Determining the Cost of an Adequate Education in Minnesota

Implications for the Minnesota Education Finance System

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Executive Summary

Purpose of the Study

There are three basic reasons why school spending varies among school districts: 1) some districts *choose to* spend more to get better results; 2) some districts *have to* spend more because certain district and student characteristics create a more costly educational environment; and 3) some districts *unnecessarily* spend more because they are not as efficient as they could be. Any meaningful effort to improve accountability in public education finance must try to disentangle these three reasons for variations in district spending. Any serious attempt to create an education finance system that links funding to achieving a set of state education standards must take into account the influence environmental cost factors have on the ability to achieve state standards.

The purpose of this study is to discover what influence these factors have on school spending in order to determine what it costs to provide an "adequate" public education in Minnesota. "Adequacy" is defined as the achievement of certain state test score standards. The study examines how the cost to achieve these standards varies among school districts and what the implications of this variation are for Minnesota's education finance system.

Methodology of the Study

The cost estimates are created using an advanced statistical and linear programming technique called Data Envelopment Analysis (DEA). Data envelopment analysis is a technique for measuring the relative performance of organizations where the presence of multiple types of inputs and outcomes makes direct comparisons between organizations difficult. Because of its ability to handle multiple types of outcomes simultaneously, DEA is especially well suited for examining school district performance. DEA has been used to evaluate the performance of a wide variety of public and private institutions such as hospitals, police departments, and bank branches. Dr. John Ruggiero, the principal technical investigator for this project and professor of economics at the University of Dayton is a leading researcher in DEA analysis as it applies to public education and school district performance.

DEA is a "benchmarking" approach that compares each district to actual best performing districts or groups of districts in the state—districts getting the same or better educational outcomes at lower levels of spending. Environmental cost factors, such as district poverty, district size, numbers of special needs students, etc., are incorporated into the analysis so that this benchmarking approach does not unfairly penalize districts for having these characteristics.

Definition of "Adequacy"

Based on consultation with the Minnesota Department of Education, eight different outcome measures were used to define an "adequate education." These are:

- *Minnesota Comprehensive Assessment Test:* 3rd and 5th grade math and reading scores. "Adequacy" was defined by an index score of 1420 which represents a student achieving at grade level.

- *Minnesota Basic Skills Tests*: 8th grade math and reading scores and 10th grade writing scores. A score of 600 for both the math and reading tests and a score of 3.0 on the writing test represent the minimum requirements needed to graduate.

- *State graduation rate:* The state standard of 80%. A substitute measure, the "non drop-out rate" (1 minus the district drop out rate) was used to simplify data analysis across districts.

The study used fiscal year 2002 school district expenditure data and profile information, which was the most recently available as the study began Data was provided by the Minnesota Department of Education. Of the state's 343 school districts, 317 were included in the analysis. Incomplete performance data was the primary reason for having to exclude most of the other districts. One of the 317 districts had to be subsequently excluded from the cost of adequacy analysis because no meaningful estimate of adequacy could be extrapolated from the data.

Primary Findings

- **The cost of an adequate education in Minnesota (defined as achieving the eight education standards) averaged $6,236 per pupil, but varied significantly across Minnesota school districts**. The estimated cost was well over twice the state average for the district facing the harshest educational environment ($14,446 in Minneapolis) and approximately $700 less per pupil in districts with the most advantageous environment ($5,524 shared by several districts).

- **Most Minnesota school districts spent sufficient amounts to achieve an "adequate education" as defined by the eight standards.** Only 8 districts had per pupil spending totals less than the districts' per pupil cost of adequacy. By taking those districts' pupil counts and multiplying by the gap between per pupil spending and per pupil cost, we estimate that $194 million in additional targeted spending would have been needed in 2002 to bring these districts up to a "basic skills" level of performance. The additional cost of achieving adequacy in these school districts not meeting the eight standards could have been offset in part by improved spending efficiencies among Minnesota school districts. Statewide, approximately $234 million more than necessary was spent to achieve 2002 levels of educational performance.

- **On average, Minnesota school districts spent about $400 more per pupil than necessary to achieve the educational test scores they are currently achieving.** There was little difference in average excess spending between metro area school districts ($418 per pupil excess) and non-metro area districts ($397 per pupil excess).

- **Statewide, districts spent approximately 20% more per pupil than necessary to achieve an adequate education as defined by the eight standards, primarily to produce better than adequate outcomes and provide extracurricular activities**. However there were significant disparities among districts regarding this relationship between district spending and its cost of adequacy. Spending ranged from nearly 80% more per pupil above and beyond the cost of adequacy to 25% per pupil less than needed to achieve adequacy.

- **In 2002, the vast majority of the 317 Minnesota school districts included in this study met and exceeded the requirements of an "adequate education"** Nearly 80% of the districts included in the analysis achieved all eight standards, and the average number of standards met across all 317 district studies was 7.65.

? **Minnesota provided sufficient resources to Minnesota school districts to support a basic education for most state students**. Including the 2002 district general education levy into state aid totals (which approximates the current education finance system since the state takeover), general education aids alone totaled nearly 80% of the state's total cost of adequacy for all districts. On a district basis, nearly 90% of the estimated cost of an adequate education was provided through general education aids alone in 2002. This support does not include voter approved referendum aid from the state or program aids such as special education. On a district basis, 14 of the 317 districts included in this study would have received more per pupil general education aids than necessary to achieve state adequacy standards with the state takeover.

- ✍ **Teacher experience and percent of district teachers with masters degrees were highly correlated with district inefficiency.** Higher spending for teachers with many years of experience and advanced degrees is often not justified by commensurate improvement in educational outcomes and test scores.

- ✍ **The optimal ratio of pupils to all teachers in a district (classroom, special program, and early childhood) in terms of getting the greatest educational return for the amount of money spent was 18 to 1.** District efficiency was found to decline at higher or lower ratios, all else being equal. (The state average is 15 to 1.)

- ✍ **The state compensates for the "correct" cost factors, but the size and distribution of individual aid programs need adjustment.** The correlation between the calculated district cost index based on state adequacy standards and the implied district cost index stemming from the 2002 state aid distribution is 0.66. We found 142 districts (45%) were overcompensated for their environmental costs; 134 districts (42%) were undercompensated for their environmental costs; and 40 districts (13%) were correctly compensated. A review of overcompensated and undercompensated districts suggests that sparsity related cost factors are overfunded and at-risk cost factors such as poverty are underfunded.

Primary Conclusions

- ✍ For 2002, Minnesota provided sufficient resources to support an adequate education in most school districts.

- ✍ Reallocation of state education resources could go a long way toward getting all districts up to adequacy standards.

- ✍ Education finance reform that is linked to educational outcomes, that promotes efficiency, and that is responsive to higher costs associated with harsher educational environments is achievable, and would provide a rational way to re-allocate the state's resources. Such an approach would entail a base "adequacy aid" amount similar in nature to existing basic education aid and would have a single cost factor adjustment for each district that controls for efficiency and compensates for environmental costs. One added benefit of this approach is that it could dramatically simplify the education aid system by eliminating individual compensatory programs.

- ✍ The projected level of spending needed to close achievement gaps (i.e., getting the highest risk students up to adequacy standards) may be cost prohibitive to the state and politically unfeasible. Alternative educational strategies and delivery reforms are likely to be necessary to achieve adequacy standards at a lower cost.

- ✍ District efficiency findings suggest the "steps and lanes" system that compensates teachers based on longevity and achievement of advanced degrees needs to be reexamined. Given the relative influence of teacher wages as a percent of total district spending, improvements in systems of teacher compensation could make a significant impact on improving the cost efficiency of delivering a quality public education in Minnesota.

Important Study Interpretations and Limitations

- **It is essential to recognize that DEA efficiency scores measure <u>relative</u> efficiency (relative to other districts), not <u>absolute</u> efficiency.** This means it is possible that all districts in Minnesota are inefficient relative to districts in other states, or relative to available practices that are not used anywhere in Minnesota because of statutory restrictions or other reasons. **In other words, a district with an efficiency score of 1.00 does <u>not</u> mean that the district cannot improve on its spending efficiency**. It is very possible further opportunities for efficiency improvements are available or that there are alternative educational delivery practices and administrative systems in existence outside of Minnesota that could result in better educational outcomes at the same or less cost. A score of 1.00 only means we have no current evidence that another district facing similar environmental conditions and cost factors in Minnesota is achieving the same or better results with less spending..

- Cost estimates generated in this study are based on statistical analysis of district spending and mathematical programming techniques. These results are estimates of *how much* a district needs to spend to achieve adequacy but provides no direct information on *how* districts could improve their spending to become more efficient and achieve better performance results. Since DEA is a benchmarking technique, insights could be gained into this issue by comparing inefficient and lowest cost districts with similar educational environments. However, this more in-depth analysis was beyond the scope and resources of this study.

- As a benchmarking technique, the analysis in this study is based on school district comparisons. This presents a problem for districts that have especially distinctive, unusual, or harsh characteristics or environments for which no comparable districts can be found. Such is the case with Minneapolis and St. Paul, for which no “peer” districts can be identified. Comparison to other large cities around the nation is not possible since the same tests must be used by all districts to measure performance.

- Technically, DEA analysis ascribes a default efficiency score of 1.00 for Minneapolis and St. Paul under the methodological premise that districts are considered lowest cost producers unless it can be proven otherwise. For purposes of calculating the cost of adequacy for these districts, we used the default efficiency score of 1.00. Additional insight into efficiency issues within these districts would require that a DEA evaluation be conducted at the school level. Although this report does contain the findings of such an evaluation based on a small subset of individual Minneapolis schools, the results cannot be extrapolated to the entire district.

- Because the study is based on 2002 expenditure information, cost of adequacy estimates may be low given recent increases in various educational inputs, such as health care benefits.

I. Introduction

The stability of a republican form of government depending mainly upon the intelligence of the people, it is the duty of the legislature to establish a general and uniform system of public schools. The legislature shall make such provisions by taxation or otherwise as will secure a thorough and efficient system of public schools throughout the state.

Minnesota Constitution, Article XIII, Section 1

Minnesotans have always placed a high priority on public education as evidenced by the fact that our state constitution provides for the public school system. This commitment is also reflected in the state budget. In 2004, Minnesota is expected to provide $4.8 billion of general education aids to Minnesota school districts as part of over $5.6 billion in total K-12 education appropriations. The magnitude of this spending and the stakes involved—the education of our children—inevitably results in the same three questions being asked every legislative session:

Are we spending enough to provide an adequate education? Historically, the only way to gauge whether the level of support is sufficient has been to compare Minnesota school expenditures to other states. Such a comparison may be interesting, but it provides little in the way of information about whether a "thorough and efficient system" as described in the constitution is actually being provided here in the state.

Are aids being distributed fairly? In addition to a base per pupil aid amount given to all districts, Minnesota also provides several other types of general education aids. These supplemental aids are intended to compensate districts for higher educational costs they incur as a result of certain district and student characteristics like the prevalence of poverty and the number of non-English speaking students. But we have little information to determine whether these aid programs are adequately compensating, overcompensating, or under compensating districts for these costs. On a more fundamental level, we cannot tell if higher levels of district spending are due to harsher educational environments or are symptoms of district inefficiency.

Are we getting the educational outcomes we should be getting from this investment? Many states are using standardized test scores to evaluate the results achieved by education spending in order to improve accountability in education finance. Minnesota is no exception. But connecting spending to outcomes is problematic since so many other factors outside of the school's control—including the home environment—determine how well a student performs.

Two recent developments make finding answers to these questions even more important. The first is the 2001 state takeover of the general education levy. With over 80% of all education funding now coming from the state, Minnesota has assumed an even greater financial responsibility for ensuring an adequate public education for all students. Ensuring a fair and accountable system for distributing funds to school districts becomes even more critical. The second is the emergence of the "achievement gap" existing between Caucasian and minority students on state test scores. While many non-financial issues may contribute to the existence of the gap, efforts to close it will undoubtedly have some implications for the allocation of state education funds.

I. Introduction

Overview of this Study

The purpose of this research study was to examine what it costs to provide an adequate public education in Minnesota and explore the implications of moving toward an education finance system based on achieving student performance standards. The centerpiece of the investigation is the development of school district-specific estimates of what it costs to provide an “adequate” education as defined by the achievement of certain state test score standards. From these cost estimates, district-specific cost indices are derived which indicate how much more or less a district has to spend in order to achieve the target “adequacy” standards due to environmental cost factors beyond districts’ control. These cost indices are used to evaluate how well existing state aid programs compensate districts for costs outside of their control and identify potential areas of improvement in state aid distribution.

The report is organized as follows:

Section 2 provides a brief introduction to key issues involved in an effort to quantify what it costs school districts to provide a basic or “adequate” education, as well as a description of the methodology used in this study.

Section 3 presents the findings pertaining to the components of district cost estimates, the cost estimates themselves, and findings regarding the sufficiency of Minnesota education funding and the quality of its aid system.

Section 4 provides summary analysis and conclusions regarding study findings and their implications for education finance reform.

Two appendices are also included. Appendix A is a technical appendix written by Dr. John Ruggiero, the principal technical investigator for this project. The appendix provides a more detailed discussion of the steps and mathematical procedures used in Data Envelopment Analysis (DEA)—the methodology employed in this study—as well as the relevant statistical results.

Appendix B contains summary school district profiles—district specific results regarding educational cost, spending, efficiency, outcomes, and adequacy of state compensation for district environmental cost factors.

II. Basics of Estimating the Cost of an "Adequate" Education

Defining an Adequate Education

Any effort to estimate the cost of an adequate education begins with identifying a set of performance standards that can be used to define what an adequate education requires. These achievement standards must be measurable and used by all districts in the state to allow cross-district comparisons and analysis. Based on consultation with the Minnesota Department of Education, we used eight different outcome measures to define "adequacy" (see Table 1). From the Minnesota Comprehensive Assessment Test we used 3rd and 5th grade math and reading scores. "Adequacy" was defined by an index score of 1420 which represents a student achieving at grade level. From the Minnesota Basic Skills tests we used 8th grade math and reading scores and 10th grade writing scores. A score of 600 for both math and reading tests and a score of 3.0 on the writing test represent the minimum requirements needed to graduate. Finally, we used a state graduation standard of 80%. A substitute measure, the "non drop-out rate" (1 minus the district drop out rate) was used to simplify data analysis across districts.

TABLE 1: Outcome Measures Used to Define an "Adequate" Education

Test	Score Indicating "Adequacy"
MN Comprehensive Assessment Tests 3rd and 5th grade math 3rd and 5th grade reading	1420 for all tests
MN Basic Skills Tests 8th grade math 8th grade reading 10th grade writing	 600 600 3.0
Graduation Rate (non-drop out rate)	80%

It is possible that the achievement of these "basic skill" performance levels could be considered too low to satisfy the concept of adequate education. As part of our analysis we also examined the index scores of 1500 for the 3rd and 5th grade Minnesota Comprehensive Assessment tests which indicate "proficiency" skill levels according to the Minnesota Department of Education.

Why District Spending is Not the Same as District Cost

Once adequacy test score levels are established, the relationship between district spending and district cost can be explored. Current district spending can **not** serve as a proxy for district costs for three reasons:

1) *A district is likely to be achieving results above or below the adequacy standards (or perhaps a mix of both) with their current spending*. An effort to estimate a cost of meeting adequacy standards needs to control for the different outcomes districts are obtaining with their existing spending.

2) *District spending reflects costs that are both under the control of school districts and outside of their control*. For example, in setting hiring policies, districts make decisions about the quality of teachers they recruit and retain—decisions that have obvious financial implications. School boards also have influence on salary negotiations with administrators. Spending requirements from these decisions are within the control of school districts. On the other hand, a district may feature a large concentration of at-risk students requiring lower teacher-to-pupil ratios to achieve adequacy standards. This same district characteristic may increase the price of teachers, that is, force the district to pay some type of wage premium in order to attract teachers to this more difficult educational environment. This kind of district spending is outside of the control of school districts. An effort to estimate district cost of adequacy should identify and separate the "controllable" from the "uncontrollable" cost factors and include only spending that is driven by cost factors over which the district has no control.

3) *Districts will vary in how efficiently they make use of their financial resources*. An effort to estimate a district cost of adequacy should also factor in how efficiently the district is in spending its money.

As might be expected, estimating district costs of achieving adequacy standards while controlling for different current performance outcomes, different environmental cost factors, and different levels of spending efficiency is a complicated task. This has been a topic of great interest in school finance research, and several different approaches have been developed[1]. In this study we employed a linear programming based technique called Data Envelopment Analysis to develop the cost estimates for Minnesota school districts.

Study Methodology—Overview of Data Envelopment Analysis

Data envelopment analysis (DEA) is a technique for measuring the relative performance of organizations where the presence of multiple inputs and outcomes makes direct comparisons between organizations difficult. It has been used to measure and compare the efficiency and performance of a wide variety of public and private institutions such as police departments, hospitals, retail shops, and bank branches. Because of its ability to handle multiple outcomes simultaneously, DEA is especially well suited for examining school district performance. Unlike other statistical approaches that would compare individual districts to a hypothetical "state average school district," DEA is a "benchmarking" approach which compares each district to actual best performing districts.

The three-stage DEA model used in this study is described in Appendix A and summarized in the chart below. It calculates measures of district efficiency while controlling for district environmental cost factors and performance outcomes. The measure of district efficiency generated by DEA identifies the minimum cost necessary to achieve the performance levels the district is currently achieving. By running the linear programming model a second time using adequacy standards, a district cost estimate for achieving adequacy is created.

