular, can have a range of other needs that require substantial local revenues (e.g., additional social service, housing, and infrastructure). New York

has eased some of the impact of school taxes on low-income homeowners through the School Tax Relief (STAR) program, but this program does not help low-income renters. Requiring local districts to substantially increase local effort will lead to higher local tax rates, and thus to higher STAR reimbursements to districts. For the tables that follow I have not determined the impact of a particular minimum local effort rate on the costs of STAR. [24]

Table 8 summarizes the estimated local contribution of school districts in 1999-2000 with the required local contribution to meet an adequacy standard of 140. With the minimum tax rate set at $20 per $1,000 full value, school districts would be required on average to increase their local contribution by one-third. The required increase in local contribution would be quite different across types of districts. New York City, and the other large cities with local contribution rates close to the state average rate of $15 in 2000 would need to increase local tax effort by over one-third. Rural high-need districts and average-need districts also have average local contributions, but would have to raise taxes by 60 percent, and 39 percent, respectively, because their state aid would actually go down under a performance foundation grant. In contrast, other high-need urban/suburban districts would need to increase their local contribution by only 10 percent, because they already have local contribution rates close to the required rate of $20 per $1,000.

Based on these state aid and local contribution estimates, it is possible to estimate the share of local-state-federal contributions to financing an adequate education. The first panel of Table 9 reports the shares of spending by level of government for 2000. State aid represents about 46 percent of total spending in New York City, which is about the same share as in the average-need districts. This contrasts with shares of 64 percent in the Big Four and high-need rural districts, and 56 percent in other high-need urban districts. The only districts with a substantially lower state share than New York City are the low need districts, which have an average property tax base of over $1 million per student.

The use of a performance foundation formula changes dramatically the state share of financing in different groups of districts. While the state share for the Big Four remains approximately the same, the state share in New York City jumps 13 percentage points to 59 percent. This significant increase in state aid to New York City is financed in part by a drop in state aid to other districts. The state share drops to 47 percent for rural districts, 25 percent for average-need districts, and 3 percent in low-need districts. As standards increase, the state share of financing increases to 47 percent for a standard of 150, and 51 percent for a standard of 160 (assuming that the minimum local tax rate remains $20 per $1,000). With a standard of 160, all high-need urban districts, on average, would receive over 60 percent of their funds from state aid. However, the high-need rural, average-need, and low-need districts would all receive less aid than they did in 2000.

Policy Choices in Financing an Adequate Education

Assuming that the estimates presented in this report on the costs of achieving adequacy standards in New York are correct, the changes that would be required in the New York school finance system to achieve adequacy would be dramatic. Spending levels in the high-need urban districts would have to rise significantly to provide the resources these districts need to get their students to meet the standards. Part of that spending increase would be for teacher salary increases so that the Big Five could compete successfully with their suburbs for the best teachers. In addition, substantial amounts of additional might be required to significantly reduce class size, hire additional staff to support intense instruction in reading and math, and fund innovative programs to address social and health needs of at-risk children. While the spending estimates presented in this report may appear unreasonably high, it is important to keep in mind that to meet the adequacy standards presented in this report will require raising student performance in

New York's large cities to levels that have seldom been achieved nationally in major urban areas.

This study has presented estimates of the required spending for a district to have the opportunity to reach the adequacy standard, but how this spending is financed is a matter of state (and local) policy. It is clear that the higher the standard is set, the higher the required level of spending to reach adequacy. In designing a school finance system, it is important for state policymakers to address several questions.

State versus Local Contribution to School Funding

The level of state aid that is required for adequacy is directly related to two key policy decisions—how high is the standard, and how high is the minimum local contribution. The advantage of a simple aid formula, such as the performance-based foundation, is that these trade-offs are very clear. Under any reasonable level of local tax effort, the state aid budget will have to increase significantly to finance the adequacy standards presented in this report.

In determining the appropriate state and local share of financing, several issues need to be considered. The higher the state share of financing, the lower the property tax rate in most school districts. While well-administered property taxes are not as regressive as is commonly believed, they can impose a significant burden on some low-income households. STAR helps to ease this burden on homeowners, but it does not help renters or businesses. Substantial tax increases, particularly in large cities, can hurt the competitiveness of these communities in attracting or retaining residents and businesses. Some of the largest required tax increases may have to be in Buffalo, Syracuse, and similar upstate cities, which have experienced little economic growth in the last decade.

On the other hand, financing schools in high-need districts almost entirely with state (and federal) aid may reduce efficiency in those school districts. Some research using New York State data suggests that increases in state aid lead to higher levels of inefficiency.[25] Logically, citizens

are more apt to put pressure on school boards and superintendents when they are being asked to finance education through local taxes than when the money is being provided from state aid. The empirical evidence from decades of research is that a grant increase of a certain amount will lead to significantly more local spending than an equivalent increase in private income.[26] There are a number of possible reasons for this effect, but one is likely to be increased inefficiency.

Effort of Maintenance

A key policy parameter in a foundation formula is the required minimum tax rate. The higher this tax rate is set, the lower the contribution required by the state government, and the higher is the required local contribution to financing education. For whatever level of local tax effort is selected, it is important, if a foundation formula is used, that the minimum tax rate be enforced. Otherwise, financially strapped districts, such as in the large cities, will be tempted to cut local school tax rates, and siphon state aid into other services or tax cuts.[27]

An alternative to enforcing an effort of maintenance provision is to use matching grants for operating aid. If the matching rate were adjusted for fiscal capacity and costs, then the state-matching rate would be much higher in the large cities. Matching grants attempt to encourage local tax effort without forcing an effort-of-maintenance provision. However, there is no guarantee that cities will, in fact, significantly increase tax effort in response to the grant, and determining the required state aid budget will be more difficult. An analysis using New York data shows that, for any given state aid budget, even well-designed matching grants will not be as effective as performance foundation grants in reaching adequacy standards.[28] While enforcing effort of maintenance provisions may be politically unpopular with some local officials, this is probably a more cost-effective strategy for assuring adequate spending on education than using a matching grant.

School Efficiency

The cost function estimates of the level of spending required for adequacies presented in this study are based on the historical relationship between spending and student performance. Another alternative is to do more with the resources that are available to districts. While it is highly unlikely that efficiency improvements alone will be sufficient to raise low-performing districts and schools up to the state standards, efforts to improve district efficiency clearly could save the state government substantial amounts of state aid. In addition, a reasonable concern of state policymakers is that high-need districts may have difficulty effectively utilizing large increases in state aid, particularly in the short run. A substantial increase in state aid to high-need districts could increase inefficiency by: 1) putting pressure on already strained teacher labor markets; 2) encouraging rapid expansion of teacher salaries without accountability; 3) raising local construction costs through a large building program; and 4) straining the capability of district personnel to efficiently manage finances, monitor private contracts, and evaluate student and school performance.

The New York State Department of Education could play a crucial role in helping districts improve their efficiency and effectiveness by providing technical assistance in a numbers of areas, including:

- Personnel functions, such as planning and forecasting future staffing needs, teacher recruitment and retention policies, teacher evaluation methods, etc.
- Program evaluation methods and student performance data to help guide program decisions made by school districts.
- Long-range capital plan development and evaluation of alternative capital financing options.
- Financial management practices (in conjunction with other organizations, such as the New York State Comptroller's office) such as cost accounting techniques and school-based budgeting.

To assist districts in these areas may require an expanded staff and a diversification of specializations within State Education Department. However, compared to providing additional state aid, investing in increased state capacity in education or some other state agencies to provide technical assistance might be a very good investment.

Endnotes

1. For a detailed review of state Supreme Court decisions on school finance, see Anna Lukemeyer. 1999. *Education Finance Equity: Judicial Treatment of Key Issues and Impact of That Treatment on Reform*. Ph.D. dissertation. Syracuse: Syracuse University.

2. *Campaign for Fiscal Equity, Inc., v. State,* 187 Misc. 2d 1,719 N.Y.S. 2d 475 (N.Y. Sup. Ct. 2001) (CFE).

3. Ulrich Boser. 2001. "Pressure Without Support." *Education Week*, *Quality Counts 2001*. January 11, 2001, 68-74.

4. For a review of these methods see, James Guthrie and Richard Rothstein. 1999. "Enabling "Adequacy" to Achieve Reality: Translating Adequacy into State School Finance Distribution Arrangements." In H. Ladd, R. Chalk, and J. Hansen (eds.) *Equity and Adequacy in Education Finance: Issues and Perspectives*. Washington, DC: National Academy Press; and William Duncombe and John Yinger. 1999. "Performance Standards and Educational Cost Indexes: You Can't Have One Without the Other." ibid.

5. John Augenblick.1993. *Determining a Base Student Cost Figure for Use in Ohio's School Foundation Program*. Report to The Alliance for Adequate School Funding; John Augenblick, 1997. *Recommendations for a Base Figure and Pupil-Weighted Adjustments to the Base Figure for Use in a New School Finance System in Ohio*. Report presented to the School Funding Task Force, Ohio Department of Education.

6. Augenblick (1997) derived the pupil weights from a single-equation spending regression produced by Bruce Gensemer. 1997. "Cost Variation Among Ohio School Districts." Paper prepared for the Ohio School Funding Task Force. (May 31, 1997). Gensemer states in this paper that, "If policy makers prove to be interested in a comprehensive cost adjustment, the more sophisticated simultaneous-equations approach should then be pursued in the second stage." (p. 4) He specifically cited the work of John Yinger and his colleaques, which is similar to the approach used in this study.

7. For examples, see Jay Chambers and Thomas Parish. 1982. *The Development of a Resource Cost Model Funding Base for Education Finance in Illinois*. Report prepared for the Illinois State Board of Education; James Guthrie and Richard Rothstein. 1997. *A Proposed Cost-Based Block Grant Model for Wyoming School Finance*. Report prepared for the Joint Appropriations Committee of the Wyoming Legislature.

8. Robert Bifulco. 2001. *Do Whole-School Reform Models Boost Student Performance: Evidence from New York City.* Ph.D. dissertation. Syracuse: Syracuse University.

9. For other examples of this approach, besides this report, see Thomas Downes and Thomas Pogue. 1994. "Adjusting School Aid Formulas for the Higher Costs of Educating Disadvantaged Students." *National Tax Journal*, 47: 89-110; and Andrew Reschovsky, and Jennifer Imazeki. 1997. "The Development of School Finance Formulas to Guarantee the Provision of Adequate Education to Low-Income Students." *Developments in School Finance*: 123-147.

10. James Guthrie and Richard Rothstein. 1999. "Enabling "Adequacy" to Achieve Reality: Translating Adequacy into State School Finance Distribution Arrangements." In H. Ladd, R. Chalk, and J. Hansen (eds.) *Equity and Adequacy in Education Finance: Issues and Perspectives*. Washington, DC: National Academy Press, p. 223.

11. For a good introduction to methods used for adjusting for input cost differences see U.S. Department of Education, National Center for Education Statistics. 2001. *A Primer for Making Cost Adjustments in Education*. NCES 2001-323, by William Fowler and David Monk, Washington, DC: NCES.

12. For a detailed discussion of the process of developing a teacher cost index, see Jay Chambers. 1997. *A Technical Report on the Measurement of Geographic and Inflationary Differences in Public School Costs.* Prepared for the National Center for Education Statistics, Washington, DC.

13. In another cost model, discussed in Appendix B (Model 2 in Table B-5), I have used the share of elementary school children eligible for free lunch under the federal school lunch program as an indicator of poverty. Based on recommendation from SED staff, free lunch shares for K-6 students were used, because this share is more representative of the underlying free lunch eligible population, than the actual share of users from all grades. The cost index results are not significantly different (compare Tables B-6 and B-13 in Appendix B).

14. My own research on New York has indicated significant economies of size moving from enrollment levels below 1000 students, to enrollment levels of 1500 to 3000 students. After this enrollment level, however, the cost savings from getting larger are generally small. William Duncombe and John Yinger. 2001. "Does School District Consolidation Cut Costs?" Center for Policy Research Working Paper No. 33, The Maxwell School. Syracuse, NY: Syracuse University; and William Duncombe, Jerry Miner, and John Ruggiero. 1995 "Potential Cost Savings from School District Consolidation: A Case Study of New York," *Economics of Education Review*, 14 (September): 356-384.

15. Standardized regression coefficients are calculated by multiplying the regular regression coefficients by the ratio of the standard deviation for the independent variable by the standard deviation for the dependent variable. They can be interpreted as the standard deviation change in the dependent variable for a one standard deviation change in the independent variable. The regular regression coefficients are reported as Model 1 in Table B-5 in Appendix B.

16. The dependent variable used in the cost model is the natural logarithm of per pupil spending. To convert the predicted value of this variable into per pupil spending requires taking the anti-log of this sum.

17. Kern Alexander and Richard Salmon. 1995. *Public School Finance.* Boston: Allyn and Bacon, Table 9.2.

18. CFE, 187 Misc.2d at 14.

19. Combined adjusted average daily membership (CAADM) is calculated by taking the average enrollment in a district over the course if the year (average daily membership) and including half day kindergarten students and prekindergarten students (multiplied by 0.5), students with disabilities attending full-time BOCES classes, pupils serving in incarcerated youth programs, and the equivalent attendance of students under the age of 21 not on a regular day school register in programs leading to a high school diploma or GED.

20. In some cases the estimated required spending to reach adequacy will not equal the cost index multiplied by the spending in the average district. If the district is not meeting the adequacy standard, but already spends more than the estimated required spending level, then actual 1999-2000 spending is used as the required spending level. This assumption is made so that the estimated increase in required spending will be zero rather than a negative number.

21. This section draws heavily from Helen Ladd and John Yinger. 1994. "The Case for Equalizing Aid." *National Tax Journal*. 47: 211-224; and William Duncombe and John Yinger. 1998. "School Finance Reform: Aid Formulas and Equity Objectives." *National Tax Journal*. 51: 239-262.

22. For the most recent compilation of school finance systems, see *Public School Finance Programs of the United States and Canada: 1998-99*. Washington, DC: U.S. Department of Education, 2001.

23. William Duncombe and John Yinger. 1998. "School Finance Reform: Aid Formulas and Equity Objectives." *National Tax Journal*. 51: 258.

24. For a description of the method used to calculate the local effort rate see the last section of Appendix B.

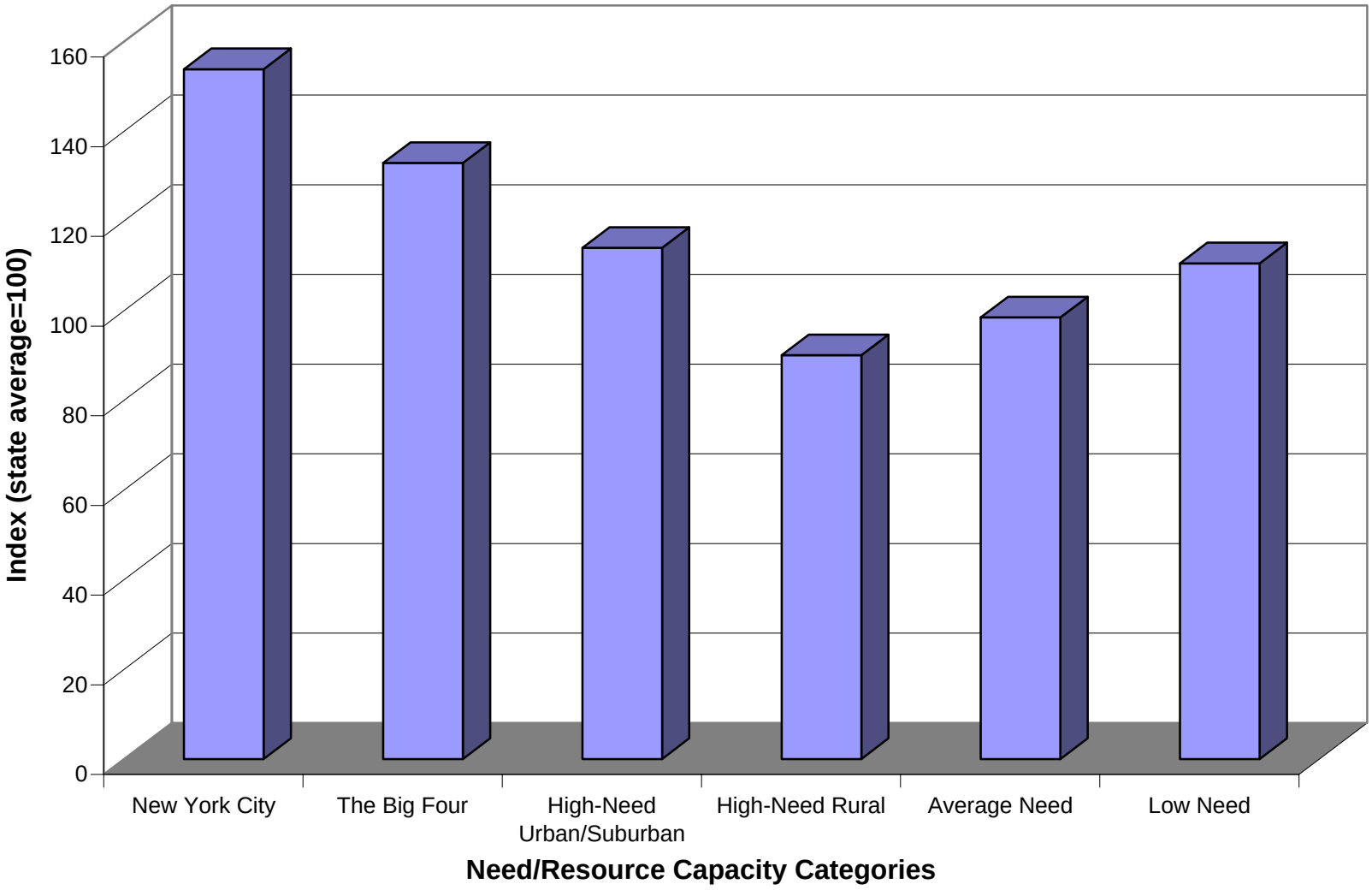
25. William Duncombe and John Yinger. 2000. "Financing Higher Student Performance Standards: The Case of New York State," *Economics of Education Review*, 19 (October): 363-386.

26. For a summary of this research, see Daniel Schwallie, 1989. *The Impact of Intergovernmental Grants on the Aggregate Public Sector*. New York: Quorum Books.

27. For a good review of the evidence on local tax effort in New York, see "Analysis of School District Fiscal Response, 1993-94 to 1998-99, prepared by the State Aid Work Group of the New York State Education Department, November 2000.

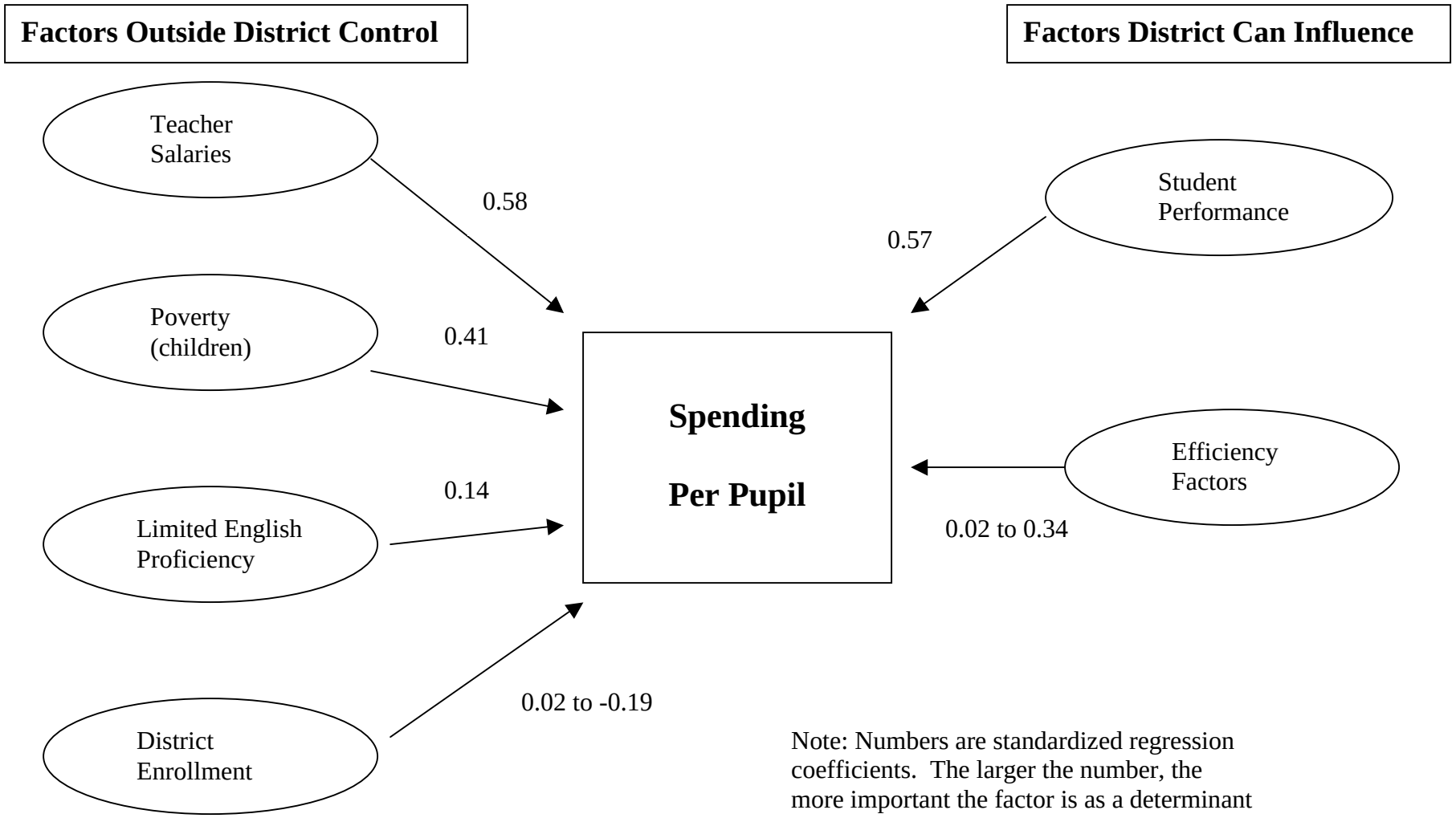
28. William Duncombe and John Yinger. 1998. "School Finance Reform: Aid Formulas and Equity Objectives." *National Tax Journal*. 51: 258.

Figure 1. Comparison of Competitive Teacher Wage Index[1]



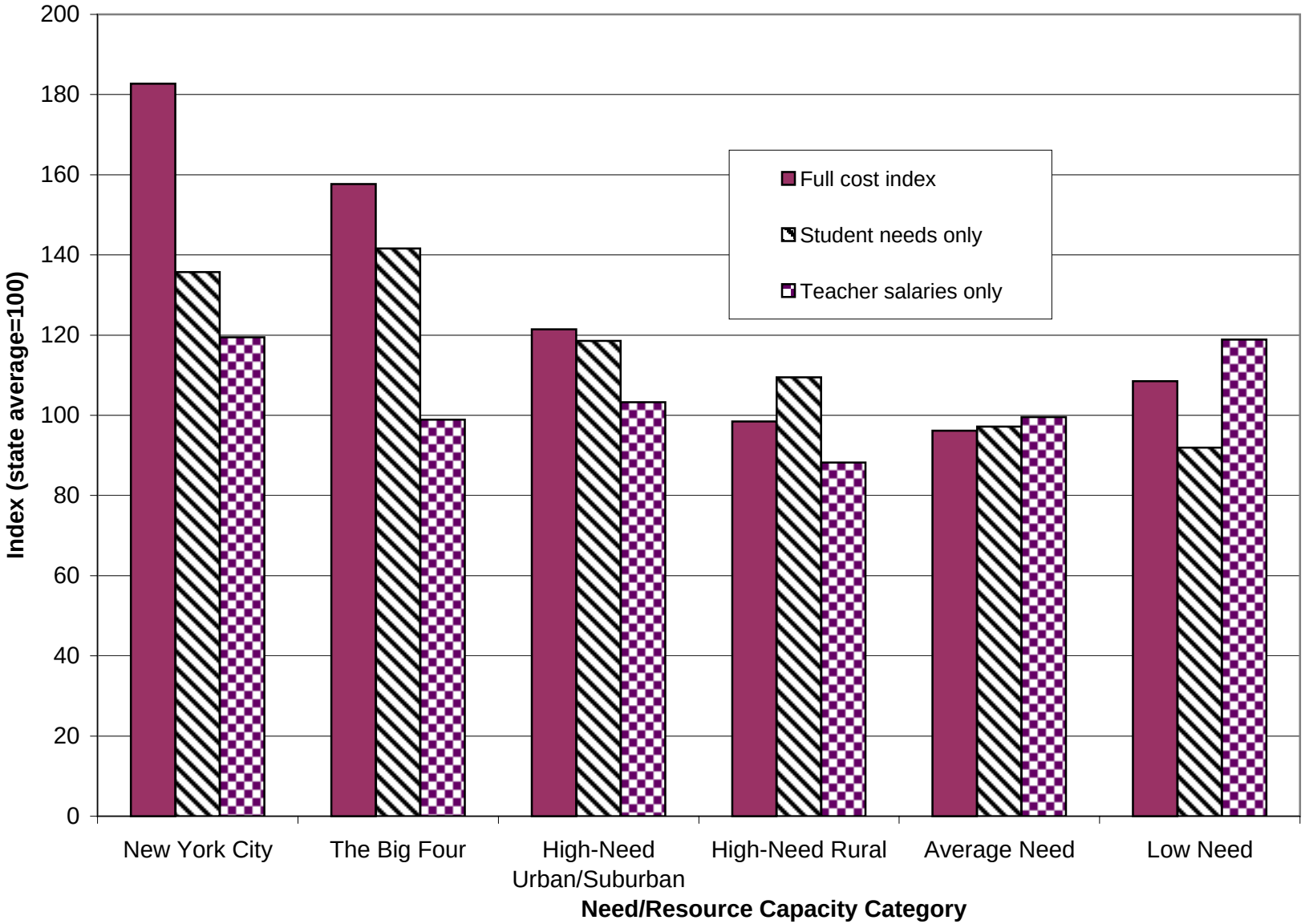
[1]Based on Model B in Table B-2 in Appendix B.

