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THE BIGGEST BANG FOR THE BUCK: AN INITIAL REPORT ON TECHNICAL ECONOMIC EFFICIENCY IN ILLINOIS K-12 SCHOOLS WITH A COMMENT ON ROSE V. THE COUNCIL

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This series of monographs is dedicated to Professor Lucy Jen Huang Hickrod, late of the Sociology Department of Illinois State University. Death has forever taken Professor Huang Hickrod from intellectual labors, but she remains an inspiration to her husband, her family and her many friends. *Sic transit Gloria Mundi.*

"The age of chivalry is gone. That of sophisters, economists, and calculators has survived; and the glory of Europe is extinguished forever."
–Edmund Burke, Reflections on the Revolution in France, 1790.

"Mere parsimony is not economy. . . Expense, and great expense, may be an essential part of true economy."
–Edmund Burke, "Letter to a Noble Lord," 1796.

I. Background

The MacArthur/Spencer special project on Illinois school finance is dedicated to the exploration of three central concepts or goals in Illinois school finance: equity, adequacy and efficiency. Publications of the project to date have dealt with equity and adequacy but only indirectly with efficiency. This monograph is intended to confront the dragon of efficiency directly. If it appears there is some reluctance to do this, it is because the whole area of efficiency analysis in education has not been very productive in the past. Indeed, to continue the analogy, knights, armour, horse, and all have disappeared in the quicksand of the very, very spongy concept of "efficiency." However, in a period of increasing short supply of revenues for public education, the authors feel they should enter the lists, however reluctantly. This is but the first sally into what may be a rather long struggle with the efficiency goal. This monograph deals with conceptual matters and with an operational definition of "technical economic efficiency." That operational definition is applied to Illinois data to identify a set of high school districts that are believed to be economically efficient within this study's definition of the term. Discussed briefly are some policy implications of this ability to identify districts as being technically economically efficient. Future studies shall search for determinants of this technical economic efficiency; that is, they shall be looking for answers to the question: "Why are these districts economically efficient?" The present task is, therefore, to explain the concept and to demonstrate that it can successfully be used to identify districts that are apparently reaching that goal. It should be noted that this type of analysis was not possible prior to the existence of legislation which required the "School District Report Card" in Illinois.

II. The Concept of Efficiency

Any standard dictionary is a place to start. The one consulted stated: "the quality of being efficient." That definition doesn't take one very far, unless the alternative definition is preferred, e.g., "a small apartment." But, since this monograph presumably deals with school finance research, and not with the real estate business, one must push on. "Efficient" takes one a little further since that is defined as "exhibiting a high ratio of output to input." Consider that definition for the moment, although it is not the one that shall eventually be used in this monograph.

Is there any evidence that American public education is demonstrating a high level of output relative to input? No, to the contrary, the evidence, at least at first appraisal, seems to point in the other direction. Both in the nation at large and in Illinois, test scores have gone down while expenditures have gone up. At least a prima facie case can, therefore, be made that inefficiency exists in the American public educational

system. There may be good, political reasons for tolerating a certain amount of economic inefficiency in the public education system; nevertheless, it is a concern for both the taxpayer and the conscientious educational finance researcher.

Economic literature and current school finance texts are also of some help. From the point-of-view of the discipline of economics, an acceptable approach to efficiency is to divide economic efficiency into two parts: allocative efficiency and technical efficiency. Allocative efficiency deals with the question of whether or not a sufficient quantity and adequate quality of goods and services are being produced in the system. Presumably, in the free market economy, this basic economic efficiency is governed by the actions of the forces of supply and demand in the market. When the market is oversupplied, the price will fall and producers will look elsewhere to employ their capital and labor. When a free market is not present, or is only partially present, as is the case in public education in the United States, a collective decision-making process must be substituted for the market and a decision reached through an essentially political process of public choice. This is also true in "planned economies" which rely less on market mechanisms.

Enhancement of allocative economic efficiency would seem to lead one into a discussion of the fundamental institutional structure of funding public education, which is a perfectly worthwhile topic to explore and, indeed, has been explored in a good deal of current literature. However, a discussion of a possible privatization of educational finance--replete with vouchers, alternative schools, and all the rest of that machinery--will be left to others. There is another form of economic efficiency which, at least for the present, commands greater attention.

Technical efficiency consists of maximizing the inputs in such a fashion so that the greatest output is achieved relative to a given level of input. This comes close to the dictionary definition. Although the concepts of allocative economic efficiency and technical efficiency are separable in theory, in the real world they merge, as do many such academic constructs. As one sage observed, "The world is simple to idiots and textbook writers."

Consider, if you will, the world of Chinese restaurants. A prima facie case can surely be argued that this market is oversupplied. Many Chinese immigrants--with little capital and sometimes with little marketable skills, but with a strong entreprenurial spirit--have placed a small Chinese restaurant on virtually every corner of every large urban area in the world and often now in semi-rural areas as well. You would think that none of them could make any money. Wrong. It is true that this market is very broad, especially in the United States where this form of ethnic food is second only to Italian--and that is because all the pizza places are defined as ethnic Italian. However, close inspection reveals that many small Chinese restaurants manage to turn a profit by scrupulous supervision of their overhead and by managing to keep their labor costs far below market levels. Some of them do then pass this profit on to their clients, thus lowering their prices relative to other food products and, in fact, increasing what is already a sizeable market. Thus, while the market appears to be overcrowded it is still expanding.

The Chinese restaurant example is useful because that is still a very labor-intensive industry as, indeed, is education. Discussions of technical economic efficiency often assume that this type of economic efficiency can only be accomplished by substituting lower-priced machine-inputs for higher-priced labor-inputs. Certainly, that is

a primary procedure for accomplishing economic efficiency and one that public education has probably underutilized. However, any industry can become more efficient by re-arranging inputs in a less costly manner providing that output quality and quantity do not fall as a result of the cheaper inputs. While producing an educated child is assuredly more difficult than producing a good dish of Egg Fu Yong, there is not an a priori reason for assuming that education cannot be provided in an economically efficient manner.