[1] One alternative approach employs the use of professional judgment panels which is the basis for the recommendations being developed by the Minnesota Department of Education's Education Finance Reform Task Force.

Summary of DEA Methodology

Steps	Outcome
Step 1: Select education outcome measures or test scores	Defines an "adequate education" for purposes of the investigation
Step 2: Develop a teacher wage index that controls for outcomes, teacher experience and teacher education	Identifies how much more or less, relative to the state average a district has to pay its teachers because of environmental cost factors
Step 3 Using linear programming, create a preliminary district efficiency index (DEA stage 1)	A benchmarking comparison of school districts based both on educational outcomes achieved and actual spending. Benchmarking does not control for the impact of environmental cost factors on district spending
Step 4: Using regression analysis, determine the impact of environmental costs—including the results of Step 2, the teacher wage index—on the preliminary efficiency index (DEA stage 2)	Converts multiple environmental cost factors into an overall index of district environmental cost
Step 5: Repeat Step 3 but this time include the results of step 4 (DEA stage 3)	A revised benchmarking comparison containing district-specific estimates of the minimum amount of spending needed to achieve current educational outcomes given environmental cost factors. The difference between this minimum amount of spending (as determined by lowest cost districts) and actual spending is the measure of a district's efficiency
Step 6: Re-run DEA model using adequacy standards rather than actual district outcomes	District-specific cost estimates for achieving the adequacy standards that control for environmental costs

Measuring efficiency provides the foundation for generating the district cost estimates for adequacy. The three key ideas behind school district efficiency measurement can be summarized this way:

- **A district is considered "efficient" if it is able to produce its set of educational performance outcomes with the lowest observed spending in the state given its environmental conditions.**
- **A district is "inefficient" if it has the same or more favorable environmental conditions as other districts but either 1) produces the same or lower educational outcomes with higher levels of spending; or 2) spends the same or more but produces lower educational outcomes.**
- **The degree of inefficiency is measured by the extent of this "excess" spending**

If a district's efficiency score is 1.00, the district produces its set of educational outcomes with the lowest spending levels in the state given its environmental cost factors. It does not mean that a district with a 1.00 score has the best test results, nor does it mean that the district is achieving all the adequacy standards. It only means no other districts or combination of districts facing similar environmental conditions can be found achieving the same or better results with less spending.

It is crucial to recognize that DEA measures relative efficiency (relative to other districts) but not absolute efficiency. This means it is very possible that all districts in Minnesota are inefficient relative to districts in other states, or relative to available practices that are not used anywhere in the state because of statutory restrictions or other reasons. In other words, a district score of 1.00 does **not** mean that the district cannot improve on its spending efficiency. It simply means we have no evidence elsewhere in the state that another district facing similar environmental conditions and cost factors is doing better.

MCPFR contracted with Dr. John Ruggiero to be the technical investigator for this study. Dr. Ruggiero is a professor of economics at the University of Dayton in Ohio and is a leading researcher in DEA analysis as it applies to public education and school district performance. Appendix A, the technical appendix on the methodology, was written by Dr. Ruggiero. It provides significantly more information on the mathematical procedures employed in DEA and the procedural steps used to develop both the district-specific efficiency scores and district-specific cost estimates for achieving adequacy standards.

Other Study Details

The study used fiscal year 2002 school district expenditure data and district profile information, which was the most recently available information at the commencement of the study. Data was provided by the Minnesota Department of Education

Of the state's 343 school districts, 317 were included in the analysis. Twenty-six districts had to be excluded due to incomplete data. One additional district, Red Lake, was excluded from the cost of adequacy estimates because no meaningful extrapolation could be developed to estimate its cost of adequacy. (This district featured current operating expenditures of over $13,000 per pupil but met none of the eight adequacy standards.)

Project researchers attempted to include charter schools in the analysis; however, lack of available achievement data for one or more outcome measures prevented their inclusion.

III. Study Findings

In this section we highlight primary findings pertaining to the elements making up DEA investigation as well as the DEA efficiency results themselves. We also present findings regarding district cost of adequacy estimates and findings regarding the adequacy and distribution of state financial aid based on these estimates.

Educational Outcomes

Minnesota's reputation as a high performing education state based on national test score comparisons is corroborated by the district-level results using our chosen measures of educational performance. In 2002, the vast majority of the 317 Minnesota school districts included in this study met and exceeded the requirements of an "adequate education" as defined by performance on the Minnesota Comprehensive Assessment Test, the Minnesota Basic Skills tests, and district graduation rates. As Table 2 shows over 80% of the districts studied achieved average test scores meeting or exceeding basic skill levels on 3rd and 5th grade math and reading tests. Even if the higher "proficiency" level is used as the standard to define an adequate education, nearly a quarter of all school districts have achieved this level of performance for all four tests.

TABLE 2: 2002 District Performance on Minnesota Comprehensive Assessment Tests
N=317, District average scores used for each of the four tests
Refer to Table 1 for performance scores reflecting adequacy standards

	Achieving "1420" Score (Basic Skills)		Achieving "1500" Score (Proficiency)	
Test Standards Met	**No. of Districts**	**Percent of Total**	**No. of Districts**	**Percent of Total**
Zero Standards	3	0.9%	28	8.8%
One Standard	3	0.9%	69	21.8%
Two Standards	14	4.4%	82	25.9%
Three Standards	39	12.3%	62	19.6%
Four Standards	258	81.4%	76	24.0%

When the three Minnesota Basic skills test and graduation rate standards are included, nearly 80% of the districts studied still achieved all eight standards defining an adequate education. The average number of standards met across all 317 districts was 7.65.

TABLE 3: 2002 District Performance on Eight Adequacy Standards
N=317, District average scores used for each of the four tests
Based on "1420" adequacy standard for MN comprehensive assessment tests

Test Standards Met	No. of Districts	Percent of Total
Zero Standards	1	0.3%
One Standard	1	0.3%
Two Standards	1	0.3%
Three Standards	0	0.0%
Four Standards	1	0.3%
Five Standards	4	1.3%
Six Standards	16	5.0%
Seven Standards	43	13.6%
Eight Standards	250	78.9%

Moving beyond the concept of simply achieving adequacy, the DEA methodology also allowed us to create a state educational outcomes index that identifies district performance relative to the state average across all eight adequacy standards. This index controls for environmental costs and district efficiency. Table 4 shows the distribution of districts across the state. The range is from .66 (performance levels 34% below the state average) to 1.44 (44% above the state average).

TABLE 4: District Educational Outcomes Index
N=316, excludes Red Lake School District
Percent totals may not equal 100 due to rounding

Index Score	No. of Districts	Percent of Total
Less than .7	1	0.3%
.70 – 80	1	0.3%
.80 – .90	9	2.8%
.90 – 1.00	192	60.8%
1.00 – 1.10	71	22.5%
1.10 – 1.20	25	7.9%
1.20 – 1.30	12	3.8%
1.30 – 1.40	3	0.9%
Greater than 1.4	2	0.6%

From the table we see that over 83% of all districts performed at plus or minus 10% of the state average. We can conclude that most districts do very well when measured against adequacy standards and that there is not much variation across districts in overall educational performance.

Effects of Environmental Costs on Teacher Salaries

The role of environmental factors in affecting educational costs is well established in school finance literature and has been verified in dozens of empirical studies. As discussed in Section 2, environmental factors can affect both the *amount* of educational inputs needed to achieve an adequacy standard as well as the *price* that must be paid for these inputs. Both amount and price affect district cost.

Pay for teachers is the single most important "input" in the production of education, and it accounts for the largest share of state school expenditures (about $2.6 billion last year). As a result, it is crucial to examine the impact of environmental factors on what districts must pay teachers.

To determine the effect on price, we quantified those factors that contribute to higher levels of spending on teacher salaries but that are outside the control of school districts. We accomplished this by using detailed information from the Department of Education on the characteristics of individual teachers in Minnesota and the socioeconomic characteristics of school districts they work in. Using regression analysis we created a teacher salary index—an estimate of what a district must spend compared to the state average to employ the same set of teachers. This index controls for student outcomes and other variables within a district's control such as teacher experience and education.

The index varied significantly among state school districts, ranging from a minimum of around .89 (11% below the state average) shared by several districts to a high of 1.27 (27% above the state average) in Minneapolis.

TABLE 5: District Teachers Salary Index Summary (State Average = 1.00)

	Group Average	Relative to State Ave.	Minimum	Relative to State Ave	Maximum	Relative to State Ave.
Minneapolis / St. Paul	1.261	+ 26.1%	1.244	+ 24.4%	1.277	+ 27.7%
7 County Metro	1.077	+ 7.7%	.932	- 6.8%	1.198	+ 19.8%
Non Metro	.985	- 1.5%	.887	- 11.3%	1.144	+ 14.4%

In examining the cost factors from this regression (see Appendix A for more on the regression analysis), the primary types of environmental conditions for which wage premiums must be paid by school districts include district size (both very large and very small districts), degree of poverty in the schools (represented by percentage of free and reduced lunch), and cost of living. It is worth noting that individual cost factors can work against each other, thereby reducing the influence of any one factor. For example, a small rural school district may have to pay more to attract teachers to their communities, but this additional cost may be partially or completely offset by reduced wage pressures stemming from a lower cost of living in the area, less competition for the labor base from the private sector, and lower concentrations of at-risk students in the district.

To determine the effect of environmental costs on total education spending, the teacher salary index is included with other environmental cost factors in the DEA model. Appendix A describes how the impact of environmental cost factors on district spending is derived using the DEA methodology.

Identifying which environmental cost factors "matter" can be a lengthy and expensive process. Fortunately, there is an extensive body of existing literature which has identified the types of environmental factors that influence school district spending. In order to save time and money, we used these cost factors and their standard proxies (e.g. % free and reduced lunch recipients as a measure of poverty) in the DEA model. Logically, many of the cost factors relevant to the creation of the teacher salary index are also relevant to total education expenditures. As an example, high concentrations of poverty require both more teachers and wage premiums for teachers to teach in these challenging educational environments.

Table 6: Environmental Cost Factors Included in Developing District Cost Estimates [2]

Median District Income	District Enrollment
% Free and Reduced Lunch	County Unemployment Rate
% Special Education	% Minority

District Efficiency Findings

Using the three-stage DEA model described in Appendix A, efficiency scores were developed for the 317 school districts included in the study. Table 7 provides the summary results for metro area and non-metro area districts (excluding Minneapolis and St. Paul)

[2] One notably absent environmental cost factor is the percent of Limited English Proficiency (LEP) students. This factor was not included in the final analysis because it was found these other cost factors essentially controlled for the impact of LEP students. See Appendix A.

TABLE 7 : Summary District Efficiency Findings
N=315 (excludes Minneapolis and St. Paul)

No. of Districts with Efficiency scores of 1.00	150
No. of Districts with Efficiency scores below 1.00	165
State Average Efficiency Score	0.95
Average Efficiency Score of Inefficient Districts (<1.00)	0.90
Lowest District Efficiency Score	0.62

Overall, Minnesota school districts scored quite high on measures of relative efficiency. 150 of the 315 school districts provided their educational outcomes at the lowest observed cost in the state given their environmental cost factors[3]. The statewide average efficiency score was 0.95. By comparison, studies conducted of school districts in other states and other types of public institutions have typically shown average efficiency scores in the 0.80 - 0.85 range.

Efficiency scores allow for the calculation of how much "excess spending" existed among districts in achieving their 2002 test score results. Table 8 presents summary results of excess spending by region.

Table 8: Average Efficiency Results by Region

Average Scores Achieved		
Test	**7 County Metro** (excludes Minneapolis and St. Paul)	**Non-Metro**
3rd grade math	1507.4	1490.9
3rd grade reading	1506.7	1489.7
5th grade math	1526.6	1497.7
5th grade reading	1577.8	1552.3
8th grade math	634.6	628.9
8th grade reading	646.9	640.0
10th grade writing	3.2	3.2
Graduation rate *	96.2	95.4
Summary Spending and Efficiency Results		
	7 County Metro (excludes Minneapolis and St. Paul)	**Non-Metro**
Actual Average Spending Per Pupil	$7,509	$7,455
Average Spending Per Pupil Assuming Efficiency (1.00)	$7,091	$7,058
Average Excess Spending Per Pupil	$ 418	$ 397
Average Efficiency Score	0.944	0.947

* One minus the district drop out rate

To achieve the average test score results listed in Table 8, districts in the seven county metro area spent an average of $7,509 per pupil. Because of inefficiency, however, some districts are spending more than necessary to achieve these results. When factoring in the inefficiency of these districts, we calculate that the seven county metro districts should only have had to spend an average of $7,091 per pupil to achieve these results. This translates into average excess spending of $418 per pupil. Average efficiency scores and average excess spending per pupil were approximately the same amount for non-metro districts.

[3] 146 school districts received efficiency scores of 1.00. Four others had efficiency scores of .995 or greater which were rounded to 1.00

Because DEA is a benchmarking-based technique, a comparable set of districts is needed to calculate efficiency ratings. For districts like St. Paul and Minneapolis with unique environmental conditions, "peer" districts are not available. Technically, DEA ascribes a default value of 1.00 for Minneapolis and St. Paul under the methodological premise that districts are considered lowest cost producers of their outcomes unless it can be proven otherwise. For purposes of calculating the cost of adequacy for these districts, we used an efficiency score of 1.00.

In an attempt to gain some insight into the efficiency of district spending in the center city districts, a DEA analysis of individual Minneapolis schools was conducted. Test score and demographic information for individual schools were obtained from the Minnesota Department of Education. Because of data availability issues as well as project funding and time constraints, an analysis of only a small subset of Minneapolis schools was possible.

Thirty-eight Minneapolis elementary schools were included in a separate DEA analysis (self-contained elementary school campuses). The analysis was adjusted to reflect the fact that only four outcomes (3^{rd} and 5^{th} grade math and reading) were applicable for this subgroup. Some of the socio-economic variables could not be used because information was unavailable at the school level. Table 9 lists the summary efficiency results for the Minneapolis schools with data available.

TABLE 9: Minneapolis Elementary School Efficiency Findings
N=38

No. of Schools with Efficiency Scores of 1.00	24
No. of Districts with Efficiency scores below 1.00	14
Average Efficiency Score	0.95
Average Score of Inefficient Districts	0.89
Minimum Efficiency Score	0.71
Average Excess Spending per pupil	$432
Maximum Excess Spending per pupil	$2,965

This partial examination suggests efficiency results similar to the state average. The high number of lowest cost producing schools may be partly affected by the lack of comparable peers (the same issue making efficiency analysis problematic for the Minneapolis and St. Paul school districts themselves). It is worth noting, however, the large excess per pupil spending resulting from lower efficiency scores. One possible explanation for this result is that the Minneapolis school district is a highly diverse district. Minneapolis features relatively high per pupil spending totals and receives significant amounts of extra compensatory aids for serving economically disadvantaged students. This higher spending may be showing up as inefficiency in those elementary schools that serve more advantaged students and households within the city. The ability of experienced teachers to take openings in less challenging schools through seniority and tenure may compound this effect.

Correlates of District Efficiency and Inefficiency

What district characteristics are correlated with district efficiency and inefficiency? In order to shed light on this issue, a regression based analysis of DEA efficiency scores was conducted. Explanatory/control variables of interest include:

- Variables related to competition (private students in the county)
- Teacher characteristics (teacher experience, percent of teachers with a master's degree)

- District characteristics (percent minority, pupil/teacher ratio, administrative expenditures per ADM) and
- General financial conditions (state revenue, general fund, tax capacity.)

We also considered the pupil/teacher ratio squared to uncover any information about whether there exists an optimum pupil-to-teacher ratio. Examining the square of the pupil-to-teacher ratio uncovers any non-linear relationship that may exist between the ratio and district efficiency. The cost index was used to control for districts identified as efficient by default due to limited information on high cost districts. Table 10 presents the summary findings. Complete regression results are found in Appendix A.

TABLE 10: Statistically Significant Factors Affecting District Efficiency.
N=317

Inversely Related to Efficiency **Statistically Significant Factors** (***=significant at .01 **=significant at .05	**Directly Related to Efficiency** **Statistically Significant Factors** (***=significant at .01 **=significant at .05)
Index of state revenue (% state funded) *** Index of adjusted net tax capacity *** Teacher experience *** District Pupil/Teacher ratios*** District Pupil/Teacher ratio (squared) *** Percent of teachers with masters degree** Percent minority **	District general fund reserves as a percent of annual district expenditures ***

The index of state revenue is a measure of state aid as a percent of total district revenue. The more a district relied on state sources of revenue, the more likely it would be inefficient in its spending, all else being equal. Such a finding has potentially important implications for education finance because the state takeover of the general education levy has made all districts more reliant on state funding. One of the potential tradeoffs of having made the property tax more of a true "local services" tax, implicit in the state takeover, is that it may have increased inefficiency in school district spending. Additional study will be needed with more recent data in order to determine whether this has happened. Property wealth of the district (as indicated by the index of adjusted net tax capacity) is also inversely related to district efficiency, which suggests that wealthier districts on average do not receive the full educational return for the dollars invested.