Figure 2. Determinants of School District Spending



Note: Numbers are standardized regression coefficients. The larger the number, the more important the factor is as a determinant of spending per pupil.

Figure 3. Comparison of Cost Indices by Type of District[1]



[1]Based on cost Model 1 in Table B-5 in Appendix B. For teacher cost index, based on Model B in Table B-2.

Figure 4. Comparison of Student Performance Index By District Type

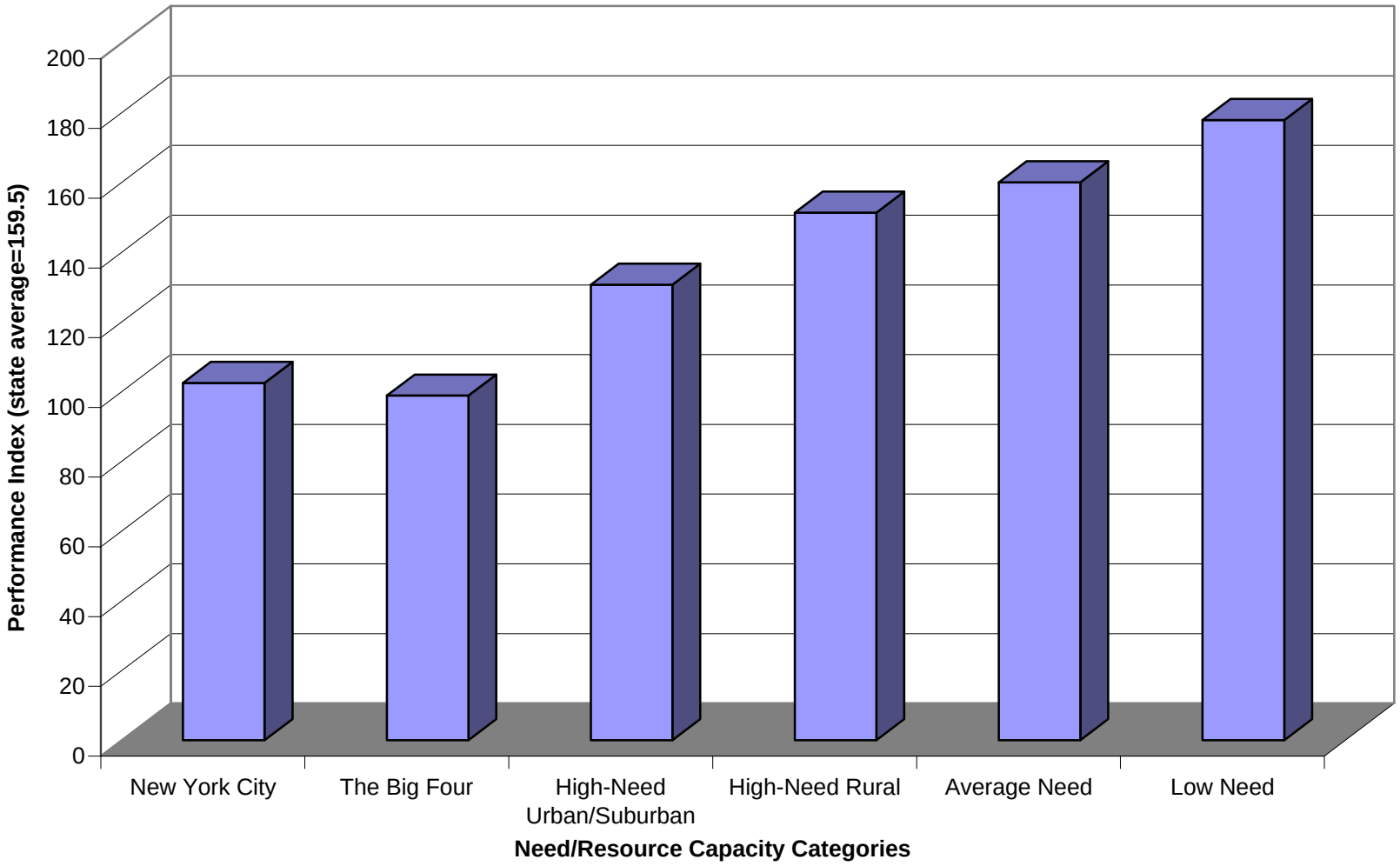
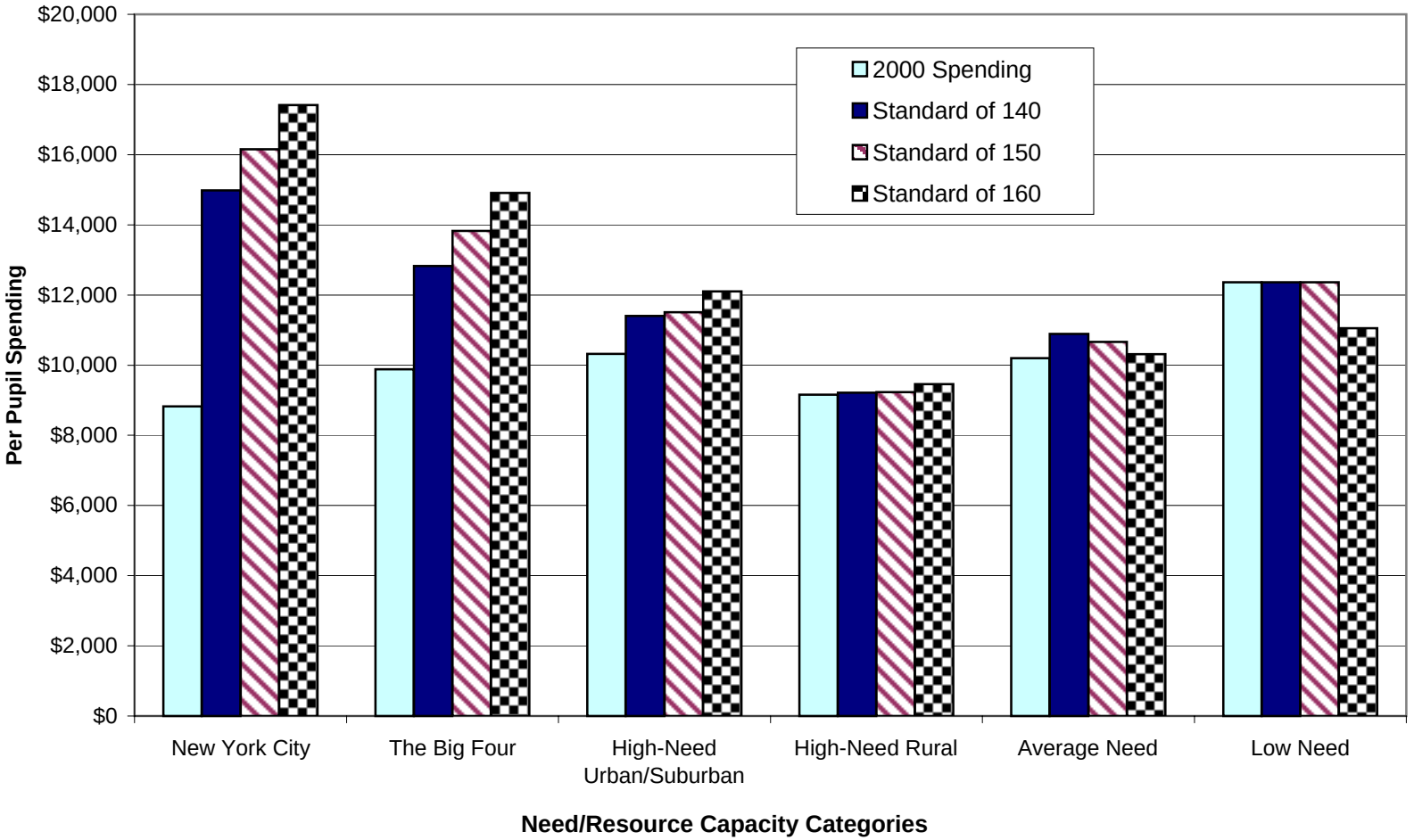


Figure 5. Required Per Pupil Spending (1999-2000) to Achieve Adequacy Standard For Districts With Performance Below the Standard[1]



[1] Based on cost index adjusting for all cost factors (Table 2).

Figure 6a. Share of Additional Spending to Achieve 2001 Standard of 140, by Need-Capacity Category ($7.2 Billion)

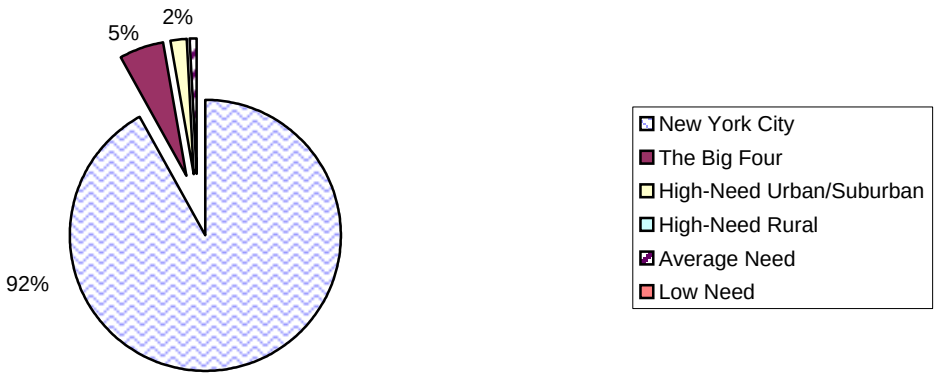


Figure 6b. Share of Additional Spending to Achieve Standard of 150, by Need-Capacity Category ($8.8 Billion)

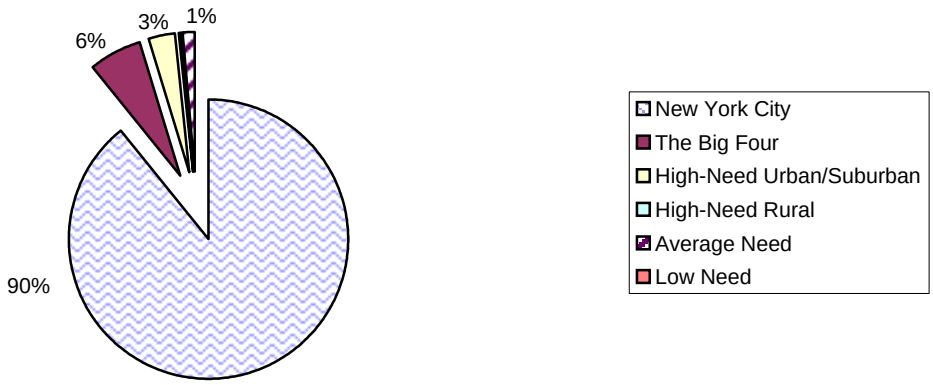
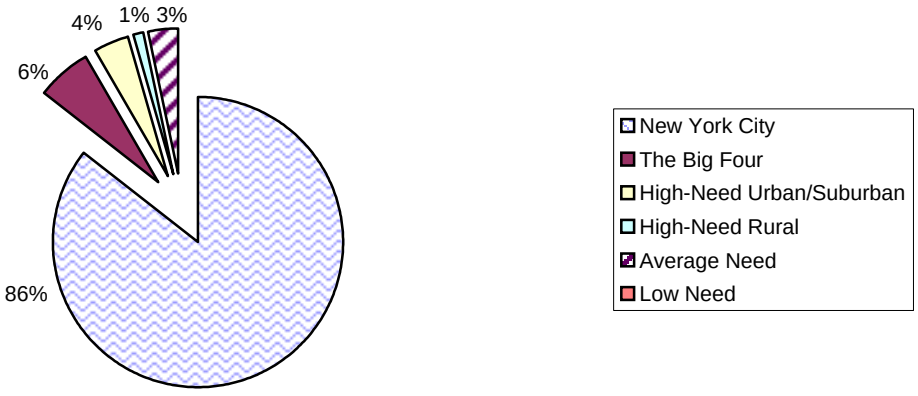
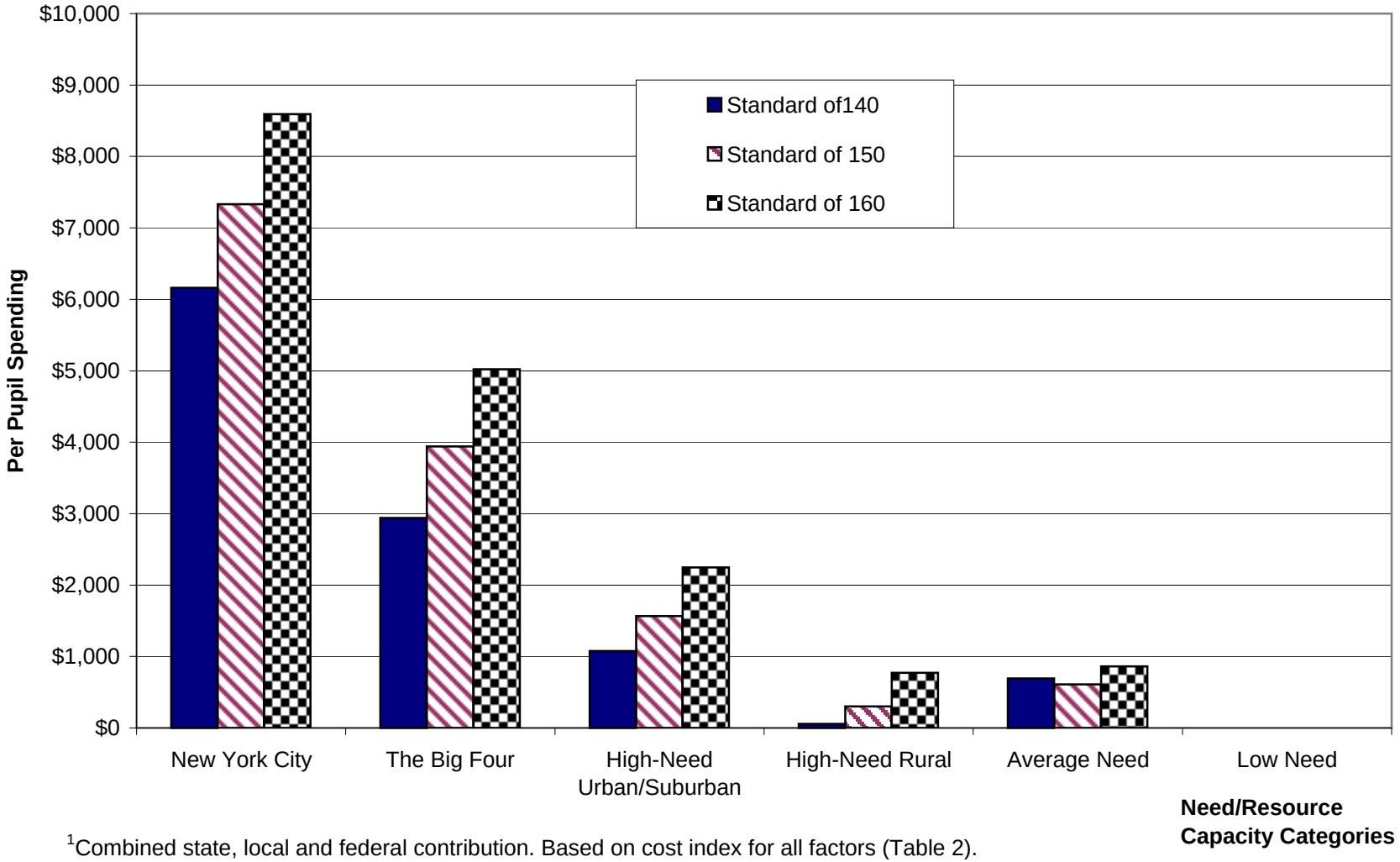


Figure 6c. Share of Additional Spending to Achieve Standard of 160, by Need-Capacity Category ($10.7 Billion)



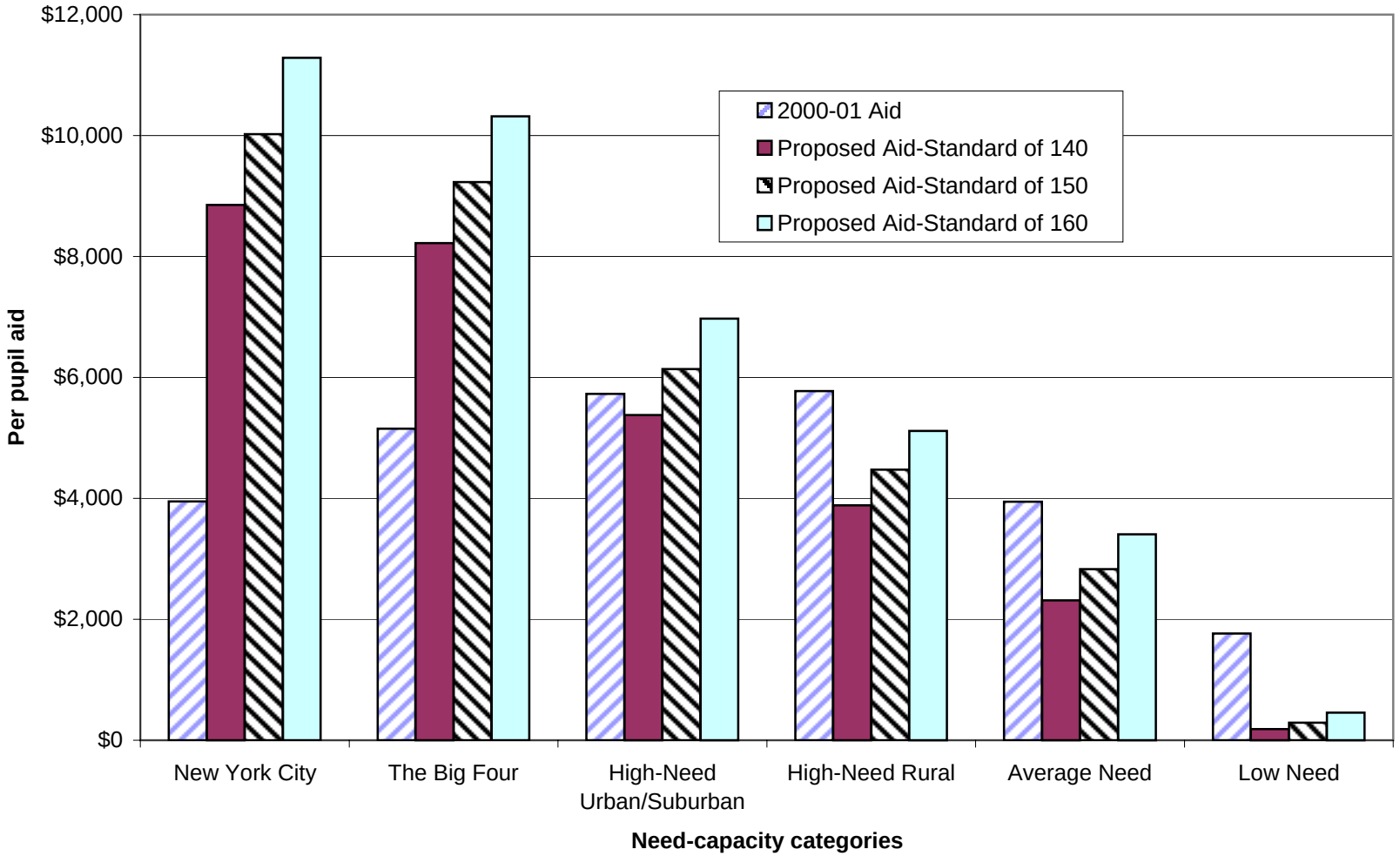
Based on cost index with adjustment for all cost factors (Table 2).

Figure 7. Required Additional Per Pupil Spending to Achieve Adequacy Standards Compared to 1999-2000 Spending For Districts With Performance Below the Standard[1]



[1]Combined state, local and federal contribution. Based on cost index for all factors (Table 2).

Figure 8. Comparison of Present Aid with Performance Foundation Aid Per Pupil for Different Adequacy Standards



[1]Assuming minimum local tax effort of $20 per $1.000 FV.

Figure 9a. Share of Performance Foundation State Aid by Need-Capacity Category--Standard of 140 ($14.6 Billion)

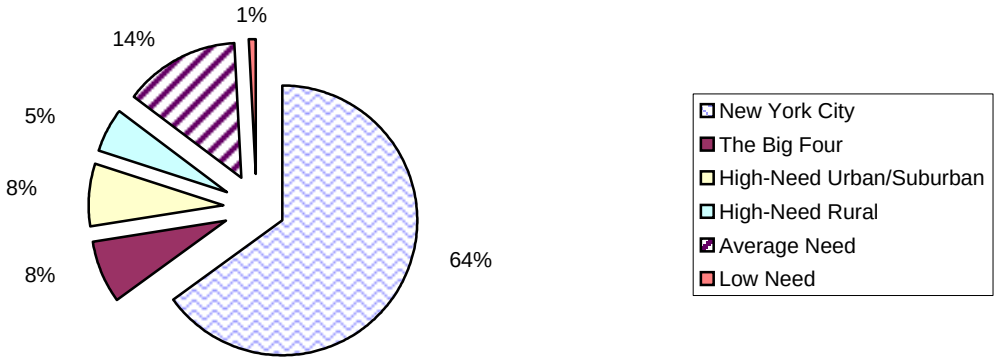


Figure 9b. Share of Performance Foundation State Aid by Need-Capacity Category--Standard of 150 ($16.8 Billion)

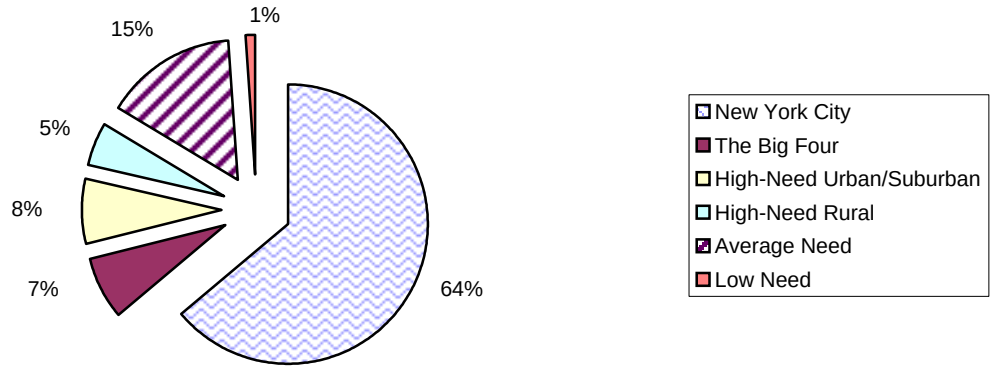
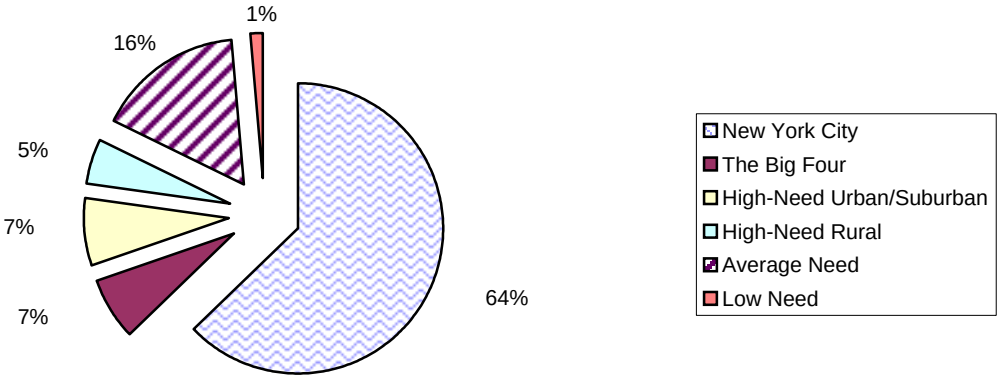


Figure 9b. Share of Performance Foundation State Aid by Need-Capacity Category--Standard of 160 ($19.3 Billion)



Based on full cost index (1) in Table B-6 in Appendix B.