Considerable confusion arises in a profession like education because professional effectiveness has somehow become confused with economic efficiency. The two goals are separate; and, in fact, many professions either consciously or unconsciously subordinate economic efficiency to professional effectiveness. Lawyers wish to win cases; doctors wish to either cure diseases or at least help their patients if they cannot cure them. For many professions the goal is not to do an acceptable job at the least cost, but to do the best possible job with little consideration to cost at all. Their goal is nothing short of "best professional practice," although the high costs of many medical procedures have driven some doctors back to the less demanding criterion of "treatment of choice." In reality, of course, cost considerations do interact with professional judgments. That is why many legal suits are settled either out of court or by plea bargaining. It is also why many operations are not performed, especially on more elderly patients. But it is interesting that doctors and lawyers do tend to view economic constraints as essentially "non-professional" limitations on their desired behavior. It is also the reason that the school business manager is still viewed, not as a facilitator of actions, but as the person who says, "No," to requests for more input. Sometimes, he or she shares this unenviable position with the school attorney. The point is that an individual school board, particularly an affluent one, might consciously decide not to be technically economically efficient, but, rather, to go for "best professional practice." If they take that public policy position, however, they should take it with full knowledge of the facts; but that is not the case at the present time in Illinois. Whether an entity as large as the whole state can afford the luxury of that choice is also a debatable question.

There is a massive amount of literature in education that uses test scores as a dependent variable and a whole host of independent variables to predict those test scores, including an enormous volume of those types of studies in educational psychology and a very respectable number of them in school finance. In school finance they are variously termed "production function" studies, or, more generally, "input-output" studies. The amount of hours spent in this kind of investigation is prodigious and the amount of ink spilled over its description is as vast as the seven seas. There are also some very fine summaries of this type of research available to the school finance student. Initially, consideration was given to trying to add a small contribution to this mountain of research; however, it was concluded that the MacArthur/Spencer funds could be better spent in a quite different kind of investigation. By the terms of the study grant, not all the funds could be used to study efficiency but had to be spread between the three principal topics: equity, adequacy and efficiency. However, even if the entire sum could have been spent on efficiency analysis, the researchers would not have elected to try to add to the literature on determinants of test scores. They refuse to enter the lists, because they basically feel that these studies are not studies of technical efficiency, but, rather, are studies of professional effectiveness.

There is one notable exception: those "input-output" studies that try to determine the effect of dollars spent on education; e.g., the studies that try to determine, "Does educational spending make a difference"? Again, combat was declined in this

monograph, because, at the present time, there appears to be no way around the principal problem in this type of research: the interaction between the socioeconomic status of students and educational expenditures by the district. There has been no satisfactory resolution to that problem since the classic Coleman study and the various responses to that study.

As long as districts with children from wealthy families have high expenditure levels and districts with poor families have much lower expenditure levels, there appears to be no way to separate the socioeconomic status effects on test scores from the expenditure effects on test scores. Certainly, that is the case with single equation least squares estimates. While the more elaborate path analysis or sets of recursive equations can build in and test these relationships, neither the path analysis nor the sets of recursive equations can untangle the interactions, although they have the advantage of formalizing the interactions. On the other hand, the empirical work displayed in this monograph does relate more closely to the type known as the "cost-effectiveness" study. Such "cost effectiveness" studies come close to the heart of technical economic efficiency as defined here. In essence, this study has related a predicted form of cost to a predicted form of effectiveness, as will be seen from the operational definition of technical economic efficiency sketched below.

The view held here is that some of the early investigators in this field--like the late Paul Mort--were correct in that it is not the overall level of funding that is important. Rather, what makes the difference in outputs is the way in which dollars are applied to the purchase of inputs--that is, on what the dollars are spent. Other current writers in educational finance also take this position. Not for one moment are these valiant attempts to charge directly the ramparts of economic ignorance in school finance disparaged; however, the great cost of such an infantry charge must be recognized. What the reader is apt to find in this manuscript is closer to a cavalry maneuver which attempts only to turn the flank of the enemy and not to seek an outright victory on the field. A more comprehensive analysis of the conceptual and theoretical issues involved in efficiency, with particular reference to Illinois school finance, is forthcoming in The Concept of Efficiency in Illinois School Finance by James Gordon Ward.

III. The Efficiency/Effectiveness Quadriform

A quadriform is anything in nature that has a four-fold design impressed deeply upon it. This monograph argues that school finance displays such a quadriform, although such a formation is not much to the liking of a good many educators. This quadriform arises due to the interaction of two forces. In this analysis, one force is the primary determinant of test scores in Illinois. That force is the poverty impaction of the school district, often measured as the percent of low income children in the school district. The greater the percentage of low income children, the lower the expected test scores in the district. This is NOT a hypothesis; it is far more like an empirical law, albeit a very cruel law. Several doctoral dissertations at Illinois State University plus several independent investigations by the Illinois Board of Education have shown beyond any reasonable doubt that the single, strongest factor depressing test scores in a district is the percentage of low income children in that district. It is very regrettable, but it is a fact, not an opinion. To the everlasting credit of a group of professors and legislators, that fact was recognized quite early, even though it has been only in the last three years that the empirical evidence has been available to document this relationship in any detail. In 1973, the state placed a "poverty impaction" factor into its general state aid

formula; and, although for highly debatable reasons, that factor has been manipulated from time to time. Nonetheless, it has distributed, and continues to distribute, a great deal of state money to districts with high concentrations of poverty. Illinois can say with some pride that for almost 16 years it has gotten much of the general state aid funds to the districts that needed those funds the most. Few states can make that claim stick.

In a broader sociological sense, of course, this relationship is precisely the relationship pointed to by the classic Coleman study and by a library-full of studies in educational sociology. There has never been any argument whatsoever over the effect of the socioeconomic backgrounds of children on their learning. As mentioned earlier, the debate has come only over whether the educational expenditures can do anything to offset this fully-expected negative relationship between the socioeconomic level of the district and the test scores. Empirical investigation in Illinois also strongly suggests that it is the concentration of poverty that is the most important predictor of average test scores, and not the general socioeconomic level of the district. Since this study has deliberately eschewed any desire to proceed into the determinants of achievement, no more will be said here except that the great body of sociological evidence pointing to peer influences on learning may well be on the correct track. If so, then one of the primary influences on learning could well be the segregation of socioeconomic classes, rather than the segregation of minority groups, which has received far more legal and social science study. In any event, Illinois educators perceived correctly and perceived early that: as the percentage of poverty in the district climbed, the climate of the school changed--and changed in a manner that was prejudicial to the learning environment.