Teacher experience and percentage of a district's teachers with a masters degree are two other factors inversely related to spending efficiency. Both factors are statistically significant at the 99% and 95% confidence interval respectively. We can conclude, therefore, that higher spending for teachers with many years of experience or with advanced degrees in a district often does not result in commensurate improvements in educational outcomes and test scores.

The percentage of minority students in the district was inversely related to efficiency at lower levels of statistical significance. The percentage of minority students may be reflecting some economic dimensions of the well-documented "achievement gap" in test scores between Caucasian and minority students.

Of particular interest is the finding regarding the relationship between pupil-to-teacher ratio and district efficiency. The findings suggest that district efficiency increases with lower pupil-to-teacher ratios up to a point, but then decreases as the incremental cost of additional teachers exceeds the incremental improvements in educational results. Using calculus, it was determined that this inflection point for

Minnesota school districts is a pupil-to-teacher ratio of 18 to 1. In 2002, the actual average pupil-to-teacher ratio in all Minnesota school districts was 15 to 1 (The lowest district ratio was 8 students per teacher; and the highest was 20.5 students per teacher).

Two important caveats must be noted on this finding. First the pupil to teacher ratio is not a proxy for class size. Teacher totals were based on full time equivalent teachers in the district, which includes classroom teachers as well as special program teachers (art, music, physical education, special education, etc.) plus early childhood instructors. Second, grouping all grades and all types of teachers into a district total may distort efficiency results that do occur by having smaller classes in certain grades, such as grades K-3. However, a district could have smaller class sizes for some grades, larger sizes for others, and in total achieve the 18:1 ratio.

A separate regression was done that only included inefficient districts (districts with scores less than 1.00.) Results were the same with “percent minority students” and “percent of teachers with masters degrees” showing statistical significance at the 99% confidence interval. The one notable difference in results pertained to the variable “administrative spending per average daily membership.” While this variable was inversely related to efficiency in both regressions, it was only statistically significant within the “inefficient district only” analysis at a very high confidence level (99%). See Appendix A.

One factor was found to be correlated with district efficiency at very high levels of statistical significance. The general fund balance as a percent of annual district expenditures is a measure of how much financial “cushion” the district has. Not surprisingly, it is also highly correlated with district efficiency. If the money is not being spent, it cannot show up as inefficient spending. This finding does have potential implications for aid reform in that just because a district is found to be the lowest cost producer of its outcomes does not necessarily mean it is deserving of more resources.

Cost of Adequacy

Table 11 contains the primary findings regarding district cost estimates for achieving an adequate education as defined by the eight selected academic standards. Individual district information can be found in Appendix B. *The cost of adequacy estimates are based on districts achieving efficiency scores of 1.00; thus the estimates assume efficiency. Therefore, the estimates represent the different levels of spending needed by each district to achieve adequacy standards solely because of district and student cost factors outside of their control.*

Using the eight performance standards described in Section 2, the state average cost of adequate education was found to be $6,236 per pupil. However, the estimated cost is well over twice the state average for the district facing the harshest educational environment (Minneapolis) and approximately $700 less per pupil in districts with the most advantageous environment (shared by several districts). If the state were to use the same 8th and 10th grade Basic Skills test results and graduation standard, but instead used the “proficiency” level in the 3rd and 5th grade tests to define an adequate education, the state average cost increases by about $350 per pupil. However, an estimated additional $2,000 per pupil would have to be spent in the district with the harshest educational environment and $700 more per pupil in districts with the most favorable environment.

In comparing 2002 district operating expenditures per pupil to the district specific cost estimates we find that the vast majority of school districts are already spending sufficient amounts to achieve the basic skills adequacy standards. This is validated by the 2002 performance of Minnesota school districts on these tests. Only 8 of the 316 districts included in this analysis had per pupil spending totals less than the districts’ per pupil cost of adequacy. By taking those districts’ pupil counts and multiplying by the gap between per pupil spending and per pupil cost, we find that an estimated $194 million in additional targeted spending would be need to bring these districts up to basic skills level of performance. Should the more ambitious "proficiency" level of scores be used to define an adequate education, $358 million of additional spending would need to be targeted towards these same eight districts plus eleven others whose per pupil spending is less than the per pupil cost of achieving this higher performance standard.

TABLE 11: Primary Cost of Adequacy and District Spending Findings

For fiscal year 2002. Based on 316 of 343 Minnesota school districts. Includes Minneapolis and St. Paul unless otherwise noted

	State Average	Median	District High	District Low
Cost of Adequacy Per Pupil (1420*)	$6,236	$6,039	$14,446	$5,524
Cost of Adequacy Per Pupil (1500)**	$6,589	$6,393	$16,439	$5,904

No. of school districts whose 2002 operating expenditures per pupil were insufficient to achieve adequacy: **8**

Additional targeted spending needed for these districts to achieve adequacy: **$194,339,000**

No. of school districts whose 2002 operating expenditures per pupil were insufficient to achieve adequacy as defined by using the higher 1500 standard (proficiency) on MCA tests: **19**

Additional targeted spending needed for these districts to achieve adequacy using the 1500 standard: **$358,490,000**

Total statewide excess spending by districts in achieving their 2002 performance outcomes: **$233,800,000**

District Per Pupil Spending as a Percentage of Per Pupil Cost of Adequacy			
	State Average (Mean)	**District High**	**District Low**
Adequacy defined using 1420 MCA standards	119.7%	178.9%	74.6%
Adequacy defined using 1500 MCA standards	113.2%	172.6%	65.5%

* Based on use of 1420 scores for the four Minnesota Comprehensive Assessment tests
** Based on use of 1500 scores for the four Minnesota Comprehensive Assessment tests

The adequacy findings suggest that some of this additional cost could be offset in part by improved spending efficiencies among Minnesota school districts. Statewide, it is estimated that for the 165 districts that were not the lowest cost producers (i.e., did not achieve 1.00 on their efficiency scores) approximately $234 million more than necessary was spent to achieve their respective levels of educational performance.[4]

Overall, districts spent approximately 20% more per pupil than necessary to achieve an adequate education as defined by using the 1420 standards. This seems reasonable given that 1) many districts are not satisfied with achieving basic skill levels of performance, and 2) this total includes per pupil spending that may be only indirectly related to test score achievement such as art, music, and sports. However there is significant disparity among districts regarding this relationship between district spending and its cost of adequacy. Spending ranged from nearly 80% more per pupil above and beyond the cost of adequacy to 25% per pupil less than what is needed to achieve adequacy.

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[4] This total excludes potential excess spending from Minneapolis and St. Paul who received default efficiency scores of 1.00 due to the lack of comparable districts. It is important to remember that efficiency scores measure relative efficiency against best performing districts. If we assumed a hypothetical district like Minneapolis existed featuring the same harsh educational environment but was able to achieve Minneapolis' test score results with 5% less spending, then Minneapolis' efficiency score would be .95 and both the district cost of adequacy and amount of excess spending would be affected.

Sufficiency of State Funding

Turning attention to the sufficiency of state education funding in light of these cost of adequacy results, we find that the state has provided sufficient resources to support an adequate education for most school districts. In 2002, the state's total general education aid comprised 78.6% of the state's total cost of adequacy in the aggregate.[5] On a district basis, we find that the state's general education aids to districts average 88.5% of the districts cost of adequacy. The differences between the aggregate total and the district average total reflect the differences among districts in the receipt of state support. The differences are reflected in the "High" and "Low" columns in Table 12. One district in the state received nearly 40% more in general education aids than necessary to achieve adequacy while another district received less than half of what was necessary to achieve the same standards.

TABLE 12: Sufficiency of State Funding
Totals based on all 2002 state general education aids excluding referendum aid

	State Aggregate	District Average	District High	District Low
State General Education Aid Plus 2002 General Education Levy as a % of State's Total Cost of Adequacy	78.6%	88.5%	138.8%	43.8%

It is important to note that this estimate assumes the general education levy was part of state aid in 2002 as it is under our current education finance system. It is also important to note that this estimate does not include program aids, such as special education aids, or referendum aid which is discretionary aid provided based on the approval of local referendum by voters.

State Aid Distribution

A district's cost of adequacy estimate controls for differences in district performance and efficiency. As a result, it is fundamentally a measure of the influence of environmental cost factors on district spending necessary to achieve the adequacy standard.

A cost of adequacy index is generated by taking the district's estimated cost of adequacy and dividing it by the state average cost of adequacy. The index represents how much more or less, relative to the state average a district needs to spend to achieve adequacy standards solely because of its environmental cost factors. For example, a district with a cost of adequacy of $6,199 would have a cost adequacy index of .99 ($6,199 divided by state average of $6,236). This district is estimated to have to spend 1% less than the state average to compensate for environmental cost factors.

This cost index is important because it suggests how to distribute state aids to compensate districts for cost factors outside of their control in a fair and equitable way. It also provides a means of evaluating the quality of our existing supplemental aid system. The existing distribution of state aids creates an implied index of how much more or less districts are getting because of environmental cost factors. Comparing the cost of adequacy index results with the cost index generated from existing state aids provides information on how robust our existing aid system is.

For purposes of this analysis we used the state general education and program aids listed in Table 13.

[5] General education aid includes all general education aid categories except referendum aid which is discretionary aid provided based on the approval of local referendum by voters.

TABLE 13: State Aids Used to Calculate District Cost Indexes

General Education Aids	Program Aids
Basic Education Aid (weighted per pupil unit, includes district general education levy) Compensatory aid Limited English Proficiency Aid Training and Experience Aid Sparsity Aids Transportation Sparsity Aids Operating Capital Aid Equity Aid	Special Education Aid (Regular) Special Education Excess Cost Aid Integration Aids

The intent was to include aids that directly or indirectly are designed to offset higher costs that districts face because of environmental cost factors. The list of state aid programs is far from complete—numerous other district aid programs exist. However the aid programs included in the table are the major aid programs designed to offset higher district general operating expenditures due to district and student population characteristics.

Overall the correlation between the calculated cost indices and the indices based on 2002 state aids was .66. This suggests that the state aid programs have done a fair job of compensating districts for environmental cost factors. This finding is somewhat surprising considering that the size of these state aid programs and the formulas used to distribute them are not typically rooted in the type of empirical analysis necessary to determine what the "true" effect of these factors are on district costs.

The far right shaded columns in Appendix B, "District Profiles," provide the complete results of this comparison. Table 14 provides some summary information and some specific district examples.

TABLE 14: Cost Index Comparison Results

No. of Districts Overcompensated	**142**
No. of Districts Undercompensated	**134**
No. of Districts Correctly Compensated	**40**

Example Districts

District	Cost Index Based on Adequacy	Cost Index Based on 2002 State Aids
Albert Lea	1.02	.99
Edina	.89	.92
Brooklyn Center	1.32	1.02
South Koochiching	1.02	1.47
White Bear Lake	.97	.97

Using Albert Lea as an example, the calculated cost of adequacy index is 1.02 which means this district has environmental costs 2% greater than the state average. However, their cost index based on 2002 state aids was .99 meaning it was compensated at a rate 1% less than the state average. Conversely, Edina's cost index of .89 indicates environmental costs 11% below the state average. Although, this district was compensated at 8% less than the state average, the findings suggest it was still "overcompensated."

Brooklyn Center and South Koochiching school districts are examples of outliers found in this analysis. Brooklyn Center faces a harsh educational environment that is not reflected in the amount of aid received by the district. Conversely, although South Koochiching has higher than average environmental costs, the amount of aid received by the district is far greater than the impact of these environmental costs on district spending.

White Bear Lake is one of the 40 districts for which the state aid system correctly compensated for district environmental costs.

Although DEA methodology does not calculate the relative contribution of individual cost factors[6], a closer examination of the major outliers (where cost indices differ by substantial margins both positively and negatively), gives some indication of what types of improvements might be made in the state aid system. One characteristic shared by several overcompensated districts was the receipt of significant amounts of sparsity aid. Conversely, districts found to be undercompensated were often recipients of already significant amounts of compensatory aid and limited English proficiency aid. In short, there is some evidence to suggest that the state overcompensates for sparsity-related cost factors while undercompensating for at-risk characteristics such as poverty.

One test of this hypothesis was to compare 2002 unreserved district general fund balances as a percent of annual expenditures between districts receiving sparsity aid and all other districts. According to the Department of Education, reserve balances of around 10% of annual expenditures are generally recommended. Statewide, district unreserved general fund balances as a percent of annual expenditures was 8.8% in FY '02. For districts receiving sparsity aid, the average reserve balance was 22.5%. For districts receiving $500 or more per pupil in sparsity aid, reserve balances were 31.9%. The largest recipient of sparsity aid (nearly $2,500 per pupil) had a reserve balance of 64.8%.

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[6] In the analysis we want to include all factors that may create a harsher, and therefore more costly, educational environment for districts. However, DEA does not attempt to isolate and quantify the respective contributions of each factor to educational cost. Attempts to do this through regression analysis have several problems, most notably the strong correlations which often exist between these cost factors and the assumptions that must be made about the relationship to cost (for example, a 1% increase in poverty concentration always leads to a 2% increase in district spending requirements). Instead DEA examines the set of cost factors holistically to derive a single cost factor representing environmental harshness which can be applied to a base education amount to adjust for cost differences across districts.

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IV. Conclusions

Based on 2002 data, we conclude that Minnesota provided sufficient resources to Minnesota school districts to support a basic education for most state students. Recent increases in the price of educational inputs (for example, health care premiums that are exceeding the general inflation rate) combined with smaller percentage increases in recent education aid appropriations may have reduced this support. However, assuming that the general education levy was part of state aid in 2002, Minnesota provided nearly 90% of the state's total estimated cost of an adequate education through general education aids alone in 2002. This support does not include voter approved referendum aid from the state or program aids such as special education. On a district basis, 14 of the 317 districts included in this study would have received more per pupil general education aids than necessary to achieve state adequacy standards with the state takeover.

There were gaps in this state support, and the gaps were often significant. Those districts facing the harshest environmental conditions, although already receiving greater shares of compensatory aids, had per pupil cost of adequacy estimates exceeding per pupil state support. However, one district in particular stood out from all others. Of the estimated $194 million in additional targeted spending estimated to have been needed to bring all state's students up to the adequacy standards in 2002, $183 million, or over 94%, would have needed to be directed to Minneapolis.

This projected level of increased spending to achieve adequacy standards and close the achievement gap is both cost prohibitive to the state and politically difficult—especially with per pupil operating expenditures in Minneapolis already 44% higher than the 317 district state average in this study. These difficulties suggest the need for alternative educational strategies and delivery methods to be tested and employed to lower the costs of achieving adequacy in the most challenging educational environments. Because state taxpayers are providing even more of the financial support for educational delivery in Minneapolis since the state takeover in 2001, it is even more imperative to find lower cost methods to achieve adequacy.

Opportunities do exist to improve the general distribution of educational aids. We conclude that Minnesota does compensate the "correct" collection of environmental cost factors but that the amounts and distribution of these aids need to be reexamined. Many of these supplemental aids are driven by per pupil basic education aid amounts rather than by an empirical analysis of the actual additional spending required by these districts due to these cost factors. Not only would equity be improved in the delivery of compensatory-type aids, but the reallocation resulting from this reform could help move underperforming districts toward achieving adequacy standards at no extra cost to the state.

This study concludes it is possible to design a general education aid system that encourages efficiency, compensates districts for environmental cost factors, and is linked to the achievement of state adequacy standards. Under such an approach, a base amount of per pupil adequacy aid would be established based on the state's average cost of adequacy estimate. To determine how much general education aid a district would receive, this adequacy estimate would be multiplied by the district cost of adequacy index to adjust for environmental conditions and cost factors. Such an approach would have the added advantage of greatly simplifying the state general education aid system by eliminating the need for many aid programs targeting individual cost factors and their complex formulas.

The concept of compensating districts for environmental costs through a single environmental cost factor adjustment rather than through individual aid programs targeting each factor (poverty, limited English proficiency, sparsity, etc.) would be a major conceptual shift in state education finance policy. However, it is important to recognize the inherent weaknesses of the existing approach, most notably the strong correlations which often exist between cost factors and the assumptions that are made about specific relationships to actual cost.

This approach would signal a philosophical shift in state aid distribution away from the concept of general district parity in state support. A shift to funding "adequacy" could increase the differences in the amount of state aid received by districts with potential major redistributional consequences. If the state's first responsibility in education finance is to ensure all districts have the resources to provide an "adequate" education, and if no new resources are made available for this effort, then aid would have to shift from districts where state support is yielding "beyond adequacy" levels of educational performance. Even under such a scenario, districts could choose to spend more from local revenue to continue to achieve better outcomes.

This study was only intended to illustrate this approach and examine its implications. It cannot be used as the basis for actual aid reform. If the state were to further investigate this type of education finance reform approach, several actions would need to be taken:

- Generate a state consensus on the complete list of performance measures needed to represent an "adequate" education in the state and ensure a means of measuring performance in these areas.
- Make necessary threshold reporting changes so that all districts can be included in the analysis.
- Use a 3- or 5-year moving average for district test scores to minimize aberrations from a particular class or year.
- Assemble stakeholders to identify and test the relevant environmental cost factors to be included in the analysis, rather than rely on the academic literature.

Finally, with regards to the overall efficiency of school district spending, we conclude that the state's takeover of an even greater share of education funding may have the unintended effect of introducing less efficiency in school district spending. The state needs to be aware of this potential and identify strategies to mitigate it.