Table 1. Averages for Variables in Cost Model[1]

	Teacher Salaries[2]	Free Lunch Percent[3]	Child Poverty Rate (1997)	LEP Percent[4]	Average Enrollment[5]	Student Performance Index[6]
Descriptive Statistics:						
Minimum	$24,484	0.00%	0.90%	0.00%	34	83
25th Percentile	$32,459	9.51%	7.40%	0.00%	987	149
Median	$35,413	21.81%	14.67%	0.00%	1,657	161
75th Percentile	$41,701	32.42%	22.14%	1.10%	3,217	172
Maximum	$57,196	87.35%	50.71%	22.70%	1,069,141	196
Need/Resource Capacity:						
New York City	$39,561	74.86%	34.90%	12.32%	1,069,141	103
The Big Four	$36,644	70.83%	42.67%	9.18%	32,893	99
High-Need Urban/Suburban	$37,709	52.29%	28.57%	5.02%	5,139	131
High-Need Rural	$32,680	34.60%	25.92%	0.32%	1,146	151
Average Need	$36,341	19.65%	13.03%	0.94%	2,625	160
Low Need	$45,269	5.01%	6.22%	1.98%	2,789	178
Regions:						
Downstate Small Cities	$47,947	33.48%	16.62%	7.73%	5647	148
Downstate Suburbs	$46,082	11.22%	8.80%	3.20%	3387	169
New York City	$39,561	74.86%	34.90%	12.32%	1069141	103
Yonkers	$47,237	59.72%	31.31%	16.42%	24847	107
The Big Three (upstate)	$33,113	74.53%	46.46%	6.76%	35575	96
Upstate Rural	$33,135	29.09%	21.57%	0.22%	1113	156
Upstate Small Cities	$34,848	41.73%	25.39%	2.23%	4324	145
Upstate Suburbs	$35,004	19.39%	13.24%	0.32%	2450	160

[1]Data are for 1999-00 school year unless otherwise noted.

[2]Based on average salaries for fulltime teachers with 0 to 5 years of experience.

[3]Based on percent of elementary school children receiving free lunch.

[4]Percent of children classified by the State Education Department as limited English proficiency.

[5]Combined adjusted average daily membership (CAADM). See Appendix A for details.

[6]Composite of 4th and 8th grade English language arts and math exams, and Regents Exams in math and English. See Appendix A for details.

Table 2. Summary of Cost Indices -- Calculated from Cost Regression[1]

(State Average =100)

	Number of Districts	All Cost Factors[2]	All But Enrollment[3]	Student Needs[4]	Teacher Salaries	Overall Teacher Wage Index[5]
Descriptive Statistics:						
Minimum		81	79	85	79	81
25th Percentile		91	92	92	90	90
Median		97	96	98	97	97
75th Percentile		106	105	106	109	109
Maximum		184	186	154	159	185
Need/Resource Capacity:						
New York City	1	183	162	136	119	154
The Big Four	4	158	140	142	99	133
High-Need Urban/Suburban	37	121	123	119	103	114
High-Need Rural	161	98	97	110	88	90
Average Need	341	96	97	97	100	98
Low Need	134	109	109	92	119	111
Regions:						
Downstate Small Cities	7	139	140	108	130	128
Downstate Suburbs	168	114	115	96	120	114
New York City	1	183	162	136	119	154
Yonkers	1	178	158	137	115	152
The Big Three (upstate)	3	151	134	143	94	127
Upstate Rural	207	95	94	105	89	90
Upstate Small Cities	49	107	109	112	97	104
Upstate Suburbs	242	93	94	97	97	97

Note: A cost index is interpreted as the percent increase in predicted spending in a district to reach a given performance level when these cost factors are allowed to change, compared to a district with average values for all cost factors. For example, the student need index for New York City of 136 indicates that predicted spending in New York City is 36 percent higher than the average district to reach the same performance level, because of higher student needs (free lunch and LEP).

[1]Includes in the cost model a weighted performance measure, predicted wages,the percent of children in poverty (1997), share of students with limited English proficiency (LEP), enrollment and efficiency variables. See cost Model 1 in Table B-5 iin Appendix B.

[2]Includes adjustment for children in poverty, LEP students, teacher salaries, and enrollment size.

[3]Includes adjustment for children in poverty, LEP students, teacher salaries, but not enrollment size.

[4]Includes adjustment for children in poverty and LEP students.

[5]Based on Model B in Table B-2 in Appendix B. This is predicted salary required to attract teacher with average characteristics, and in district with average school enrollment, class size, and efficiency.

Table 3. Cost Impact of Student Needs (1999-2000)[1]

Classification	Extra Cost Per Child in Poverty[2]	Child Poverty Weight	Extra Cost Per LEP Student[2]	LEP Student Weight
Descriptive Statistics:				
Minimum	$2,425	0.30	$10,067	1.08
25th Percentile	$7,350	0.90	$10,115	1.08
Median	$7,927	0.97	$10,172	1.09
75th Percentile	$8,570	1.05	$10,339	1.10
Maximum	$23,780	2.92	$11,399	1.22
Need/Resource Capacity:				
New York City	$7,945	0.98	$10,762	1.15
The Big Four	$8,640	1.06	$10,582	1.13
High-Need Urban/Suburban	$7,943	0.98	$10,392	1.11
High-Need Rural	$8,082	0.99	$10,221	1.09
Average Need	$7,920	0.97	$10,225	1.09
Low Need	$7,993	0.98	$10,269	1.10
Regions:				
Downstate Small Cities	$8,002	0.98	$10,571	1.13
Downstate Suburbs	$7,941	0.98	$10,343	1.10
New York City	$7,945	0.98	$10,762	1.15
Yonkers	$7,606	0.94	$11,008	1.18
The Big Three (upstate)	$8,985	1.10	$10,440	1.12
Upstate Rural	$8,086	0.99	$10,170	1.09
Upstate Small Cities	$7,715	0.95	$10,260	1.10
Upstate Suburbs	$7,951	0.98	$10,129	1.08

Note: Pupil weight is defined as the percent increase in costs associated with a student of a certain type. For example, the LEP student weight in New York City is 1.15. This indicates that bringing a typical LEP student in NYC up to a given performance level will cost 115 percent more than a non-LEP student with otherwise similar characteristics.

[1]Includes in the cost model a weighted performance measure, predicted wages, percent of children in poverty, share of students with limited English proficiency (LEP), enrollment and several efficiency variables (Model 1 in Table B-5).

[2]This is the cost of bringing a student with this characteristic up to average performance in the state, which is 159.5.

Table 4. Required Spending to Achieve Adequacy Standards (1999-2000) In a Benchmark District--Comparison of Two Approaches

	Per Pupil Spending		
	Standard of 140	**Standard of 150**	**Standard 160**
Cost function approach:[1]			
Required spending for adequacy in a district with average costs	$8,201	$8,841	$9,532
Empirical identification approach:[2]			
Mean	$9,075	$9,165	$9,534
Median	$8,579	$8,598	$8,900

[1]All variables in the cost function are set equal to the state average except student performance which is set equal to the adequacy standard. Defined as the spending required by districts with average costs to reach the adequacy standard.

[2]Districts equal to or above the standard are first identified. The top and bottom 10% of districts in terms of per pupil income and market value are trimmed from the sample. Average or median spending per pupil is then calculated.

Table 5a. Required Spending to Achieve Adequacy (1999-2000) In Districts with Performance Below the Specified Standard (full cost adjustment)[1]

	Performance Index (2000)	1999-2000 Expenditures (millions)	Required Spending For Adequacy (millions)	1999-2000 Per Pupil Expenditure	Required Spending For Adequacy Per Pupil
STANDARD OF 140					
Total (average)	125	$13,210	$20,380	$9,145	$14,108
Required additional spending			$7,169		
Number of districts below standard			71		
Need/ResourceCapacity:					
New York City	103	$9,433	$16,019	$8,823	$14,983
The Big Four	99	$1,300	$1,687	$9,884	$12,823
High-Need Urban/Suburban	120	$1,294	$1,429	$10,325	$11,403
High-Need Rural	131	$273	$275	$9,159	$9,214
Average Need	131	$881	$941	$10,200	$10,893
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 150					
Total (average)	137	$15,256	$24,036	$9,182	$14,465
Required additional spending			$8,780		
Number of districts below standard			178		
Need/ResourceCapacity:					
New York City	103	$9,433	$17,271	$8,823	$16,154
The Big Four	99	$1,300	$1,819	$9,884	$13,825
High-Need Urban/Suburban	128	$1,778	$2,058	$9,944	$11,512
High-Need Rural	140	$770	$797	$8,932	$9,235
Average Need	142	$1,946	$2,064	$10,052	$10,661
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 160					
Total (average)	146	$17,924	$28,666	$9,130	$14,602
Required additional spending			$10,741		
Number of districts below standard			332		
Need/ResourceCapacity:					
New York City	103	$9,433	$18,620	$8,823	$17,416
The Big Four	99	$1,300	$1,961	$9,884	$14,905
High-Need Urban/Suburban	131	$1,874	$2,301	$9,857	$12,103
High-Need Rural	147	$1,330	$1,448	$8,686	$9,456
Average Need	149	$3,826	$4,176	$9,454	$10,317
Low Need	149	$160	$160	$11,057	$11,057

[1]The estimated costs of achieving adequacy are only for districts with performance below the standard. Cost of adequacy is calculated by taking the required spending in the average district to reach a standard (Table 4) multiplied by the cost index with adjustment for all cost factors (Table 2) divided by 100. If the required cost of adequacy is less than the actual spending level, then the cost is set at the present spending level.

Table 5b. Required Spending to Achieve Adequacy (1999-2000) In Districts with Performance Below the Specified Standard (full cost adjustment)[1]

	Performance Index (2000)	1999-2000 Expenditures (millions)	Required Spending For Adequacy (millions)	1999-2000 Per Pupil Expenditure	Required Spending For Adequacy Per Pupil
STANDARD OF 140					
Total (pupil-weighted average)	125	$13,210	$20,380	$9,145	$14,108
Required additional spending			$7,169		
Number of districts below standard			71		
Regions:					
Downstate Small Cities	131.33	$239	$282	$10,400	$12,266
Downstate Suburbs	120.09	$1,023	$1,087	$11,723	$12,456
New York City	102.50	$9,433	$16,019	$8,823	$14,983
Yonkers	107.00	$309	$362	$12,437	$14,576
The Big Three (upstate)	96.13	$991	$1,325	$9,289	$12,415
Upstate Rural	131.18	$192	$193	$9,509	$9,527
Upstate Small Cities	125.92	$730	$812	$9,335	$10,386
Upstate Suburbs	130.31	$292	$299	$8,307	$8,513
STANDARD OF 150					
Total (average)	137	$15,256	$24,036	$9,182	$14,465
Required additional spending			$8,780		
Number of districts below standard			178		
Regions:					
Downstate Small Cities	136	$371	$435	$11,414	$13,368
Downstate Suburbs	129	$1,480	$1,587	$11,689	$12,537
New York City	103	$9,433	$17,271	$8,823	$16,154
Yonkers	107	$309	$390	$12,437	$15,714
The Big Three (upstate)	96	$991	$1,429	$9,289	$13,385
Upstate Rural	142	$591	$607	$9,038	$9,285
Upstate Small Cities	135	$1,329	$1,527	$9,190	$10,562
Upstate Suburbs	141	$751	$790	$8,186	$8,608
STANDARD OF 160					
Total (average)	146	$17,924	$28,666	$9,130	$14,602
Required additional spending			$10,741		
Number of districts below standard			332		
Regions:					
Downstate Small Cities	136	$371	$459	$11,414	$14,098
Downstate Suburbs	138	$1,988	$2,198	$11,476	$12,689
New York City	103	$9,433	$18,620	$8,823	$17,416
Yonkers	107	$309	$421	$12,437	$16,942
The Big Three (upstate)	96	$991	$1,540	$9,289	$14,430
Upstate Rural	149	$1,310	$1,404	$8,698	$9,326
Upstate Small Cities	141	$1,640	$1,970	$9,093	$10,922
Upstate Suburbs	149	$1,882	$2,054	$8,333	$9,098

[1]The estimated costs of achieving adequacy are only for districts with performance below the standard. Cost of adequacy is calculated by taking the required spending in the average district to reach a standard (Table 4) multiplied by the cost index with adjustment for all cost factors (Table 2) divided by 100. If the required cost of adequacy is less than the actual spending level, then the cost is set at the present spending level.

Table 6a. Distribution of State Education Aid Using a "Performance" Foundation Formula (full cost adjustment)[1]

	Number of Districts	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
		Total--Millions of Dollars				
All Districts	678	$17,681	$11,070	$14,587	$16,807	$19,253
Required additional aid				$3,516	$5,737	$8,183
Need/Resource Capacity:						
New York City	1	$5,771	$4,222	$9,467	$10,718	$12,067
The Big Four	4	$461	$710	$1,101	$1,233	$1,375
High-Need Urban/Suburban	37	$727	$1,059	$1,111	$1,265	$1,430
High-Need Rural	161	$645	$1,045	$747	$859	$981
Average Need	341	$5,292	$3,322	$2,035	$2,546	$3,121
Low Need	134	$4,786	$712	$125	$186	$278

	Property Values (1998)	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
			Per Pupil--Dollars			
Need/Resource Capacity:						
New York City	$269,888	$5,398	$3,949	$8,855	$10,025	$11,287
The Big Four	$189,229	$3,785	$5,154	$8,220	$9,230	$10,319
High-Need Urban/Suburban	$197,210	$3,944	$5,726	$5,379	$6,138	$6,974
High-Need Rural	$201,122	$4,022	$5,773	$3,887	$4,476	$5,115
Average Need	$313,092	$6,262	$3,945	$2,313	$2,828	$3,407
Low Need	$1,003,299	$20,066	$1,765	$183	$291	$456

Note: Performance foundation aid is calculated by taking the estimated per pupil spending required for a district to reach a particular adequacy standard (see Table 4) and subtract from it the required minimum local tax contribution. If the calculated aid is negative, it is set equal to zero.

[1]Based on the cost index which adjusts for all cost factors (see Table 2).

[2]Includes all formula aid except Building Aid, Transportation Aid, and Reorganization Building aid.

[3]Based on a millage rate of $20 per $1,000 of actual property values.

Table 6b. Distribution of State Education Aid Using a "Performance" Foundation Formula (full cost adjustment)[1]

	Number of Districts	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
		Total--Millions of Dollars				
All Districts	678	$17,681	$11,070	$14,587	$16,807	$19,253
Required additional aid				$3,516	$5,737	$8,183
Regions:						
Downstate Small Cities	7	$378	$125	$112	$138	$169
Downstate Suburbs	168	$6,060	$1,690	$819	$1,032	$1,292
New York City	1	$5,771	$4,222	$9,467	$10,718	$12,067
Yonkers	1	$165	$77	$178	$207	$237
The Big Three (upstate)	3	$296	$633	$923	$1,026	$1,138
Upstate Rural	207	$1,030	$1,173	$747	$872	$1,010
Upstate Small Cities	49	$894	$1,015	$938	$1,085	$1,245
Upstate Suburbs	242	$3,086	$2,135	$1,404	$1,729	$2,095

	Property Values (1998)	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
			Per Pupil--Dollars			
Regions:						
Downstate Small Cities	$541,959	$10,839	$3,205	$2,120	$2,640	$3,332
Downstate Suburbs	$858,868	$17,177	$2,419	$824	$1,075	$1,392
New York City	$269,888	$5,398	$3,949	$8,855	$10,025	$11,287
Yonkers	$332,061	$6,641	$3,112	$7,183	$8,322	$9,549
The Big Three (upstate)	$141,618	$2,832	$5,835	$8,565	$9,533	$10,576
Upstate Rural	$276,110	$5,522	$5,203	$3,144	$3,660	$4,224
Upstate Small Cities	$202,708	$4,054	$4,937	$4,252	$4,924	$5,649
Upstate Suburbs	$271,541	$5,431	$4,031	$2,586	$3,113	$3,703

Note: Performance foundation aid is calculated by taking the estimated per pupil spending required for a district to reach a particular adequacy standard (see Table 4) and subtract from it the required minimum local tax contribution. If the calculated aid is negative, it is set equal to zero.

[1]Based on the cost index which adjusts for all cost factors (see Table 2).

[2]Includes all formula aid except Building Aid, Transportation Aid, and Reorganization Building aid.

[3]Based on a millage rate of $20 per $1,000 of actual property values.

Table 7. Distribution of Performance Foundation Aid, Comparison with Different Levels of Local Tax Effort[1] (Performance Standard of 140)

	Performance Foundation Aid By Local Tax Effort Rate (per $1,000 of FV)			Performance Foundation Aid By Local Tax Effort Rate (per $1,000 of FV)		
	$20	$25	$15	$20	$25	$15
	Total--Millions of Dollars			**Per Pupil--Dollars**		
All Districts	$14,587	$11,743	$17,881	$2,478	$1,778	$3,379
Required additional aid	$3,516	$673	$6,811			
Need/Resource Capacity:						
New York City	$9,467	$8,024	$10,909	$8,855	$7,505	$10,204
The Big Four	$1,101	$986	$1,217	$32,880	$29,095	$36,664
High-Need Urban/Suburban	$1,111	$930	$1,293	$199,020	$164,752	$234,707
High-Need Rural	$747	$603	$899	$625,789	$503,195	$758,370
Average Need	$2,035	$1,166	$3,184	$788,834	$495,106	$1,163,155
Low Need	$125	$35	$379	$24,565	$5,925	$87,912
Regions:						
Downstate Small Cities	$112	$75	$177	$14,843	$9,942	$25,501
Downstate Suburbs	$819	$511	$1,379	$138,425	$77,633	$263,158
New York City	$9,467	$8,024	$10,909	$8,855	$7,505	$10,204
Yonkers	$178	$137	$220	$7,183	$5,523	$8,843
The Big Three (upstate)	$923	$849	$997	$25,696	$23,572	$27,821
Upstate Rural	$747	$567	$949	$650,907	$501,309	$822,849
Upstate Small Cities	$938	$742	$1,145	$208,329	$163,691	$254,802
Upstate Suburbs	$1,404	$838	$2,105	$625,704	$416,404	$877,835

[1]Based on the cost index which adjusts for all cost factors (see Table 2).

Table 8: Required Local Contribution to Meet Adequacy Standard of 140 With Minimum Local Contribution Rate of $20 per $1,000 of Property Values Type of Aid Formula: Performance Foundation Formula

District Name	2000 Local Contribution[1]			Local Contribution[2] Required to Meet Adequacy			Percent Change in Local Contribution
	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	
Total	$13,410			$17,840			33.0%
Simple Average		$5,175	$15		$7,039	$22	
Need/Resource Capacity:							
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
The Big Four	$338	$2,572	$15	$461	$3,505	$20	36.2%
High-Need Urban/Suburban	$696	$3,661	$19	$772	$4,060	$21	10.9%
High-Need Rural	$470	$2,548	$15	$756	$4,095	$23	60.7%
Average Need	$4,277	$4,778	$16	$5,929	$6,623	$22	38.6%
Low Need	$3,333	$8,920	$14	$4,150	$11,107	$17	24.5%
Regions:							
Downstate Small Cities	$310	$7,830	$16	$380	$9,614	$20	22.8%
Downstate Suburbs	$4,577	$8,044	$15	$5,767	$10,137	$19	26.0%
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
Yonkers	$105	$4,241	$13	$165	$6,641	$20	56.6%
The Big Three (upstate)	$233	$2,184	$16	$296	$2,775	$20	27.1%
Upstate Rural	$703	$3,052	$14	$1,139	$4,942	$22	61.9%
Upstate Small Cities	$733	$3,459	$16	$926	$4,372	$21	26.4%
Upstate Suburbs	$2,455	$4,141	$16	$3,395	$5,727	$22	38.3%

[1]Local contribution calculated by taking actual spending (without debt service, transportation, tuition, and other undistributed spending) minus formula state aid (minus building and transportation aid) and federal aid.

[2]Local contribution is calculated by taking the minimum local contribution rate multiplied by property values in a district. If performance is already above the adequacy standard (or local contribution is already above the minimum), then this is set at the 2000 contribution. For districts where their 2000 local contribution exceeds the minimum local contribution their required local contribution may go down as the standard increases if they start receiving state aid. This is especially true for average need and low need districts. It is for this reason that the total local contribution goes down slightly as the as the adequacy standard increases.

Table 9a: State and Local Share of Financing Spending Required for An Adequate Education
Performance Foundation Aid Formula and Minimum Local Contribution Rate of $20 per $1,000 of Property Values

Need/Capacity Category	Required Spending To Achieve Adequacy (millions)	State Aid[1] (Foundation Formula) Total (millions)	State Aid[1] (Foundation Formula) % of Total Spending	Local Contribution to Meet Adequacy[2] Total (millions)	Local Contribution to Meet Adequacy[2] % of Total Spending	Federal Aid Total (millions)	Federal Aid % of Total Spending
2000 Actual Spending and Aid:							
Total State	$26,679	$11,847	44.4%	$13,410	50.3%	$1,422	5.3%
New York City	$9,433	$4,357	46.2%	$4,295	45.5%	$782	8.3%
The Big Four	$1,300	$837	64.4%	$338	26.0%	$125	9.6%
High-Need Urban Suburban	$1,874	$1,052	56.1%	$696	37.1%	$126	6.7%
High-Need Rural	$1,597	$1,031	64.5%	$470	29.4%	$96	6.0%
Average Need	$8,141	$3,628	44.6%	$4,277	52.5%	$236	2.9%
Low Need	$4,333	$942	21.7%	$3,333	76.9%	$58	1.3%
Adequacy Standard: 140							
Total State	$33,849	$14,587	43.1%	$17,840	52.7%	$1,422	4.2%
New York City	$16,019	$9,467	59.1%	$5,771	36.0%	$782	4.9%
The Big Four	$1,687	$1,101	65.3%	$461	27.3%	$125	7.4%
High-Need Urban Suburban	$2,009	$1,111	55.3%	$772	38.4%	$126	6.3%
High-Need Rural	$1,599	$747	46.7%	$756	47.3%	$96	6.0%
Average Need	$8,201	$2,035	24.8%	$5,929	72.3%	$236	2.9%
Low Need	$4,333	$125	2.9%	$4,150	95.8%	$58	1.3%
Adequacy Standard: 150							
Total State	$35,459	$16,807	47.4%	$17,230	48.6%	$1,422	4.0%
New York City	$17,271	$10,718	62.1%	$5,771	33.4%	$782	4.5%
The Big Four	$1,819	$1,233	67.8%	$461	25.4%	$125	6.9%
High-Need Urban Suburban	$2,155	$1,265	58.7%	$764	35.5%	$126	5.8%
High-Need Rural	$1,623	$859	52.9%	$668	41.1%	$96	5.9%
Average Need	$8,259	$2,546	30.8%	$5,477	66.3%	$236	2.9%
Low Need	$4,333	$186	4.3%	$4,090	94.4%	$58	1.3%
Adequacy Standard: 160							
Total State	$37,423	$19,253	51.4%	$16,748	44.8%	$1,422	3.8%
New York City	$18,620	$12,067	64.8%	$5,771	31.0%	$782	4.2%
The Big Four	$1,961	$1,375	70.1%	$461	23.5%	$125	6.4%
High-Need Urban Suburban	$2,301	$1,430	62.1%	$745	32.4%	$126	5.5%
High-Need Rural	$1,715	$981	57.2%	$638	37.2%	$96	5.6%
Average Need	$8,493	$3,121	36.7%	$5,136	60.5%	$236	2.8%
Low Need	$4,333	$278	6.4%	$3,997	92.2%	$58	1.3%

[1]Actual aid in 2000 is calculated as a residual based on spending minus local contribution and state aid. In almost all cases this is below total state aid received by the district.

[2]For actual local contribution in 2000, this is calculated by taking actual total local revenue and subtracting from it the local revenue share (local revenue divided by total revenue) expenditures not included in the expenditure measure used in this study (transportation, debt service, tuition, and other undistributed spending).