DIAGRAM A: THE POVERTY IMPACTION FUNCTION

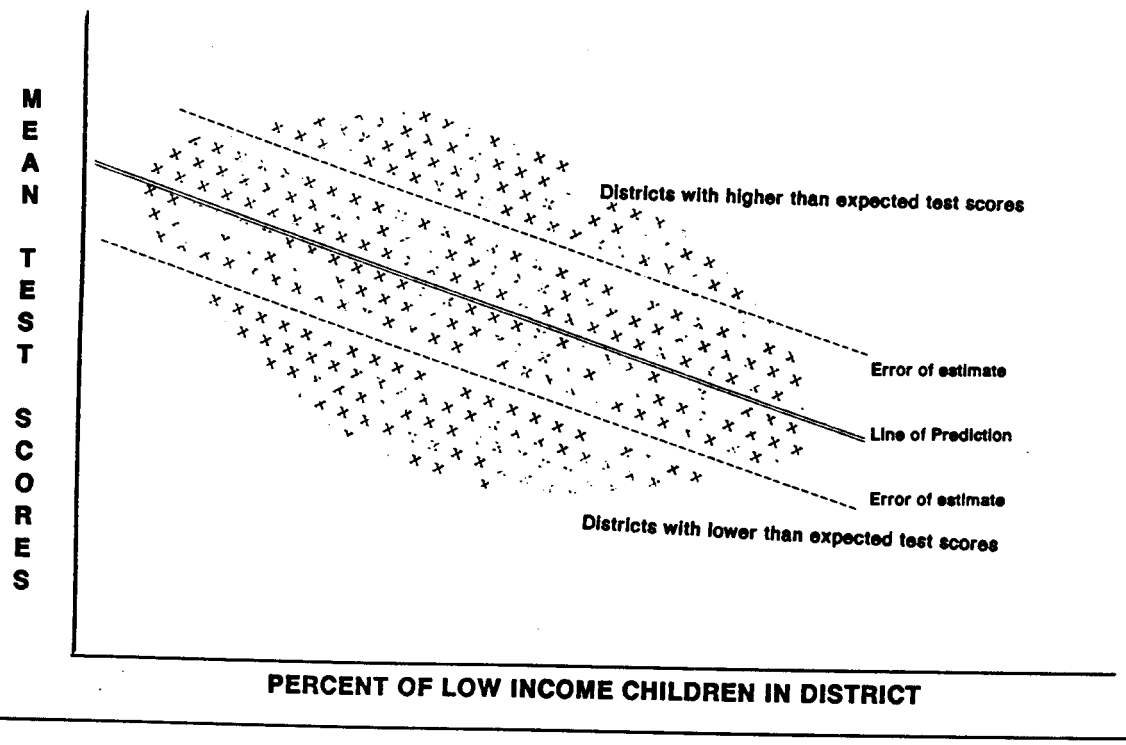
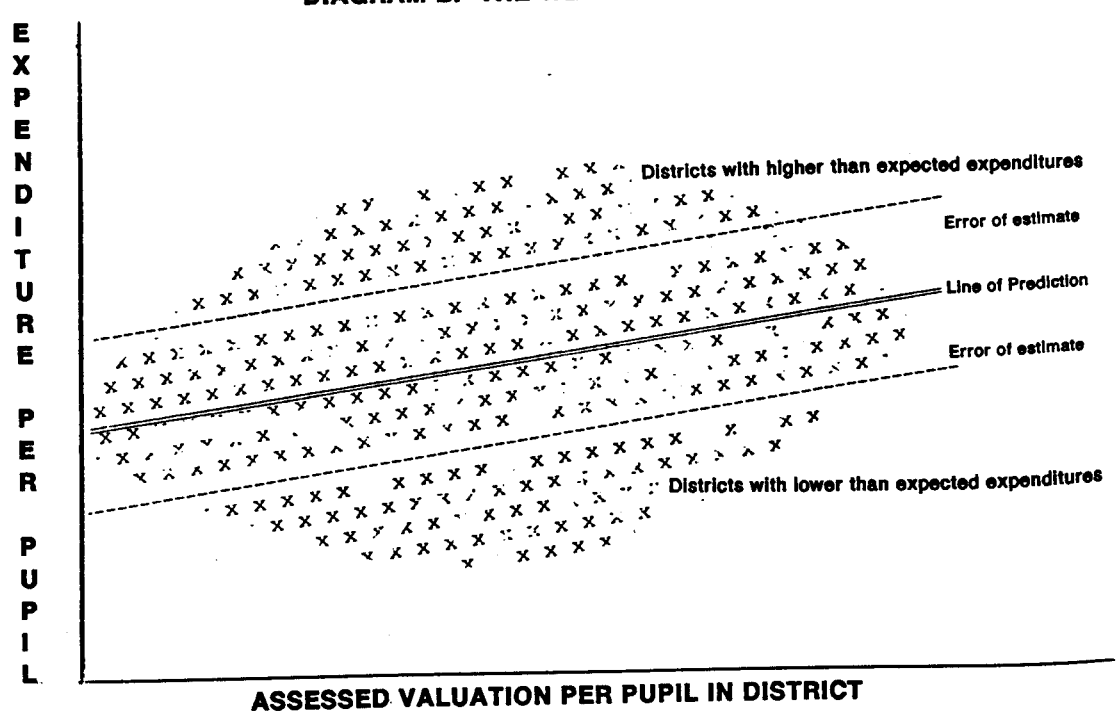


Diagram A represents this situation in Illinois. The actual strength of this situation has been shown to vary depending on the test score that is used, the grade level, the type of school district, and a number of other variables. Nevertheless, it is seldom under a Pearson product moment correlation of .50, indicating that at least 25% of the variance in test scores is associated with poverty impaction. That is a very conservative estimate; often it is much higher. Since the line of prediction is provided by ordinary least-squares procedures which require the line of prediction to pass through the means, based upon their poverty impaction, half of the districts in Illinois can be shown to have test scores greater than expected and half of them will have test scores less than expected. If the distribution is homoscedastic--that is, it looks like a football--then an error of estimate can be computed to express probability of any given score falling along the line of prediction. It is possible to use this standard error of estimate in grouping districts into categories, but that procedure is not followed in this study.