One opportunity lies in the area of teacher compensation. Study findings regarding correlates of district inefficiency suggest pay increases made solely on the basis of longevity and achievement of advanced degrees need to be reexamined. Given the relative influence of teacher wages as a percent of total district spending (statewide 57% in 2002), improvements in systems of teacher compensation could significantly improve the cost efficiency of delivering a quality public education in Minnesota.

V. Appendix A: A Quantitative Approach To Analyzing Educational Costs

Modeling Approach

Education can be viewed as a production process whereby discretionary school inputs (teachers, assistants, administrators, computers, etc.) are combined to produce educational outcomes (test scores, graduation rates, etc.). The academic literature on the educational production process is vast, and the evidence suggests that we can model the education process with the following function:

$$Y \; ? \; f(X, Z),$$

where *Y* represents educational outcomes, *X* represents discretionary inputs, and *Z* is a vector of non-discretionary inputs. The latter variables include student characteristics (*e.g.* limited English proficiency), family characteristics (*e.g.* education levels of parents) and school factors (*e.g.* percentage of students that have learning disabilities). Most evidence beginning with the Coleman Report and supported by a large research suggests that the most important variables in the production process are non-discretionary socio-economic variables.

The educational production function provides the basis for analyzing costs given resource prices *W* associated with the discretionary inputs *X*. The cost function can be specified as:

$$C \; ? \; g(Y, Z, W),$$

where *C* is the cost of producing outcomes *Y* given non-discretionary inputs *Z*. It is assumed that higher costs will result from (1) increases in any outcome for a given level of the socio-economic environment (represented by *Z*) and (2) a harsher socio-economic environment for a given level of outcomes. These assumptions are consistent with the academic literatures including Coleman. For a discussion, see Hanushek (1979 and 1986).

The effect of the socio-economic environment, input prices and outcomes on educational costs is revealed in Figure A1. For simplicity, we assume one outcome (or aggregate outcome) is produced. Two different cost curves, *C1* and *C2*, are depicted depending on the level of the socio-economic environment. Cost curve *C1* represents a more favorable environment, either due to lower input prices (teacher wages, *e.g.*) or better socio-economic conditions. Three districts *A*, *B* and *D* are highlighted. It is assumed that districts *A* and *D* face the more favorable environment; district *A* spends $5,000 per pupil to achieve an outcome level of 70 while district *D* spends $6,000 to provide an outcome level of 80. Since *A* and *D* face the same environment, the difference in costs represents the difference in outcome provision. Differential outcome provision represents one important reason why costs are different.

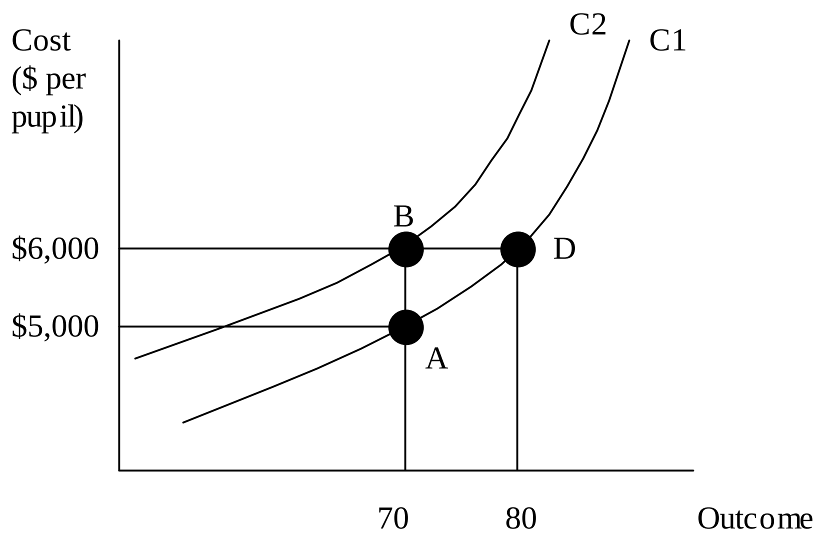

Figure A1 Educational Costs, Outcomes and the Socio-Economic Environment

District *B*, on the other hand, has a less favorable environment. As a result, district *B* must spend $1,000 more than district *A* to achieve the same level of outcome. This represents a cost factor of 1.2: holding outcome levels constant, district *B* needs to spend 20 percent more than district *A*. Alternatively, for the same level of costs, district *D* is able to provide a higher level of outcome than *B*, due only to a more favorable cost environment. This reveals a second important reason for cost differentials; the socio-economic environment that is beyond the control of the school district could lead to higher costs.

The cost of providing education is equivalent to observed expenditures only if the school district is operating efficiently. Efficiency can be defined as providing outcomes at minimum cost. Figure A1 reveals that districts *A*, *B* and *D* are all providing their observed outcomes at minimum cost and hence, are efficient. We can define the relationship between expenditures (*Exp*) and costs (measured per pupil) with the following function:

$$Exp \; ? \; \frac{C}{Eff} \; ? \; \frac{g(Y,Z,W)}{Eff},$$

where 0 < *Eff* = 1 is the measure of cost efficiency. If *Eff* = 1, then the district is efficient and observed expenditures are equal to minimum costs. If *Eff* < 1, then *Exp* > *C*, and the district is spending *Exp* – *C* above minimum costs.

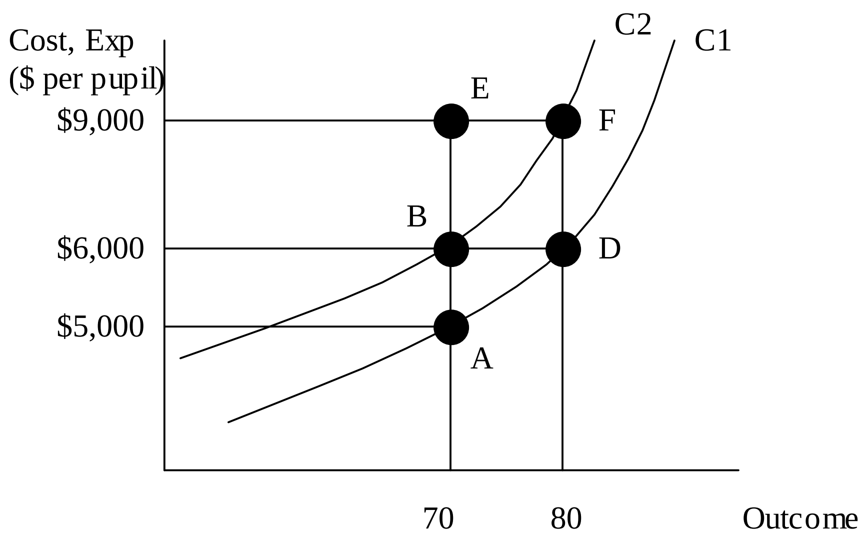

Figure A2 Expenditures, Cost and Efficiency

The introduction of inefficiency into the analysis is shown in Figure A2, which extends the analysis of Figure A1. Two more districts (*E* and *F*) are included in the diagram. It is assumed that *E* has a harsh environment and *F* has a favorable environment. Because *E* and *F* are not on their cost frontiers *C2* and *C1*, respectively, both are cost inefficient. District *E* is observed spending $9,000 per pupil to provide the outcome level of 70. However, using district *B* as a benchmark, the minimum cost of providing an outcome of 70 is $6,000. We note that district *B* is the appropriate benchmark because *B* and *E* operate under the same cost environment. Hence, the efficiency of district *E* is 0.67 (i.e., 6000/9000.) District *F*, on the other hand, can be benchmarked against district *D*, leading to an efficiency rating for *F* that is also 0.67.

Conceptually, we see that there are three reasons why expenditures per pupil vary among school districts. Firstly, districts that provide higher outcomes have higher costs, and hence must spend more on resources. Secondly, districts with adverse cost environments reflected by a harsher socio-economic environment and/or higher resource prices, must spend more to achieve a given outcome level. These two factors represent cost differentials. Finally, districts that are inefficient will spend more than the minimum cost of providing a given outcome level, holding constant the environmental costs.

The analysis in Figure A2 can be extended to determine the cost of providing an adequate education. We assume that an adequate education is defined by providing an outcome level of 75. Consider Figure A3, where we add another district *G* that is observed spending $9,000 per pupil and providing an outcome level of 80. This district is similar to district *F* with the exception that it faces a harsher cost environment. Since *G* is on the *C2* cost curve, it is efficient.

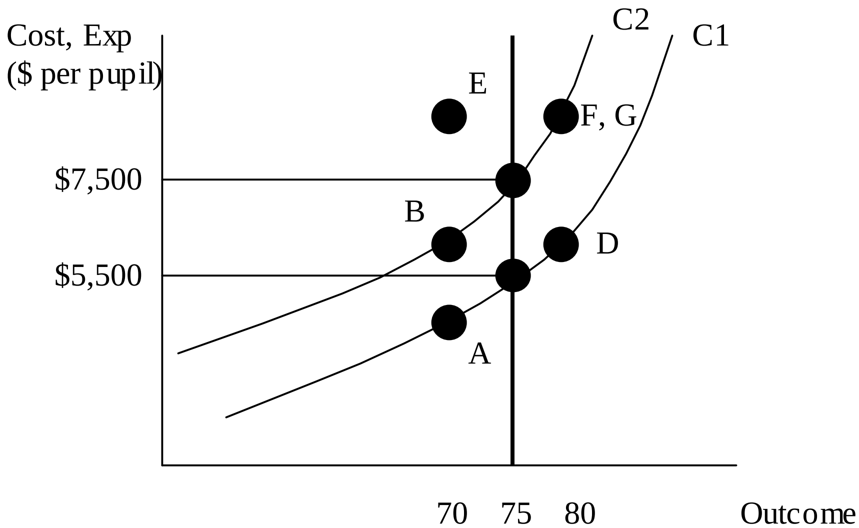

Figure A3 Measuring Adequacy

The cost curves provide the necessary information for determining the cost of an adequate education. Districts (*A*, *D* and *F*) facing the more favorable environment would need to spend $5,500 per pupil to achieve an outcome level of 75. Districts with a harsher environment need to spend $2,000 per pupil more to achieve the same adequate outcome level. These stylized facts imply that districts with the harsh environment need to spend about 36 percent more than districts with the favorable environment. Figure A3 also reveals that districts *A*, *B* and *E* are not meeting the adequacy standard. District *A* would need additional funding of $500 per pupil to meet the adequacy standard, assuming that it remained efficient. Likewise, district *B* requires an additional $1,500.

District *E*, on the other hand, is not meeting the adequacy standard because of inefficient and not insufficient expenditures. Given its harsh environment, the cost curve reveals that *E* requires $7,500 but is observed spending $9,000. This has important policy implications: inefficiency must be considered in any reasonable adequacy cost estimate. Naïve approaches might suggest that *E* requires additional revenue to meet the standards, but as the diagram shows, this is not true. Any additional funding to *E* is likely to lead to more inefficiency without necessarily increasing outcomes. In the next section, we provide a model developed by Ruggiero (1998) to disentangle the three causes of expenditure variation.

Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a nonparametric programming approach to the measurement of efficiency. DEA was developed by Charnes, Cooper and Rhodes (1978) to analyze public sector performance and has been extended by various authors to handle diverse production environments. The model compares the relative performance of decision-making units in converting discretionary inputs into outputs. The approach has become popular because it extends simple ratio analysis to allow multiple inputs and multiple outputs without assuming any functional form for the production process. Rather than estimating an equation via regression, the approach envelops the observed data and makes comparisons between decision-making units.

Ruggiero (1996 and 1998) extended the approach to allow non-discretionary inputs. This represented an important step in the application to education where socio-economic variables have a major effect on the transformation of inputs into outcomes. This approach, which was used to decompose the three causes of expenditure variation, has been shown by Ruggiero (1998) to be effective using simulated data. In this section, we will present the three-stage approach. We will assume that the vector Y consists of s outcomes $y_1, \ldots, y_s$ and the vector Z consists of m non-discretionary factors outcomes $z_1, \ldots, z_m$, which includes not only the socio-economic variables but also the resource prices. In this modeling approach, there is no difference between types of non-controllable factors. Furthermore, we represent outcomes $Y_i = (y_{1i}, \ldots, y_{si})$, expenditures per pupil exp_i, and non-discretionary variables $Z = (z, \ldots, z_{mi})$ for district i. We also assume that there are N school districts (in the motivating example, $N = 6$). In the empirical analysis of Minneapolis school districts, we had complete data for 317 Minnesota school districts.

Decomposition of expenditures into costs, outcomes and efficiency components requires three stages. In the first stage, linear programming is used to find the minimum expenditures necessary to provide at least the observed outcomes of the district under analysis for each district, assuming that all districts face the most favorable cost environment. Formally, the linear program is:

$$\begin{aligned} FSI_0 \; ? \; & \underset{?_1,\ldots ?_N}{Min} \; ?_0 \\ s.t. \; & \overset{N}{\underset{i?1}{?}} \; ?_i exp_i \; ? \; ?_0 \, exp_0 \\ & \overset{N}{\underset{i?1}{?}} \; ?_i y_{si} \; ? \; y_{s0} \quad ? \; s ? 1,\ldots,S \\ & \overset{N}{\underset{i?1}{?}} \; ?_i \; ? \; 1 \\ & ?_i \; ? \; 0 \quad ? \; i, \end{aligned} \qquad \text{(A1)}$$

where ? is the intensity vector that determines the comparison set and FSI is the first-stage index. In essence, this model identifies districts (or convex combinations of districts) that produce at least as much of each outcome variable with the lowest possible costs. Model A1 needs to be solved once for each observation (school district), where the subscript "0" represents the data for the district under analysis. Using the data from Figure A3, we highlight the approach of the first-stage.

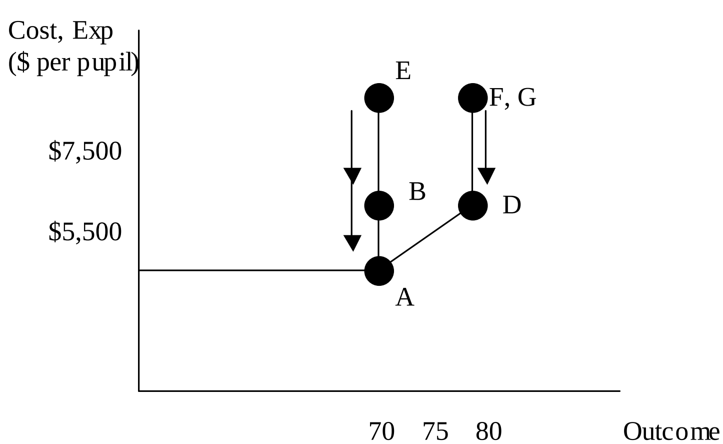

Figure A4 First Stage Analysis

Consider district *E*, which is observed spending $9,000 per pupil while producing an outcome of 70. Holding outcomes constant, we seek to find the maximum reduction in expenditures possible consistent with the production/costs of all of the districts. This is shown in Figure A4 with the arrows from district *E*. As shown, *E*'s expenditures would be contracted to district *A*, which is producing the same amount of the outcome, but with lower expenditures. In this case, the solution of programming model A2 for *E* would be FSI_E ? $5{,}000/9{,}000$? $0.55\overline{5}$. In other words, if *E* faced the most favorable environment, it could have produced its observed outcome level of 70 by reducing its expenditures by 55.56 percent. Of course, this reduction captures not only *E*'s inefficiency, but also its harsh cost environment. The results for all districts are revealed in the following table:

DMU	Expenditures ($ per pupil)	Outcome	*FSI*	?
A	5,000	70	1.000	$?_A$? 1
B	6,000	70	0.833	$?_A$? 1
D	6,000	80	1.000	$?_D$? 1
E	9,000	70	0.556	$?_A$? 1
F	9,000	80	0.667	$?_D$? 1
G	9,000	80	0.667	$?_D$? 1

The results for the first-stage index are generated from the lower frontier consisting of districts *A* and *D*. This is confirmed by the values of ? in the last column of the table. We note that only for districts *B*, *E* and *G* the first-stage index ? is not the efficiency value. Not coincidentally, these districts have higher costs and do not have the most favorable environment. In order to derive the true efficiency measure, we move to the second-stage. In this stage, we need to use define the overall cost index. In this simple example, we have defined only one cost factor (favorable environment and harsh environment) and have the necessary information to move to the third stage. In real world applications, however, we do not have the overall cost index but rather multiple cost factors. Following Ruggiero (1998), we can derive an overall cost index using regression analysis. In particular, the first-stage index is regressed on the cost factors and the regression is used to construct an overall index of costs due to non-discretionary factors. This step will be discussed in the empirical analysis.

Given the overall cost index, we now can move to the third-stage and estimate the efficiency of each district. In this stage, we compare a given district to the districts that have a cost index that is no greater than the district under analysis. For example, since districts *B*, *E* and *G* have the harsh environment, districts *A*, *D* and *F* are not allowed in the peer group. This is achieved by setting $?_A$? $?_D$? $?_F$? 0. In the analysis of districts *A*, *D* and *F*, no such constraints are needed. The third-stage model can be written as:

$$
\begin{aligned}
Eff_0 \ ? \ & \underset{?_1,\ldots ?_N}{Min} \ ?_0 \\
s.t. \ & \sum_{i?1}^{N} ?_i exp_i \ ? \ ?_0 \, exp_0 \\
& \sum_{i?1}^{N} ?_i y_{si} \ ? \ y_{s0} \quad ? \ s ? 1,\ldots,S \\
& \sum_{i?1}^{N} ?_i \ ? \ 1 \\
& ?_i \ ? \ 0 \quad ? \ i \ ? \ CI_i \ ? \ CI_0, \\
& ?_i \ ? \ 0 \quad ? \ i \ ? \ CI_i \ ? \ CI_0.
\end{aligned}
\qquad (A2)
$$

The last two constraints effectively eliminate the districts with a more favorable cost environment from the analysis. The effect of the added constraints is revealed in Figure A5. Given the possible reductions in the peer group, we see that district *E* is projected to district *B*, a district with the same environmental costs observed producing the same outcome as *E* with lower expenditures. Also, *B*'s projection is to itself, since there is not another district (or combination of districts) with the same cost environment producing the same level of outcomes with lower expenditures.