Table 9b: State and Local Share of Financing Spending Required for An Adequate Education Performance Foundation Aid Formula and Minimum Local Contribution Rate of $20 per $1,000 of Property Values

Region	Required Spending To Achieve Adequacy (millions)	State Aid (Foundation Formula) Total (millions)	State Aid (Foundation Formula) % of Total Spending	Local Contribution to Meet Adequacy Total (millions)	Local Contribution to Meet Adequacy % of Total Spending	Federal Aid Total (millions)	Federal Aid % of Total Spending
Adequacy Standard: 140							
Total State	$33,849	$14,587	43.1%	$17,840	52.7%	$1,422	4.2%
Downstate Small Cities	$508	$112	22.1%	$380	74.8%	$16	3.1%
Downstate Suburbs	$6,719	$819	12.2%	$5,767	85.8%	$133	2.0%
New York City	$16,019	$9,467	59.1%	$5,771	36.0%	$782	4.9%
Yonkers	$362	$178	49.3%	$165	45.6%	$19	5.2%
The Big Three (upstate)	$1,325	$923	69.6%	$296	22.3%	$106	8.0%
Upstate Rural	$1,982	$747	37.7%	$1,139	57.5%	$97	4.9%
Upstate Small Cities	$1,990	$938	47.1%	$926	46.5%	$126	6.3%
Upstate Suburbs	$4,942	$1,404	28.4%	$3,395	68.7%	$144	2.9%
Adequacy Standard: 150							
Total State	$35,459	$16,807	47.4%	$17,230	48.6%	$1,422	4.0%
Downstate Small Cities	$528	$138	26.1%	$375	70.9%	$16	3.0%
Downstate Suburbs	$6,763	$1,032	15.3%	$5,598	82.8%	$133	2.0%
New York City	$17,271	$10,718	62.1%	$5,771	33.4%	$782	4.5%
Yonkers	$390	$207	53.0%	$165	42.3%	$19	4.8%
The Big Three (upstate)	$1,429	$1,026	71.8%	$296	20.7%	$106	7.4%
Upstate Rural	$1,998	$872	43.7%	$1,029	51.5%	$97	4.8%
Upstate Small Cities	$2,106	$1,085	51.5%	$895	42.5%	$126	6.0%
Upstate Suburbs	$4,974	$1,729	34.8%	$3,101	62.3%	$144	2.9%
Adequacy Standard: 160							
Total State	$37,423	$19,253	51.4%	$16,748	44.8%	$1,422	3.8%
Downstate Small Cities	$552	$169	30.5%	$368	66.6%	$16	2.9%
Downstate Suburbs	$6,866	$1,292	18.8%	$5,440	79.2%	$133	1.9%
New York City	$18,620	$12,067	64.8%	$5,771	31.0%	$782	4.2%
Yonkers	$421	$237	56.4%	$165	39.2%	$19	4.4%
The Big Three (upstate)	$1,540	$1,138	73.9%	$296	19.2%	$106	6.9%
Upstate Rural	$2,077	$1,010	48.6%	$970	46.7%	$97	4.7%
Upstate Small Cities	$2,238	$1,245	55.6%	$867	38.7%	$126	5.6%
Upstate Suburbs	$5,110	$2,095	41.0%	$2,870	56.2%	$144	2.8%

Appendix A: Data Sources and Measures

The estimates provided in this report are based on a number of data sources and assumptions about what data to use, how to aggregate the data, and what measures should be used to represent key underlying concepts. Most of the data are from published sources produced by the New York State Education Department (SED). Because one of the objectives of the project was to develop estimates that could be replicated in the future, I tried to rely on SED data sources as much as possible. While the data were generally provided by SED, ultimately I am responsible for the decisions about their use. Thus, I am responsible for any errors, omissions, and misrepresentations that may exist in this report. Part of the objective of this appendix is to make these decisions as transparent as possible, in the hope that this will lead to improvements and enhancements in the future.

The data appendix is organized by type of variable used in the analysis. I will present the major data sources used in constructing these variables, any assumptions made about how to aggregate the data, and any transformations made to the data to produce variables used in the analysis. In a later section, I discuss any imputations I have made for missing observations.

Number of Districts in Study

School district organization in New York, as is typical of many northeastern states, is fairly complex. With the exception of the Big Five cities, school districts are independent units of government with their own taxing and budget authority, which generally span across several general-purpose governments. School districts can range in the level of grades for which education is provided, and in the types of students receiving services. School districts in New York range from the largest school district in the country, with over 1 million students and 50,000 teachers, to several districts with under 100 students and 8 teachers.

Not surprisingly, the amount of data available varies by type of district. The objective in preparing the dataset for this study was to include all districts in the study for which data is available for most variables used in the analysis. From an initial base of 703 districts, 7 districts with less than 8 teachers were removed, as were 16 "special act" districts that generally serve severely disabled students. The remaining 680 districts are typically called "major districts." Two districts consolidated in July of 2000, reducing total districts by one, and one district was removed from the analysis because no performance data on the district were available. Among the 678 districts examined in this study, 638 are K12 districts, 4 are central high school districts, 22 are K6 districts, and 14 districts serve grades K through 8.

Student Performance Measures

A key element in determining the cost of providing an adequate education is measuring student performance. Adequacy measures should reflect the underlying standard for acceptable student performance at different grades and in different subjects. New York, through the use of Regents Examinations, has long been a leader in developing standards and testing instruments at the secondary level. The decision by the New York State Board of Regents to require passage of 5 Regents exams by 2003 has raised the stakes for New York students from minimum competency to proficiency. To meet these higher standards, the New York State Education Department has developed a new set of exams for 4th grade, 8th grade, and high school. I have relied in my analysis on these test results and on school accountability measures developed by the staff at SED. The following is a brief discussion of these measures.

4th and 8th Grade Examinations: Newly developed examinations in mathematics and English language arts are required of all 4th and 8th grade students. The results of these examinations are reported in the *New York State School Report Cards* for each school and district. To aggregate results to the school level, SED has divided test results into 4 levels and reports the counts (and percent) of students reaching a given level. The levels are selected to

reflect students with "serious academic deficiencies" (level 1), students needing "extra help to meet the standards and pass the Regents examinations" (level 2), students meeting "the standards and with continued steady growth, should pass the Regents examinations" (level 3), and students exceeding "the standards and are moving toward high performance on the Regents examinations" (level 4).

To measure adequacy, I am using an approach similar to what SED has developed as part of the System of Accountability for Student Success (SASS). The percent of student reaching given levels is first identified, and then a weighted average of these percents is calculated. The objective of the index is to identify acceptable performance (levels 3 and 4) and to provide some credit for schools moving from very low performance (level 1) to below average performance (level 2). For each level, the percent of general education and special education students in the 4^{th} or 8^{th} grade just reaching this level (highest level reached) are calculated. The accountability measure (Y) is then,

$$Y = \%L2 + 2 (\%L3 + \%L4).$$

Students reaching only level 1 are given no weight, students reaching level 2 are counted once, and those reaching levels 3 or 4 are weighted twice. Accountability scores can range from zero (all level 1 students) to 200 (all level 3 and 4 students). The cutoff for acceptable school performance in 2000/2001 has been set at a score of 140. Besides examining the costs of achieving the standard of 140, I have examined several other standards to provide a range of estimates. Specifically, I have also considered a standard of 150 and a standard of 160, which is very close to the district average in 2000 of 159.5.

Regents examinations: New York is one of the first states in the country to move to a "high stakes" high school testing program. With relatively few exceptions (severe disabilities), all students will have to pass a series of Regents examinations to receive a regular high school diploma. The most recent data on Regents scores are available for students entering

the 9th grade in the fall of 1997. Students in this cohort will be required to pass a Regents examination in English and one in mathematics to receive either a local or Regents diploma.

As part of *2000 School Report Cards*, information is reported on "cohort performance" on the English and mathematics Regents examinations for students entering 9th grade in this school (or district) in the Fall of 1997. Reported are the number of students entering 9th grade, the number tested, and the number receiving scores below 55, between 55 and 64, between 65 and 84, and over 84. In estimating the percent of the cohort reaching these different levels, it is important to identify legitimate reasons for students to leave the cohort. Based on information from SED, students were removed if they transferred to another New York district or out of state, died, or were classified with severe disabilities. Students who either dropped out or received a GED were counted in the 9th grade cohort. Because information for many of these exclusions was not available for New York City, it was assumed that the relative share of exclusions in the other large city districts (Big Four) applies to New York City. To be consistent with the accountability measure used for 4th and 8th grade exams, accountability for high school is measured as;

$$Y = \%L2 + 2 (\%L3 + \%L4),$$

where L2 is a score between 55 and 64, L3 is a score between 65 and 84, and L4 is a score over 84.

Overall adequacy index: To identify districts providing an adequate education the three accountability measures need to be combined into an overall index. The weights used to combine these measures reflect subjective judgments about the relative importance of exams in different subjects and grade levels. I have relied on the judgments of SED staff in developing the overall adequacy measure. They used two basic rules in their decisions:

1) Performance in math and English are equally important; thus, a simple average of accountability scores for math and English are used in each grade.

2) Performance in high school is a more accurate reflection of the accumulated knowledge and skills of students than performance in earlier grades. Thus, a weight of 50 percent is applied to the Regents exams, 25 percent to 4th grade exams, and 25 percent to 8th grade exams.

Sensitivity analysis was also performed using equal weights on exams from all three grade levels. The results of my analysis are not highly sensitive to these weights.

District Expenditures

The dependent variables used in the cost models estimated in this study are district expenditures per pupil. Expenditures are used as a proxy for the underlying costs of producing education services. As discussed in Appendix B, several variables are added to the cost model to adjust for the fact that spending is not the same as costs. In selecting a spending measure to use in the cost model, it is important to consider the underlying objective of the cost model. In this study, the major objective is to provide estimates of the required spending by districts to provide an adequate education to their students. A second objective is to develop cost indices that can be used in the development of state education aid formulas to help districts provide adequate funding. To serve these functions, the spending should reflect the resources used to provide direct education services to students. Thus, in this report, spending for students who reside in the district but attend private schools (or schools in other districts) is not included in the calculation.

The spending data used in the cost models rely on data published by SED in the *School District Fiscal Profile Report* and are based on the *Annual Financial Reports* (ST-3) prepared by school districts. SED has aggregated the spending items in the ST-3 reports to reflect important spending categories. In this report the principal spending measure used is total spending minus transportation and debt service, other undistributed expenditures, and tuition payments for students placed in non-district schools. Transportation and debt service were not included, because the natures of these spending categories are different. For example, capital decisions are

made over a longer time horizon, and capital expenditures can vary significantly across years. Transportation costs are affected much more directly by features of the physical geography than instructional spending. It is because of these distinctions that states commonly have separate aid formulas for building and transportation aid.[1]

State Education Aid

State education aid is included in the cost model as a control for possible efficiency differences across districts. As discussed more fully in Appendix B, previous research has suggested that districts that receive a relatively large amount of state education aid will be less efficient in their use of funds than other districts, holding other factors constant. The measure of education aid used in the analysis should ideally match the type of education aid for which formulas may be developed using the estimated cost indices. Accordingly, I use a broad measure of aid: total aid minus Building Aid, Transportation Aid, and Reorganization Incentive Building Aid. State SED staff provided aid data, which are part of the state aid database. Total aid includes formula aids only.

Pupil Count

A key variable in a cost model is the number of students served by the district. Student counts are used both directly as a variable in the cost model, and to create per pupil spending, income, actual value, aid, and the percentage of students with certain characteristics. Student counts used in aid formulas generally are of three types:

- Enrollment, which measures the count of all students officially enrolled in a district at a certain point in time (usually the fall);
- Average daily membership, which captures the average enrollment in a district over the course of the year;
- Average daily attendance, which measures the average number of students actually attending class.

In general, the difference between these student counts is quite small (under 1 percent) except in the large cities, where attendance rates are lower.

Arguments can be made for use of any of these definitions with regard to costs. If district budgets and staff are based on fall enrollment counts, then enrollment might be most relevant in an analysis of costs. If district spending is sensitive to the average number of students enrolled in the districts, this would be the preferable measure. If districts anticipate a certain level of nonattendance, then staff and supply costs might be related to daily attendance. The decision made for this project was to use average daily membership, because it represents the underlying enrollment of the district and is less sensitive to unusual results associated with a single enrollment count taken on a given day. It is expected that for the major spending categories—instructional staff and capital facilities—districts have to hire staff and build facilities as if there were full attendance.

The specific measure used in the study is "combined adjusted average daily membership" (CAADM). It includes the average daily membership (with enrollment in half day kindergarten multiplied by 0.5) plus students with disabilities attending full-time BOCES classes, the equivalent attendance of students under the age of 21 not on a regular day school register in programs leading to a high school diploma or high school equivalency diploma, prekindergarten pupils multiplied by 0.5, and pupils served in incarcerated youth programs.

Student Characteristics—Poverty Measures

One of the key factors affecting the cost of reaching an adequate education is the number of students requiring additional assistance to be successful in school. While a number of factors might affect differences in student needs, poverty has consistently been found to be negatively correlated with student performance. Of particular concern is concentrated poverty in large urban school districts. Poverty measures should reflect the concentration of poor children in a school district. I use two different poverty measures in this study.

Census poverty estimate: Ideally, poverty measures would accurately capture the percentage of a school or district enrollment that is living below the poverty line. The most

generally accepted poverty estimates are derived from the decennial *Census of Population*. Unfortunately, these data are only available every 10 years. Recently, the U.S. Bureau of the Census has produced school district child poverty estimates for non-census years for use in the distribution of Title 1 grants to school districts. These estimates are constructed by, first, updating county level population and child poverty and population counts from the *1990 Census of Population* using administrative records and results from the Current Population Survey. The proportional change at the county level is then applied to school districts within the county. Thus, these estimates are simply versions of the 1990 estimates rescaled for estimated poverty changes at the county level. While the Census Bureau has indicated that the errors with the child poverty estimates may be fairly large for small districts, the results were deemed accurate enough to recommend their use in the distribution of Title 1 aid.[2] For this report, I use the percentage of children 5 to 17 years of age who are classified as living below the poverty line. I will also use from this data set the estimates of 1997 total population, and child population (5-17 years of age) for school districts in New York.

Free lunch counts: The most commonly used measure of poverty in education research is the counts of students receiving free or reduced price lunch in a school. The National School Lunch Program is administered by the U.S. Department of Agriculture, and individual school districts are reimbursed by the meal depending on the level of subsidy for which a child is eligible. Children with incomes at or below 130 percent of the federal poverty line are eligible for free lunch, and students between 130 and 185 percent of the poverty line are eligible for reduced price lunch. In addition, households receiving Food Stamps, Aid to Dependent Children (ADC), Temporary Assistance to Needy Families (TANF), or the Food Distribution Program on Indian Reservations (FDPIR) are also eligible for free lunch.[3] Parents must apply for the program, and school districts have some discretion in how aggressively they attempt to "market" the program to the target population.

While counts from this program are the only readily available school-level poverty measure, there is concern about both the accuracy of the records and potential discretionary decisions by schools and districts to influence these counts. The staff at SED has determined that these counts can be quite volatile across years, particularly in small districts. Free lunch counts at the secondary level may be less reflective than in elementary schools of the underlying poverty population, because students have more discretion in deciding whether to participate. Thus, I use a two-year average of the percentage of K6 enrollment in a district receiving free lunch. Free lunch was selected as opposed to both free and reduced price lunch, because it more closely matches Census estimates of child poverty (correlations of approximately 0.8).

Student Characteristics—Limited English Proficiency

Large cities have traditionally drawn the majority of new immigrants into the United States. New York City continues to have one of the largest immigrant populations in the country. The other large cities in the state, and some of the small cities and suburbs surrounding New York City also contain significant immigrant populations. While the country of origin, educational and professional background, and proficiency in the English language varies widely across immigrant groups and individual households, on average children of immigrant parents face language and cultural barriers in school. ESL or bilingual education programs, which are designed to ease their transition into public schools, add to the cost of providing education. If these children are also growing up in poverty and live in poor neighborhoods, additional resources may be required to help them succeed in school. The estimates of limited English proficiency (LEP) pupil counts used in this study are those collected for state aid purposes. LEP students are defined as "pupils who by reason of foreign birth or ancestry, speak a language other than English; and (1) either understand and speak little or no English; or (2) score at or below the 40th percentile…on an English language assessment instrument…."[4] To control for potential

volatility in these estimates, I use a two-year average of the percent of CAADM in a district classified as LEP.

Student Characteristics—High Cost Students

One of the most rapidly growing spending categories nationally as well as in New York has involved the provision of services for students with special needs.[5] It is often difficult to separate spending on regular education and special education, particularly since the mandate under IDEA has been to increase this integration. New York and many other states have also moved toward integration of special needs students into testing and accountability systems. The measures of school accountability in this report include most special education students. Thus, it is important to identify the potential cost impacts of special education students on school districts. Ideally, special education counts involve objective categories used consistently by all school districts. Unfortunately, the classification of special education students into different groups involves some subjective judgment, and the financial consequences of the classifications are not trivial.[6] In other words, discretionary classification decisions made by districts can lead to uneven classification rates across districts. I have selected for use in this report the count of students classified as "high cost," which are defined as students whose special education costs "the lesser of: 1) $10,000, or 2) four times the 1998-99 approved operating expense per pupil without limits."[7] The source of data used in the analysis is the state aid database. Again, to deal with potential volatility of classifications across years, I use a two-year average of the percentage of CAADM classified as high cost students as my measure of the special needs population.

Teacher Characteristics

A key part of developing cost indices and adequacy estimates is examining the determinants of variation in teacher salaries across districts. As discussed more fully in Appendix B, I estimate a teacher salary regression model as part of this study, which will be used to develop a predicted wage variable included in the cost model. The predicted wage will reflect

factors affecting teacher salaries that are outside the control of the school district. The following is a brief summary of the variables in the teacher salary model and the sources of these data.

Teacher data in the PMF: The principal source of information on individual teachers is the Personnel Master File (PMF) in the Basic Educational Data System (BEDS) operated by SED. Surveys are sent to all teachers every year requesting information on their salary, assignments, and other professional characteristics. For this study I use fulltime classroom teachers, which are defined as teachers employed at least eight months a year, and working 100 percent of their time in this school district. I use for this study information on the following:

- Salaries for primary pay assignment: does not include pay for extra services or fringe benefits. Although ideally the salary measure used is comprehensive, the use of base salary is adequate for the salary regression as long as there are not large systematic differences in extra pay or fringe benefits across districts and types of teachers.
- Education: highest degree earned.
- Experience: both in the local district and in total.
- Certification status by assignment. I calculate for each teacher the percent of their time (FTE) for which they have either provisional or permanent certification.
- Type of appointment: probationary or with tenure.
- Type of assignment: whether they are a math or science teacher.

Teacher test score and education data (TCERT file): As part of receiving provisional certification and permanent certification in New York State a teacher needs to pass certain qualifying exams and take sufficient college coursework in appropriate subjects. In addition, teachers are required to have a Bachelor's degree for provisional certification, and a Master's degree for permanent certification. This information is organized into the TCERT database, which contains records on the certification history for a particular teacher, including

the key education and exam requirements for certification. From this database, I use the following information;

- Teacher certification tests: whether a teacher passed the required general teacher certification exams, and how many attempts it took to pass the exam. Information is available on whether they passed, not on their actual test score. The specific certification exams include the NTE exams in communication skills, general knowledge and professional knowledge, the NYSTCE exams in liberal arts and science (LAST), and written assessment of elementary and secondary teaching skills (ATS-W).[8]

- College of attendance: The college where the teacher received their undergraduate and graduate degrees, and whether they attended an integrated teacher certification program. This is combined with several different rankings of undergraduate colleges (and education programs) to measure the selectivity of the college the teacher attended. The ranking systems used include Barrons's Top 50 colleges, and *U.S. News and World Report's* ranking of liberal art colleges, national universities, and education graduate schools. While any ranking system is subjective and incomplete, these lists are probably the most commonly available references to potential employers about college selectivity.[9]

Other Variables in the Teacher Wage Model

Characteristics of the school district, city, and county can affect the local cost of living and desirability of living and working in this district. These factors will be discussed in more detail in Appendix B but can include some of the factors that we have discussed already, such as poverty, LEP status, special needs students, and enrollment size of the district. The following is a brief summary of additional variables and data.

Professional wage rates: One of the key variables in a teacher wage equation is the wage rate in competitive private sector occupations, or what is often called the opportunity wage. Teachers are generally well-educated professionals, and as such they have opportunities in private sector occupations. The wage rate in these occupations serves as a constraint on what a school district can pay to attract good teachers. Private sector wage rates capture both the underlying cost of living in the community and the labor market in the area for similar professionals. In New York State, the opportunity wage is the variable most apt to pick up the substantial difference in wages and housing prices between upstate and downstate New York.

Ideally, the private wage variable measures salaries for comparable jobs in the relevant labor market for a school district. For cities, the relevant labor market area may encompass the full metropolitan area; for rural areas, the county is probably the appropriate geographic unit. For the opportunity wage in this study, I have tried two different alternatives;

- SED regional cost index: Using data from the U.S. Bureau of Labor Statistics, *1998 Occupational Employment Statistics*, SED selected 77 occupational titles to be used. The geographic unit is the "labor force region" developed by the New York Department of Labor. To calculate a comparable professional wage across regions, the state employment shares for each occupational title are multiplied by the median hourly wage and summed.[10] The strength of this approach is that the composite wage measure will more accurately reflect the underlying private sector wages for similar occupations. This occupational accuracy comes at the price of less geographic precision, as estimates were made for nine labor force regions.

- An alternative approach is to use average payroll data for the sector of the economy that includes "professional, scientific, and technical services." (NAICS sector 54) This sector would include many of the occupations that would be possible occupations for teachers including legal, accounting, payroll, architecture, engineering, computer specialists, and research. Using data from the *1997 Economic Census*, average wage is calculated as total payroll, which includes all forms of compensation, such as salaries, wages, commissions, and fringe benefits, divided by total full time and part time employment. Data are available at the county level.[11] While these data are more disaggregated geographically, the calculation of the average private wage is less accurate because of differences between counties in the mix of businesses and occupations within this sector.

While these two wage estimates vary substantially in methodology, they have a fairly high correlation across New York counties: 0.67.

Crime Rates: Teacher wage equations try to capture both the cost of living in an area, the opportunity wage in the private sector, and the attractiveness of an area to live and work. Given the recent concern about violence in schools, the underlying level of crime in a community, particularly among juveniles, might be expected to affect the ability of the school district to attract teachers. The higher the crime rate, the less attractive the district, other variables held constant, and the higher the required wage to attract the same quality of teacher.[12] Most crime statistics are based on the FBI Uniform Crime Reporting System. Arrests and

clearances reported by officers to their law enforcement agency are typically sent to state Uniform Crime Reporting programs, and then the FBI. The most commonly used crime rate is based on arrests for Part I offenses per 100,000 persons. Part I offenses include homicide, rape, robbery, aggravated assault, burglary, larceny, motor vehicle theft, and arson. Among these, homicide, rape, robbery, and aggravated assault are included in the category of violent crime. In this report I use crime rates for total Part I crimes and violent crime rates for all persons and for juveniles (under 18 years of age).[13]

Unemployment rate: Models of teacher labor markets typically try to measure how tight the labor market is, that is, how easy is it to find employment. Ideally, the measure of unemployment reflects the types of employment that are alternatives to teaching, such as other professional employment. However, only overall unemployment rates are generally available. To reflect how tight the labor market affecting school districts is I use the annual average of the 1997, 1998 and 1999 county unemployment rates for all types of employment.[14]

Other Variables Used in Cost Model and Teacher Wage Model

Income: Income of residents in the community is a common measure of the underlying fiscal capacity of a school district. Ideally, the income measure captures the change in the net assets of a household over the course of the year, including capital gains and imputed income sources. The income measure used in this report is the adjusted gross income (AGI) for all resident taxpayers in a school district. AGI is a fairly comprehensive measure of income, including capital gains and many sources of capital income. It does not include accrued but not realized capital gains, many fringe benefits, and most forms of imputed income. The most recent AGI data are for 1998 from the New York State Department of Taxation and Finance as provided to SED for state aid purposes.

Market property value: Most local revenue is raised from property taxes; thus, the full value of taxable property in a school district is the best measure of the capacity of the district

to raise local revenue. Because not all local governments in New York reassess property on a frequent basis, the New York Office of Real Property Services estimates an "equalization rate," defined as the estimated market value of property value divided by the assessed value. Equalization rates are based on market value surveys conducted on a regular basis. The estimate of actual value is based on actual assessed value multiplied by the equalization rate. The most recent source of actual value data is for 1998 from the New York Office of Real Property Services as provided to SED for state aid purposes.

Imputation of Missing Data

In general, missing data were not a serious problem in this study, because the sample was limited to the 680 major school districts. For many of the variables, imputation was not required for any districts. The following is a brief description of the methods used to impute data for the variables where data were missing.

Districts reorganizing in 1999 and 2000: Two groups of districts reorganized during the years used in this analysis:

- Sullivan West (591502) was created in July 1999 from the centralization of Jefferson-Youngsville (590201), Delaware Valley (590401), and Narrowsburg (591501).
- Cattaraugus-Little Valley (042302) was created in July 2000 from the annexation of Little Valley (041801) by Cattaraugus (042301).

Because some of the data used were for 1998 through 2000, in some cases the data were for the reorganized districts and in some cases they were for the component parts. I aggregated the data from all years into the reorganized districts, since these represent the present organization. To do this, totals for all variables were summed for the component parts before any relative measures were created.

Percent of students receiving free lunch: For reasons explained above, total enrollment and counts of students receiving free lunch in grades K through 6 are used to construct the share of students receiving free lunch in a district. These data are available for all districts except the

four central high school districts. For these districts, the K6 enrollment and free lunch counts are summed for the component districts for each central high school district, and the resulting totals are used to create the percent free lunch variable.

Teacher salaries: Teacher salary data are not available for all districts, and the districts for which data are missing varies by year. Teacher salary data are missing from a district if the district does not have a current teacher contract in place. For example, teacher salary data are available for teachers in Yonkers in 1999, but are missing for 2000, because a district contract was not in place at the time the surveys were filled out. To impute missing salary data two steps were used:

- The teacher salary variables used in the cost models are predicted teacher salaries from a teacher wage model (discussed in Appendix B). Even if the salary data were missing for a district, a predicted wage could be estimated for a district as long as all the independent variables used in the teacher wage model were available for this district.

- For districts for which a predicted wage was not possible, I imputed a predicted wage by using the average predicted wage for districts in the same county of the same type (small city, suburb, rural). Given that districts and unions often compare themselves to similar neighboring districts in contract negotiations, this seemed to be a reasonable imputation strategy.[15]

Student Performance Measures: The major variable for which data were unavailable for some districts is measures of student performance. Test data were unavailable for several reasons: [16]

- Central high school districts: missing 4th grade results.
- K-6 districts: missing 8th grade and Regents Examination results.
- K-8 districts: missing Regents Examination results.
- Other districts (usually K12) with missing performance measures.

For central high school districts, 4th grade performance was imputed by using the weighted average (by enrollment share) for the component districts.