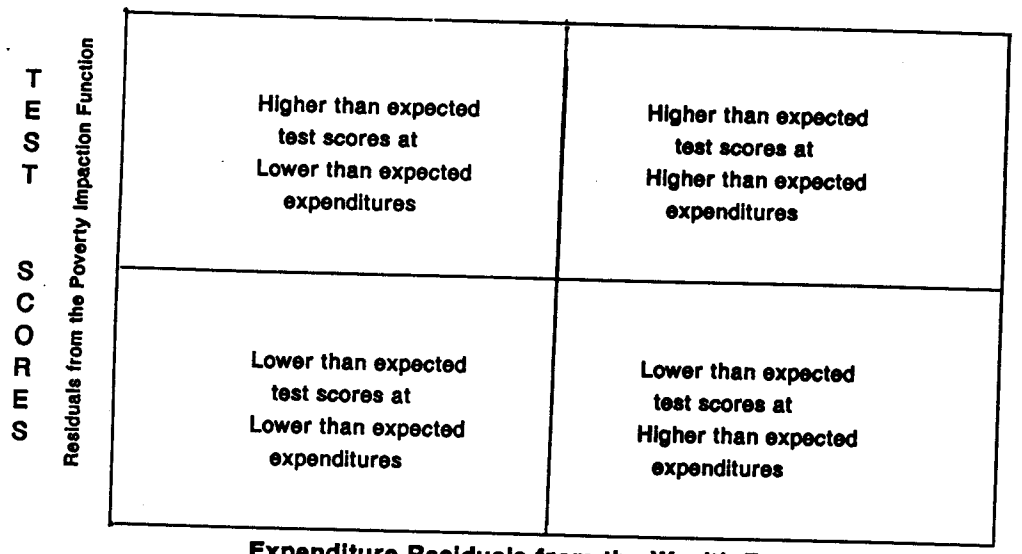
The second force in the quadriform is also very well-known in school finance. It is equally disliked by a number of educators and by not a few legislators and jurists. Ever since Serrano v. Priest in the early 1970's in California, some state supreme courts have asserted that when expenditure per pupil is strongly determined by the wealth of a district then that situation is repugnant to the state constitution, either in its equal protection components or in its educational article or in both. A prior, lengthy study in the MacArthur/Spencer series by Dr. David Franklin has explored this situation and that study is in the process of being updated. However, in this monograph, little will be said concerning the desirability of trying to establish "wealth neutrality" in Illinois--a matter which has been covered extensively in prior studies at the Center for the Study of Educational Finance at Illinois State University. Again, the only point to be made here is that, like it or not, constitutional or not, the fact remains that wealthier districts spend more on education and poorer districts spend less on education.

DIAGRAM B: THE WEALTH FUNCTION



This second state of affairs is represented in Diagram B which again shows a situation in which a line of prediction can be formed and an "expected" expenditure per pupil generated by the wealth of a school district. Note that the line this time is not negatively sloped, e.g., the wealthier the district the greater the expenditure, whereas before the more poverty impacted the district the lower the test scores. Again the line of prediction passes through the means. Therefore, given their wealth, half of the districts can be expected to spend more than thought likely and half can be expected to spend less than expected. Parenthetically it must be noted that there are many specifications of district wealth. Used here is the one that is present in most general grant-in-aid formulas, including the one in Illinois: the property valuation per pupil.

DIAGRAM C: A QUADRIFORM OF TECHNICALLY ECONOMICALLY EFFICIENT SCHOOL DISTRICTS VERSUS PROFESSIONALLY EFFECTIVE SCHOOL DISTRICTS



So far, little has been added to existing knowledge in school finance. However, the next step is both innovative and controversial. But, then, one can probably not be innovative without being also controversial. The Center at ISU has a reputation for innovative measurements, not the least of which was the early application of the Gini Index to the measurement of equity in school finance. (We humbly think we have probably rung the bell again with the next step in the analytical apparatus being displayed here.) Diagram C plots the residuals from the poverty impaction function against the residuals from the wealth function. If some of the conceptual formulations in the first part of this study are correct, then a quadriform should emerge with very interesting components. The upper left-hand quarter of the quadriform will contain districts with higher than expected test scores and lower than expected expenditure levels. These are technically economically efficient school districts, in a limited sense of the term.

Using a narrow definition, compared with other districts, these districts have maximized one output, ACT scores, with minimal input. By contrast, the lower right-hand quarter will contain districts with lower than expected test scores and higher than expected expenditures. These districts may not be technically efficient. So far, this follows the analysis first set forth in the unpublished dissertation of Ching-Chung Liu at Illinois State University. The line of inquiry now departs from that original formulation to add the remaining two components to the quadriform. In the the upper right-hand quadrant of the quadriform is a set of districts that have higher than expected test scores and higher than expected expenditures per pupil. If it is possible to assume that these expenditures are buying more than just higher test scores--thus, broadening the definition--it may be possible to define this set of districts as displaying best professional practice; that is, they are what Paul Mort would have called the "Light House" districts. They get the best professional practices early and then other districts follow in their wake as best they can. It is to be stressed, however, that these are not technically economically efficient school districts, in the strict sense of the definition used in this study. Here, the definition of efficiency rests on test scores and not upon some other output that the schools might be creating. However, the quadriform does allow one to assume that other outputs might be being purchased with these additional expenditures.

Finally, the remaining box is the lower left side of the structure. Here the test scores are lower than expected given the degree of poverty concentration and the expenditures are lower than expected given the amount of wealth in the district. These are frugal districts, but their frugality may have been purchased at the cost of low levels of educational service and, consequently, low test scores by the students in those districts.

The authors believe that the districts with higher than expected test scores and lower than expected expenditures should be identified and rewarded by the state department of education. That position will be discussed further in the policy implication section at the conclusion of the study. However, before that can be done, it must be demonstrated that these theoretical constructs contain some reality. Lenin was correct, "All theory must be tried in the fiery crucible of experience."

