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G. Alan Hickrod
Ramesh B. Chaudhari
Ben C. Hubbard

With assistance from:
Philip Lake
Boon Yiu Lee

Center for the Study of Educational Finance
Department of Educational Administration and Foundations
College of Education
Illinois State University
Normal, Illinois 61761

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"He that will not apply new remedies must expect new evils, for time is the greatest innovator."

- Francis Bacon

"We are reformers in spring and summer; in autumn and winter we stand by the old; reformers in the morning, conservers at night. Reform is affirmative, conservatism negative; conservatism goes for comfort, reform for truth."

- Ralph Waldo Emerson

"In politics again, it is almost a commonplace, that a party of order or stability, and a party of progress or reform, are both necessary elements of a healthy state of political life; until the one or the other shall have so enlarged its mental grasp as to be a party equally of order and of progress, knowing and distinguishing what is fit to be preserved from what ought to be swept away."

- John Stuart Mill

Background: Reforms, Values, and Evaluations

James Guthrie has recently characterized the period from 1955 to 1980 as one of "greater change than at any other time in our nation's history in the means by which resources for support of public schools are generated and distributed."(1) In particular, a wave of K-12 finance "reforms" followed the landmark California Supreme Court decision in the summer of 1971.(2) The effectiveness of these K-12 reforms is still very much in question. Concerning these reforms, Guthrie is accurate when he concludes, "The jury would appear to need a period in which to hear the evidence and deliberate."(3) In the summer of 1973 Illinois passed a major school finance "reform" stimulated, in large part, by the Serrano decision just two years earlier. In 1974 the Illinois School Problems Commission authorized and supported an evaluation of the 1973 reform by the Center for the Study of Educational Finance at Illinois State University.(4) The Commission later requested the Center to conduct an annual monitoring of the "equity" effects, not only of the initial 1973 reform, but also of all the subsequent amendments to the basic general grant-in-aid legislation passed in 1973.(5) This report continues that sequence of monitoring studies with an "equity" evaluation for each year in Illinois from 1972-73 through 1980-81. We believe this to be the longest time series of K-12 equity measurements currently available in the union.

Reforms of any type are guided by certain principles. Evaluations of these reforms cannot take place unless and until these principles are carefully stated and operationally defined. These principles are usually values--often values of a social, economic, political, and legal nature. H. Thomas James has noted that our need for philosophers--particularly social, political, and legal philosophers--is urgent at this juncture in the history of school finance.(6) While we cannot lay claim to a philosopher's mantle, we can, and shall, make an honest attempt from the outset of this report to state the underlying value assumptions upon which the criteria for this evaluation of the general K-12 grant-in-aid system in Illinois rest. Such an undertaking is not without cost to us. Those who do not agree with the underlying value assumptions, and their number may be increasing, will doubtless attack the credibility of the study by rejecting the values upon which it is based. However, decent regard for intellectual integrity requires that we proceed in this manner rather than to try to obscure the value assumptions from which the empirical work has been launched. There are other reasons for making our values as clear as possible. While the work reported here was undertaken primarily for the use of the state legislature, we have reason to believe the results may also be of interest to the state judiciary. If the values upon which the empirical work rests are made clear, then the utilization of the research for litigation purposes should be facilitated.

The fundamental value upon which this evaluation rests is that of "equalization of educational opportunity." As Ravitch and Wirt have made clear, this value has long been the centerpiece of a liberal or progressive philosophy of education.(7) In school finance literature this value is often discussed in terms of "student equity," and it leads directly to an empirical test known as "wealth neutrality" or "fiscal neutrality." This test is also associated with litigation arising under the "equal protection" and "education" clauses or articles of most state constitutions.(8) In short, we believe it to be unethical, unprofessional, and probably repugnant to the intent of the Illinois Constitution (although only the Illinois courts can determine this) for the quality of a child's education to be determined by the wealth of a school district in which that child and his or her parents happen to reside. To the extent that the wealth of an Illinois district determines what kind of education an Illinois child receives, to that same extent has equality of educational opportunity been denied to the children of the state. To make the quality of a child's education a function of district wealth is just as suspect to us as making the quality of that education a function of race, creed, or sex. When the level of public educational services offered to a child is drastically curtailed due to the absence of sufficient property valuations to support those services, then that child's civil rights have been violated just as surely as if the services were reduced or denied to him or her because of race, creed, or sex. We thus believe that the level of public educational services may vary by educational need, but they should not vary by the wealth of the child's family and the family's neighbors. Note the deliberate use of the term "public" educational services. If one believes that family wealth should indeed determine the level of educational services offered to a child, then the private sector is available to those who hold such beliefs. We do subscribe, as do many of our colleagues, to the healthy existence of an "alternative" private educational sector, which permits education to be a function of personal wealth. But a child is also a citizen, and a citizen is not being given the "equal protection" of the law when the law allows <u>public</u> educational services to be a function of local district wealth. Nor do we believe that a child can be educated "to the full extent of his or her capacities" if the educational service level is a function, not of those capacities, but rather a function of local wealth. We have therefore evaluated the effect of the Illinois general grant-in-aid system on the basis of whether that grant-in-aid has reduced the relationship between revenues available and local district wealth. If a "reform" reduces this relationship between monies available for education and wealth, it is deemed successful. If the relationship is not reduced, or if the relationship increases, then the reform is deemed not successful.