In imputing unavailable data in other districts, the objective was to forecast what the performance would have been for this district, grade and subject area. The basic imputation strategy is to use test performance of students in the district on similar subject area exams, either

math or English, for which performance measures are available. Two possible strategies for using available subject area tests include:

- Method 1: Take the average of the performance scores on the similar subject area tests, for which information is available. For example, for the K-8 districts to impute performance on the Regents math examination use the average of the performance on the 4th grade and 8th grade math exams.

- Method 2: Create an index relative to the state average for all performance measures where data are available. For the K8 example, to estimate the Regents math score, first calculate the average state performance level on the 4th grade and 8th grade math examinations. Second, take the performance in the district on these two exams and divide it by the state average. If the calculated ratio for the 4th grade exam was 1.2, then the district has performance on the 4th grade math exam 20 percent above the state average. Third, take a simple average of the calculated ratios for subject area exams that are available. In the case of a K8 district, average the 4th and 8th grade ratios. Finally, multiply the ratio by state average performance for the test, which is missing in the district. For example, assume that the calculated ratios (relative to the state average) for the 4th and 8th grade math exams average 1.2, and that the average state performance level on the Regent math exam is 140, then the estimated performance in this district on the Regents math exam is 1.2 x 140 = 168.

A comparison of the imputations for overall grade level scores (average of math and reading) illustrates the differences between these methods. In general, the imputed scores in 4th grade are higher with Method 2 than Method 1; for 8th grade Method 2 is lower; and for Regents the two methods produce similar imputed scores. The principal reason for these differences is that, on average, districts have scored higher on the 4th grade exams than they have on the 8th grade exams. By using 4th grade scores to impute 8th grade scores for a K6 district, for example, Method 1 is probably overestimating how 8th grade students would have done in this district. The opposite is the case if 8th grade scores are used to impute missing 4th grade scores. For this reason, I have chosen to use Method 2 to impute missing test score data. This method adjusts for the overall difficulty of an exam before using it to impute missing observations on other exams.

Endnotes

1. Other spending definitions considered in this report but not used, because they are less comprehensive, include: 1) same definition minus operations and maintenance spending, which also includes significant capital spending. Because O&M also includes operating spending, this definition probably underestimates true operating spending; 2) previous definition also minus administrative expenditures on the board of education and central administration in each district. This is instructional spending minus tuition to outside schools plus undistributed employee benefits (health, retirement, and other benefits).

2. U.S. Bureau of the Census. "Small Area Income and Poverty Estimates: 1997 Overview of School District Estimates." http://www.census.gov/hhes/www/saipe/school/sd97over.html.

3. A description of the program and eligibility requirements is available on the Food and Nutrition Service website, http://www.fns.usda.gov/cnd/Lunch/AboutLunch/faqs.htm.

4. "Part 154, Apportionment and Services for Pupils with Limited English Proficiency." Chapter II: Regulations of the Commissioner, page 677.

5. Hamilton Lankford and James Wyckoff. 1996, "The Allocation of Resources to Special Education and Regular Instruction." In H. Ladd (ed.) *Holding Schools Accountable*. Washington DC: The Brookings Institution, pp.221-257.

6. Thomas Parish. 1996. "Restructuring Special Education Funding in New York to Promote the Objective of High Learning Standards for All Students." In J. Wyckoff (ed.) *Educational Finance to Support Higher Learning Standards.* Albany, New York: New York State Board of Regents: 196-219; Thomas Parish and Jean Wolman. 1999. "Trends and New Developments in Special Education Funding: What the States Report." In T. Parish, J. Chambers, C. Guarino (eds.) Funding Special Education. Thousand Oaks, CA: Corwin Press, pp. 203-229.

7. State Aid Unit. 2000. "State Formula Aids and Entitlements for Schools in New York State." Albany, NewYork: The State Education Department, p. 32.

8. Based on conversations with SED staff, it appears that the testing program for teacher certification has been in transition over the last two decades. Prior to 1983 teachers did not have to take teacher certification tests for certification. From 1983 to 1993, the NTE exams were required for new teachers. From 1993 until 1999 students could take either set of exams, while the NYSTCE was phased in. Presently, all provisionally certified teachers much pass the ATS-W and LAST exams. In addition, both New York City and Buffalo have in the past used different certification requirements for teachers, but both now generally require passage on the same set of exams. See also Hampton Lankford, Jim Wyckoff and Frank Papa. 2000. "The Labor Market for Public School Teachers: A Descriptive Analysis of New York State's Teacher Workforce." Condition report prepared for the New York Educational Finance Research Consortium, October 25, 2000;

and SED. 2000. "NYSTCE Teacher Certification Examinations." Albany, New York: SED.

9. Barron's uses a relatively simple scale created from three measures; percentage of applicants accepted, percentage of applicants accepted for admission who actually enrolled, and combined verbal and quantitative scores on the SAT I examinations. Tom Fischgrund. 1995. *Barron's Top 50*, 3rd Edition. New York: Barron's Publishing. U.S. News and World Reports uses 16 measures to develop their rankings, which include academic reputation, retention of students, faculty resources, student selectivity, and graduation rate performance, among others. Robert Morse, and Samuel Flanigan. 2001. "America's Best Colleges." *U.S. News and World Reports*, on the website, www.usnews.come/usnews/edu/colleg/rankings/collmeth.htm.

10. SED. 2000. "Recognizing High Cost Factors in the Financing of Public Education: The Calculation of a Regional Cost Index, Methodology." Technical Paper #20. Albany,New York: SED, November. In constructing their index they have drawn from Richard Rothstein and James Smith. 1997. "Adjusting Oregon Education Expenditures for Regional Cost Differences: A Feasibility Study." Sacramento, CA: Management Analysis & Planning Associates.

11. Data on payroll, shipments, employment and establishments are available for all counties for major economic sectors. The economic census is an establishment survey; separate surveys are required for every separate facility. The data was downloaded from the website, http://www.census.gov/epcd/www/econ97.html.

12. For a good discussion of the use of hedonic wage models, including the use of crime rates, see Jay Chambers. 1997. "A Technical Report on the Measurement of Geographic and Inflationary Differences in Public School Costs." Prepared for the National Center for Education Statistics. The models discussed in this report are the basis for the cost of education indices available from the NCES on the website, http://nces.ed.gov/edfin/prodsurv/data.asp.

13. For more information on the crime rates used in this study, see: FBI. 1999. Crime in the United States, 1998 Uniform Crime Reports. (Washington, DC: U. S. Department of Justice), and available on the web at http://www.fbi.gov/ucr/98cius.htm.

14. The source of the data is the U.S. Bureau of Labor Statistics, "Local Area Unemployment Statistics" and the data was extracted from the website, http://146.142.4.24/labjava/outside.jsp?survey=la.

15. For a good discussion of public sector labor markets, see Richard Freeman. 1986. "Unionism Comes to the Public Sector." *Journal of Economic Literature*. 24 (March): 41-86.

16. The discussion of imputation for missing student test data borrows heavily from some internal analysis done by SED staff of this issue. The method that I have decided to use in this study is similar to the "prediction index" approach that they discuss.

Appendix B: Models and Methods

The development of an estimate of the cost of educational adequacy involves three components: 1) a measure of student performance that can be used to identify adequate and inadequate performance; 2) identification of the required spending for adequacy in at least one "benchmark" school district; and 3) adjustment of this adequate spending level to reflect different characteristics in other school districts. The first component, discussed in Appendix A, is based on a weighted average of 4th grade math and English tests, similar 8th grade tests, and high school Regents exams in math and English. The performance measures and weighting scheme for exams were selected by SED staff to reflect the underlying standards developed by the New York State Board of Regents.

The development of the second and third components of measuring an adequate education is the focus of this appendix. The approach used in this report is based on the concept in microeconomics of a cost function. As discussed more fully below, a cost function is an equation that measures the impact of key variables affecting the minimum spending required to reach a given level of student performance. These variables can be roughly divided into four categories: input prices, physical attributes of a district (e.g., enrollment), student need measures, and inefficiency.

The major strength of a cost function approach to measuring the cost of adequacy is that the estimates are based on actual data. Instead of relying on the judgment of professionals about what additional spending is required to compensate for LEP status, for example, cost functions use actual experience to estimate these additional costs. As long as recent history is a good reflection of what is possible in school districts, at least in the near future, then the cost function approach has the potential of providing accurate estimates of the cost of adequacy. However,

with any statistical method the potential accuracy of the estimates depends on the validity of the measures used and on eliminating possible biases in the statistical estimates. The focus on this appendix is explaining the empirical models and statistical methods used to estimate cost indices and the cost of adequacy. The appendix is organized into four sections: 1) estimation of a teacher's wage model and developing a predicted teacher's wage; 2) model specification and estimation methodology for an education cost model; 3) development of education cost indices and estimates of the cost of adequacy; and 4) developing "performance foundation" aid formulas.

Teacher's Wage Model and Developing a Teacher Cost Index

If the adequacy standard involves assuring that all school district can obtain some minimum level of resources, then differences in the cost of doing business should be accounted for (also commonly called geographic cost-of-living differences). Ideally, cost indices would be developed for each of the major types of resources. The most important of these is a teacher cost index that would measure differences in the *underlying wage that school districts will have to pay to recruit teachers of comparable skill and certification*. For this study, I develop a teacher cost index based on a model of the determinants of teacher wages.

As discussed in Appendix A, the teacher compensation data that are readily available are actual salaries paid to teachers (without fringe benefits or compensation for extra assignments) collected in the Personnel Master File. Actual teacher salaries can reflect both factors outside a district's control, such as underlying labor market characteristics and impact of socio-economic factors on working conditions, and the discretionary decisions made by school districts on what types of teachers to hire and how much to compensate them. The objective of the teacher wage models that I develop is to separate the impact of discretionary district decisions on wages from underlying cost factors that are outside the control of the district.[1]

Discretionary factors: School districts can affect the compensation paid to teachers through both the teacher contract and through policies to recruit and retain teachers with certain characteristics.

- Teachers' contracts typically provide salary schedules that indicate the level of compensation paid to teachers with a given level of experience and education.

- Personnel policies set at the district or state level can influence a teacher's longevity in a district by affecting whether the teacher gets tenure (teacher evaluation), what requirements there are for a teacher to receive provisional or permanent certification, and how teachers are allocated across schools within the district. In addition, the kinds of teachers who are recruited in terms of the quality of the college they attended, and how successful they have been in teacher certification exams are also discretionary decisions of a district.

- Other district policies (possibly outlined in the teacher contract) that can affect the working conditions for teachers include number of assignments taught, length of the school day, class size, school size, site-based management, opportunities for in-service training, and control of curriculum decisions. Availability of additional compensation for other assignments, and decisions over who receives these assignments are other areas where a district can exercise discretion.

- Inefficiency in the compensation of teachers. Because teacher salary schedules are determined through negotiation with the teachers union, there is the possibility that teacher salaries can be higher than necessary to recruit the quality of teacher that exists in the district, either because of poor negotiations with the union, poor recruiting practices, or an ineffective teacher evaluation/mentoring system.

Table B-1 presents the actual variables that I have used in the teacher salary model, the sources of the data, and level of aggregation of the data. The sources for this data have generally been discussed in Appendix A. I was able to construct variables for most of the factors identified above except length of school day, number of different assignments, existence of site-based management, in-service training, control of curriculum decisions, and compensation for other assignments. Some variables, such as the passing rate on certification exams, were not found to be significantly related to teacher wage differences. Several efficiency-type variables are included in the model; these are discussed below in the section on cost indices.

Factors outside a school district's control: Research on the determinants of teacher salaries indicates that the salaries required to recruit and retain teachers of a certain type and skill level depend on conditions in the private labor market and on the working conditions they face.[2]

- *Labor market:* the labor market will affect the salaries that school districts are required to pay for teachers and professionals in similar occupations. Factors include;[3]

    - Salaries in the private sector for similar occupations.
    - Salaries paid to similar teachers in surrounding districts.
    - Tightness of the labor market as measured by the unemployment rate.
    - Monopsony power: Control that one district has over the local teacher labor market, which can be measured by the percent of the teacher labor force in the county or labor market area in this district. Economic theory suggests that the more control a district has over the local labor market, the lower the wages they need to pay.[4]

- *Working conditions:* Besides the elements of working conditions that are within the control of a school district, teachers may have preferences with regard to the characteristics of the students they want to work with, or the physical environment of the district they want to work in.

    - Enrollment size of the district may influence how much input a teacher has on curriculum and pedagogy. Teachers may prefer smaller districts, all else equal.
    - Higher population density (or pupil density) of the district may raise a teacher's transportation time and cost to school, and cost of housing. On the other hand, some teachers may prefer to live in an urban area, because of the access to urban amenities.
    - High poverty of the students is apt to make the task of raising student performance levels more difficult for a teacher, and may increase disciplinary problems in the classroom. This may be particularly the case if there is concentrated poverty.
    - High share of students with limited English proficiency.
    - High share of students with significant special needs.
    - Crime rate: Given the recent attention paid to violence in schools, a high level of violent crime in a county, particularly among juveniles, may make a school district less attractive to teachers.

The variable definitions and data sources for the factors outside the control of a school district are listed in Table B-1. I estimate the teacher wage model with two different private sector wage variables. As discussed in Appendix A, one variable is based on average county-

level payroll for occupations in the professional, scientific, and technical services sector. The other variable, developed by SED staff, measures the average wage in 77 different professional occupational categories, weighted by the state share for this occupational category. This average wage is estimated for nine labor force regions. Measures of high-cost special needs students were not found to be statistically significant, so the model was estimated with and without this variable. The poverty measure used in the wage model is an adjusted version the two-year average of K6 free lunch as a percent of enrollment.[5]

Model estimation and results: The dependent variable in the teacher wage equation is the natural logarithm of the teacher wage for fulltime classroom teachers. Because the equation is estimated at the individual teacher level, it is reasonable to assume that teachers are price takers. They cannot influence the salary schedule they face or the underlying personnel policies of the school district. Thus, endogeneity of some of the independent variables is not likely to be a problem.

However, the variables used in the model are from at least two different levels, the individual teacher and the school district. This implies that the standard errors from an ordinary least squares regression (OLS) are biased, because the error terms from each observation are not independent of each other. In particular, the estimated standard errors on district-level variables may significantly understate the actual standard errors. To correct for clustering in the standard errors I used a method for adjusting the standard errors to produce more accurate hypothesis tests.[6]

The results from several teacher wage models are reported in Table B-2. Four models are presented, which vary depending on the private wage variable (county professional wage versus the regional cost index from SED), and whether the percentage of high cost students is included in the model. Looking first at teacher characteristics, most of the variables are statistically significant and have the expected sign. For example, there is a positive relationship between

teacher salaries and total teaching experience, whether the teacher has a graduate degree, permanent certification, and teaches math or science. While the two variables representing the quality of the college the teacher attended (as rated by the *U.S. News & World Report*) have the expected positive sign, they are not statistically significant in many cases.

Among the other discretionary factors, I found that working in a larger school and having larger classes are associated with higher wages, holding other factors constant. Not surprisingly, I find that the more resources that a district has relative to its peer groups (efficiency variables), the higher the wages are. The one unusual result is the positive coefficient on the student outcome measure, which implies that teachers require additional pay to work with high performing students. It is possible that this variable is picking up fiscal capacity differences across districts associated with unobserved teacher quality.

Turning to the factors outside of district control, most of the variables fit expectations. As expected, higher salaries are associated with larger (in terms of enrollment), more urbanized districts, and those with higher private sector wages. Higher shares of students with limited English proficiency, or receiving free lunch (higher poverty) are also positively related to higher teacher salaries. For the unemployment rate variable, which is included to reflect the condition of the labor market, the coefficient has different signs depending on the model. In Model A and Model B, the coefficient has the expected negative sign—lower unemployment rates lead to tighter labor markets and higher salaries. In Model C and Model D, however, the sign on this variable is positive. The one difference in these models is the use of private wage measured at the regional level rather than county level. In Models C and D the unemployment rate may be picking up some type of within-region variation.

One of the variables included to measure working conditions—juvenile violent crime rate—is negatively related to higher wages. Two possible explanations for these counterintuitive results are: 1) teacher quality has not been adequately controlled for, so that this variable is

picking up both working conditions and poor quality teachers, or 2) the crime rate is capturing omitted urbanization and fiscal capacity variables, and thus reflects the fact that poorer urban areas tend to pay lower wages. In either case, the crime rate variable is not reflecting differences in working conditions, which was the intention of the variables.

Developing a predicted teacher salary: The objective of estimating the teacher wage model is to develop a measure of the underlying wage that a school district must pay to attract teachers with a given set of characteristics to a school district. I want this predicted wage to measure only variation in factors outside a school district's control. Constructing the predicted wage involves three steps:

1. Multiply the regression coefficient associated with each discretionary variable by the state average for that variable. For example, for teacher experience I multiply the coefficients in Model A on the log of total experience, 0.216, (Table B-2) by the average for this variable, 2.384 (Table B-1). I also multiply the coefficients on the juvenile crime rate by its means, because this variable is not capturing the working conditions for teachers as intended. I sum up all these terms, and add them to the intercept for the regression (7.847 in Model A). The result of this is a single number that is constant across all school districts.

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2. Multiply the regression coefficients associated with each variable outside a district's control by the actual amount for that variable in each district. Outside factors include district enrollment, pupil density, professional wage (or regional cost index), percent LEP students, and adjusted percent free lunch. For example, for LEP students in New York City, I multiply 0.415 for Model A by the LEP percent (12.32 percent). The higher the LEP share, the higher this number, and the higher the predicted wages. After calculating these numbers for each district for each outside variable, I then sum them. The resulting sum varies across each school district.

3. Sum for each district the results in part 1 and 2 to get the predicted logarithm of the wage. To find the predicted wage, I take the anti-log of this sum. This involves using the predicted logarithm of the wage as an exponent for the base "e" (2.718). For example, the logarithm for the predicted wage for New York City (Model A) is 11.17219. If I calculate $2.718^{11.17219}$ this is equal to $71,125, which is the predicted salary.

To calculate a teacher cost index, I have calculated the predicted wage for each district as an index of the state average (average =100). The predicted wage indices for each model are reported in Table B-3 by need/resource capacity classification. For all of the models, the

predicted wages for New York City are more than 30 percent above the state average, and they exceed 50 percent in models A and B. Predicted wages for Model A and Model B in the Big Four and other high-need urban/suburban districts are 33 percent, and 15 percent, respectively, above the state average. In general, predicted wages are higher in Models A and B, than Models C and D. This may be due in part by the difference in geographic aggregation between the two private wage variables. The regional cost index is based on broad categories that generally assign the same regional cost index to all counties in a metropolitan area (MSA), while the professional wage index allows variation between counties in an MSA. Predicted wages are above average in low-need districts, reflecting the fact that most of these districts are downstate.

Education Cost Model

One of the central findings 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. A harsher environment, characterized by high rates of poverty and students with limited English proficiency, 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 approach used in this report to estimating the cost impact of important input and environmental cost factors, draws from the large literature on education cost functions.[7] The dependent variable used in cost function research is typically per pupil expenditure. It is important to distinguish between actual or reported spending for a particular public service and the costs of providing the service. As applied to local schools, the term "costs" refers to the minimum

amount of expenditure or outlay needed by a district to provide specified levels of educational attainment, and not actual observed expenditure. Costs arise from the underlying "technology" of producing education, and not discretionary decisions of school districts. Expenditures, on the other hand, are affected not only by the costs of production, but by the efficiency with which the resources are used, and the level of education demanded by local residents. An education cost function should include four types of variables: 1) measure(s) of student performance; 2) factors to control for differences in efficiency of school districts; 3) measures of input prices; 4) environmental cost factors that reflect both the physical attributes of a district (e.g., enrollment size), and characteristics of students, families, and peers. The following is a brief discussion of these factors. Descriptive statistics for the variables in the cost model are reported in Table B-4.

Student performance measures: It is not possible to estimate the cost of adequacy without first selecting measures of student performance that will be used to set an adequacy standard. Performance measures also play the role of outputs, or more accurately outcomes, in an education cost function. No set of performance standards can capture all aspects of learning, and school districts may differ in their priorities for both the cognitive and non-cognitive objectives of education. However, any policy to enhance school performance involves, either explicitly or implicitly, specific performance measures. Besides selecting the types of measures, choices need to be made about what part of the performance distribution to include (lower tail, upper tail, or middle) and what weights to attach to the different performance measures. As discussed more fully in Appendix A, I have relied on the judgment of the SED staff in the selection of the exams, the measures of performance for each exam, and the weights to attach to each performance measure. Math and English exams are used for 4^{th} and 8^{th} grades, and for Regents exams. Exam performance is divided into four levels, and a weighted average of the percent of students reaching levels 2, 3 and 4 is constructed. In assigning weights to performance measures, exams in the same grade are first averaged, and then weights of 25 percent are applied to both the 4^{th}

grade and 8th grade exams, and 50 percent to the Regents examinations. We would expect a positive coefficient on this variable, since achieving higher performance generally requires more resources, holding other factors constant.

Efficiency measures: An important step in developing cost indices and estimates of the cost of adequacy is to separate the impact of cost factors and inefficiency on the level of spending. Without such controls, a district that pays overly generous wages to its teachers, for example, will be classified as a high cost district, when in fact inefficiency is the cause of high spending levels. A district is said to be inefficient if it spends more on education than other districts with the same performance level and the same educational cost factors. The definition of efficiency is linked directly to the performance measure(s) in the cost model. If a district invests heavily in art and music programs, and these programs have little impact on math and English, then this district will be classified as inefficient if only math and science are used as performance measures, even if the programs are provided as efficiently as possible.

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.[8] Incentives for efficient use of resources may be lower in wealthier or higher income districts, because easier financial constraints diminish the incentive for taxpayers to put pressure on their school district. Inefficiency does not prevent high student performance if enough resources are available.[9] In contrast, taxpayers in poor districts have lower incomes, in general, and may be particularly sensitive to tax increases. Research on New York school districts suggests that fiscal capacity measures are important determinants of efficiency, and that both income and wealth are negatively related to district efficiency.[10]

State aid can act in a similar fashion to affect school district efficiency. In the extreme, if a school district were guaranteed that the state government would reimburse all its costs, there

would be little incentive to use the resources efficiently, since the costs are spread over all state taxpayers.[11] We might expect then that the higher the relative amount of state school aid a district receives, the lower its level of efficiency, holding other factors constant. The relative nature of efficiency implies that districts may compare themselves to similar districts in assessing how affluent they are. The need/resource capacity categories defined by SED were used, with the Big 5 treated as one peer group. To measure the relative affluence of a district, the difference between the per pupil income, per pupil property values, and aid as a percentage of income in a district, and the average of these variables for their peer group is calculated. I would expect that the higher resources are, relative to their peer group, the less efficient a district is, which in turn raises spending (positive coefficients on these variables).

Input prices: Ideally, a cost function includes the market prices for the major inputs used in providing education. I have chosen to use teacher salaries to represent input prices in the cost model for several reasons. First, education is a labor-intensive service. Even with the growing use of educational technology, teachers and other instructional staff are the primary resource used by school districts. Teacher salaries and fringe benefits represented over 50 percent of total expenditures in 1997-98, and all instructional salaries and benefits are almost two-thirds of total spending.[12] Second, teacher salaries are highly related to salaries of other professional staff used in a school district;[13] thus, variation in teacher salaries should capture most of the variation in all professional salaries. Prices for instructional equipment and materials are set in a national market, implying that they are not likely to vary much among school districts. Since I exclude debt service from the measure of spending used in the cost model, variation in construction costs across school districts should have limited impact on this measure of spending. To identify a relatively uniform group of teachers, I have included fulltime teachers with a graduate degree and five years or less of experience. The average teacher salary is calculated for each school district, and missing observations are imputed using methods described in Appendix A.

Environmental cost factors: Given the well-established effect of non-school factors on student performance, it is important to include these factors in the cost model. Cost factors can be separated into two groups:

- *Physical characteristics of the district* such as land area, enrollment size, population density, and physical geography of the district. The physical geography (e.g., mountainous) is more apt to affect transportation costs than instruction. Population density has been included in the cost model, but generally it is highly correlated with the teacher salary variable. I have chosen to keep teacher salaries in the model instead of population density, because salaries are more directly related to costs. It is important in modeling the effect of enrollment to recognize that the relationship between per pupil costs and enrollment is likely to be non-linear. Per pupil costs drop sharply as enrollment increases up to an enrollment of 1,000 pupils, and may at some point begin to rise again at higher levels of enrollment.[14] Because the enrollment size of New York City is so much larger than the next largest district, it is clearly an outlier. To limit the impact of New York City, I have included dummy variables for 6 different enrollment classes—1,000-2,000, 2,000-3,000, 3,000-5,000, 5,000-7,000, 7,000-15,000, and over 15,000 (under 1,000 category is the default).

- *Student characteristics:* Ideally, a range of student, family and neighborhood characteristics would be included in the cost model. Access to socio-economic variables is limited in non-census years, and it is important that the cost indices and adequacy measures can be updated on a frequent basis. As discussed in Appendix A, I have included in the cost model two-year averages for
  - Percentage of K6 enrollment receiving free lunch.
  - Percentage of CAADM with limited English proficiency.
  - Percentage of CAADM classified as a "high cost" special needs student.[15]

  I have also included in one model the percentage of children (5 to 17 years of age) in poverty as the poverty measure.