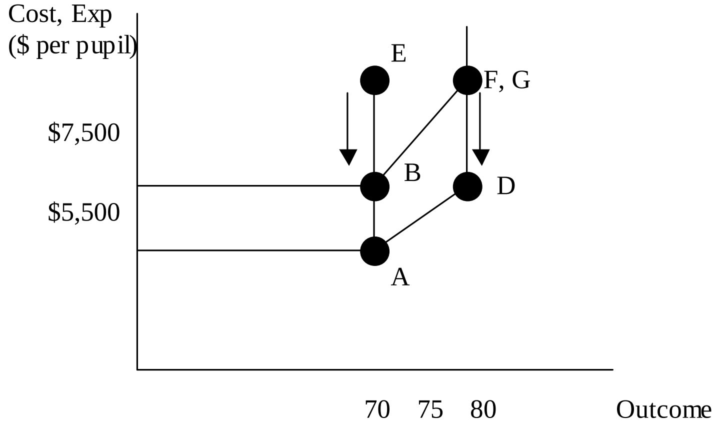

Figure A5 Third-Stage Analysis

The complete results from the third-stage are revealed in the following table.

DMU	Expenditures ($ per pupil)	Outcome	*Eff*	?
A	5,000	70	1.000	$?_A ? 1$
B	6,000	70	1.000	$?_B ? 1$
D	6,000	80	1.000	$?_D ? 1$
E	9,000	70	0.667	$?_B ? 1$
F	9,000	80	0.667	$?_D ? 1$
G	9,000	80	1.000	$?_G ? 1$

Ruggiero has shown that the ratio of *Eff* to *FSI* provides an index of the costs due to the environment costs, i.e., the extra costs necessary to achieve the associated level of outcome. We note that for districts *A*, *D* and *F*, the resulting cost index (ratio) is equal to 1.0. For districts *B* and *E*, the cost index is equal to 1.2, suggesting that these two districts need to spend 20 percent more than a district (*A*) with a more favorable environment. To achieve the higher outcome of 80, district *G* has a cost index of 1.5, i.e., districts with a harsh environment need to spend 50 percent more to achieve the higher outcome level.

An Index of Outcomes

Using the above diagram, we can derive an overall index of outcome provision. This is especially important in cases when multiple outcomes are present. As shown in Figure A5, observed expenditures vary due to three factors: environmental costs, outcome provision and inefficiency. An overall index of outcomes is obtained by deflating observed expenditures by indices of costs and inefficiency. We note that this deflation is shown in Figure A4. By contracting expenditures to the overall frontier, we are able to derive a measure of overall outcomes. In this case, we observe that districts *A*, *B* and *E* have deflated expenditures of $5,000 per pupil while districts *D*, *F* and *G* have deflated expenditures of $6,000 per pupil. We note that the deflation captures the variations that can be attributed only to outcome differentials. In general, we need only indices of socio-economic costs, expenditures and inefficiency, all of which are provided in the above DEA models.

Measuring Adequacy

Finally, Ruggiero (2003) provided a model to determine the cost of adequacy. Continuing with our example and assuming that adequacy is defined by an achievement of 75, we can employ the following programming model:

$$\begin{aligned} AI_0 \; ? \; & \underset{?_1,\ldots ?_N}{Min} \; ?_0 \\ s.t. \; & \sum_{i?1}^{N} ?_i exp_i \; ? \; ?_0 exp_{\max} \\ & \sum_{i?1}^{N} ?_i y_{si} \; ? \; y_{sA} \quad ? \; s ? 1,\ldots,S \\ & \sum_{i?1}^{N} ?_i \; ? \; 1 \\ & ?_i \; ? \; 0 \quad ? \; i \; ? \; CI_i \; ? \; CI_0 , \\ & ?_i \; ? \; 0 \quad ? \; i \; ? \; CI_i \; ? \; CI_0 . \end{aligned} \qquad \text{(A3)}$$

Model A3 differs from A2 with the use of exp_{max}, which is the maximum observed expenditures in the sample and with the use of the adequacy standards y_{sA} in the outcome constraint. The solution to this program for any given district *i* results in a measure of the cost $AC_i \; ? \; ?_i exp_{\max}$ of meeting the adequacy standard. The program holds outcomes constant at the pre-defined adequate levels and determines the costs given a district's socio-economic environment. We note two caveats. First, a solution may not be possible for districts with the harshest environments because there may not exist sufficient information to identify costs. Second, districts with similar costs may have the same cost of adequacy. This results because such fine comparisons may not yield enough information to differentiate the adequacy costs. Nonetheless, the adequacy costs can be considered reliable over the range of the cost index.

Empirical Analysis of Minnesota School Districts

The models presented above were applied to analyze 317 Minnesota school districts. Outcome data were missing for very small districts and hence, the sample size had to be reduced. In this section, we will present the variables selected for the analysis and provide sensitivity analysis. Expenditures per pupil were measured using Total PK-12 operating expenditures (excluding capital expenditures) per ADM.

Eight outcomes were selected for use in the analysis. The eight measures include outcomes from 3rd grade through high school; we believe the eight measures are indicative of the outcomes provided by the school districts. Seven of the eight measures used are average outcomes on standardized tests. While the importance of standardized tests is debatable, we believe they are useful and reliable indicators of the outcomes provided by districts. The first four measures used were scores on the 3rd and 5th grade reading and math MCAs for school year 2001-2002. These outcomes have been selected because of the importance placed on them by the Minnesota Department of Education. Adequacy for these tests is defined with an average score of 1420, which is consistent with meeting grade-level expectations. In addition, test results for 8th grade math and reading and 10th grade writing were included to capture outcome levels at the middle and high school grade levels. The adequacy level was set at a score of 600 for each of the 8th grade tests and 3.0 for the 10th grade writing test. Finally, the non-drop out rate was included as a final measure of outcomes.

Non-discretionary variables considered included the unemployment rate, the income of the district, enrollment, percent minority, limited English proficiency, the percent of free and reduced lunches, the percent of special education students, and a teacher wage index. The teacher wage index was predicted using regression analysis where average district salaries (in natural logs) were regressed on outcomes and socio-economic conditions. The results of the regression are reported in Table A1. In general, the results are as expected. More experience and more educated teachers require higher salaries. In addition, adverse socio-economic conditions (enrollment, percent minority and percent free and reduced lunch) also require higher salaries. We would expect higher salaries for districts with better outcome measures. This is true for the non-dropout rate, 3rd grade reading, 5th grade math, 8th grade reading and 10th grade writing. The other outcomes have the wrong sign, but are insignificant at the 5 percent level.

The teacher wage index is calculated using the regression equation and holding outcomes and teacher characteristics at the stage average. As a result, differences in teacher salaries are attributed to only those factors that are non-discretionary. After generating predicted salaries, an index was created centered on the average predicted salary. This index reveals the differential cost of hiring teachers arising from differences in the socio-economic environment.

Table A1: Teacher Salary Regression

Variable	Coefficient
Intercept	8.696754***
Average teacher years	0.014594***
Percent of teachers with a master's degree	0.001895***
Enrollment (LN)	0.052794***
Percent minority	0.001003**
Non-drop out rate	0.000269
Limited English Proficiency	-0.001905*
Unemployment rate	0.005155
Income (LN)	0.044892
Percent free and reduced lunches	0.001060**
3rd grade math score	-0.000129*
3rd grade reading score	0.000219**
5th grade math score	0.000161
5th grade reading score	-0.000163
8th grade math score	-0.000239
8th grade reading score	0.000764
10th grade writing score	0.061654***
Adjusted R^2	0.709

***, **, * indicate statistical significance at the 1, 5 and 10 percent level, respectively.

For illustrative purposes, we calculate predicted salary for the Aitkin school district. The data used are reported in Table A2. We want to find the predicted salary for Aitkin holding outcomes at the state average. Socio-economic variables reported in Table A2 are specific to Aitkin. Also, we assume that the teacher quality variables are discretionary since Aitkin can alter the mix in the hiring process. To obtain predicted salaries, we sum the product of the regression coefficients and the value of the variables:

$$\text{Ln Predicted Salary} = (8.70)(1.00) + (0.015)(15.00) + \ldots + (0.062)(3.17) = 10.58.$$

The predicted salary for Aitkin is then found by converting back to dollars:

> Predicted Salary = exp(10.58) = $39,366. This represents the average salary Aitkin would have to pay assuming they provided the average outcomes and hired teachers with average experience and education.

The predicted salary is calculated using this approach for all school districts in the sample. The average predicted salary is $39,077. Finally, the index of teacher salaries is calculated by dividing the predicted salary by the average predicted salary. For Aitkin, this ratio is equal to 1.007; Aitkin has to spend about 0.7 percent above the state average given their socio-economic conditions. For comparison purposes, Minneapolis needs to spend $49,890 on average, or about 27 percent more than the state average.

Table A2: Predicted Salary Components for Aitkin		
Variable	Coefficient	Value
Intercept	8.696754	1.00
Average teacher years*	0.014594	15.00
Percent of teachers with a master's degree*	0.001895	28.44
Enrollment (LN)	0.052794	7.21
Percent minority	0.001003	4.33
Non-drop out rate	0.000269	90.74
Limited English Proficiency	-0.001905	0.00
Unemployment rate	0.005155	4.74
Income (LN)	0.044892	10.70
Percent free and reduced lunches	0.001060	37.81
3rd grade math score*	-0.000129	1493
3rd grade reading score*	0.000219	1491
5th grade math score*	0.000161	1501
5th grade reading score*	-0.000163	1555
8th grade math score*	-0.000239	630
8th grade reading score*	0.000764	641
10th grade writing score*	0.061654	3.17
*The value for this variable was held at the sample average.		

Table A3 summarizes the variables used in the analysis and provides the pre-defined adequacy standards.

Table A3: Variables Used in Analysis			
Symbol	Variable	Adequacy Standard	Proficiency Standard
exp	Operating expenditures per ADM		
y_1	3rd grade reading*	1420	1500
y_2	3rd grade math*	1420	1500
y_3	5th grade reading*	1420	1500
y_4	5th grade math*	1420	1500
y_5	8th grade reading**	600	600
y_6	8th grade math**	600	600
y_7	10th grade writing**	3.0	3.0
y_8	Non-dropout rate	80 %	80 %
z_1	Unemployment rate		
z_2	Income (LN)		
z_3	Enrollment (LN)		
z_4	Percent Minority		
z_5	Percent Free and Reduced Lunch		
z_6	Salary Index		
z_7	Percent Special Education		
*represents Minnesota Comprehensive Assessment Test; ** represents Minnesota Basic Skills Test			

For robustness, we also considered limited English proficiency as a non-discretionary factor but the resulting first-stage index was virtually identical.

Step 1: First-Stage DEA Model

After gathering the data, we turn to the implementation of the DEA models presented above. The first step required solving the following linear program for each of the 317 school districts:

$$
\begin{aligned}
FSI_0 \; ? \; & \underset{?_1,\ldots ?_{317}}{Min} \; ?_0 \\
s.t. \; & \sum_{i?1}^{317} ?_i exp_i \; ? \; ?_0 \, exp_0 \\
& \sum_{i?1}^{317} ?_i y_{si} \; ? \; y_{s0} \quad ? \; s ? 1,\ldots,8 \\
& \sum_{i?1}^{317} ?_i \; ? \; 1 \\
& ?_i \; ? \; 0 \quad ? \; i.
\end{aligned}
\qquad \text{(A4)}
$$

As discussed above, this model generates an index representing the distance to the overall cost frontier, which is defined from the districts with the lowest costs for a given outcome level, without regard to the non-discretionary factors. Hence, the resulting index consists not only of inefficiency but also environmental costs. Unlike the motivating example, we do not have a cost index; instead we have 7 non-discretionary cost factors.

Step 2: Second-Stage Regression Model

Ruggiero (1998) provided a way to convert multiple cost factors into an overall index of environmental costs. In particular, the natural log of the first-stage index *FSI* obtained from the solutions of A4 are regressed on the non-discretionary factors[7]:

$$
Ln\, FSI \; ? \; ? \; ? \sum_{k?1}^{7} ?_k z_k \; ? \; ?. \qquad \text{(A5)}
$$

The error term $?$ captures inefficiency while $CI \; ? \; ? \; ? \sum_{k?1}^{7} ?_k z_k$ provides an overall cost-index (in natural log). See Ruggiero (1998) for further details on the second-stage approach. The regression was performed using the non-discretionary variables listed in Table A3 and the results are reported in Table A4.[8]

[7] Functional form is not a serious issue because the results from the third-stage model are unique for monotonic transformations of the first-stage index. Log-linear and linear functional forms produced similar rankings.

[8] Various combinations of non-discretionary variables including limited English proficiency were tested; the resulting correlations between cost indices were highly correlated (in the range of 0.99 – 1.00). Given that the efficiency is truncated at 1, we also considered a Tobit model; the results were similar.

Table A4: Second-Stage Regression Results	
Variable	Coefficient
Intercept	-0.830
Unemployment rate	-0.012
Income (LN)	0.092
Enrollment (LN)	0.175***
Ln Enrollment Squared	-0.009**
Percent Minority	-0.003***
Percent Free and Reduced Lunch	-0.001
Salary Index	-0.872
Percent Special Education	-0.012***
Adjusted R^2	0.471
***, **, * indicate statistical significance at the 1, 5 and 10 percent level, respectively.	

Step 3: Third-Stage DEA Model

In summary, the first stage provided an overall index composed of environmental costs and inefficiency. The second-stage decomposed the cost factors from the inefficiency using regression analysis. The output from the second-stage is an overall cost index that can be incorporated into a third-stage DEA model. For the application to Minnesota school districts, the linear program is:

$$
\begin{aligned}
Eff_0 \ ? \ & \underset{?_1,\ldots ?_{317}}{Min} \ ?_0 \\
s.t. \ & \overset{317}{\underset{i ? 1}{?}} \ ?_i exp_i \ ? \ ?_0 \, exp_0 \\
& \overset{317}{\underset{i ? 1}{?}} \ ?_i y_{si} \ ? \ y_{s0} \quad ? \ s ? 1,\ldots,8 \\
& \overset{317}{\underset{i ? 1}{?}} \ ?_i \ ? \ 1 \\
& ?_i \ ? \ 0 \quad ? \ i \ ? \ CI_i \ ? \ CI_0 , \\
& ?_i \ ? \ 0 \quad ? \ i \ ? \ CI_i \ ? \ CI_0 .
\end{aligned}
\qquad \text{(A6)}
$$

Ruggiero (1998) showed that this three-stage approach properly decomposes the first-stage index and provides a reliable measure of efficiency. An alternative way to measure efficiency is regression based. From the first page of this appendix, we note that the expenditure function can be specified as:

$$Exp \ ? \ \frac{C}{Eff} \ ? \ \frac{g(Y,Z,W)}{Eff}.$$

Assuming a functional form, this equation can be estimated using regression analysis. The resulting error term, representing unexplained variation in *Exp* is assumed to capture school district inefficiency. This approach was used to test the reliability of the DEA approach used in this paper. The results suggest a strong correlation between DEA and the regression approach. The correlation between the two measures for all districts was about 0.82 and for only the DEA identified inefficient districts the correlation increased to 0.93.

Measuring Adequacy

For this analysis, two adequacy indexes were calculated. We were interested in finding the cost of providing an adequate education, defined with a score of 1420 on the 3rd and 5th grade tests. The model, due to Ruggiero (2003) is specified for the Minnesota districts as:

$$
\begin{aligned}
AI_0 \; ? & \min_{?_1,\ldots ?_{317}} \; ?_0 \\
s.t. \; & \sum_{i?1}^{317} ?_i exp_i \; ? \; ?_0 exp_{\max} \\
& \sum_{i?1}^{317} ?_i y_{si} \; ? \; y_{sA} \quad ? \; s ? 1,\ldots,8 \\
& \sum_{i?1}^{317} ?_i \; ? \; 1 \\
& ?_i \; ? \; 0 \quad ? \; i \; ? \; CI_i \; ? \; CI_0 , \\
& ?_i \; ? \; 0 \quad ? \; i \; ? \; CI_i \; ? \; CI_0 .
\end{aligned}
\qquad \text{(A7)}
$$

The results for efficiency, environmental costs and adequacy are reported in Appendix B.

Correlates of Inefficiency

Using the index of efficiency obtained from Model A6, we use statistical analysis to identify causes of inefficiency. In particular, regression analysis was used to explain efficiency results. The efficiency score from A6 was used as the dependent variable. Explanatory/control variables of interest include variables related to competition (private students in the county), teacher characteristics (teacher experience, percent of teachers with a master's degree), district characteristics (percent minority, pupil/teacher ratio, administrative expenditures per ADM) and general financial conditions (state revenue, general fund, tax capacity.) We also consider the pupil/teacher ratio squared to uncover any non-linearity in this ratio. The cost index was used to control for districts identified as efficient by default due to limited information on high cost districts.