IV. The Empirical Test

As alluded to above, the data which provided the empirical demonstration for this study were taken from the unpublished dissertation written by Ching-Chung Liu at Illinois State University. The data in the Liu dissertation were analyzed using a regression technique. Statisticians tell us that regression is a very simple technique; however, to return to the Chinese restaurant metaphor, so is the reading of the menu if one happens to be skilled in the reading of Chinese. While it is beyond the scope of this monograph to acquaint the reader with any level of literacy in the reading of Chinese (and here insert the word statistical equations!) it may be beneficial to offer a few introductory remarks. The discussion of the quantitative aspects of the Liu study begins with a brief description of the meaning of regression.

In most cases, regression is an analysis which is driven by the need to produce a prediction. The analysis uses one or more independent measures and a single dependent, or outcome measure. By examining the mathematical relationships among the variables, a set of predicted, or expected scores for the outcome variable, can be derived.

Imagine, for a moment, that a highway is to be constructed in Illinois which will run between Chicago and St. Louis. Assume that the terrain is such that a perfectly straight highway can be built between the two points, thereby producing the the shortest possible route at the least cost in terms of right-of-way acquisition and materials expenditures. This road will pass close to many of the cities along its route and, while it may run through some of the cities, most of the cities will be some distance from the highway. If the distances from the highway to each of the cities along the route are added, the average distance from the highway to each of the cities will be minimized.

The prediction equation which will result from a regression analysis is similar to the hypothetical highway. Using one or more characteristics of a school district, Liu has derived predicted values for the district's expected (or predicted) ACT score and for the district's expected (or predicted) cost per pupil. To continue the highway metaphor, remember that the expected values will be found in a straight line. The actual district values (the actual ACT for the district and the actual district cost per pupil) will be close to this line but most will not be a part of the line.

The critical question for cities along the imaginary highway and for districts in this study becomes: how far from the straight line of the right-of-way are they? That is, if the city is only one mile from the new highway, people may well visit the city by default. However, if the city is ten miles from the new highway and people continue to visit it, then something must have attracted these visitors. The same is true of individual district values when compared to a regression line. If the values are relatively close to the prediction line (the straight, right-of-way line) there is little interest in them. However, as the values move farther from the prediction line some explanation must be found as to why or how these values came to be. This is the base on which the current study is built.

Returning to Diagram C, the process by which districts became members of the desired group of the quadriform is a three phase one. First, using a regression analysis, expected district ACT scores were derived from the districts' percentage of low income families and the percentage of students in the district taking the ACT exam. Then, the differences between the individual district's actual ACT scores and the predicted ACT scores for each district were calculated. These differences (residuals) were examined to find which of the districts had, in a relative sense, large differences between expected and actual values of the ACT scores.

Second, the expected district cost per pupil was derived from the district's percentage of low income families and the equalized assessed valuation per pupil in the district. The residuals, or differences between the predicted and actual values for the district cost per pupil, were then calculated. In this case, those districts which displayed relatively large negative values were of interest. That is, which of the districts were able to spend less money per pupil than would be expected, given the district's percentage of low income students and assessed valuation per pupil?

Finally, districts were selected which simultaneously fit both of the definitions set out in each of the previous stages. That is, districts needed to display higher than expected test scores AND lower than expected cost per pupil to be identified as members of the desired group. General forms of the equations used to identify these schools are shown below. The actual equations can be found in Appendix B.

Stage one identified those districts in which students produced higher than expected ACT scores. In this stage the dependent variable was the ACT composite score (ACTCOMP) for each high school district and the independent variables were district percentages of low income families (DPLIN) and district adjusted percentages of students taking the ACT (DAPACT). The DPLIN (the estimated number of students eligible for free school lunch or from an orphanage or from families which receive public assistance) was divided by the total number of students in the school district. DAPACT was defined as the number of college-bound students taking the ACT divided by the number of student taking the ACT in the district.

The regression model used was:

$$Y'_{ik} = b_0 + b_1X_{1k} + b_2X_{2k}$$

where:

Y'_{ik} = predicted k^{th} year of district i^{th} ACT mean score;
X_{1k} = k^{th} year of district percent of low income families;
X_{2k} = k^{th} year of district adjusted percent of students taking the ACT.

After a predicted score had been calculated for each of the districts, residuals were drawn. Districts were then identified as producing higher than expected ACT scores if the residual was greater than 0 (zero).

In stage two, districts were identified in which lower than expected costs per pupil were achieved. The dependent variable used in this stage was district operating expenditure per pupil (DOEPP). DOEPP was the gross operating cost of a school district (except summer school, adult education, bond principal, and capital expenditures) divided by the average daily attendance for the regular school term.

Independent variables in stage two were equalized assessed valuation per pupil (EAVPP) and district percentage of low income families (DPLIN). EAVPP was the total value of the real property of a school district and was determined by assessment and application of multipliers. These multipliers were calculated and assigned by the county board of review and the Illinois Department of Revenue, and the valuations were then divided by the enrollment.

The general linear form of the regression equation for stage two then became:

$$Y'_{ek} = b_0 + b_1X_{1k} + b_2X_{2k}$$

where:

Y'_{ek} = predicted k^{th} year of j^{th} district operating expenditure per pupil (e = district operating expenditure per pupil and k = year);
X_{1k} = k^{th} year of district equalized assessed valuation per pupil
X_{2k} = k^{th} year of district percent of low income families.

Residuals were derived after a predicted score had been calculated for each of the districts for both of the independent measures. Using both measures, districts which had actual costs which were less than expected costs (districts in which the residual was less than 0) were identified as having lower than expected costs per pupil.

The third stage of the data analysis simply asked which of the districts in the sample had been identified (in stage one) as producing higher than expected ACT scores while (in stage two) displaying lower than expected costs. Therefore, three groups of districts were then of interest. Those which fit this definition of economic efficiency in 1986, those which fit the definition in 1988, and those which fit the definition in both years. The names of these districts found to have higher than expected test scores and lower than expected expenditures in both 1986 and 1988 are listed in Appendix A.