Model estimation and results: The dependent variable in the cost model is the natural logarithm of per pupil expenditure. As discussed in Appendix A, I have tried several different expenditure variables. The expenditure measure I am using is total expenditure minus spending for debt service, transportation, and tuition payments for students attending schools outside the district. The natural logarithm of the average salary for fulltime teachers with a graduate degree and one to five years of experience are used as the teacher salary measure.

Spending on education is set at the school district level as part of the annual budget process. Budget decisions involve trade-offs between desired student performance levels, constraints on local property tax rates, and decisions over teacher salaries. In other words, spending levels, performance targets, and teacher salaries are set simultaneously in the budget process. This implies that the performance measure and teacher salaries are likely to be endogenous. Including endogenous variables in a standard ordinary least squares (OLS) regression can lead to biased coefficients on variables in the model. To correct for this potential bias, I have estimated the cost model with linear 2-stage least squares regression (2SLS).

To use 2SLS requires the selection of "instrumental variables" that will serve, in a sense, as proxy variables for the endogenous variable.[16] In developing instruments, I have taken advantage of the fact that characteristics of a district are often related to characteristics of adjacent districts. I have calculated measures of the average, minimum and maximum values of adjacent districts for a set of student characteristics, performance levels, physical characteristics, and fiscal capacity measures. These potential instruments are then tested, and those that meet the requirements of an instrument are used in the cost model.[17] Instruments are first tested to make sure that they are appropriate instruments in the sense that they are not correlated with the error term of the cost model.[18] Instruments that passed this test were then tested to determine if they were potentially weak instruments, which might lead to significant bias in the regression coefficients.[19]

The results for two different specification of the cost model are listed in Table B-5. Model 1 uses the child poverty rate as the measure of poverty, and Model 2 uses an adjusted average free lunch share as the poverty measure.[20] In general, the coefficients in the regression models fit expectations about the direction of the effect. The student performance variable has a positive coefficient and is statistically significant, indicating higher performance requires more resources. The precision of this coefficient is important since it will be used in the adequacy

calculations discussed below. As anticipated, the more resources that a district has relative to its peers (efficiency variables) the higher is spending (and possibly inefficiency). Teacher salaries are positively related to per pupil spending and the coefficients are sensible—a 1 percent increase in predicted salaries is associated with a 0.87 percent to 0.99 percent increase in per pupil spending. With regard to the student characteristic variables, a higher share of low-income students and LEP students is associated with higher spending levels required to achieve any given performance standard. All of these coefficients are statistically significant at conventional levels. In Model 1, for example, we can interpret the coefficient on the child poverty variable (LEP variable) as indicating that a 1 percentage point increase in the child poverty rate (share of LEP students) is associated with a 0.98 (1.075) percent increase in per pupil spending. Finally, the coefficients for the enrollment class variables indicate that, relative to very small districts (under 1,000 students), cost per pupil is generally lower for most enrollment levels except very large districts (over 15,000 students). For example, the coefficient on the 1,000 to 2,000 student variable in Model 1 indicates that these districts spend, on average, 9.3 percent less than districts with less than 1,000 students, holding other variables constant. These results suggest that sparsity, as reflected in enrollment levels, does increase costs for very small districts.

The last two columns of Table B-5 present standardized regression coefficients that indicate the relative importance of different independent variables in "explaining" the variation in per pupil spending. In both models, one of the variables with the largest impact on spending is the student performance level. This result certainly runs counter to the "money doesn't matter" hypothesis, and also strengthens the use of the cost model to identify the costs of adequacy in a benchmark school district. Predicted teacher salary is an important variable in all models, as are the measures of poverty. The enrollment variables are also important determinants of spending per pupil, especially between 1,000 and 5,000 students. The efficiency variable related to property values does appear to influence variation in spending.

Developing Cost Indices, Pupil Weights and Cost of Adequacy Estimates

The objective of estimating education cost models is to use the results to develop teacher cost indices and estimates of the cost of an adequate education. Both of these estimates use the coefficients from the cost model; thus, their accuracy is affected directly by the accuracy of the cost model coefficients. It is to minimize possible biases in the regression results that extra steps have been taken, particularly including efficiency variables in the cost model, and treating the student performance measure and teacher salaries as endogenous in estimating the model. The coefficients on several variables change significantly if these precautions are not taken.

Developing cost indices: A cost index is designed to measure the impact of one or several variables that are outside of the district's control on the cost of achieving a given performance level. To develop a cost index involves four steps:

1. Multiply the regression coefficient associated with each cost variables that is to be included in the cost index by the actual amount for that variable in each district. For Model 1 for New York City, for example, multiply the regression coefficient on the child poverty rate, 0.978, by the actual value for this variable in New York City, 0.349. For teacher salaries, use the predicted value from the first stage regression as the salary measure. Sum each of these terms.

2. Multiply the regression coefficients associated with the performance measure, efficiency variables, and any cost variables not in the cost index by the average for each of these variables. For example, the coefficient in Model 1 on the performance index, 0.0075, is multiplied by average performance, 159.5. Sum each of these terms and add them to the intercept of the regression (-2.584 in Model 1). The result is a single number that is constant across all school districts.

3. Sum for each district the results in part 1 and 2 to get the logarithm of the predicted per pupil spending. Take the anti-log of the resulting sum to calculate predicted spending in each district. For example, in New York City the sum of part 1 and part 2 for Model 1 when all cost factors are allowed to vary is 9.76. If I use this as an exponent for the base "e" I get $2.718^{9.76}$ = $17,342.

4. Divide the predicted per pupil spending in each district by the estimated spending in a district with average characteristics. This is multiplied by 100 to get a cost index for the cost factors that were allowed to vary in step 1. For the case discussed above, the average spending level is $9,491, so the cost index is $17,342/$9,491 x 100 = 182.7.

Several cost indices from the cost Model 1 (Table B-5) are reported in Table B-6 for need/resource capacity categories and regions. (Cost indices for cost Model 2 are reported in Table B-13.) Besides several composite indices, I have included a separate index for each cost factor—teacher salaries, child poverty, LEP, and enrollment. Not surprisingly, the indices indicate significantly higher costs in New York City, the Big Four, and other high-need urban/suburban districts. Higher spending in these districts is due to higher costs associated with wages, enrollment, and the two student-need variables. High-need rural districts have higher than average costs associated with poverty but below average costs associated with wages and LEP students. The low-need districts, which are mainly located downstate, have higher than average costs associated with teacher salaries but below average costs with regard to enrollment or student characteristics.

To develop a composite index for any combination of these factors, simply multiply the relevant indices together for individual districts. For example, to create a student need cost index; multiply the cost index for child poverty (divided by 100) by the cost index for LEP (divided by 100). For New York City, if I multiply 1.2054 by 1.126 I get 1.357, which when multiplied by 100 is equal to the composite student need index. (This calculation can only be done for individual districts, not for averages of groups of districts.)

Developing pupil cost weights: Closely related to the development of cost indices is the calculation of pupil cost weights. Pupil cost weights are defined as the additional cost associated with a student of a certain type divided by total costs without students of this type. In other words, it is the percentage increase in total costs associated with an additional student of a certain type. Since the cost model is multiplicative in form, rather than additive, the pupil cost weights will vary for each district. In general, the weights will go up as the percentage of the student body with this particular characteristic goes up. There are five basic steps to calculating pupil cost weights, which I illustrate for the share of LEP students:

1. Multiply the regression coefficients by the average for all variables in the cost model, except for the percent of LEP students, which is set at zero. Sum each of these terms and the regression intercept, and take the anti-log of the sum. This is the predicted cost in the average district with no LEP students. For cost Model 1 (Table B-5) the predicted per pupil spending without LEP students is $9,361.

2. Multiply the regression coefficients by the average for all variables in the cost model, except for the percent of LEP students. For this variable multiple the regression coefficient by the actual percent of LEP students in each district. Sum each of these terms and the regression intercept, and take the anti-log of the sum. This is the predicted cost in each district if it had average characteristics, but actual levels of LEP students. For New York City, the predicted cost is $10,687.

3. Take the difference between predicted costs in step 2 and step 1, and multiply by CAADM for the district. This is the increase in total costs associated with the share of LEP students in this district. For New York City, the increase in total costs associated with having LEP students is estimated to be $1.4 billion.

4. Divide the total costs in step 3 by the total LEP students. This is the additional cost associated with another LEP student. Divide this cost per pupil by the predicted per pupil cost in step 1 to get the pupil cost weight associated with a LEP student in this district. The predicted cost increase for a LEP student in New York City is $10,762 to bring them up to the average performance level. This is divided by $9,361, resulting in the LEP pupil weight of 1.15 (Table 3). The cost of raising a LEP student up to a standard is over twice as high as for a non-LEP student.

Pupil cost weights and the extra cost for each student of a certain type are reported in Table 3 for poverty students and LEP students (based on cost Model 1 in Table B-5). (Pupil weights based on cost Model 2 are presented in Table B-14.) The pupil weights associated with a child in poverty or LEP student are both approximately equal to one, which implies that a district will have to spend twice as much for these students compared to a typical student to bring them up to a standard.

Calculating the cost of an adequate education: Closely related to developing education cost indices and pupil cost weights is the calculation of the cost of providing an adequate education in each district. Essentially, this is defined as the spending required in a particular district to achieve a certain student performance standard. To calculate the cost of adequacy involves six steps:

1. Select the level of student performance that is considered adequate. Multiply this level by the regression coefficient for the student performance measure (.00752 in Model 1).

2. Multiply the regression coefficients associated with the efficiency variables by what is considered an acceptable level of efficiency. For example, if we think that districts should achieve the same level of efficiency as their peer group, then the coefficients on the efficiency variables would be multiplied by zero. This is the assumption used in this analysis.

3. Multiply the regression coefficients on any cost variables not used in calculating the cost of adequacy by the average for each of these variables. Sum each of these terms and add them to the intercept of the regression. The result is a single number that is constant across all school districts.

4. Multiply the regression coefficients for the cost variables that are going to be used in the calculation of the cost of an adequate education by the actual district value for this variable. Sum each of these terms. This is the only term used in this calculation that varies across districts.

5. Add the results of parts 1 through 4, and take the anti-log of this sum. The result is the estimate of the per pupil cost of achieving an adequate education, as defined by the adequacy standard selected in part 1. Multiply this per pupil cost by CAADM to get the total costs required to reach adequacy in a particular district. For example, the sum of these terms for New York City with a standard of 140, accounting for all cost factors, is 9.68. The anti-log is $16,019, which is the predicted per pupil spending required to bring students up to a standard of 140 (see column 3 and top panel in Table 5a).

6. For districts not reaching the adequacy standard, take the difference between the required spending calculated in part 5 and actual spending. If this difference is positive, this represents the additional spending required for this district to have the opportunity to reach adequacy. If this difference is negative, this district is already spending enough to reach adequacy if resources are deployed in a different fashion or used more efficiently. For New York City, the 1999-2000 expenditures per pupil (for the spending definition discussed in Appendix A) is $9,433 and the spending difference is $16,019 - $9,433 = $6,586.

Adequacy estimates for several different cost indices and standards are reported in Tables B-7 and B-8 for the need-capacity categories defined by SED (based on cost Model 1 in Table B-5). (Adequacy estimates using cost Model 2 are reported in Tables B-15 and B-16.).

Cost Indices and Design of Performance Foundation Aid Formulas

Educational cost indexes are important largely because they make it possible to design aid formulas that are more effective at achieving educational equity objectives. This section explores the link between educational cost indexes, adequacy standards, and the design of equitable aid formulas, and shows how to bring educational cost indexes into a foundation aid formula. The issues discussed here also arise in programs designed to reward districts that meet performance standards or to punish districts that fall short. As several states have discovered, rewards or punishments that focus exclusively on performance, with no adjustment for costs, end up helping the districts that need help the least and punishing the districts that are, through no fault of their own, stuck with the harshest educational environments.[21]

About 80 percent of states use some form of a foundation grant system, which is designed to ensure that all districts meet some minimal performance standard. For the most part, however, these systems use spending as a measure of "performance," and therefore do not bring many districts up to any given performance standard defined on the basis of student performance. This need not be the case: cost indexes make it possible to design a foundation formula that brings all districts up to a performance standard defined by test scores or any other reasonable measure.

Expenditure-based foundation: A foundation plan is designed to bring all districts up to a minimum spending level per pupil. Let V_i stand for the per pupil property tax base in district i; then an expenditure-based foundation grant per pupil is defined by[22]

$$A_i = E^* - t^* V_i - FA, \qquad (1)$$

where E^* is the expenditure standard, t^* is the minimum tax rate set by the state and FA is per pupil federal aid. A foundation aid program is designed to provide every district with enough

resources to provide the foundation level of spending per pupil at the minimum tax rate specified by policymakers. 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, (1) implies that some districts with high tax bases actually receive negative aid. 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^*. Because they do not systematically account for cost differences across districts, these plans do not bring all districts up to a minimum performance level. In particular, districts with relatively high costs cannot reach the standard unless they set a tax rate that is above the required minimum.

Performance-based foundation: To make the switch from spending to performance, one must incorporate an educational cost index into the aid formula. This index indicates how much a district with a certain cost level would have to spend to achieve a performance target. This approach cannot be implemented, of course, without selecting a way to measure performance and setting a performance standard, say S^*. This standard could be based on a single performance measure, such as the one described in Appendix A. The cost index needs to be consistent with the performance measure. A performance-based formula that brings all districts up to the selected performance standard, S^*, at an acceptable tax burden on their residents is as follows:

$$A_i = S^* \, C_i - t^* \, V_i - FA, \qquad (2)$$

where C_i is the amount the district must spend to obtain one unit of S (which is per unit cost instead of a cost index). S^*C is the estimate of the cost of an adequate education as defined by S^*. 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 equation (1), raising S^* to an extremely high level would, at great cost, result in an equal educational performance in every district, and allowing negative grants would boost the equalizing impact of the grant.

Because some districts are less efficient than others in using their resources, a program based on equation (2) will not bring all districts up to the foundation level (and implicit performance standard) even with a required minimum tax rate. One of the policy decisions that has to be made either implicitly or explicitly in setting up a performance foundation aid formula is what is an acceptable level of efficiency. Remember, several efficiency variables are in the cost model, and in constructing the estimated cost of an adequate education, some fixed level for these variables has to be selected. For this study, it was assumed that the acceptable level of efficiency is the level achieved by their peers (as defined by the need-capacity categories), which implies that all the efficiency variables are equal to zero. Certainly other levels could be selected.

For a local contribution rate of $20 per $1,000 of full value, the state aid distribution with a performance foundation formula using the full cost index is reported in Tables 6a and 6b. (See Tables B-17 and B-18 for the aid estimates when cost Model 2 is used.) For illustrative purposes, estimated aid distribution is calculated when the cost index just controls for student needs (Table B-9), and when the teacher cost index is used (Table B-10).

Local effort and state-local share: Clearly, one of the difficult decisions that will have to be made in developing a school finance system to finance higher student performance standards

is the share of total spending local governments should finance. Significant local financing of education can substantially raise property tax burdens on local residents, which may be particularly difficult for low-income households. New York has eased some of the impact of school taxes on low-income homeowners through the STAR program, but this program does not help low-income renters. Requiring local districts to substantially increase local effort will lead to higher local tax rates and to higher STAR reimbursements to districts. For the calculation of local effort I have not determined the impact of a particular minimum local effort rate on the costs of STAR. To calculate the local contribution rate involves four steps.

1. The required spending level to reach a particularly adequacy standard is determined. In calculating the 2000 local effort rate, the actual local revenue was used and adjusted for spending categories not considered in this study. The adjustment involves multiplying the difference between total expenditure and the expenditure measure used in this study by the ratio of local revenue divided by total revenue in 2000. This number is then subtracted from the total local revenue.

2. For federal aid use information on federal revenue from the ST-3 reports for FY 2000.

3. Take the required spending per pupil and subtract the state aid from a performance foundation formula and federal aid per pupil calculated in step 2.

4. Divide the estimated local effort by per pupil property values to get the required millage rate (dollars per $1,000 of property values).

Table 8 summarizes the estimated local contribution of school districts in 2000 with an adequacy standard of 140, and Tables B-11 and B-12 provide estimates with standards of 150 and 160. (Table B-19 provides an estimate of local contribution with a standard of 140 using the results of cost Model 2.)

Based on the state aid and local contribution estimates, it is possible to estimate the share of local-state-federal contributions to financing an adequate education. Tables 9a and 9b report

the shares of spending by level of government using cost Model 1. (The state-local shares when the cost index is based on cost model 2 are reported in Tables B-20 and B-21.)

Endnotes

1. Models that capture the impact of market and amenity characteristics of geographic areas go under the broad heading of hedonic price models. One of the classic papers in the literature is by Sherwin Rosen. 1974. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy* 82: 34-55.

2. Models that focus on the determinants of market wages are often called "compensating wage differential" models to reflect that additional wages must be paid to compensate for harsh working conditions. See Jay Chambers. 1978. "Educational Cost Differentials and the Allocation of State Aid for Elementary/Secondary Education." *Journal of Human Resources* 13: 459-481; Jay Chambers. 1981. "The Hedonic Wage Technique as a Tool for Estimating the Cost of School Personnel: A Theoretical Exposition with Implications for Empirical Analysis." *Journal of Education Finance* 6: 330-354; Jay Chambers. 1997. "A Technical Report on the Measurement of Geographic and Inflationary Differences in Public School Costs." Washington, DC: National Center for Education Statistics. For a paper on New York, see Wayne Wendling. 1981. "The Cost of Education Index: Measurement of Price Differences of Education Personnel Among New York State School Districts." *Journal of Education Finance*. 6: 485-504.

3. For a good discussion on public sector labor markets in general, and factors considered in wage equations, see Richard Freeman. 1986. "Unionization Comes to the Public Sector." *Journal of Economic Literature* 24: 41-86; Jeffrey Zax and Casey Ichniowski. 1988. "The Effects of Public Sector Unions on Pay, Employment, Department Budgets, and Municipal Expenditures." In R. Freeman and C. Ichniowski (eds.) *When Public Sector Workers Unionize.* Chicago, Illinois: The University of Chicago Press: 323-363.

4. Another measure of monopsony power used recently by Jay Chambers is a Herfindahl index of concentration. The Herfindahl index for a county is calculated by squaring the percent of total county enrollment in each district, and then summing these squares. This index can range from 0 to 1, with 1 indicating all enrollment concentrated in one district. See Jay Chambers, "A Technical Report on the Measurement of Geographic and Inflationary Differences in Public School Costs." The Herfindahl Index would be the same for all districts in a county. This implicitly assumes that a very large district can negotiate lower wages with teachers, because of its market power, and that all the surrounding districts are able to take advantage of these lower wages.

5. One of the difficulties of estimating a "reduced form" teacher wage model is that variables, such as poverty, can pick both working condition differences and fiscal capacity differences across districts. The coefficient on the percent of free lunch students was consistently negative suggesting that this variable is picking up fiscal capacity differences. To separate these two effects, I regressed the percent free lunch students on the natural log of per pupil income and property values, and used the residual in the

regression as the measure of poverty. This variable had the expected positive relationship with wages holding other factors constant.

6. See P. J. Huber. 1967. "The Behavior of Maximum Liklihood Estimates Under Non-standard Conditions." Proceedings of the Fifth Berkley Symposium on Mathematical Statistics and Probability 1: 221-233; and H. White. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica* 48: 817-830. These corrections were made using the software package STATA, and clustering was assumed only at the district-level. There are three variables at the county-level—professional wage, unemployment and crime rate. It is possible that the standard errors for these variables are underestimated.

7. For recent cost function studies see Thomas Downes and Thomas Pogue. 1994. "Adjusting School Aid Formulas for the Higher Cost of Educating Disadvantaged Students." *National Tax Journal* 47: 89-110; William Duncombe and John Yinger. 2000. "Performance Standards and Educational Cost Indexes: You Can't Have One Without the Other." In H. Ladd, R. Chalk, and J. Hansen (eds.) *Equity and Adequacy in Education Finance*. Washington, DC: National Academy Press; and Andrew Reschovsky and Jennifer Imazeki. 1997. "The Development of School Finance Formulas to Guarantee the Provision of Adequate Education to Low-Income Students." *Developments in School Finance*: 123-147.

8. See Harvey Leibenstein. 1966. "Allocative Efficiency vs. X-Efficiency," *American Economic Review* 56: 392-415; William Niskanen. 1971. "Bureaucracy and Representative Government." Chicago, Illionois: Aldine-Atherton.; Paul Wyckoff. 1990. "The Simple Analytics of Slack-Maximizing Bureaucracy." *Public Choice* 67: 35-67; and William Duncombe, Jerry Miner and John Ruggiero. 1997. "Empirical Evaluation of Bureaucratic Models of Inefficiency." *Public Choice* 93: 1-18.

9. High-income residents also may have a relatively high opportunity cost for their time.

10. William Duncombe and John Yinger. 2000. "Financing Higher Student Performance Standards: The Case of New York State." *Economics of Education Review* 19: 363-386.

11. There is a large literature demonstrating that an equal increase in state aid or income in a local government will lead to much higher spending in the case of aid than income. This is what is commonly called a "flypaper effect," because money sticks where it hits. The reason is intuitively clear; if income rises, then a local government must raise taxes to take advantage of this income increase, but a local government can spend an aid increase without asking voters. For a good recent review of response to grants in education, see Ronald Fisher and Leslie Papke. 2000. "Local Government Response to Education Grants." *National Tax Journal* 53: 153-168.

12. Fiscal Analysis and Research Unit. 2000. Eleventh Annual School District Fiscal Profile Report: 1993-94 and 1997-98 School Year. Albany: The State Education Department, Table 3.

13. The correlation between average teacher salaries and salaries of principals and vice principals is approximately 0.70.

14. For a review see Matthew Andrews, William Duncombe, and John Yinger. Forthcoming. "Revisiting Economies of Size in American Education: Are We Any Closer to a Consensus?" *Economics of Education Review*.

15. Percent high-cost students was not found to be a significant determinants of the expenditure measure used in the study, so was not included in the final models.

16. OLS requires that all independent variables in a regression are independent of the error term in this equation. In the case of an endogenous variable, this assumption is violated. Instruments are selected to serve as proxies for this endogenous variable. For a good discussion of simultaneous equations and instrumental variable methods, see A. H. Studenmund. 1997. *A Practical Guide to Using Econometrics*, Third Edition. Menlo Park, CA: Addison-Wesley, Chapter 14.

17. Instruments in Model 1 includes the log of the pupil density, the average of LEP students in adjacent districts, the maximum for income and performance on the grade 8 exams, and the minimum of performance on grade 8 exams for adjacent districts. For Model 2 the instruments include the average of teacher salaries and percent of population between 5 and 17 years for adjacent districts, the maximum free lunch percent, and the performance on grade 8 exams among adjacent districts.

18. The potential endogeneity of instruments was tested in several ways. First, potential instruments were included in the cost model along with the two endogenous variables to determine if they had an independent association with the dependent variable. Any variables with a t-statistics of over 1.2 were dropped as instruments. The final set of instruments were examined using an over-identification test as suggested in Jeffrey Wooldridge. 2000. *Introductory Econometrics*. New York: South-Western College Publishing.

19. Several methods were used to test for weak instruments. For each combination of instruments, partial F-statistics were calculated and partial R2 statistics based on the recommendation of John Bound, David Jaeger, and Regina Baker. 1995. "Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable is Weak." *Journal of the American Statistical Association* 90 (June): 443-450. The set of instruments that lead to the highest F-statistic for both endogenous variables was selected. The F-statistic for student performance in Model 1 is 17.82 (6.26 in Model 2), and for teacher salaries the F-statistics is 84.53 (19.36 in Model 2). In addition, I used the approach developed by Jinyong Hahn and

Jerry Hausman. 2000. "A New Specification Test for the Validity of Instrumental Variables." *Econometrica*. Forthcoming. This method involves comparing the coefficients on the endogenous variables in the regular 2SLS and the inverse of the coefficient in a model where the dependent variable and right-hand side endogenous variables are switched. If the difference in the coefficients is small, then bias created by weak instruments should be small. In both models, the difference in the coefficients was never larger than 5 percent.

20. When the free lunch share and percent of LEP students were included in the model, coefficient on the free lunch variable was significant, and the coefficient on LEP was not suggesting a multicollinearity problems. In order to identify an effect for both variables, the free lunch variable used in the cost model is the residual from a regression of free lunch on LEP. This in effect assigns the covariation between these variables to the LEP variable. As a result, the cost indices and pupil weights associated with each of these variables should be viewed with caution. It is partially for this reason that Model 1 was used in the Summary Report.

21. Helen Ladd, and Charles Clotfelter. 1996. "Holding Schools Accountable." Washington DC: The Brookings Institution.

22. This section draws heavily from Helen Ladd and John Yinger. 1994. "The Case for Equalizing Aid." *National Tax Journal* 47: 211-224; and William Duncombe and John Yinger. 1998. "School Finance Reform: Aid Formulas and Equity Objectives." *National Tax Journal* 51: 239-262.