Two separate regressions were run. First, we consider all districts in the sample. The second regression only considered those districts that were identified as inefficient. Of potential concern is the truncation of the efficiency score, which has a maximum value of 1. Separating out the inefficient districts provides additional information. In particular, coefficient estimates may be biased to the truncation.[9] The regression results are reported in Table A5.

[9] A separate Tobit regression was also performed. The results were consistent with the OLS results and are omitted for space consideration.

Table A5: Causes of Inefficiency

	Full Sample	Inefficient Districts
Variable	Coefficient	Coefficient
Intercept	0.349**	0.141
Cost Index	0.338***	0.464***
Index of State Revenue	-0.140***	-0.227***
Teacher Years	-0.006***	-0.006***
Percent Minority	-0.001**	-0.003***
Private Students in County (000s)	0.0001	0.000
Index of Tax Capacity	-0.045***	-0.093***
General Fund (%)	0.080***	0.074***
Teachers with a Master's Degree (%)	-0.001**	-0.001***
Pupil/Teacher Ratio	0.064***	0.091***
Pupil/Teacher Ratio Squared	-0.002***	-0.003***
Administrative Expend per ADM (000s)	-0.044	-0.121***
Adjusted R^2	0.225	0.520

***, **, * indicate statistical significance at the 1, 5 and 10 percent level, respectively.

The regression results suggest that the amount of state aid received, teacher years, percent minority, tax capacity, the percentage of teachers with a master's degree and administrative expenditures per ADM are all negatively related to district efficiency. Further, the coefficients are statistically significant at any reasonable level of confidence. The results are consistent with expectations.[10] Of interest is the relationship between efficiency and the pupil teacher ratio (*PTR*). Using the sample of inefficient districts, we note:

$$\frac{?Eff}{?PTR} \; ? \; 0.091 \; ? \; 0.006PTR.$$

From this first-order equation, we observe that efficiency increases as the *PTR* increases for *PTR* < 18. With respect to efficiency, it would be optimal for school districts to have a pupil teacher ratio of 18; as the *PTR* increases beyond 18, efficiency declines. This result is consistent with the regression using the full sample.

[10] We note the "relatively low Adjusted R^2" for the full sample regression. The regression only explains 23 percent of the variation in efficiency. However, as pointed out in Goldberger (1991), the most important thing about R^2 is that it is not important. We are concerned with coefficient estimates and their statistical significance and not with the amount of variation explained; nothing in the theory of regression states that the variation explains needs to be high.

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VI. Appendix B: Summary District Profiles

This appendix contains summary information for all 317 districts included in this study. A glossary of terms follows:

Efficiency Score: the measure of district spending efficiency. A score of 1.00 means the district is producing its educational outcomes with the lowest observed expenditures in the state given its environmental conditions. It does <u>not</u> mean the district cannot improve on its spending efficiency <u>or</u> that it is achieving the best test scores, <u>or</u> that is even achieving adequacy standards. It simply means we have no evidence elsewhere in the state that another district facing similar environmental conditions and cost factors is generating the same or better results with less spending.

A score of less than 1.00 indicates inefficiency. It represents the difference between what the district is spending to achieve its test score results and what the minimum cost is of achieving the same results as determined by a peer group of districts.

Since efficiency scores are based on school district comparisons, this presents a problem for districts that have especially distinctive, unusual, or harsh characteristics or environments for which no comparable districts can be found. Such is the case with Minneapolis and St. Paul, for which no "peer" districts can be identified. Technically, DEA analysis ascribes a default efficiency score of 1.00 for Minneapolis and St. Paul under the methodological premise that districts are considered lowest cost producers unless it can be proven otherwise. For purposes of calculating the cost of adequacy for these districts, we used an efficiency score of 1.00.

Note on district peer groups: Linear programming equations "find" the right weighted combination of districts to be the benchmark for inefficient districts. The requirements of a being in a district's peer group are:

- must have an efficiency score of 1.00
- must have an educational cost environment <u>no better than</u> the district being evaluated
- in combination with other peer group members, performance levels at least as high in all eight standards areas; and
- in combination with other peer group members, the lowest possible cost.

Operating Expenditure Per Pupil: the amount per pupil the district spent in 2002 for school operations. Does not include capital expenditures.

Cost of Adequacy: the estimate of what is costs a district to provide an adequate education as defined by achieving the following standards:

- An index score of "1420" ("basic skills" level) on the Minnesota Comprehensive Assessment Tests for 3rd and 5th grade math and reading
- An index score of "600" on the Minnesota Basic Skills Tests for 8th grade math and reading; and a score of "3.0" for the 10th grade writing test
- A graduation rate of 80%

Expenditure Index: a measure of how much a district spends per pupil relative to the state average. An index score of 1.08 means that district spent 8% more per pupil than the state average.

Outcome Index: A measure of how well a district performs on the eight performance measures relative to the state average. An outcome index of 1.12 means the district's performance was 12% above the state average.

Cost Index (based on adequacy): A measure of how much more or less a district needs to spend, relative to the state average, to achieve adequacy standards exclusively because of its environmental cost factors. A higher number represents a harsher educational environment, a lower number indicates a more favorable educational environment. A cost index of 1.14 means the district has to spend 14% more than the state average to achieve adequacy standards because of the cost factors outside of the district's control.

Cost Index (based on 2002 state aids) - A measure of how much more or less a district actually received from the state, relative to the state average, to compensate for environmental cost factors.

Percent Overcompensated / Undercompensated: Amount of district over compensation or under compensation. It is calculated by taking the difference between the cost index based on 2002 state aids and the cost index based on adequacy and dividing it by the 2002 cost index base on state aids. For example, a district with a cost index based on adequacy of 1.03 and a cost index based on state aids of .96 is 7.3% undercompensated by the state {(.96-1.03)/.96)

Comparison to State Average: The summary of the four key district education variables

- Spending – per pupil spending
- Efficiency – efficiency index
- Outcomes – outcomes index
- Environmental Costs – degree of harshness of educational environment (based on cost of adequacy index)

"Average" means the district score is plus or minus 2% of the state average. Note that since the overall state efficiency score average is .95, efficiency scores of .97 and above are considered "above average".

APPENDIX B: MN SCHOOL DISTRICT PROFILES, Fiscal Year 2002
("Average" = +/- 2% of state average)

District Name	Efficiency Score (**=assigned)	Cost of Adequacy	Operating Expenditure Per Pupil	Expenditure Index	Outcome Index	Cost Index (based on adequacy)	Cost Index (based on 2002 aids)	Percent Overcompensated/ -Undercompensated	Comparison to State Average: Spending	Efficiency	Outcomes	Environmental Costs
A.C.G.C.	1.00	$6,370	$8,098	1.08	1.12	1.02	1.00	-2.0%	Above	Above	Above	Average
ADA-BORUP	1.00	6,199	7,532	1.01	1.07	0.99	1.04	4.8%	Average	Above	Above	Average
ADRIAN	1.00	5,574	6,563	0.88	1.04	0.89	0.94	5.3%	Below	Above	Above	Below
AITKIN	0.98	6,199	6,917	0.92	0.96	0.99	0.99	0.0%	Below	Above	Below	Average
ALBANY	1.00	5,925	6,596	0.88	0.98	0.95	0.93	-2.2%	Below	Above	Average	Below
ALBERT LEA	0.92	6,370	7,173	0.96	0.92	1.02	0.99	-3.0%	Below	Below	Below	Average
ALDEN	1.00	6,039	6,640	0.89	0.97	0.97	0.94	-3.2%	Below	Above	Below	Below
ALEXANDRIA	1.00	6,036	6,823	0.91	1.00	0.97	0.97	0.0%	Below	Above	Average	Below
ANNANDALE	0.94	5,925	6,736	0.90	0.94	0.95	0.95	0.0%	Below	Average	Below	Below
ANOKA-HENNEPIN	1.00	6,370	6,799	0.91	0.94	1.02	0.97	-5.2%	Below	Above	Below	Average
ASHBY	0.98	5,524	6,074	0.81	0.95	0.89	0.92	3.3%	Below	Above	Below	Below
AUSTIN	0.93	6,370	7,231	0.97	0.93	1.02	1.01	-1.0%	Below	Average	Below	Average
BADGER	1.00	6,370	7,851	1.05	1.09	1.02	0.99	-3.0%	Above	Above	Above	Average
BAGLEY	1.00	7,182	7,336	0.98	0.90	1.15	1.09	-5.5%	Average	Above	Below	Above
BARNESVILLE	1.00	5,924	6,940	0.93	1.03	0.95	0.99	4.0%	Below	Above	Above	Below
BARNUM	0.98	6,370	6,931	0.93	0.94	1.02	0.96	-6.3%	Below	Above	Below	Average
BATTLE LAKE	0.95	6,039	6,904	0.92	0.95	0.97	0.96	-1.0%	Below	Average	Below	Below
BECKER	0.88	5,924	7,121	0.95	0.93	0.95	0.90	-5.6%	Below	Below	Below	Below
BELGRADE-BROOTEN-ELROSA	0.94	6,036	7,562	1.01	1.04	0.97	1.03	5.8%	Average	Average	Above	Below
BELLE PLAINE	0.92	5,524	6,810	0.91	1.00	0.89	1.00	11.0%	Below	Below	Average	Below
BEMIDJI	1.00	7,182	7,773	1.04	0.95	1.15	1.04	-10.6%	Above	Above	Below	Above
BENSON	0.91	6,039	6,988	0.93	0.92	0.97	0.96	-1.0%	Below	Below	Below	Below
BERTHA-HEWITT	0.93	7,182	8,043	1.08	0.91	1.15	1.03	-11.7%	Above	Average	Below	Above
BIG LAKE	1.00	5,924	6,232	0.83	0.93	0.95	0.92	-3.3%	Below	Above	Below	Below
BIRD ISLAND-OLIVIA-LAKE LILLIAN	1.00	6,039	6,856	0.92	1.00	0.97	0.96	-1.0%	Below	Above	Average	Below
BLACKDUCK	1.00	6,370	7,758	1.04	1.07	1.02	1.12	8.9%	Above	Above	Above	Average
BLOOMING PRAIRIE	1.00	6,036	6,971	0.93	1.02	0.97	0.95	-2.1%	Below	Above	Average	Below
BLOOMINGTON	1.00	6,370	7,975	1.07	1.10	1.02	1.01	-1.0%	Above	Above	Above	Average
BLUE EARTH AREA PUBLIC SCHOOL	1.00	6,039	6,868	0.92	1.00	0.97	0.97	0.0%	Below	Above	Average	Below
BRAHAM	0.97	5,925	6,975	0.93	1.00	0.95	0.97	2.1%	Below	Average	Average	Below
BRAINERD	1.00	6,370	7,425	0.99	1.03	1.02	0.99	-3.0%	Average	Above	Above	Average
BRANDON	0.83	5,559	7,160	0.96	0.95	0.89	0.94	5.3%	Below	Below	Below	Below
BRECKENRIDGE	0.98	6,039	6,800	0.91	0.97	0.97	0.99	2.0%	Below	Above	Below	Below
BROOKLYN CENTER	0.92	8,227	9,372	1.25	0.93	1.32	1.02	-29.4%	Above	Below	Below	Above
BROWERVILLE	0.96	6,039	6,951	0.93	0.97	0.97	1.02	4.9%	Below	Average	Below	Below
BROWNS VALLEY	1.00	9,628	8,540	1.14	0.78	1.54	1.17	-31.6%	Above	Above	Below	Above
BUFFALO	0.98	6,036	6,789	0.91	0.97	0.97	0.92	-5.4%	Below	Above	Below	Below
BUFFALO LAKE-HECTOR	0.98	6,039	7,212	0.96	1.03	0.97	0.98	1.0%	Below	Above	Above	Below
BURNSVILLE	0.84	6,199	7,861	1.05	0.93	0.99	0.97	-2.1%	Above	Below	Below	Average
BUTTERFIELD	1.00	6,370	9,230	1.23	1.28	1.02	0.99	-3.0%	Above	Above	Above	Average
BYRON	1.00	5,524	6,256	0.84	1.00	0.89	0.93	4.3%	Below	Above	Average	Below
CALEDONIA	0.89	6,036	7,284	0.97	0.95	0.97	0.98	1.0%	Below	Below	Below	Below
CAMBRIDGE-ISANTI	0.93	5,924	6,748	0.90	0.93	0.95	0.93	-2.2%	Below	Average	Below	Below
CANBY	1.00	6,370	7,463	1.00	1.03	1.02	1.00	-2.0%	Average	Above	Above	Average
CANNON FALLS	0.96	5,559	6,545	0.87	0.99	0.89	0.92	3.3%	Below	Average	Average	Below
CARLTON	0.89	6,199	7,613	1.02	0.96	0.99	0.94	-5.3%	Average	Below	Below	Average
CASS LAKE-BENA SCHOOLS	1.00	10,172	10,009	1.34	0.87	1.63	1.26	-29.4%	Above	Above	Below	Above
CEDAR MOUNTAIN	1.00	6,039	7,409	0.99	1.08	0.97	1.01	4.0%	Average	Above	Above	Below
CENTENNIAL	0.99	6,036	6,832	0.91	0.99	0.97	0.96	-1.0%	Below	Above	Average	Below
CHASKA	0.83	5,559	7,470	1.00	0.98	0.89	0.98	9.2%	Average	Below	Average	Below
CHATFIELD	1.00	5,559	6,019	0.80	0.95	0.89	0.94	5.3%	Below	Above	Below	Below
CHISAGO LAKES	1.00	5,574	6,203	0.83	0.98	0.89	0.92	3.3%	Below	Above	Average	Below
CHISHOLM	1.00	6,036	8,198	1.10	1.20	0.97	0.94	-3.2%	Above	Above	Above	Below
CHOKIO-ALBERTA	1.00	5,925	8,654	1.16	1.29	0.95	0.97	2.1%	Above	Above	Above	Below
CLEARBROOK-GONVICK	0.84	6,587	8,304	1.11	0.93	1.06	1.02	-3.9%	Above	Below	Below	Above
CLEVELAND	0.97	5,524	6,097	0.82	0.94	0.89	1.00	11.0%	Below	Average	Below	Below
CLIMAX	1.00	9,628	13,084	1.75	1.20	1.54	1.16	-32.8%	Above	Above	Above	Above
CLINTON-GRACEVILLE-BEARDSLEY	1.00	6,199	7,612	1.02	1.08	0.99	1.10	10.0%	Average	Above	Above	Average
CLOQUET	1.00	6,370	7,623	1.02	1.05	1.02	1.01	-1.0%	Average	Above	Above	Average
COLUMBIA HEIGHTS	0.95	7,182	7,869	1.05	0.92	1.15	1.02	-12.7%	Above	Average	Below	Above
COMFREY	1.00	6,039	9,489	1.27	1.38	0.97	1.05	7.6%	Above	Above	Above	Below
COOK COUNTY	1.00	6,039	7,450	1.00	1.09	0.97	1.07	9.3%	Average	Above	Above	Below
CROMWELL	1.00	6,370	7,907	1.06	1.09	1.02	1.14	10.5%	Above	Above	Above	Average
CROOKSTON	1.00	6,587	6,926	0.93	0.93	1.06	1.00	-6.0%	Below	Above	Below	Above
CROSBY-IRONTON	0.87	6,199	7,512	1.00	0.93	0.99	1.02	2.9%	Average	Below	Below	Average

APPENDIX B: MN SCHOOL DISTRICT PROFILES, Fiscal Year 2002
("Average" = +/- 2% of state average)