Note that only the population of Illinois high school districts was used in the demonstration reported in this monograph. The Liu dissertation does contain similar calculations for unit districts, but it was felt that the use of the mean ACT is less of an acceptable predictor of output for unit districts than for high school districts. No calculations have been performed to data using this procedure for elementary districts.

V. Limitations (Misgivings?)

There are so many limitations on this type of analysis that one hardly knows where to start. In fact, they are so strong that perhaps this section should really be labeled "misgivings." For example, to position itself in the most desirable quadrant, a district may cut all curricula not directly related to what is being tested and concentrate its attention and its resources entirely upon the tested subject matter. That will raise the scores a good deal above what is expected, given the socioeconomic level of the district. Second, such a district could then also increase the pupil-teacher ratio, and, if that action does not result simultaneously in lower test scores, the resultant drop in costs will probably put the costs under what would be expected, given the wealth of the district. Thus, cost cutting and curricula trimming can indeed render the district technically economically efficient in the terms of the definition used by this study. If, and only if, all worthwhile outcomes could be captured in the test scores used, would that be a defensible position. Obviously, all desirable outcomes cannot be captured in the test scores, and perhaps that is why some districts consciously may not want to be in the upper left quadrant and prefer to be in the upper right quadrant. If that troubles the neat, tidy minds of the rigorously trained in economics, then Emerson may be correct: "A petty consistency is the hobgoblin of little minds."

Even with the presently available test scores, there are major, problems. In the first place, it is well-known that the school district can at least partially control its position in the state distribution of test scores by judicially arranging which students will take the ACT test and which students will not take the ACT test. A district might discourage students from taking the ACT test if the administration thought they would bring down the average. Perhaps that would be less true if some other tests were used; say, some of the state-constructed student assessment tests that are now becoming available. (We certainly hold no brief for the ACT; in fact, we do strongly believe that, if these procedures possess any merit at all, they should be duplicated using many kinds of test scores.) This first empirical test used the average ACT in the district. The Liu dissertation used a number of subtests from the ACT battery, and there were some interesting variations in technical economic efficiency noted when the sub-tests were used. Indeed, the publication date of this particular monograph was hastened in the hope that others who have access to different kinds of tests in Illinois might be encouraged to try this procedure with the different kinds of test data that are available to them.

In addition to the cross-sectional nature of the design used it should be stressed that the two major contributing equations are linear, not curvilinear in nature. We are indebted to Michael Belletire (Associate Superintendent of Finance/Support Services, Illinois Board of Education) for pointing out that it is entirely possible that the percentage of children in poverty might prove to be in curvilinear relationship to the test scores. If so, then the model used here actually underestimates the already great linear impact of poverty concentration on test scores. The structure of the equations is important, because districts with higher than expected test scores on a linear model might not be higher than expected on a curvilinear model. Therefore, before the twenty high school districts light bonfires in the streets and celebrate Bastille day in a big way, they should reflect on the possibility that either switching to a curvilinear model, or adding additional variables to the two contributing prediction equations, might knock them out of the favored quadrant. Additional research will, of course, cast further light upon these refinements in the procedure. But these observations again underline just how experimental this approach really is.

It should also be noted that this is a cross-sectional study, which is unusual for the Center for the Study of Education Finance which normally stresses longitudinal studies. Much more needs to be done here in a longitudinal sense--changes in test scores through time relative to changes in expenditures through time--however test score data in the School District Report Card are available for only three years.

Because there are so many misgivings about the validity and reliability of the procedure, no suggestion that the procedure be worked into the major funding system of the state is implied here; at least, not at this time. The problems here are not unlike the matter of whether test scores should be worked into grant-in-aid formulas of any kind. There are states that do use test score results in their state aid formulas; although, only Connecticut currently uses the test scores in its general aid formula. Some states prefer to use the test scores in various kinds of categorical grants. The authors are not prepared to go that far in Illinois at the moment.

There is another very serious limitation of these procedures that is of interest both to the researcher and to the practitioner. The use of the biologically-derived term, "quadriform" carries a suggestion, at least to some, that something new in the school finance world was found. Not so. There is no "cold fission" here. In a sense, the "findings" are a deliberate artifact of the procedures used. To be sure, the study did verify what many other researchers have found; e.g., that poverty impaction predicts test scores and that district wealth predicts expenditures. But this is not new information. The joining of the two residuals does not "discover" any new relationships. To the contrary, it forces districts to be classified into one of the four cells of the quadriform. The practical point is that no matter what the local board, the local superintendent, the local business manager, or anyone else might do or might not do, as long as the stated procedures used here are employed, there will ALWAYS be a set of districts that have higher than expected test scores and lower than expected expenditures and, likewise, a set of districts that have higher than expected expenditures and lower than expected test scores. The "self-fulfilling" nature of the system prompted the authors not to identify, publicly, districts in three corners of the quadriform, short of a court order to do so. However, public identification of districts in the economically efficient category would seem to produce no charge of unfair treatment. Nor would it be a legitimate "finding" of this study that only 20 percent of the high school districts are "technically economically

efficient," while 80 percent are not. The researchers have merely used a procedure which can always identify a minority of districts as more economically efficient than the rest of the population. This is a step forward, but, again, "no cold fission."

All of this discussion should alert the reader to the disheartening possibility that the "quadriform" is merely an artifact of the statistical processes used, and has no counterpart in the "real world." If ALL of the repeated attempts to find variables that discriminate between the four categories of districts fail, then the possibility would have to be faced that nothing more has been done here than to compare the random error of one function with the random error of a second function. The "quadriform" could then join the "unicorn" in that land of mythical beasties. Obviously, the authors think they are dealing with more than an intellectual aberration, and that there really is something out there that future empirical research can find. It could be argued, like Hamlet, that "There are more things in heaven and earth, Horatio, than are dreamt of in our philosophy." However, it must be emphasized most strongly that the "quadriform" is not much more than an interesting theoretical notion at this stage of investigation; hence the reluctance to base much by way of public policy recommendations upon such a thin empirical basis. But this is the way knowledge is built. The effort to prove or disprove the existence in the real world of the "quadriform" will surely uncover more than is presently known of the notion of efficiency in educational finance. It provides at least an "intermediate" theory in an area of intellectual inquiry that is admittedly rather long on empirical analysis and quite short on theoretical structure.