Table B-1. Variables in a Teacher Wage Equation

Variable Name	Variable Description	Source	Level	Mean[1]	Standard Deviation[1]
Dependent variable:					
Lnsalary	Natural log of basic salary (no fringes or extra-pay)	PMF	teacher	10.82305	0.30820
Discretionary Factors					
Teacher quality measures:					
Lexper	Log of total teaching experience	PMF	teacher	2.38441	0.97610
Gradsch	1 if have PhD. or M.A.	PMF	teacher	0.74533	0.43568
Mathsci	1 if major assignment is in math or science	PMF	teacher	0.14258	0.34108
Sumcert	Share of assignments teacher has permanent certification.	PMF	teacher	0.88374	0.30213
MA_USN	1 if B.A. college is in US News 1st Tier	TCERT/*US News*	teacher	0.03037	0.17161
BA_USN	1 if M.A. college is in US News 1st Tier	TCERT/*US News*	teacher	0.04543	0.20824
Working condition measures:					
Lschenr	Log of enrollment in school where teacher teaches	IMF	school	6.61511	0.63250
Clsize	Average class size for teacher's assignments	PMF	teacher	23.75623	19.49249
Outcomes	Average district student performance	SED	district	141.52944	30.97875
Efficiency measures:					
Aiddif	Difference in aid per $ of income in this district and average district with similar need-capacity	State aid	district	-0.01208	0.02283
Fvdif	Difference in per pupil property value in this district and average district with similar need-capacity	State aid	district	13845.46	65577.61
Incdif	Difference in per pupil income (AGI) in this district and average district with similar need-capacity	State aid	district	-49725.67	251517.60
Factors Outside District Control					
Labor market variables:					
Lprofwage	Log of average county payroll for professional, scientific and technical sector (1997)	Census	county	10.59301	0.35579
Regcost	Occupational wage index based on 77 professional occupations (1998)	SED	Labor force area	1.38028	0.16620
Avgunemp	Average unemployment rate (1997-1999)	BLS	county	4.63639	1.44679
Tchshare	District share of county fulltime teachers	IMF	district	0.41629	0.34830
Working condition variables:					
Lpupden	Log of CAADM per square mile	IMF	district	5.83664	1.96455
Ldisenr	Log of district CAADM (average enrollment)	IMF	district	9.85490	2.65105
Flunres[2]	Adjusted 2-year average of percent K6 enrollment receiving free lunch (1999-2000)	SED	district	-0.03499	0.26970
Avglep	2-year average of percent LEP students (1999-2000)	SED	district	0.05142	0.05515
Avhcost	2-year average of percent high cost special needs students (1999-2000)	SED	district	0.01497	0.00963
Crrate2	Violent crime rate for juveniles (under 18) per 100,000 people (1998)	FBI	county	0.00275	0.00199

[1]Average of values associated with individual teachers. Sample size is 121,203. For county or district-level variables, level variables, this is equivalent to a weighted average, weighted by the relative number of teachers. All data are for 2000 (or the 1999/00 school year or fiscal year) unless otherwise noted.

[2]Residual from a regression of the average (1999-2000) share of free lunch students in elementary school regressed on the log of per pupil income and per pupil property values.

Sources: PMF = Personnel Master File, TCERT = teacher certification data base, IMF = Institutional Master File, State aid = state aid files, Census = U. S. Bureau of the Census, BLS = U.S. Bureau of Labor Statistics, *U.S. News* = *U.S. News & World Reports* rankings of undergraduate colleges, FBI= FBI Uniform Crime Reporting system, SED=Provided directly by SED staff.

Table B-2. Results of the Teacher Wage Models[1]

	Model A		Model B		Model C		Model D	
	Coefficient	**t-statistics**	**Coefficient**	**t-statistics**	**Coefficient**	**t-statistics**	**Coefficient**	**t-statistics**
Constant	7.84674	26.70	7.84418	26.40	8.81886	87.69	8.81924	87.68
Teacher characteristics:								
Total experience[2]	0.21602	10.12	0.21596	10.13	0.21860	9.94	0.21860	9.94
Masters or higher	0.06403	2.51	0.06403	2.51	0.05861	2.18	0.05862	2.18
Teacher of math/science	0.01265	6.04	0.01261	6.00	0.01397	8.65	0.01398	8.65
Percent of assignments certified	0.03318	7.85	0.03318	7.78	0.03500	11.79	0.03499	11.80
M.A. from top-rated school	0.00921	0.95	0.00932	0.97	0.01568	2.28	0.01565	2.27
B.A. from top-rated school	0.00219	0.91	0.00215	0.88	0.00273	1.29	0.00274	1.29
Factors under district control:								
School enrollment[2]	0.01808	4.55	0.01827	4.50	0.01443	6.39	0.01439	6.40
Class size	0.00006	1.38	0.00006	1.39	0.00006	1.27	0.00006	1.27
Aid efficiency variable[3]	0.61001	2.71	0.59311	2.55	0.29897	1.66	0.30344	1.68
Income efficiency variable[3]	0.00000	5.13	0.00000	5.00	0.00000	5.34	0.00000	5.32
Full value efficiency variable[3]	0.00000	0.39	0.00000	0.45	0.00000	-0.76	0.00000	-0.78
Average student peformance	0.00354	7.51	0.00348	7.50	0.00230	8.98	0.00231	9.09
Factors outside district control:								
Average unemp. rate (97-99)	-0.01680	-4.26	-0.01626	-3.95	0.01039	3.07	0.01021	3.03
Pupil density[2]	0.03108	5.69	0.03074	5.58	0.03086	8.04	0.03095	8.04
District enrollment[2]	0.02570	2.38	0.02708	2.50	0.01288	1.96	0.01262	1.92
Professional wage[2]	0.14898	5.26	0.14947	5.22				
Regional cost index					0.59341	17.43	0.59219	17.28
Percent high cost special needs	0.64721	0.81			-0.14274	-0.38		
Average percent LEP	0.41491	1.99	0.43459	2.03	0.02555	0.19	0.02217	0.17
Adjusted free lunch student rate[4]	0.23772	5.65	0.23406	5.38	0.16556	5.16	0.16658	5.24
Juvenile violent crime rate	-45.92430	-3.87	-45.71180	-3.72	-40.31091	-7.66	-40.34876	-7.71
Share of counties teachers	-0.16193	-2.93	-0.16798	-3.00	-0.17790	-4.49	-0.17663	-4.44
R^2	0.71420		0.71400		0.74210		0.74210	

[1]Estimated with ordinary least-squares regression, with standard errors adjusted for non-independence using Huber (White) method. Dependent variable is the natural logarithm of teacher salaries. Sample size is 121203.

[2]Expressed as natural logarithm.

[3]Calculated the difference between district level and average level in peer group. See text in Appendix B.

[4]Residual from a regression of the average (1999-2000) share of free lunch students in elementary school regressed on the log of per pupil income and per pupil property values.

Table B-3. Predicted Teacher Salary Indices (State average=100)[1]

Need-Capacity Classification	Model A	Model B	Model C	Model D
New York City	1.54	1.55	1.34	1.34
Big Four	1.33	1.33	1.16	1.16
High-Need Urban/Suburban	1.14	1.15	1.10	1.10
High-Need Rural	0.90	0.90	0.87	0.87
Average Need	0.99	0.99	0.98	0.98
Low Need	1.11	1.10	1.18	1.18
Region				
Downstate Small Cities	1.29	1.29	1.29	1.29
Downstate Suburbs	1.14	1.14	1.22	1.22
New York City	1.54	1.55	1.34	1.34
Yonkers	1.53	1.51	1.41	1.41
The Big Three (upstate)	1.27	1.26	1.08	1.08
Upstate Rural	0.90	0.90	0.88	0.88
Upstate Small Cities	1.04	1.04	0.99	0.99
Upstate Suburbs	0.97	0.97	0.96	0.96

[1]See Table B-3 for model results.

Table B-4. Descriptive Statistics for Variables in Cost Model

Variables	Mean	Standard Deviation
Per pupil spending[1]	9.106	0.231
Performance index	159.4347	17.5813
Efficiency variables:[2]		
Full value	0.00000	623613.33000
Aid	0.00000	0.02723
Income	0.00000	73010.23000
Average teacher salary[3]	10.5137	0.1342
Adjusted 2-year avg. free lunch[4]	0.0000	0.1526
Percent child poverty (1997)[5]	0.1580	0.0978
2-year avg. LEP[5]	0.0129	0.0307
Enrollment classes:[6]		
1,000-2,000 students	0.3201	0.4668
2,000-3,000 students	0.1608	0.3676
3,000-5,000 students	0.1431	0.3504
5,000-7,000 students	0.0605	0.2385
7,000-15,000 students	0.0516	0.2214
Over 15,000 students	0.0103	0.1012
Downstate small city or suburb	0.2589	0.4383

[1]Total spending without transportation, debt services, or tuition payments for students in private placements. Sample size is 678 school districts.

[2]Calculated as the difference between district value and the average in peer group. See text in Appendix B.

[3] For fulltime teachers with 1 to 5 years experience. Expressed as natural logarithm.

[4]The residual from a regression of free lunch share regressed on the percent LEP students.

[5]All variables expressed as a percent of enrollment (or CAADM). For free lunch, this is the percent of K6 enrollment.

[6]The base enrollment is 0 to 1000 students. Variable equals 1 if district is this size, else it equals 0.

Table B-5. Results of the Education Cost Models[1]

Variables	Model 1 Coefficient	Model 1 t-statistics	Model 2 Coefficient	Model 2 t-statistics	Standardized Coeffcients Model 1	Standardized Coeffcients Model 2
Constant	-2.58360	-2.29	-1.50718	-0.45		
Performance index	0.00752	3.57	0.00946	2.40	0.573	0.721
Efficiency variables:[2]						
Full value	0.00000	10.55	0.00000	11.60	0.341	0.358
Aid	1.12073	3.83	0.51555	1.83	0.132	0.061
Income	0.00000	0.61	0.00000	-0.18	0.021	-0.006
Average teacher salary[3]	0.99296	7.65	0.87231	3.07	0.577	0.507
Adjusted 2-year avg. free lunch[4]			1.04423	2.83		0.690
Percent child poverty (1997)[5]	0.97819	5.46			0.414	
2-year avg. LEP[5]	1.07514	2.30	1.15393	2.17	0.143	0.153
Enrollment classes:[6]						
1,000-2,000 students	-0.09342	-4.20	-0.07613	-3.22	-0.189	-0.154
2,000-3,000 students	-0.07956	-2.72	-0.07678	-2.76	-0.127	-0.122
3,000-5,000 students	-0.09500	-2.68	-0.09678	-2.94	-0.144	-0.147
5,000-7,000 students	-0.07944	-2.01	-0.08547	-2.32	-0.082	-0.088
7,000-15,000 students	-0.09579	-2.08	-0.10451	-2.47	-0.092	-0.100
Over 15,000 students	0.05404	0.51	0.00247	0.03	0.024	0.001
Downstate small city or suburb			0.12282	1.70		0.233
Adjusted R-square	0.493		0.551			

[1]Estimated with two-stage linear regression, with the student performance and teacher salaries treated as endogenous. Selection of instruments is discussed in Appendix B. Sample size is 678.

[2]Calculated as the difference between district value and the average in peer group. See text in Appendix B.

[3] For fulltime teachers with 1 to 5 years experience. Expressed as natural logarithm.

[4]The residual from a regression of free lunch share regressed on the percent LEP students. All covariation between these two variables is assigned to the LEP variable.

[5]All variables expressed a percent. Coefficients are similar to elasticities.

[6]The base enrollment is 0 to 1000 students. The coefficients can be interpreted as the percent change in costs from being in this enrollment class compared to the base enrollment class.

Table B-6. Summary of Cost Indices -- Calculated from Cost Regression (Model 1)[1]

	Number of Districts	All Cost Factors[2]	All But Enrollment[3]	Student Needs Only[4]	Child Poverty Only	Teacher Salary Only	LEP Only	Enrollment Only	Overall Teacher Wage Index[5]	Prof. Wage Index (County)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)
Descriptive Statistics:										
Minimum		81.29	79.18	85.36	86.43	78.82	98.63	97.01	80.53	46.61
25th Percentile		91.18	91.55	91.66	92.12	89.93	98.63	97.24	89.77	75.93
Median		96.80	96.15	98.44	98.96	96.73	98.63	97.24	96.67	96.57
75th Percentile		105.55	105.34	106.26	106.40	108.70	99.81	106.77	108.94	116.39
Maximum		183.72	186.30	154.43	140.70	159.47	125.90	112.70	184.54	197.67
Need/Resource Capacity:										
New York City	1	182.71	162.13	135.73	120.54	119.45	112.60	112.70	153.83	197.67
The Big Four	4	157.70	139.93	141.63	130.33	98.94	108.97	112.70	132.94	128.62
High-Need Urban/Suburban	37	121.43	122.92	118.56	113.62	103.24	104.31	98.87	114.01	106.13
High-Need Rural	161	98.46	96.56	109.51	110.63	88.22	98.97	102.04	90.06	76.69
Average Need	341	96.15	96.76	97.18	97.50	99.58	99.67	99.47	98.49	96.84
Low Need	134	108.51	109.38	91.91	91.14	118.88	100.81	99.18	110.53	132.77
Regions:										
Downstate Small Cities	7	139.47	139.83	108.44	101.07	129.59	107.28	99.74	128.37	152.07
Downstate Suburbs	168	113.86	115.05	95.78	93.57	120.01	102.20	98.98	113.61	131.34
New York City	1	182.71	162.13	135.73	120.54	119.45	112.60	112.70	153.83	197.67
Yonkers	1	177.74	157.72	136.95	116.38	115.17	117.68	112.70	152.09	159.33
The Big Three (upstate)	3	151.02	134.01	143.19	134.98	93.53	106.07	112.70	126.56	118.39
Upstate Rural	207	95.37	93.62	104.93	106.12	89.36	98.87	101.92	89.95	77.27
Upstate Small Cities	49	106.96	108.89	111.63	110.27	97.49	101.08	98.22	103.89	92.41
Upstate Suburbs	242	93.34	93.90	96.83	97.85	97.38	98.97	99.41	96.77	96.84

[1]Includes in the cost model a weighted performance measure, predicted wages,the percent of children in poverty (1997), share of students with limited English proficiency (LEP), enrollment and efficiency variables. See cost Model 1 in Table B-5 iin Appendix B.

[2]Includes adjustment for children in poverty, LEP students, teacher salaries, and enrollment size.

[3]Includes adjustment for children in poverty, LEP students, teacher salaries, but not enrollment size.

[4]Includes adjustment for children in poverty and LEP students.

[5]Based on Model B in Table B-2 in Appendix B. This is predicted salary required to attract teacher with average characteristics, and in district with average school enrollment, class size, and efficiency.

Table B-7. Required Spending to Achieve Adequacy (1999-2000) In Districts with Performance Below the Specified Standard (student needs cost adjustment)[1]

	Performance Index (2000)	1999-2000 Expenditures (millions)	Required Spending For Adequacy (millions)	1999-2000 Per Pupil Expenditure	Required Spending For Adequacy Per Pupil
STANDARD OF 140					
Total (average)	125	$13,210	$16,030	$9,145	$11,097
Required additional spending			$2,819		
Number of districts below standard			71		
Need/ResourceCapacity:					
New York City	103	$9,433	$11,900	$8,823	$11,130
The Big Four	99	$1,300	$1,564	$9,884	$11,891
High-Need Urban/Suburban	120	$1,294	$1,361	$10,325	$10,862
High-Need Rural	131	$273	$284	$9,159	$9,525
Average Need	131	$881	$892	$10,200	$10,321
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 150					
Total (average)	137	$15,256	$19,363	$9,182	$11,653
Required additional spending			$4,107		
Number of districts below standard			178		
Need/ResourceCapacity:					
New York City	103	$9,433	$12,829	$8,823	$12,000
The Big Four	99	$1,300	$1,663	$9,884	$12,636
High-Need Urban/Suburban	128	$1,778	$1,976	$9,944	$11,054
High-Need Rural	140	$770	$852	$8,932	$9,882
Average Need	142	$1,946	$2,015	$10,052	$10,405
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 160					
Total (average)	146	$17,924	$23,703	$9,130	$12,074
Required additional spending			$5,778		
Number of districts below standard			332		
Need/ResourceCapacity:					
New York City	103	$9,433	$13,832	$8,823	$12,937
The Big Four	99	$1,300	$1,784	$9,884	$13,556
High-Need Urban/Suburban	131	$1,874	$2,215	$9,857	$11,648
High-Need Rural	147	$1,330	$1,599	$8,686	$10,444
Average Need	149	$3,826	$4,114	$9,454	$10,163
Low Need	149	$160	$160	$11,057	$11,057

[1]The estimated costs of achieving adequacy are only for districts with performance below the standard. Cost of adequacy is calculated by taking the required spending in the average district to reach a standard (Table 4) multiplied by the cost index with adjustment for student needs (Table 2) divided by 100. If the required cost of adequacy is less than the actual spending level, then the cost is set at the present spending level.

Table B-8. Required Spending to Achieve Adequacy (1999-2000) In Districts with Performance Below the Specified Standard (teacher salary cost adjustment)[1]

	Performance Index (2000)	1999-2000 Expenditures (millions)	Required Spending For Adequacy (millions)	1999-2000 Per Pupil Expenditure	Required Spending For Adequacy Per Pupil
STANDARD OF 140					
Total (average)	125	$13,210	$17,477	$9,145	$12,099
Required additional spending			$4,267		
Number of districts below standard			71		
Need/ResourceCapacity:					
New York City	103	$9,433	$13,488	$8,823	$12,615
The Big Four	99	$1,300	$1,420	$9,884	$10,794
High-Need Urban/Suburban	120	$1,294	$1,345	$10,325	$10,733
High-Need Rural	131	$273	$274	$9,159	$9,183
Average Need	131	$881	$922	$10,200	$10,672
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 150					
Total (average)	137	$15,256	$20,865	$9,182	$12,557
Required additional spending			$5,608		
Number of districts below standard			178		
Need/ResourceCapacity:					
New York City	103	$9,433	$14,541	$8,823	$13,601
The Big Four	99	$1,300	$1,531	$9,884	$11,637
High-Need Urban/Suburban	128	$1,778	$1,923	$9,944	$10,757
High-Need Rural	140	$770	$782	$8,932	$9,065
Average Need	142	$1,946	$2,060	$10,052	$10,636
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 160					
Total (average)	146	$17,924	$25,259	$9,130	$12,867
Required additional spending			$7,335		
Number of districts below standard			332		
Need/ResourceCapacity:					
New York City	103	$9,433	$15,677	$8,823	$14,663
The Big Four	99	$1,300	$1,651	$9,884	$12,546
High-Need Urban/Suburban	131	$1,874	$2,141	$9,857	$11,257
High-Need Rural	147	$1,330	$1,392	$8,686	$9,088
Average Need	149	$3,826	$4,226	$9,454	$10,442
Low Need	149	$160	$173	$11,057	$11,977

[1]The estimated costs of achieving adequacy are only for districts with performance below the standard. Cost of adequacy is calculated by taking the required spending in the average district to reach a standard (Table 4) multiplied by the teacher salary cost index (Table 2) divided by 100. If the required cost of adequacy is less than the actual spending level, then the cost is set at the present spending level.

Table B-9. Distribution of State Education Aid Using a "Performance" Foundation Formula (student need cost adjustment)[1]

	Number of Districts	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
		Total--Millions of Dollars				
All Districts	678	$17,681	$11,070	$10,255	$12,085	$14,095
Required additional aid				-$816	$1,015	$3,025
Need/Resource Capacity:						
New York City	1	$5,771	$4,222	$5,347	$6,277	$7,279
The Big Four	4	$461	$710	$949	$1,068	$1,198
High-Need Urban/Suburban	37	$727	$1,059	$1,029	$1,176	$1,334
High-Need Rural	161	$645	$1,045	$921	$1,048	$1,185
Average Need	341	$5,292	$3,322	$1,940	$2,405	$2,930
Low Need	134	$4,786	$712	$68	$111	$169

	Property Values (1998)	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				2001 Standard	Stand. of 150	Stand. of 160
			Per Pupil--Dollars			
Need/Resource Capacity:						
New York City	$269,888	$5,398	$3,949	$5,002	$5,871	$6,808
The Big Four	$189,229	$3,785	$5,154	$6,902	$7,810	$8,788
High-Need Urban/Suburban	$197,210	$3,944	$5,726	$5,142	$5,882	$6,700
High-Need Rural	$201,122	$4,022	$5,773	$4,752	$5,414	$6,140
Average Need	$313,092	$6,262	$3,945	$2,471	$2,976	$3,544
Low Need	$1,003,299	$20,066	$1,765	$92	$162	$264

Note: Performance foundation aid is calculated by taking the estimated per pupil spending required for a district to reach a particular adequacy standard (see Table 4) and subtract from it the required minimum local tax contribution. If the calculated aid is negative, it is set equal to zero.

[1]Based on the cost index which adjusts for student needs (children in poverty, and those with limited English proficiency (Table 2).

[2]Includes all formula aid except Building Aid, Transportation Aid, and Reorganization Building aid.

[3]Based on a millage rate of $20 per $1,000 of actual property values.

Table B-10. Distribution of State Education Aid Using a "Performance" Foundation Formula (teacher salary cost adjustment)[1]

	Number of Districts	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
		Total--Millions of Dollars				
All Districts	678	$17,681	$11,070	$11,959	$13,995	$16,235
Required additional aid				$889	$2,925	$5,164
Need/Resource Capacity:						
New York City	1	$5,771	$4,222	$6,935	$7,989	$9,125
The Big Four	4	$461	$710	$834	$945	$1,065
High-Need Urban/Suburban	37	$727	$1,059	$965	$1,107	$1,260
High-Need Rural	161	$645	$1,045	$655	$760	$874
Average Need	341	$5,292	$3,322	$2,364	$2,905	$3,502
Low Need	134	$4,786	$712	$205	$289	$409

	Property Values (1998)	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				2001 Standard	Stand. of 150	Stand. of 160
			Per Pupil--Dollars			
Need/Resource Capacity:						
New York City	$269,888	$5,398	$3,949	$6,487	$7,472	$8,534
The Big Four	$189,229	$3,785	$5,154	$6,190	$7,041	$7,960
High-Need Urban/Suburban	$197,210	$3,944	$5,726	$4,760	$5,479	$6,267
High-Need Rural	$201,122	$4,022	$5,773	$3,270	$3,800	$4,379
Average Need	$313,092	$6,262	$3,945	$2,529	$3,066	$3,661
Low Need	$1,003,299	$20,066	$1,765	$326	$483	$706

Note: Performance foundation aid is calculated by taking the estimated per pupil spending required for a district to reach a particular adequacy standard (see Table 4) and subtract from it the required minimum local tax contribution. If the calculated aid is negative, it is set equal to zero.

[1]Based on a teacher cost index which adjusts for factors outside a district's control affecting required salary to recruit teachers of a given quality (Table 2).

[2]Includes all formula aid except Building Aid, Transportation Aid, and Reorganization Building aid.

[3]Based on a millage rate of $20 per $1,000 of actual property values.

Table B-11: Required Local Contribution to Meet Adequacy Standard of 150 With Minimum Local Contribution Rate of $20 per $1,000 of Property Values Type of Aid Formula: Performance Foundation Formula

District Name	2000 Local Contribution[1]			Local Contribution[2] Required to Meet Adequacy			Percent Change in Local Contribution
	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	
Total	$13,410			$17,230			28.5%
Simple Average		$5,175	$15		$6,662	$20	
Need/Resource Capacity:							
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
The Big Four	$338	$2,572	$15	$461	$3,505	$20	36.2%
High-Need Urban/Suburban	$696	$3,661	$19	$764	$4,017	$21	9.7%
High-Need Rural	$470	$2,548	$15	$668	$3,617	$21	41.9%
Average Need	$4,277	$4,778	$16	$5,477	$6,118	$21	28.0%
Low Need	$3,333	$8,920	$14	$4,090	$10,945	$17	22.7%
Regions:							
Downstate Small Cities	$310	$7,830	$16	$375	$9,483	$20	21.1%
Downstate Suburbs	$4,577	$8,044	$15	$5,598	$9,839	$18	22.3%
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
Yonkers	$105	$4,241	$13	$165	$6,641	$20	56.6%
The Big Three (upstate)	$233	$2,184	$16	$296	$2,775	$20	27.1%
Upstate Rural	$703	$3,052	$14	$1,029	$4,466	$20	46.3%
Upstate Small Cities	$733	$3,459	$16	$895	$4,224	$20	22.1%
Upstate Suburbs	$2,455	$4,141	$16	$3,101	$5,231	$20	26.3%

[1]Local contribution calculated by taking actual spending (without debt service, transportation, tuition, and other undistributed spending) minus formula state aid (minus building and transportation aid) and federal aid.

[2]Local contribution is calculated by taking the minimum local contribution rate multiplied by property values in a district. If performance is already above the adequacy standard (or local contribution is already above the minimum), then this is set at the 2000 contribution. For districts where their 2000 local contribution exceeds the minimum local contribution their required local contribution may go down as the standard increases if they start receiving state aid. This is especially true for average need and low need districts. It is for this reason that the total local contribution goes down slightly as the as the adequacy standard increases.