District Name	Efficiency Score (**=assigned)	Cost of Adequacy	Operating Expenditure Per Pupil	Expenditure Index	Outcome Index	Cost Index (based on adequacy)	Cost Index (based on 2002 aids)	Percent Overcompensated/ -Undercompensated	Comparison to State Average: Spending	Comparison to State Average: Efficiency	Comparison to State Average: Outcomes	Comparison to State Average: Environmental Costs
DASSEL-COKATO	1.00	5,925	6,333	0.85	0.94	0.95	0.92	-3.3%	Below	Above	Below	Below
DAWSON-BOYD	0.94	6,036	7,609	1.02	1.04	0.97	0.98	1.0%	Average	Average	Above	Below
DEER RIVER	1.00	8,227	8,274	1.11	0.89	1.32	1.05	-25.7%	Above	Above	Below	Above
DELANO	1.00	5,524	6,582	0.88	1.05	0.89	0.93	4.3%	Below	Above	Above	Below
DETROIT LAKES	1.00	6,370	7,354	0.98	1.02	1.02	1.00	-2.0%	Average	Above	Average	Average
DILWORTH-GLYNDON-FELTON	1.00	6,036	6,519	0.87	0.95	0.97	0.97	0.0%	Below	Above	Below	Below
DOVER-EYOTA	1.00	5,524	5,908	0.79	0.94	0.89	0.90	1.1%	Below	Above	Below	Below
DULUTH	1.00	6,587	7,941	1.06	1.06	1.06	1.06	0.0%	Above	Above	Above	Above
EAGLE VALLEY	0.82	6,370	8,079	1.08	0.92	1.02	1.02	0.0%	Above	Below	Below	Average
EAST CENTRAL	0.80	7,182	9,257	1.24	0.90	1.15	1.10	-4.5%	Above	Below	Below	Above
EAST GRAND FORKS	1.00	6,370	7,156	0.96	0.99	1.02	0.96	-6.3%	Below	Above	Average	Average
EDEN PRAIRIE	0.98	5,891	7,234	0.97	1.06	0.94	0.91	-3.3%	Below	Above	Above	Below
EDEN VALLEY-WATKINS	1.00	6,291	7,457	1.00	1.04	1.01	0.97	-4.1%	Average	Above	Above	Average
EDGERTON	0.87	6,157	7,586	1.01	0.94	0.99	0.99	0.0%	Average	Below	Below	Average
EDINA	1.00	5,524	8,061	1.08	1.28	0.89	0.92	3.3%	Above	Above	Above	Below
ELGIN-MILLVILLE	1.00	5,891	6,855	0.92	1.02	0.94	0.94	0.0%	Below	Above	Average	Below
ELK RIVER	0.94	6,036	6,794	0.91	0.93	0.97	0.95	-2.1%	Below	Average	Below	Below
ELY	0.86	5,925	7,568	1.01	0.96	0.95	0.95	0.0%	Average	Below	Below	Below
ESKO	1.00	5,574	6,228	0.83	0.98	0.89	0.92	3.3%	Below	Above	Average	Below
EVANSVILLE	0.88	5,524	7,351	0.98	1.03	0.89	0.92	3.3%	Average	Below	Above	Below
EVELETH-GILBERT	1.00	6,036	6,603	0.88	0.96	0.97	0.94	-3.2%	Below	Above	Below	Below
FAIRMONT AREA SCHOOLS	1.00	6,291	7,688	1.03	1.08	1.01	0.99	-2.0%	Above	Above	Above	Average
FARIBAULT	0.88	6,370	7,510	1.00	0.91	1.02	1.04	1.9%	Average	Below	Below	Average
FARMINGTON	0.96	5,891	6,591	0.88	0.95	0.94	0.93	-1.1%	Below	Average	Below	Below
FERGUS FALLS	0.93	6,039	7,066	0.94	0.96	0.97	0.97	0.0%	Below	Average	Below	Below
FERTILE-BELTRAMI	0.81	6,199	8,120	1.09	0.94	0.99	1.08	8.3%	Above	Below	Below	Average
FILLMORE CENTRAL	0.87	5,924	7,549	1.01	0.97	0.95	0.95	0.0%	Average	Below	Below	Below
FISHER	0.99	6,039	6,963	0.93	1.01	0.97	0.94	-3.2%	Below	Above	Average	Below
FLOODWOOD	1.00	6,587	7,375	0.99	0.99	1.06	1.08	1.9%	Average	Above	Average	Above
FOLEY	0.97	6,036	6,666	0.89	0.94	0.97	0.95	-2.1%	Below	Average	Below	Below
FOREST LAKE	0.96	5,891	6,615	0.88	0.95	0.94	0.92	-2.2%	Below	Average	Below	Below
FOSSTON	1.00	6,291	7,941	1.06	1.11	1.01	1.09	7.3%	Above	Above	Above	Average
FRAZEE	1.00	6,587	6,941	0.93	0.93	1.06	1.03	-2.9%	Below	Above	Below	Above
FRIDLEY	0.85	6,291	7,779	1.04	0.92	1.01	0.99	-2.0%	Above	Below	Below	Average
FULDA	1.00	6,199	6,952	0.93	0.99	0.99	0.99	0.0%	Below	Above	Average	Average
G.F.W.	0.90	5,925	7,136	0.95	0.95	0.95	1.02	6.9%	Below	Below	Below	Below
GLENCOE-SILVER LAKE	0.91	6,036	6,986	0.93	0.92	0.97	0.93	-4.3%	Below	Below	Below	Below
GLENVILLE-EMMONS	0.96	6,199	7,485	1.00	1.02	0.99	0.96	-3.1%	Average	Average	Average	Average
GOODHUE	0.92	5,524	6,660	0.89	0.97	0.89	0.93	4.3%	Below	Below	Below	Below
GOODRIDGE	1.00	6,291	10,224	1.37	1.43	1.01	1.37	26.3%	Above	Above	Above	Average
GRANADA HUNTLEY-EAST CHAIN	0.81	6,039	8,081	1.08	0.95	0.97	1.01	4.0%	Above	Below	Below	Below
GRAND MEADOW	1.00	6,036	8,050	1.08	1.17	0.97	0.97	0.0%	Above	Above	Above	Below
GRAND RAPIDS	1.00	6,370	7,727	1.03	1.07	1.02	1.04	1.9%	Above	Above	Above	Average
GREENBUSH-MIDDLE RIVER	1.00	6,199	8,762	1.17	1.24	0.99	1.22	18.9%	Above	Above	Above	Average
GREENWAY	1.00	6,587	8,861	1.18	1.18	1.06	1.02	-3.9%	Above	Above	Above	Above
GRYGLA	1.00	6,370	10,214	1.37	1.41	1.02	1.44	29.2%	Above	Above	Above	Average
HANCOCK	0.96	6,036	7,561	1.01	1.06	0.97	0.94	-3.2%	Average	Average	Above	Below
HASTINGS	0.91	5,925	6,961	0.93	0.94	0.95	0.97	2.1%	Below	Below	Below	Below
HAWLEY	1.00	5,524	6,381	0.85	1.02	0.89	0.92	3.3%	Below	Above	Average	Below
HAYFIELD	0.94	5,524	6,619	0.88	0.99	0.89	0.92	3.3%	Below	Average	Average	Below
HENNING	1.00	6,199	7,577	1.01	1.08	0.99	1.02	2.9%	Average	Above	Above	Average
HERMANTOWN	1.00	5,891	6,270	0.84	0.94	0.94	0.95	1.1%	Below	Above	Below	Below
HERON LAKE-OKABENA	0.81	5,925	8,142	1.09	0.98	0.95	1.01	5.9%	Above	Below	Average	Below
HIBBING	0.86	6,039	7,679	1.03	0.96	0.97	0.95	-2.1%	Above	Below	Below	Below
HILL CITY	1.00	7,509	8,077	1.08	0.95	1.20	1.16	-3.4%	Above	Above	Below	Above
HILLS-BEAVER CREEK	1.00	5,524	7,518	1.01	1.20	0.89	0.97	8.2%	Average	Above	Above	Below
HINCKLEY-FINLAYSON	0.97	6,039	6,732	0.90	0.95	0.97	0.95	-2.1%	Below	Average	Below	Below
HOLDINGFORD	0.92	5,524	6,546	0.88	0.96	0.89	0.91	2.2%	Below	Below	Below	Below
HOPKINS	1.00	6,039	9,215	1.23	1.34	0.97	1.00	3.0%	Above	Above	Above	Below
HOUSTON	1.00	5,925	6,668	0.89	0.99	0.95	0.91	-4.4%	Below	Above	Average	Below
HOWARD LAKE-WAVERLY-WINSTED	0.87	5,574	7,256	0.97	1.00	0.89	0.94	5.3%	Below	Below	Average	Below
HUTCHINSON	0.97	5,574	6,289	0.84	0.97	0.89	0.92	3.3%	Below	Above	Below	Below
INTERNATIONAL FALLS	0.83	6,039	7,579	1.01	0.92	0.97	0.98	1.0%	Average	Below	Below	Below
INVER GROVE	1.00	6,291	7,375	0.99	1.03	1.01	0.99	-2.0%	Average	Above	Above	Average
ISLE	0.93	6,370	7,095	0.95	0.91	1.02	1.01	-1.0%	Below	Average	Below	Average

APPENDIX B: MN SCHOOL DISTRICT PROFILES, Fiscal Year 2002
("Average" = +/- 2% of state average)

District Name	Efficiency Score (**=assigned)	Cost of Adequacy	Operating Expenditure Per Pupil	Expenditure Index	Outcome Index	Cost Index (based on adequacy)	Cost Index (based on 2002 aids)	Percent Overcompensated/ -Undercompensated	Comparison to State Average: Spending	Efficiency	Outcomes	Environmental Costs
JACKSON COUNTY CENTRAL	0.93	6,039	7,159	0.96	0.97	0.97	0.97	0.0%	Below	Average	Below	Below
JANESVILLE-WALDORF-PEMBERTON	0.76	6,199	8,605	1.15	0.93	0.99	1.04	4.8%	Above	Below	Below	Average
JORDAN	0.92	5,574	6,465	0.86	0.94	0.89	0.99	10.1%	Below	Below	Below	Below
KASSON-MANTORVILLE	0.97	5,524	6,205	0.83	0.96	0.89	0.91	2.2%	Below	Above	Below	Below
KELLIHER	1.00	9,630	12,441	1.66	1.14	1.54	1.52	-1.3%	Above	Above	Above	Above
KENYON-WANAMINGO	0.81	5,574	7,277	0.97	0.93	0.89	0.99	10.1%	Below	Below	Below	Below
KERKHOVEN-MURDOCK-SUNBURG	0.87	6,199	7,531	1.01	0.93	0.99	1.03	3.9%	Average	Below	Below	Average
KIMBALL	0.84	6,039	7,674	1.03	0.93	0.97	0.95	-2.1%	Above	Below	Below	Below
KINGSLAND	0.93	6,039	7,074	0.95	0.96	0.97	1.00	3.0%	Below	Average	Below	Below
KITTSON CENTRAL	0.77	6,039	8,849	1.18	1.00	0.97	1.03	5.8%	Above	Below	Average	Below
LAC QUI PARLE VALLEY	0.91	6,039	7,598	1.02	1.01	0.97	1.02	4.9%	Average	Below	Average	Below
LACRESCENT-HOKAH	0.87	5,524	6,898	0.92	0.95	0.89	0.92	3.3%	Below	Below	Below	Below
LAKE CITY	0.96	5,924	6,521	0.87	0.93	0.95	0.90	-5.6%	Below	Average	Below	Below
LAKE CRYSTAL-WELLCOME MEMORIAL	0.82	6,039	8,020	1.07	0.96	0.97	1.00	3.0%	Above	Below	Below	Below
LAKE OF THE WOODS	1.00	6,039	6,892	0.92	1.00	0.97	1.02	4.9%	Below	Above	Average	Below
LAKE PARK AUDUBON DISTRICT	1.00	6,199	7,469	1.00	1.06	0.99	0.99	0.0%	Average	Above	Above	Average
LAKE SUPERIOR	0.88	5,925	7,434	0.99	0.97	0.95	1.01	5.9%	Average	Below	Below	Below
LAKEVIEW	0.93	5,524	6,730	0.90	1.00	0.89	0.93	4.3%	Below	Average	Average	Below
LAKEVILLE	1.00	5,574	6,791	0.91	1.07	0.89	0.92	3.3%	Below	Above	Above	Below
LANCASTER	1.00	6,291	8,878	1.19	1.24	1.01	1.14	11.4%	Above	Above	Above	Average
LANESBORO	1.00	6,199	7,354	0.98	1.04	0.99	0.97	-2.1%	Average	Above	Above	Average
LAPORTE	1.00	7,509	7,168	0.96	0.84	1.20	1.11	-8.1%	Below	Above	Below	Above
LECENTER	1.00	6,039	6,525	0.87	0.95	0.97	0.97	0.0%	Below	Above	Below	Below
LEROY	0.84	6,036	7,810	1.04	0.96	0.97	0.96	-1.0%	Above	Below	Below	Below
LESTER PRAIRIE	0.92	5,524	6,512	0.87	0.95	0.89	0.89	0.0%	Below	Below	Below	Below
LESUEUR-HENDERSON	1.00	6,291	6,701	0.90	0.94	1.01	0.96	-5.2%	Below	Above	Below	Average
LEWISTON-ALTURA	0.94	5,925	6,704	0.90	0.94	0.95	0.92	-3.3%	Below	Average	Below	Below
LITCHFIELD	0.96	6,199	6,872	0.92	0.93	0.99	0.95	-4.2%	Below	Average	Below	Average
LITTLE FALLS	0.92	6,370	7,197	0.96	0.92	1.02	1.03	1.0%	Below	Below	Below	Average
LITTLEFORK-BIG FALLS	0.93	5,925	7,832	1.05	1.08	0.95	1.20	20.8%	Above	Average	Above	Below
LONG PRAIRIE-GREY EAGLE	1.00	6,291	7,174	0.96	1.00	1.01	0.98	-3.1%	Below	Above	Average	Average
LUVERNE	0.96	5,925	6,709	0.90	0.95	0.95	0.96	1.0%	Below	Average	Below	Below
LYLE	0.91	6,291	7,479	1.00	0.95	1.01	0.98	-3.1%	Average	Below	Below	Average
M.A.C.C.R.A.Y.	0.82	6,291	8,942	1.20	1.03	1.01	1.01	0.0%	Above	Below	Above	Average
MABEL-CANTON	0.80	5,891	7,885	1.05	0.94	0.94	0.93	-1.1%	Above	Below	Below	Below
MADELIA	1.00	6,370	8,588	1.15	1.19	1.02	1.07	4.7%	Above	Above	Above	Average
MAHNOMEN	1.00	10,172	9,962	1.33	0.86	1.63	1.21	-34.7%	Above	Above	Below	Above
MAHTOMEDI	1.00	5,524	7,231	0.97	1.15	0.89	0.93	4.3%	Below	Above	Above	Below
MANKATO	0.93	6,199	7,050	0.94	0.94	0.99	0.96	-3.1%	Below	Average	Below	Average
MAPLE LAKE	1.00	5,574	6,794	0.91	1.07	0.89	0.91	2.2%	Below	Above	Above	Below
MAPLE RIVER	1.00	6,291	6,965	0.93	0.97	1.01	0.96	-5.2%	Below	Above	Below	Average
MARSHALL	0.90	6,157	7,373	0.99	0.94	0.99	0.97	-2.1%	Average	Below	Below	Average
MARTIN COUNTY WEST	0.88	6,036	7,525	1.01	0.96	0.97	0.97	0.0%	Average	Below	Below	Below
MCGREGOR	1.00	7,651	10,192	1.36	1.17	1.23	1.23	0.0%	Above	Above	Above	Above
MCLEOD WEST SCHOOLS	0.85	5,924	7,301	0.98	0.93	0.95	0.95	0.0%	Average	Below	Below	Below
MEDFORD	0.98	5,559	6,074	0.81	0.94	0.89	0.89	0.0%	Below	Above	Below	Below
MELROSE	0.92	6,036	7,052	0.94	0.95	0.97	0.97	0.0%	Below	Below	Below	Below
MENAHGA	1.00	6,370	7,069	0.95	0.98	1.02	1.00	-2.0%	Below	Above	Average	Average
MESABI EAST	1.00	6,291	8,806	1.18	1.23	1.01	0.99	-2.0%	Above	Above	Above	Average
MILACA	0.98	6,199	6,667	0.89	0.93	0.99	0.94	-5.3%	Below	Above	Below	Average
MINNEAPOLIS	1.00**	14,446	10,772	1.44	0.66	2.32	1.37	-69.3%	Above	N/A	Below	Above
MINNEOTA	1.00	5,925	6,556	0.88	0.97	0.95	0.95	0.0%	Below	Above	Below	Below
MINNETONKA	1.00	5,574	7,864	1.05	1.24	0.89	0.93	4.3%	Above	Above	Above	Below
MINNEWASKA	1.00	6,157	7,590	1.01	1.09	0.99	0.98	-1.0%	Average	Above	Above	Average
MONTEVIDEO	0.89	6,039	7,746	1.04	1.01	0.97	0.99	2.0%	Above	Below	Average	Below
MONTGOMERY-LONSDALE	0.99	6,036	7,189	0.96	1.04	0.97	0.99	2.0%	Below	Above	Above	Below
MONTICELLO	1.00	6,039	7,165	0.96	1.04	0.97	0.93	-4.3%	Below	Above	Above	Below
MOORHEAD	0.97	6,370	7,080	0.95	0.95	1.02	1.07	4.7%	Below	Above	Below	Average
MOOSE LAKE	1.00	6,039	6,515	0.87	0.95	0.97	0.95	-2.1%	Below	Above	Below	Below
MORA	1.00	6,157	6,431	0.86	0.92	0.99	0.93	-6.5%	Below	Above	Below	Average
MORRIS	1.00	6,036	6,935	0.93	1.01	0.97	0.95	-2.1%	Below	Above	Average	Below
MOUNDS VIEW	1.00	6,039	7,585	1.01	1.11	0.97	0.94	-3.2%	Average	Above	Above	Below
MOUNTAIN IRON-BUHL	0.74	6,036	8,816	1.18	0.95	0.97	1.01	4.0%	Above	Below	Below	Below
MOUNTAIN LAKE	1.00	7,651	7,831	1.05	0.90	1.23	1.09	-12.8%	Above	Above	Below	Above
N.R.H.E.G.	1.00	6,199	6,915	0.92	0.98	0.99	0.97	-2.1%	Below	Above	Average	Average

APPENDIX B: MN SCHOOL DISTRICT PROFILES, Fiscal Year 2002
("Average" = +/- 2% of state average)