VI. Further Research

There is a great deal that needs to be done here. This line of research will be run throughout the rest of the life of the MacArthur/Spencer project. One very obvious question that needs to be explored in detail is just why the districts fall into the categories which have been established here. That is, if the quadriform is real, then what are the variables that decide whether a district will appear in any of the four parts of the form? In future research, as many archival variables as can be identified will be run to see which discriminates. This will bother some, because it does come close to a pure fishing expedition, and in this area there is not very much by way of theoretical structure, grounded or otherwise. Some obvious expenditure-related variables were checked out in the original Liu dissertation, but the results were not encouraging. Perhaps better discriminates will be found in a number of other areas which were not explored by Liu . For example, measurements of the scope and diversity of the curricula seem a logical place to look. As has already been suggested, one way a district can place itself in the upper left-hand quadrant category is by restricting its curricular offerings. A second place may well be in administrative staffing patterns. The presence or absence of a full-time business manager has already been shown in other research to affect costs, and that may well be another determinant of the placement of the district in the quadriform. It could be that the experience and training of the superintendent or the business manager affects the placement in the quadriform. There could even be some effect of the school board composition that determines where the district is placed or places itself. No doubt that doctoral students in search of a dissertation topic may find this a gold mine. Good. If the study serves only that purpose, it was probably worth the effort, although the MacArthur and Spencer Foundations certainly have the right to hope for more.

VII. Policy Implications

The broadest policy implications are truly awesome, because consciously posited here is the conflict between professional effectiveness and economic efficiency; e.g., the upper left-hand quadrant versus the upper right-hand quadrant. A full exploration of that subject would carry one into the realm of professional ethics; obviously, this small preliminary monograph is too fragile a vehicle to make a trip of that nature. Nor, as indicated above, at this stage in the research, should these findings be carried into the institutional funding structure for public education in Illinois. If the measurements can be validated and the reliability proven, it might be possible to establish a modest categorical grant that would reward school districts consistently found to be technically efficient. The grant should neither be large nor should it be counted in the expenditure of the district, because if it were large and if it were counted in the expenditure of the district, it would have the effect of immediately knocking the district out of its valued quadrant. If additional investigation indicates that there are variables that can discriminate districts into the four groups, then the State Superintendent may wish to notify the districts that they have been identified as being technically efficient and perhaps congratulate them for the accomplishment. There is little doubt that these local boards will find ways to make the designation useful to them at the local level. Furthermore, the State Superintendent may wish to use the districts' positions in the other corners of the quadriform for fiscal planning purposes, although the state department may well decide not to publicly identify the districts in these three quadrants.

VIII. Legal Implications

As Professor Franklin's earlier work in the MacArthur/Spencer series makes clear, there is a legal definition of "thorough and efficient" that must also be taken into consideration when discussing whether a school finance system meets the goal of "efficiency." At the outset, it was decided that in this particular monograph such a discussion should be delayed, since Dr. Franklin is updating his earlier work and the update will be published later as a part of the MacArthur/Spencer series. However, such reckoning was without the power and majesty of the Kentucky Supreme Court. On the 8th of June of 1989, the Court declared the entire Kentucky public school system to be deficient with respect to the constitutional mandates regarding public education in the Kentucky constitution. (Rose v. Council for Better Education, June 8, 1989, Kentucky Supreme Court.) Therefore, given the amount of public interest in this decision in Illinois, comment cannot be reserved until Dr. Franklin releases his update, although nothing in the following commentary forecloses Dr. Franklin's later more detailed analysis of the case.

Essentially, as the Kentucky court admits, it was simply following the lead of Pauley v. Kelly in the neighboring state of West Virginia. However, Rose seems to go further in that it sets up a judicial test of whether a state school finance system is or is not "efficient." That is worth highlighting in this monograph, because at least some do not think that Illinois could pass that test, anymore than Kentucky did. If such a legal test were to be applied in Illinois, the state might also be found deficient to its constitutional mandate to provide an "efficient" system of public schools. Since, generally, readers of this monograph are not trained in the law, the following briefly describes what a declaration of that nature might entail.

The full reasoning of the Court is not repeated here. Suffice it to say that the Court made extensive use of the very full comments of the 19th century framers of the Kentucky constitution. The strong egalitarian commitment of the framers of that constitution played no small part in the present Kentucky court's reasoning. The record of the Education Committee of the 1970 Illinois Constitution Convention, while strongly supportive of public education, was not as rigourous as was Kentucky. However, the court also relied heavily on expert testimony, especially that of Professor Salmon and Professor Alexander. Both experts made an interesting linkage of the three concepts of "adequacy, equity, and efficiency." In essence, both authorities opined that a state which was both inadequate and inequitable could not, ipso facto, be considered "efficient" as mandated by the Kentucky constitution. While no quarrel with that reasoning is presented here, it should be pointed out that prior empirical studies suggest that the three goals can be separated and that a state may or may not be meeting these goals separately. That is, it is possible for a state to be equitably financed, but not adequately financed. It is possible for a state to be adequately financed, but not equitably financed. At least from the point of view of technical economic efficiency, some of the school districts within a state may be in a condition of technical economic efficiency while the whole state system may be simultaneously inadequately financed and inequitably financed.

The difference here, if there is much difference, is that Alexander and Salmon were testifying on the efficiency of the entire state system in Kentucky. This monograph presents a means of identifying specific school districts that may or may not be economically efficient within the operational definition of that term. Both positions are policy relevant. The Alexander and Salmon approach, backed by the awesome power of the highest court in Kentucky, may result in a restructuring of the entire state school finance system. In a sense, this is closer to the basic allocative economic efficiency notion that was discussed earlier in the monograph. Clearly, the Kentucky Court, as well as Professors Alexander and Salmon, envisions the Court will require--to the extent that the separation of powers will allow-- a complete restructuring of the Kentucky public school system. The approach here is much more modest. The findings in this monograph call only for such encouragement as the Illinois Board of Education can muster for school districts which are believed to be now meeting the conditions necessary to qualify them as "technically economically efficient." Of course, there is always the mailed fist within the velvet glove. There can be little doubt that, if this procedure proves viable, it will also be used by the state department and the legislature to take action against those districts in Illinois which are found not to be technically economically efficient. As this monograph was being written, there were several bills under debate in the Illinois General Assembly which would require the state board of education to take much more strenuous action than it has in the past with those districts that are currently in financial difficulty. Preferred here is the carrot rather than the whip, acknowledging that the procedures presented here are simply operational definitions and operational definitions can be used in a punitive sense as well as in a rewarding sense.