Table B-12: Required Local Contribution to Meet Adequacy Standard of 160 With Minimum Local Contribution Rate of $20 per $1,000 of Property Values Type of Aid Formula: Performance Foundation Formula

District Name	2000 Local Contribution[1]			Local Contribution[2] Required to Meet Adequacy			Percent Change in Local Contribution
	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	
Total	$13,410			$16,748			24.9%
Simple Average		$5,175	$15		$6,406	$19	
Need/Resource Capacity:							
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
The Big Four	$338	$2,572	$15	$461	$3,505	$20	36.2%
High-Need Urban/Suburban	$696	$3,661	$19	$745	$3,920	$21	7.1%
High-Need Rural	$470	$2,548	$15	$638	$3,455	$20	35.6%
Average Need	$4,277	$4,778	$16	$5,136	$5,737	$19	20.1%
Low Need	$3,333	$8,920	$14	$3,997	$10,696	$17	19.9%
Regions:							
Downstate Small Cities	$310	$7,830	$16	$368	$9,307	$19	18.9%
Downstate Suburbs	$4,577	$8,044	$15	$5,440	$9,562	$18	18.9%
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
Yonkers	$105	$4,241	$13	$165	$6,641	$20	56.6%
The Big Three (upstate)	$233	$2,184	$16	$296	$2,775	$20	27.1%
Upstate Rural	$703	$3,052	$14	$970	$4,209	$19	37.9%
Upstate Small Cities	$733	$3,459	$16	$867	$4,093	$19	18.3%
Upstate Suburbs	$2,455	$4,141	$16	$2,870	$4,842	$19	16.9%

[1]Local contribution calculated by taking actual spending (without debt service, transportation, tuition, and other undistributed spending) minus formula state aid (minus building and transportation aid) and federal aid.

[2]Local contribution is calculated by taking the minimum local contribution rate multiplied by property values in a district. If performance is already above the adequacy standard (or local contribution is already above the minimum), then this is set at the 2000 contribution. For districts where their 2000 local contribution exceeds the minimum local contribution their required local contribution may go down as the standard increases if they start receiving state aid. This is especially true for average need and low need districts. It is for this reason that the total local contribution goes down slightly as the as the adequacy standard increases.

Table B-13. Summary of Cost Indices -- Calculated from Cost Regression (Model 2)[1]

	Number of Districts	All Cost Factors[2]	All But Enrollment[3]	Student Needs Only[4]	Child Poverty Only	Teacher Salary Only	LEP Only	Enrollment Only	Overall Teacher Wage Index[5]	Prof. Wage Index (County)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)
Descriptive Statistics:										
Minimum		74.30	75.85	76.23	62.67	81.89	95.58	92.97	80.34	46.61
25th Percentile		89.02	88.38	84.77	84.93	88.28	95.58	94.74	89.94	75.93
Median		94.55	94.79	96.45	97.08	92.95	95.58	95.68	96.36	96.57
75th Percentile		102.07	101.51	107.73	108.15	108.46	96.83	102.96	108.41	116.39
Maximum		228.23	236.39	189.31	169.39	128.93	124.73	103.68	294.06	197.67
Need/Resource Capacity:										
New York City	1	188.07	176.01	166.84	146.59	102.37	110.44	103.68	154.42	197.67
The Big Four	4	172.99	161.90	160.93	147.25	97.75	106.58	103.68	132.09	128.62
High-Need Urban/Suburban	37	135.06	137.59	133.62	127.43	99.30	101.62	95.28	114.17	106.13
High-Need Rural	161	101.74	99.62	110.56	111.80	87.49	95.95	99.17	90.08	76.69
Average Need	341	92.97	93.50	94.71	95.07	95.94	96.69	96.58	98.66	96.84
Low Need	134	94.53	95.33	81.03	80.42	114.33	97.90	96.20	110.06	132.77
Regions:										
Downstate Small Cities	7	134.53	136.57	109.92	101.78	121.06	104.78	95.42	128.22	152.07
Downstate Suburbs	168	104.42	105.80	87.63	85.31	117.26	99.38	95.87	113.93	131.34
New York City	1	188.07	176.01	166.84	146.59	102.37	110.44	103.68	154.42	197.67
Yonkers	1	160.53	150.24	142.16	119.04	102.55	115.88	103.68	150.85	159.33
The Big Three (upstate)	3	177.15	165.79	167.18	156.66	96.14	103.48	103.68	125.84	118.39
Upstate Rural	207	96.45	94.45	104.54	105.83	87.82	95.84	99.10	89.89	77.27
Upstate Small Cities	49	112.51	115.09	119.88	118.34	93.08	98.18	94.82	103.85	92.41
Upstate Suburbs	242	90.02	90.36	94.61	95.71	93.02	95.94	96.62	96.63	96.84

[1]Includes in the cost model a weighted performance measure, predicted wages,the percent of children receiving free lunch, share of students with limited English proficiency (LEP), enrollment and efficiency variables. See cost Model 2 in Table B-5 iin Appendix B.

[2]Includes adjustment for free lunch students, LEP students, teacher salaries, and enrollment size.

[3]Includes adjustment for free lunch students, LEP students, teacher salaries, but not enrollment size.

[4]Includes adjustment for free lunch students and LEP students.

[5]Based on Model B in Table B-2 in Appendix B. This is predicted salary required to attract teacher with average characteristics, and in district with average school enrollment, class size, and efficiency.

Table B-14. Cost Impact of Student Needs (Model 2)[1]

Classification	Extra Cost Per Free Lunch Student[2]	Free Lunch Student Weight	Extra Cost Per LEP Student[2]	LEP Student Weight
Descriptive Statistics:				
Minimum	$8,033	0.85	$10,964	1.17
25th Percentile	$9,285	0.98	$11,021	1.18
Median	$9,919	1.05	$11,089	1.19
75th Percentile	$10,475	1.10	$11,287	1.21
Maximum	$13,273	1.40	$12,558	1.34
Need/Resource Capacity:				
New York City	$12,276	1.29	$11,792	1.26
The Big Four	$12,289	1.29	$11,578	1.24
High-Need Urban/Suburban	$11,387	1.20	$11,352	1.21
High-Need Rural	$10,648	1.12	$11,147	1.19
Average Need	$9,806	1.03	$11,153	1.19
Low Need	$9,037	0.95	$11,205	1.20
Regions:				
Downstate Small Cities	$10,138	1.07	$11,564	1.24
Downstate Suburbs	$9,285	0.98	$11,293	1.21
New York City	$12,276	1.29	$11,792	1.26
Yonkers	$11,003	1.16	$12,087	1.29
The Big Three (upstate)	$12,717	1.34	$11,408	1.22
Upstate Rural	$10,352	1.09	$11,087	1.19
Upstate Small Cities	$10,954	1.15	$11,194	1.20
Upstate Suburbs	$9,838	1.04	$11,037	1.18

Note: Pupil weight is defined as the percent increase in costs associated with a student of a certain type. For example, the LEP student weight in New York City is 1.24. This indicates that bringing a typical LEP student in NYC up to a given performance level will cost 124 percent more than a non-LEP student with otherwise similar characteristics.

[1]Includes in the cost model a weighted performance measure, predicted wages, percent of children receiving free lunch, share of students with limited English proficiency (LEP), enrollment and several efficiency variables (Model 2 in Table B-5).

[2]This is the cost of bringing a student with this characteristic up to average performance in the state, which is 159.5.

Table B-15. Required Spending to Achieve Adequacy (1999-2000) In Districts with Performance Below the Specified Standard (full cost adjustment--Model 2)[1]

	Performance Index (2000)	1999-2000 Expenditures (millions)	Required Spending For Adequacy (millions)	1999-2000 Per Pupil Expenditure	Required Spending For Adequacy Per Pupil
STANDARD OF 140					
Total (average)	125	$13,210	$20,343	$9,145	$14,083
Required additional spending			$7,133		
Number of districts below standard			71		
Need/ResourceCapacity:					
New York City	103	$9,433	$15,789	$8,823	$14,768
The Big Four	99	$1,300	$1,815	$9,884	$13,791
High-Need Urban/Suburban	120	$1,294	$1,506	$10,325	$12,019
High-Need Rural	131	$273	$277	$9,159	$9,266
Average Need	131	$881	$929	$10,200	$10,753
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 150					
Total (average)	137	$15,256	$24,452	$9,182	$14,716
Required additional spending			$9,196		
Number of districts below standard			178		
Need/ResourceCapacity:					
New York City	103	$9,433	$17,366	$8,823	$16,243
The Big Four	99	$1,300	$1,996	$9,884	$15,169
High-Need Urban/Suburban	128	$1,778	$2,190	$9,944	$12,247
High-Need Rural	140	$770	$811	$8,932	$9,403
Average Need	142	$1,946	$2,062	$10,052	$10,646
Low Need	137	$28	$28	$12,360	$12,360
STANDARD OF 160					
Total (average)	146	$17,924	$29,721	$9,130	$15,139
Required additional spending			$11,797		
Number of districts below standard			332		
Need/ResourceCapacity:					
New York City	103	$9,433	$19,188	$8,823	$17,947
The Big Four	99	$1,300	$2,205	$9,884	$16,760
High-Need Urban/Suburban	131	$1,874	$2,514	$9,857	$13,223
High-Need Rural	147	$1,330	$1,504	$8,686	$9,824
Average Need	149	$3,826	$4,149	$9,454	$10,251
Low Need	149	$160	$160	$11,057	$11,120

[1]The estimated costs of achieving adequacy are only for districts with performance below the standard. Cost of adequacy is calculated by taking the required spending in the average district to reach a standard multiplied by the cost index with adjustment for all cost factors divided by 100. If the required cost of adequacy is less than the actual spending level, then the cost is set at the present spending level. Based on cost Model 2 in Table B-5.

Table B-16. Required Spending to Achieve Adequacy (1999-2000) In Districts with Performance Below the Specified Standard (full cost adjustment--Model 2)[1]

	Performance Index (2000)	1999-2000 Expenditures (millions)	Required Spending For Adequacy (millions)	1999-2000 Per Pupil Expenditure	Required Spending For Adequacy Per Pupil
STANDARD OF 140					
Total (pupil-weighted average)	125	$13,210	$20,343	$9,145	$14,083
Required additional spending			$7,133		
Number of districts below standard			71		
Regions:					
Downstate Small Cities	131.33	$239	$276	$10,400	$12,014
Downstate Suburbs	120.09	$1,023	$1,148	$11,723	$13,152
New York City	102.50	$9,433	$15,789	$8,823	$14,768
Yonkers	107.00	$309	$313	$12,437	$12,601
The Big Three (upstate)	96.13	$991	$1,501	$9,289	$14,068
Upstate Rural	131.18	$192	$193	$9,509	$9,522
Upstate Small Cities	125.92	$730	$827	$9,335	$10,577
Upstate Suburbs	130.31	$292	$296	$8,307	$8,423
STANDARD OF 150					
Total (average)	137	$15,256	$24,452	$9,182	$14,716
Required additional spending			$9,196		
Number of districts below standard			178		
Regions:					
Downstate Small Cities	136	$371	$435	$11,414	$13,360
Downstate Suburbs	129	$1,480	$1,687	$11,689	$13,327
New York City	103	$9,433	$17,366	$8,823	$16,243
Yonkers	107	$309	$344	$12,437	$13,860
The Big Three (upstate)	96	$991	$1,651	$9,289	$15,474
Upstate Rural	142	$591	$607	$9,038	$9,280
Upstate Small Cities	135	$1,329	$1,567	$9,190	$10,837
Upstate Suburbs	141	$751	$794	$8,186	$8,652
STANDARD OF 160					
Total (average)	146	$17,924	$29,721	$9,130	$15,139
Required additional spending			$11,797		
Number of districts below standard			332		
Regions:					
Downstate Small Cities	136	$371	$465	$11,414	$14,285
Downstate Suburbs	138	$1,988	$2,321	$11,476	$13,399
New York City	103	$9,433	$19,188	$8,823	$17,947
Yonkers	107	$309	$381	$12,437	$15,319
The Big Three (upstate)	96	$991	$1,825	$9,289	$17,096
Upstate Rural	149	$1,310	$1,426	$8,698	$9,472
Upstate Small Cities	141	$1,640	$2,077	$9,093	$11,515
Upstate Suburbs	149	$1,882	$2,039	$8,333	$9,032

[1]The estimated costs of achieving adequacy are only for districts with performance below the standard. Cost of adequacy is calculated by taking the required spending in the average district to reach a standard multiplied by the cost index with adjustment for all cost factors divided by 100. If the required cost of adequacy is less than the actual spending level, then the cost is set at the present spending level. Based on cost Model 2 in Table B-5.

Table B-17. Distribution of State Education Aid Using a "Performance" Foundation Formula (full cost adjustment-Model 2)[1]

	Number of Districts	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
		Total--Millions of Dollars				
All Districts	678	$17,681	$11,070	$14,137	$16,845	$19,896
Required additional aid				$3,067	$5,774	$8,826
Need/Resource Capacity:						
New York City	1	$5,771	$4,222	$9,308	$10,892	$12,635
The Big Four	4	$461	$710	$1,237	$1,419	$1,619
High-Need Urban/Suburban	37	$727	$1,059	$1,221	$1,428	$1,656
High-Need Rural	161	$645	$1,045	$750	$894	$1,053
Average Need	341	$5,292	$3,322	$1,583	$2,131	$2,787
Low Need	134	$4,786	$712	$38	$80	$146

	Property Values (1998)	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				2001 Standard	Stand. of 150	Stand. of 160
			Per Pupil--Dollars			
Need/Resource Capacity:						
New York City	$269,888	$5,398	$3,949	$8,706	$10,188	$11,818
The Big Four	$189,229	$3,785	$5,154	$8,933	$10,296	$11,796
High-Need Urban/Suburban	$197,210	$3,944	$5,726	$6,053	$7,117	$8,287
High-Need Rural	$201,122	$4,022	$5,773	$3,879	$4,620	$5,448
Average Need	$313,092	$6,262	$3,945	$1,916	$2,498	$3,175
Low Need	$1,003,299	$20,066	$1,765	$50	$119	$239

Note: Performance foundation aid is calculated by taking the estimated per pupil spending required for a district to reach a particular adequacy standard and subtract from it the required minimum local tax contribution. If the calculated aid is negative, it is set equal to zero.

[1]Based on the cost index which adjusts for all cost factors (see Table B-13) from cost Model 2 (Table B-5).

[2]Includes all formula aid except Building Aid, Transportation Aid, and Reorganization Building aid.

[3]Based on a millage rate of $20 per $1,000 of actual property values.

Table B-18. Distribution of State Education Aid Using a "Performance" Foundation Formula (full cost adjustment-Model 2)[1]

	Number of Districts	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				Stand. of 140	Stand. of 150	Stand. of 160
		Total--Millions of Dollars				
All Districts	678	$17,681	$11,070	$14,137	$16,845	$19,896
Required additional aid				$3,067	$5,774	$8,826
Regions:						
Downstate Small Cities	7	$378	$125	$108	$135	$168
Downstate Suburbs	168	$6,060	$1,690	$795	$1,034	$1,327
New York City	1	$5,771	$4,222	$9,308	$10,892	$12,635
Yonkers	1	$165	$77	$131	$162	$197
The Big Three (upstate)	3	$296	$633	$1,106	$1,257	$1,422
Upstate Rural	207	$1,030	$1,173	$702	$856	$1,028
Upstate Small Cities	49	$894	$1,015	$944	$1,128	$1,336
Upstate Suburbs	242	$3,086	$2,135	$1,044	$1,379	$1,783

	Property Values (1998)	Minimum Local Tax Contribution[3]	2000-01 Aid[2]	Performance Foundation Aid By Student Performance Standard		
				2001 Standard	Stand. of 150	Stand. of 160
			Per Pupil--Dollars			
Regions:						
Downstate Small Cities	$541,959	$10,839	$3,205	$2,142	$2,651	$3,292
Downstate Suburbs	$858,868	$17,177	$2,419	$778	$1,047	$1,392
New York City	$269,888	$5,398	$3,949	$8,706	$10,188	$11,818
Yonkers	$332,061	$6,641	$3,112	$5,270	$6,535	$7,926
The Big Three (upstate)	$141,618	$2,832	$5,835	$10,154	$11,550	$13,085
Upstate Rural	$276,110	$5,522	$5,203	$3,022	$3,659	$4,374
Upstate Small Cities	$202,708	$4,054	$4,937	$4,359	$5,215	$6,171
Upstate Suburbs	$271,541	$5,431	$4,031	$2,165	$2,758	$3,446

Note: Performance foundation aid is calculated by taking the estimated per pupil spending required for a district to reach a particular adequacy standard and subtract from it the required minimum local tax contribution. If the calculated aid is negative, it is set equal to zero.

[1]Based on the cost index which adjusts for all cost factors (see Table B-13) from cost Model 2 (Table B-5).

[2]Includes all formula aid except Building Aid, Transportation Aid, and Reorganization Building aid.

[3]Based on a millage rate of $20 per $1,000 of actual property values.

Table B-19: Required Local Contribution to Meet Adequacy Standard of 140 With Minimum Local Contribution Rate of $20 per $1,000 of Property Values Type of Aid Formula: Performance Foundation Formula (Model 2)

District Name	2000 Local Contribution[1]			Local Contribution[2] Required to Meet Adequacy			Percent Change in Local Contribution
	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	Total Taxes (Millions)	Per Pupil Taxes	$ per $1,000 of Full Value	
Total	$13,410			$18,334			36.7%
Simple Average		$5,175	$15		$7,252	$23	
Need/Resource Capacity:							
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
The Big Four	$338	$2,572	$15	$461	$3,505	$20	36.2%
High-Need Urban/Suburban	$696	$3,661	$19	$741	$3,896	$20	6.4%
High-Need Rural	$470	$2,548	$15	$754	$4,084	$23	60.3%
Average Need	$4,277	$4,778	$16	$6,370	$7,116	$24	48.9%
Low Need	$3,333	$8,920	$14	$4,237	$11,339	$18	27.1%
Regions:							
Downstate Small Cities	$310	$7,830	$16	$379	$9,576	$20	22.3%
Downstate Suburbs	$4,577	$8,044	$15	$5,851	$10,284	$19	27.8%
New York City	$4,295	$4,017	$15	$5,771	$5,398	$20	34.4%
Yonkers	$105	$4,241	$13	$165	$6,641	$20	56.6%
The Big Three (upstate)	$233	$2,184	$16	$296	$2,775	$20	27.1%
Upstate Rural	$703	$3,052	$14	$1,184	$5,136	$23	68.3%
Upstate Small Cities	$733	$3,459	$16	$937	$4,424	$21	27.9%
Upstate Suburbs	$2,455	$4,141	$16	$3,752	$6,329	$24	52.8%

[1]Local contribution calculated by taking actual spending (without debt service, transportation, tuition, and other undistributed spending) minus formula state aid (minus building and transportation aid) and federal aid.

[2]Local contribution is calculated by taking the minimum local contribution rate multiplied by property values in a district. If performance is already above the adequacy standard (or local contribution is already above the minimum), then this is set at the 2000 contribution. For districts where their 2000 local contribution exceeds the minimum local contribution their required local contribution may go down as the standard increases if they start receiving state aid. This is especially true for average need and low need districts. It is for this reason that the total local contribution goes down slightly as the as the adequacy standard increases.

Table B-20: State and Local Share of Financing Spending Required for An Adequate Education (Model 2)
Performance Foundation Aid Formula and Minimum Local Contribution Rate of $20 per $1,000 of Property Values

Need/Capacity Category	Required Spending To Achieve Adequacy (millions)	State Aid[1] (Foundation Formula) Total (millions)	State Aid[1] (Foundation Formula) % of Total Spending	Local Contribution to Meet Adequacy[2] Total (millions)	Local Contribution to Meet Adequacy[2] % of Total Spending	Federal Aid Total (millions)	Federal Aid % of Total Spending
2000 Actual Spending and Aid:							
Total State	$26,679	$11,847	44.4%	$13,410	50.3%	$1,422	5.3%
New York City	$9,433	$4,357	46.2%	$4,295	45.5%	$782	8.3%
The Big Four	$1,300	$837	64.4%	$338	26.0%	$125	9.6%
High-Need Urban Suburban	$1,874	$1,052	56.1%	$696	37.1%	$126	6.7%
High-Need Rural	$1,597	$1,031	64.5%	$470	29.4%	$96	6.0%
Average Need	$8,141	$3,628	44.6%	$4,277	52.5%	$236	2.9%
Low Need	$4,333	$942	21.7%	$3,333	76.9%	$58	1.3%
Adequacy Standard: 140							
Total State	$33,894	$14,137	41.7%	$18,334	54.1%	$1,422	4.2%
New York City	$15,860	$9,308	58.7%	$5,771	36.4%	$782	4.9%
The Big Four	$1,823	$1,237	67.9%	$461	25.3%	$125	6.8%
High-Need Urban Suburban	$2,088	$1,221	58.5%	$741	35.5%	$126	6.0%
High-Need Rural	$1,601	$750	46.9%	$754	47.1%	$96	6.0%
Average Need	$8,189	$1,583	19.3%	$6,370	77.8%	$236	2.9%
Low Need	$4,333	$38	0.9%	$4,237	97.8%	$58	1.3%
Adequacy Standard: 150							
Total State	$35,966	$16,845	46.8%	$17,700	49.2%	$1,422	4.0%
New York City	$17,445	$10,892	62.4%	$5,771	33.1%	$782	4.5%
The Big Four	$2,005	$1,419	70.8%	$461	23.0%	$125	6.2%
High-Need Urban Suburban	$2,289	$1,428	62.4%	$734	32.1%	$126	5.5%
High-Need Rural	$1,639	$894	54.5%	$649	39.6%	$96	5.9%
Average Need	$8,256	$2,131	25.8%	$5,890	71.3%	$236	2.9%
Low Need	$4,333	$80	1.9%	$4,195	96.8%	$58	1.3%
Adequacy Standard: 160							
Total State	$38,476	$19,896	51.7%	$17,158	44.6%	$1,422	3.7%
New York City	$19,188	$12,635	65.9%	$5,771	30.1%	$782	4.1%
The Big Four	$2,205	$1,619	73.4%	$461	20.9%	$125	5.7%
High-Need Urban Suburban	$2,514	$1,656	65.9%	$732	29.1%	$126	5.0%
High-Need Rural	$1,771	$1,053	59.4%	$622	35.1%	$96	5.4%
Average Need	$8,464	$2,787	32.9%	$5,441	64.3%	$236	2.8%
Low Need	$4,334	$146	3.4%	$4,130	95.3%	$58	1.3%

[1]Actual aid in 2000 is calculated as a residual based on spending minus local contribution and state aid. In almost all cases this is below total state aid received by the district.

[2]For actual local contribution in 2000, this is calculated by taking actual total local revenue and subtracting from it the local revenue share (local revenue divided by total revenue) expenditures not included in the expenditure measure used in this study (transportation, debt service, tuition, and other undistributed spending).

Table B-21: State and Local Share of Financing Spending Required for An Adequate Education (Model 2)
Performance Foundation Aid Formula and Minimum Local Contribution Rate of $20 per $1,000 of Property Values

Region	Required Spending To Achieve Adequacy (millions)	State Aid (Foundation Formula) Total (millions)	State Aid (Foundation Formula) % of Total Spending	Local Contribution to Meet Adequacy Total (millions)	Local Contribution to Meet Adequacy % of Total Spending	Federal Aid Total (millions)	Federal Aid % of Total Spending
Adequacy Standard: 140							
Total State	$33,894	$14,137	41.7%	$18,334	54.1%	$1,422	4.2%
Downstate Small Cities	$502	$108	21.4%	$379	75.4%	$16	3.1%
Downstate Suburbs	$6,780	$795	11.7%	$5,851	86.3%	$133	2.0%
New York City	$15,860	$9,308	58.7%	$5,771	36.4%	$782	4.9%
Yonkers	$315	$131	41.6%	$165	52.4%	$19	5.9%
The Big Three (upstate)	$1,508	$1,106	73.3%	$296	19.6%	$106	7.0%
Upstate Rural	$1,982	$702	35.4%	$1,184	59.7%	$97	4.9%
Upstate Small Cities	$2,007	$944	47.0%	$937	46.7%	$126	6.3%
Upstate Suburbs	$4,939	$1,044	21.1%	$3,752	76.0%	$144	2.9%
Adequacy Standard: 150							
Total State	$35,966	$16,845	46.8%	$17,700	49.2%	$1,422	4.0%
Downstate Small Cities	$528	$135	25.6%	$377	71.4%	$16	3.0%
Downstate Suburbs	$6,862	$1,034	15.1%	$5,695	83.0%	$133	1.9%
New York City	$17,445	$10,892	62.4%	$5,771	33.1%	$782	4.5%
Yonkers	$346	$162	46.9%	$165	47.7%	$19	5.4%
The Big Three (upstate)	$1,659	$1,257	75.8%	$296	17.9%	$106	6.4%
Upstate Rural	$1,999	$856	42.8%	$1,045	52.3%	$97	4.8%
Upstate Small Cities	$2,150	$1,128	52.5%	$895	41.6%	$126	5.9%
Upstate Suburbs	$4,979	$1,379	27.7%	$3,455	69.4%	$144	2.9%
Adequacy Standard: 160							
Total State	$38,476	$19,896	51.7%	$17,158	44.6%	$1,422	3.7%
Downstate Small Cities	$558	$168	30.1%	$375	67.1%	$16	2.8%
Downstate Suburbs	$6,989	$1,327	19.0%	$5,529	79.1%	$133	1.9%
New York City	$19,188	$12,635	65.9%	$5,771	30.1%	$782	4.1%
Yonkers	$381	$197	51.7%	$165	43.4%	$19	4.9%
The Big Three (upstate)	$1,825	$1,422	78.0%	$296	16.2%	$106	5.8%
Upstate Rural	$2,099	$1,028	49.0%	$973	46.4%	$97	4.6%
Upstate Small Cities	$2,345	$1,336	57.0%	$882	37.6%	$126	5.4%
Upstate Suburbs	$5,093	$1,783	35.0%	$3,166	62.2%	$144	2.8%