District Name	Efficiency Score (**=assigned)	Cost of Adequacy	Operating Expenditure Per Pupil	Expenditure Index	Outcome Index	Cost Index (based on adequacy)	Cost Index (based on 2002 aids)	Percent Overcompensated/ -Undercompensated	Comparison to State Average: Spending	Efficiency	Outcomes	Environmental Costs
NASHWAUK-KEEWATIN	1.00	7,182	8,335	1.11	1.02	1.15	1.09	-5.5%	Above	Above	Average	Above
NEVIS	1.00	6,587	7,303	0.98	0.98	1.06	1.01	-5.0%	Average	Above	Average	Above
NEW LONDON-SPICER	0.93	5,925	6,865	0.92	0.95	0.95	0.92	-3.3%	Below	Average	Below	Below
NEW PRAGUE	0.96	5,524	6,515	0.87	1.00	0.89	0.95	6.3%	Below	Average	Average	Below
NEW ULM	0.89	5,574	6,827	0.91	0.96	0.89	0.96	7.3%	Below	Below	Below	Below
NEW YORK MILLS	1.00	6,157	6,930	0.93	0.99	0.99	1.00	1.0%	Below	Above	Average	Average
NICOLLET	0.86	5,524	7,595	1.02	1.04	0.89	0.91	2.2%	Average	Below	Above	Below
NORMAN COUNTY EAST	1.00	6,370	8,895	1.19	1.23	1.02	1.04	1.9%	Above	Above	Above	Average
NORMAN COUNTY WEST	1.00	6,370	8,331	1.11	1.15	1.02	1.08	5.6%	Above	Above	Above	Average
NORTH BRANCH	1.00	6,039	6,449	0.86	0.94	0.97	0.93	-4.3%	Below	Above	Below	Below
NORTH ST PAUL-MAPLEWOOD	0.95	6,291	7,190	0.96	0.95	1.01	0.96	-5.2%	Below	Average	Below	Average
NORTHFIELD	1.00	5,925	7,090	0.95	1.05	0.95	0.92	-3.3%	Below	Above	Above	Below
NORWOOD	0.78	5,925	8,003	1.07	0.93	0.95	1.06	10.4%	Above	Below	Below	Below
OGILVIE	0.92	6,370	7,168	0.96	0.91	1.02	1.00	-2.0%	Below	Below	Below	Average
OKLEE	0.91	6,587	8,286	1.11	1.00	1.06	1.08	1.9%	Above	Below	Average	Above
ONAMIA	1.00	7,651	7,717	1.03	0.89	1.23	1.12	-9.8%	Above	Above	Below	Above
ORONO	1.00	5,524	7,642	1.02	1.22	0.89	0.92	3.3%	Average	Above	Above	Below
ORTONVILLE	0.83	6,039	7,868	1.05	0.95	0.97	1.06	8.5%	Above	Below	Below	Below
OSAKIS	1.00	5,925	6,242	0.83	0.93	0.95	0.95	0.0%	Below	Above	Below	Below
OSSEO	1.00	6,370	7,963	1.06	1.10	1.02	1.01	-1.0%	Above	Above	Above	Average
OWATONNA	0.93	6,039	7,065	0.94	0.96	0.97	0.94	-3.2%	Below	Average	Below	Below
PARK RAPIDS	1.00	6,370	7,948	1.06	1.10	1.02	1.02	0.0%	Above	Above	Above	Average
PARKERS PRAIRIE	0.97	6,039	7,567	1.01	1.07	0.97	0.97	0.0%	Average	Average	Above	Below
PAYNESVILLE	0.98	6,036	6,992	0.93	1.00	0.97	0.97	0.0%	Below	Above	Average	Below
PELICAN RAPIDS	1.00	6,039	6,310	0.84	0.92	0.97	0.98	1.0%	Below	Above	Below	Below
PEQUOT LAKES	1.00	6,199	6,904	0.92	0.98	0.99	0.93	-6.5%	Below	Above	Average	Average
PERHAM	0.92	6,039	7,362	0.98	0.98	0.97	0.97	0.0%	Average	Below	Average	Below
PIERZ	1.00	6,291	7,417	0.99	1.04	1.01	0.99	-2.0%	Average	Above	Above	Average
PILLAGER	0.92	6,370	7,166	0.96	0.91	1.02	1.02	0.0%	Below	Below	Below	Average
PINE CITY	0.90	5,925	6,947	0.93	0.93	0.95	0.94	-1.1%	Below	Below	Below	Below
PINE ISLAND	0.95	5,524	6,299	0.84	0.95	0.89	0.90	1.1%	Below	Average	Below	Below
PINE RIVER-BACKUS	0.95	6,370	6,940	0.93	0.91	1.02	1.03	1.0%	Below	Average	Below	Average
PIPESTONE-JASPER	1.00	6,036	6,450	0.86	0.94	0.97	0.97	0.0%	Below	Above	Below	Below
PLAINVIEW	1.00	5,559	6,395	0.85	1.01	0.89	0.94	5.3%	Below	Above	Average	Below
PLUMMER	1.00	8,989	8,423	1.13	0.83	1.44	1.05	-37.1%	Above	Above	Below	Above
PRINCETON	1.00	6,036	6,531	0.87	0.95	0.97	0.93	-4.3%	Below	Above	Below	Below
PRIOR LAKE	0.88	5,524	6,909	0.92	0.97	0.89	0.93	4.3%	Below	Below	Below	Below
PROCTOR	0.86	5,574	6,969	0.93	0.95	0.89	0.95	6.3%	Below	Below	Below	Below
RANDOLPH	0.89	5,524	7,112	0.95	1.00	0.89	0.90	1.1%	Below	Below	Average	Below
RED LAKE	1.00	NA	13,026	1.74	NA	N/A	1.34	N/A	Above	Above	Above	Above
RED LAKE FALLS	0.85	6,291	7,780	1.04	0.92	1.01	0.99	-2.0%	Above	Below	Below	Average
RED ROCK CENTRAL	1.00	6,039	7,558	1.01	1.10	0.97	1.02	4.9%	Average	Above	Above	Below
RED WING	0.86	6,199	7,624	1.02	0.93	0.99	0.94	-5.3%	Average	Below	Below	Average
RENVILLE COUNTY WEST	0.87	6,370	7,806	1.04	0.94	1.02	0.99	-3.0%	Above	Below	Below	Average
RICHFIELD	1.00	6,587	8,243	1.10	1.10	1.06	1.03	-2.9%	Above	Above	Above	Above
ROBBINSDALE	1.00	6,370	7,972	1.07	1.10	1.02	1.01	-1.0%	Above	Above	Above	Average
ROCHESTER	1.00	6,370	7,039	0.94	0.97	1.02	0.99	-3.0%	Below	Above	Below	Average
ROCKFORD	0.97	6,036	6,576	0.88	0.93	0.97	0.95	-2.1%	Below	Average	Below	Below
ROSEAU	1.00	6,036	6,437	0.86	0.94	0.97	0.96	-1.0%	Below	Above	Below	Below
ROSEMOUNT-APPLE VALLEY-EAGAN	1.00	6,199	6,601	0.88	0.94	0.99	0.93	-6.5%	Below	Above	Below	Average
ROSEVILLE	1.00	6,291	8,216	1.10	1.15	1.01	0.97	-4.1%	Above	Above	Above	Average
ROTHSAY	1.00	6,039	7,665	1.02	1.12	0.97	0.99	2.0%	Average	Above	Above	Below
ROYALTON	1.00	6,291	6,485	0.87	0.91	1.01	0.97	-4.1%	Below	Above	Below	Average
RUSH CITY	0.91	5,524	6,533	0.87	0.95	0.89	1.00	11.0%	Below	Below	Below	Below
RUSHFORD-PETERSON	0.93	6,039	7,081	0.95	0.96	0.97	0.97	0.0%	Below	Average	Below	Below
SARTELL	0.93	5,524	6,763	0.90	1.01	0.89	0.92	3.3%	Below	Average	Average	Below
SAUK CENTRE	1.00	6,199	7,077	0.95	1.01	0.99	0.95	-4.2%	Below	Above	Average	Average
SAUK RAPIDS	1.00	6,199	6,793	0.91	0.96	0.99	0.94	-5.3%	Below	Above	Below	Average
SEBEKA	0.98	6,370	7,022	0.94	0.95	1.02	1.02	0.0%	Below	Above	Below	Average
SHAKOPEE	0.91	5,925	6,854	0.92	0.93	0.95	0.96	1.0%	Below	Below	Below	Below
SIBLEY EAST	0.93	6,036	6,887	0.92	0.94	0.97	0.97	0.0%	Below	Average	Below	Below
SLEEPY EYE	0.84	6,157	7,741	1.03	0.93	0.99	1.06	6.6%	Above	Below	Below	Average
SOUTH KOOCHICHING	0.62	6,370	11,395	1.52	0.98	1.02	1.47	30.6%	Above	Below	Average	Average
SOUTH ST. PAUL	0.85	6,199	7,688	1.03	0.93	0.99	0.95	-4.2%	Above	Below	Below	Average
SOUTH WASHINGTON COUNTY	0.89	6,039	7,310	0.98	0.95	0.97	0.92	-5.4%	Average	Below	Below	Below

APPENDIX B: MN SCHOOL DISTRICT PROFILES, Fiscal Year 2002
("Average" = +/- 2% of state average)

District Name	Efficiency Score (**=assigned)	Cost of Adequacy	Operating Expenditure Per Pupil	Expenditure Index	Outcome Index	Cost Index (based on adequacy)	Cost Index (based on 2002 aids)	Percent Overcompensated/ -Undercompensated	Comparison to State Average: Spending	Efficiency	Outcomes	Environmental Costs
SOUTHLAND	0.90	5,925	7,036	0.94	0.94	0.95	0.95	0.0%	Below	Below	Below	Below
SPRING GROVE	0.86	5,524	7,267	0.97	1.00	0.89	0.92	3.3%	Below	Below	Average	Below
SPRING LAKE PARK	0.85	6,039	7,515	1.00	0.93	0.97	0.95	-2.1%	Average	Below	Below	Below
SPRINGFIELD	0.91	5,574	6,749	0.90	0.97	0.89	0.92	3.3%	Below	Below	Below	Below
ST. ANTHONY-NEW BRIGHTON	1.00	5,574	8,577	1.15	1.35	0.89	0.92	3.3%	Above	Above	Above	Below
ST. CHARLES	1.00	5,574	5,904	0.79	0.93	0.89	0.90	1.1%	Below	Above	Below	Below
ST. CLAIR	0.96	5,524	6,264	0.84	0.96	0.89	0.93	4.3%	Below	Average	Below	Below
ST. CLOUD	0.83	6,587	8,371	1.12	0.93	1.06	1.05	-1.0%	Above	Below	Below	Above
ST. FRANCIS	0.96	6,036	6,779	0.91	0.95	0.97	0.94	-3.2%	Below	Average	Below	Below
ST. JAMES	0.93	6,291	7,038	0.94	0.92	1.01	1.01	0.0%	Below	Average	Below	Average
ST. LOUIS COUNTY	0.71	6,370	9,612	1.29	0.94	1.02	1.22	16.4%	Above	Below	Below	Average
ST. LOUIS PARK	1.00	6,370	9,318	1.25	1.29	1.02	1.03	1.0%	Above	Above	Above	Average
ST. MICHAEL-ALBERTVILLE	0.99	5,524	6,236	0.83	0.98	0.89	0.90	1.1%	Below	Above	Average	Below
ST. PAUL	1.00**	9,945	9,716	1.30	0.86	1.59	1.29	-23.3%	Above	N/A	Below	Above
ST. PETER	0.83	6,199	7,922	1.06	0.93	0.99	1.01	2.0%	Above	Below	Below	Average
STAPLES-MOTLEY	0.84	6,370	8,237	1.10	0.96	1.02	1.04	1.9%	Above	Below	Below	Average
STEPHEN-ARGYLE CENTRAL SCHOOLS	1.00	6,036	8,204	1.10	1.20	0.97	1.08	10.2%	Above	Above	Above	Below
STEWARTVILLE	1.00	5,574	6,337	0.85	1.00	0.89	0.94	5.3%	Below	Above	Average	Below
STILLWATER	0.89	5,574	7,427	0.99	1.05	0.89	0.93	4.3%	Average	Below	Above	Below
SWANVILLE	0.97	6,291	7,387	0.99	1.00	1.01	0.96	-5.2%	Average	Average	Average	Average
THIEF RIVER FALLS	0.96	6,291	7,176	0.96	0.96	1.01	0.97	-4.1%	Below	Average	Below	Average
TRACY	1.00	6,199	7,036	0.94	1.00	0.99	1.04	4.8%	Below	Above	Average	Average
TRI-COUNTY	1.00	7,182	9,530	1.27	1.17	1.15	1.27	9.4%	Above	Above	Above	Above
TRITON	0.90	6,039	7,140	0.95	0.94	0.97	0.94	-3.2%	Below	Below	Below	Below
TRUMAN	0.90	6,291	8,466	1.13	1.07	1.01	1.02	1.0%	Above	Below	Above	Average
ULEN-HITTERDAL	0.69	6,199	9,468	1.27	0.93	0.99	1.05	5.7%	Above	Below	Below	Average
UNDERWOOD	1.00	6,039	6,571	0.88	0.96	0.97	0.94	-3.2%	Below	Above	Below	Below
UNITED SOUTH CENTRAL	1.00	6,199	7,297	0.98	1.04	0.99	1.01	2.0%	Average	Above	Above	Average
UPSALA	1.00	6,039	7,355	0.98	1.07	0.97	0.96	-1.0%	Average	Above	Above	Below
VERNDALE	1.00	6,370	6,582	0.88	0.91	1.02	1.02	0.0%	Below	Above	Below	Average
VIRGINIA	1.00	6,039	8,257	1.10	1.20	0.97	0.98	1.0%	Above	Above	Above	Below
WABASHA-KELLOGG	1.00	6,036	7,457	1.00	1.09	0.97	0.98	1.0%	Average	Above	Above	Below
WABASSO	0.83	5,925	8,104	1.08	0.99	0.95	0.98	3.1%	Above	Below	Average	Below
WACONIA	1.00	5,524	7,299	0.98	1.16	0.89	0.97	8.2%	Average	Above	Above	Below
WADENA-DEER CREEK	0.98	6,370	7,338	0.98	0.99	1.02	1.02	0.0%	Average	Above	Average	Average
WALKER-HACKENSACK-AKELEY	1.00	7,182	8,169	1.09	1.00	1.15	1.10	-4.5%	Above	Above	Average	Above
WARREN-ALVARADO-OSLO	1.00	6,587	9,019	1.21	1.21	1.06	1.08	1.9%	Above	Above	Above	Above
WARROAD	0.96	6,199	6,875	0.92	0.94	0.99	0.99	0.0%	Below	Average	Below	Average
WASECA	0.92	6,199	7,164	0.96	0.94	0.99	0.98	-1.0%	Below	Below	Below	Average
WATERTOWN-MAYER	0.91	5,524	6,721	0.90	0.98	0.89	0.95	6.3%	Below	Below	Average	Below
WATERVILLE-ELYSIAN-MORRISTOWN	1.00	6,370	7,014	0.94	0.97	1.02	0.97	-5.2%	Below	Above	Below	Average
WAUBUN	1.00	9,630	9,620	1.29	0.88	1.54	1.23	-25.2%	Above	Above	Below	Above
WAYZATA	1.00	5,574	7,442	0.99	1.18	0.89	0.93	4.3%	Average	Above	Above	Below
WEST CENTRAL AREA	0.94	6,291	7,161	0.96	0.94	1.01	0.97	-4.1%	Below	Average	Below	Average
WEST ST. PAUL-MENDOTA HTS.-EAGAN	1.00	6,370	7,806	1.04	1.08	1.02	0.99	-3.0%	Above	Above	Above	Average
WESTONKA	0.77	5,891	8,296	1.11	0.95	0.94	0.95	1.1%	Above	Below	Below	Below
WHEATON AREA SCHOOL	1.00	6,039	8,140	1.09	1.19	0.97	1.05	7.6%	Above	Above	Above	Below
WHITE BEAR LAKE	0.91	6,039	7,258	0.97	0.96	0.97	0.97	0.0%	Below	Below	Below	Below
WILLMAR	0.99	6,587	7,346	0.98	0.97	1.06	1.07	0.9%	Average	Above	Below	Above
WILLOW RIVER	0.83	6,370	7,925	1.06	0.91	1.02	1.03	1.0%	Above	Below	Below	Average
WINDOM	1.00	7,651	7,913	1.06	0.91	1.23	1.01	-21.8%	Above	Above	Below	Above
WIN-E-MAC	0.84	6,039	7,500	1.00	0.92	0.97	0.99	2.0%	Average	Below	Below	Below
WINONA AREA PUBLIC SCHOOLS	1.00	6,370	7,488	1.00	1.04	1.02	1.04	1.9%	Average	Above	Above	Average
WORTHINGTON	0.84	6,587	8,241	1.10	0.93	1.06	1.05	-1.0%	Above	Below	Below	Above
WRENSHALL	1.00	6,036	6,418	0.86	0.94	0.97	0.97	0.0%	Below	Above	Below	Below
YELLOW MEDICINE EAST	0.90	6,370	8,261	1.10	1.03	1.02	1.03	1.0%	Above	Below	Above	Average
ZUMBROTA-MAZEPPA	0.85	5,524	7,089	0.95	0.96	0.89	0.96	7.3%	Below	Below	Below	Below
State Average	**0.95**	**$6,236**	**$7,480**	**1.00**	**1.00**							

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