The Rose test as it was applied in Kentucky follows. In order for a state to be deemed legally "efficient," it must meet the following nine conditions: (We have merely dropped the word Kentucky and substituted the word Illinois.)

1. The establishment, maintenance and funding of the common schools in Illinois are the sole responsibility of the General Assembly.

2. Common schools shall be free to all.

3. Common schools shall be available to all Illinois children.

4. Common schools shall be substantially uniform throughout the state.

5. Common schools shall provide equal educational opportunities to all Illinois children, regardless of place of residence or economic circumstances.

6. Common schools shall be monitored by the General Assembly to assure that they are operated with no waste, no duplication, no mismanagement, and with no political influence.

7. The premise for the existence of common schools is that all children in Illinois have a constitutional right to an adequate education.

8. The General Assembly shall provide funding which is sufficient to provide each child in Illinois an adequate education.

9. An adequate education is one which has as its goal the seven capacities recited previously. (The Court here restated the Seven Cardinal Goals of Education, familiar to most educators.)

Only the Illinois Supreme Court can determine if the Rose test is appropriate for Illinois as well as for Kentucky. However, right now, the evidence cited in the fourth and eighth monographs in the MacArthur/Spencer series, as well as the evidence in this monograph, would clearly cast major doubt on whether anything beyond the first three points in the Rose test can be met in Illinois. In no small measure, this doubt is anchored in the realization that, like Kentucky's, Illinois' public school finance is fundamentally one which guarantees a minimum foundation and a scheme to attempt to equalize the differences in local district taxable wealth, but remains heavily dependent upon local district property taxation.

What would happen if Illinois is brought to the bar of justice and was convicted? That is another way of saying what will happen in Kentucky; and what did happen in West Virginia? The answer is both a lot and nothing. In a sense, the lone dissenting justice in the Kentucky decision, Justice Liebson, may be correct in that cases of this kind are not really "justiciable" in the ordinary sense of that term. If a single district is found wanting in a constitutional matter, a writ of mandamus or an injunction can be issued and a remedy can be required. But no writ will run against a sovereign body, and the General Assembly is just exactly that. Both the West Virginia Supreme Court and the Kentucky Supreme Court have stopped short of issuing any call for a specific remedy to their constitutional problems. The Kentucky court even refused to maintain scrutiny or jurisdiction over the case. The bottom line is that the court in Kentucky, like West Virginia's, has said to its legislative body, "The system is unconstitutional; you, like we, are sworn to uphold the constitution; now, go and do your duty." And that is probably exactly where Illinois would end up should the Rose test be applied.

Rose has not greatly modified the original positions expressed in prior publications in this series. There are both risks and benefits associated with a constitutional test of the school finance system in Illinois. In Kentucky, 66 superintendents and 66 school boards took the risk and probably won; although, it is far from clear whether they won a moral victory or a material victory. On balance, probably such a case would be helpful in Illinois, provided litigants understand the risks of the intended intervention. An alternative solution--as was expressed in monograph #8, Guilty Governments--is to work for a much stronger education article in the Illinois constitution. Very likely these two alternatives are not mutually exclusive. Two barrels to a shotgun are better than one, and the General Assembly will probably respond that a shotgun is a shotgun, is a shotgun.

IX. Related Research

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APPENDIX A

Twenty-one High School Districts Which Were Found To Be Economically Efficient in Both 1986 and 1988

Adlai E. Stevenson District 125
Belleville Township High School District 201
Central Community High School District 71
Community High School District 94
Community High School District 99
Dwight Township High School District 230
East Alton-Wood River Community High School District 14
East Peoria Community High School District 309
Freeburg Community High School District 77
Henry Senachwine Consolidated School District 20
Lake Forest Community High School District 115
Libertyville Community High School District 128
Mendota Township High School District 280
Mt. Vernon Township High School District 201
Northfield Township High School District 225
O'Fallon Township High School District 203
Pontiac Township High School District 90
Rantoul Township High School District 193
Salem Community High School District 600
St. Anne Community High School District 302
Township High School District 211

APPENDIX B

ACTUAL REGRESSION EQUATIONS AND ASSOCIATED ANALYSES

The actual regression equation for the 1988 data in stage one was:

$$ACTCOMP' = 17.641 - .087\ DPLIN + 3.081\ DAPACT.$$

The actual regression equation for the 1986 data is stage two was:

$$ACTCOMP' = 18.157 - .099\ DPLIN + 2.975\ DAPACT.$$

The actual regression equations for the 1988 data in stage two was:

$$DOEPP' = 2677.93 + .015\ EAVPP - 6.94298*10^{-9}\ EAVPP^2 + .940\ DPLIN^2$$

The actual regression equations for the 1986 data in stage two was:

$$DOEPP' = 2518.41 + .013\ EAVPP - 5.32260*10^{-9}\ EAVPP^2 + .667\ DPLIN^2$$

Note: All regression coefficients were significant at the 0.05 level.

Regression of ACTCOMP on DPLIN and DAPACT

	SE	R^2	F	Minimum Residual	Maximum Residual
			1988 Data		
ACTCOMP	1.32	.351	30.06	-3.05012	2.9777
			1986 Data		
ACTCOMP	1.30	.388	35.13	-5.0095	3.4903

Note: All F tests were significant, $p < .00$.

Regression of DOEPP on EAVPP and DPLIN

DOEPP by district	SE	R^2	F	Minimum Residual	Maximum Residual
		1988 Data			
DOEPP	705.33	.704	87.37	-1515.42	1763.70
		1986 Data			
DOEPP	696.70	.617	59.04	-1452.14	2308.17

Note: All F tests were significant, p = .00.