There is a second school finance specification which helps us to operationally define the fundamental value of "equalization of educational opportunity." This is simply the disparity of revenue levels between school districts. In school finance literature this

value is sometimes discussed in terms of "permissible variance" of revenue levels. The notion is that there is some amount of variation in expenditure or revenue levels that is "allowable" by the courts and by the legislature. We consider this criterion inferior to the "fiscal neutrality" or "wealth neutrality" criterion because there are, at least in our judgment, both philosophical and conceptual problems with the notion of "permissible variance." First, the notion seems to us to operationally define "equality of condition" rather than "equality of educational opportunity." This would pose no problems to our colleagues of socialist persuasion, but it does present some difficulties for those of us of progressive orientation. We do not feel that equality of expenditure or of revenue levels is required under a progressive approach to education. In fact, inequalities in expenditure levels are required if the expenditure levels are to respond to different levels of educational need in different districts.

However, we cannot ignore disparities in expenditure levels or in revenue levels between school districts for several reasons. In the first place, many court decisions have turned simply upon disparities in per pupil expenditures or per pupil revenues between districts, regardless of what the authors of this study happen to think about that kind of criterion. We would also have to agree that very large disparities in revenues or expenditures do suggest inequities that should be more fully investigated. We suspect that such an investigation would show that some of these expenditure differences are "legitimate" and some are not. Those that are legitimate will likely be based on different needs between districts or perhaps different geographic locations in the state, e.g., geographic price differentials. Those that are "illegitimate" will be based on wealth-generated differences in expenditure levels. Expenditure differences generated by differences in willingness to tax present special problems. Some students of the subject accept differences in revenue levels generated by differences in tax levels as "legitimate" and some do not. Those that do hold that differences in local willingness to tax are legitimate find useful a concept of "conditional" wealth neutrality that has been developed and used in other evaluations by the Center.(9) However, the concept used in this report is "absolute" or "unconditional" wealth neutrality; that is, revenue or expenditure levels should not be a function of local wealth, nothing whatever withstanding.

It should also be noted that there are ways of looking at revenue or expenditure disparities that are fully acceptable to most progressive analysts as opposed to those with more socialistic orientations. For example, it can be held that the primary responsibility of the state government is to help poor school districts or low-spending districts. Concomitantly, the state has little or no responsibility for high-spending districts. If that is the value position, then the disparity of expenditures below the median, or below some other point in the distribution, becomes the focus of attention rather than the distribution

of all the expenditures about their central tendency. Professor Eugene McLoone of the University of Maryland has devised ways of looking at the low end of the distribution alone, and these are utilized below. However, in this report, we do continue to judge the Illinois general grant-in-aid system as successful if it reduces the variation about the mean between school districts, and to hold it unsuccessful if it does not. We find this criterion, however, far less satisfying than in previous reports.

In summary, this report evaluates the Illinois general grant-in-aid system over a nine-year period of time in terms of criteria which will hopefully contribute to a rational public policy discussion of the major goal of "equalizing educational opportunities." Readers who do not find this goal very high upon their own list of priorities for Illinois education may not wish to proceed much further. Specifically, a concept of "fiscal neutrality" or "wealth neutrality" is used, as well as a notion of "permissible variance." These are considered aspects of equity between students. Obviously, there are many, many things about the Illinois K-12 finance system that this report does not attempt to evaluate. Not much attention is paid in these pages to "taxpayer" as opposed to "student" equity, although other publications of the Center have addressed aspects of that problem.(10) As in previous reports in this sequence from the Center, no attempt is made to evaluate the equity aspects of special-purpose or categorical grants-in-aid. Again, other publications of the Center have attacked this problem.(11) Perhaps more importantly, other values, criteria, goals, and so forth of school finance systems are not examined. For example, the notion of "adequacy" is not addressed herein. Investigations of what constitutes a good "basic" education and whether that "basic" level of education is available to all citizens in the state are important policy questions, but ones not addressed in this report. Further, the concepts of "efficiency" and "need" are also not addressed, nor is the important matter of just what has been purchased with the "reform" monies. This severe restriction of scope follows from the initial request of the School Problems Commission in 1974, which was to evaluate the equity effects of the general grant-in-aid system. To do that thoroughly, and to do it over a fairly long period of time, we have had to martial our limited resources very carefully. The evaluation reported here, therefore, must be considered but a partial evaluation of the Illinois K-12 finance system. We can only hope that it is sufficiently thorough that it will stimulate evaluations that are broader in scope.

After commenting briefly on prior empirical studies of K-12 reforms, the report proceeds to a description of the measurements used and the statistical techniques employed, then moves on to a findings section. This is followed by a section of qualifications on the major findings, plus some suggestions for further research should this line of inquiry be continued. Finally, we conclude the report with a section on some very hard policy choices which may have to be made in the future if equity goals are to be pursued vigilantly in Illinois.

Background: Prior Empirical Studies of Equity

When the Center published its first evaluation of the equity aspects of the 1973 Illinois school finance reform in early 1975, there were few other studies to use as models of equity evaluations of school finance reforms. In fact, the Center had to create a number of techniques to operationally define equity goals since so few studies had been done in that area.(12) The situation has changed greatly in the last nine years. A number of multi-state studies of the effects of school finance reform have taken place. Early efforts by Callahan and Wilken(13) and by Brown, Ginsberg, Killalea, Rosthal, and Tron(14) yielded mixed results concerning the effectiveness of these reforms. The monitoring attempt by the National Center for Educational Statistics yielded more optimistic conclusions,(15) while studies at the Rand Corporation by Carroll(16) were, by contrast, essentially pessimistic in tone. The very important, extensive, and comprehensive work of Berne and Stiefel(17) demonstrated clearly just how hard it is to summarize equity data over a large number of states. Berne and Stiefel, nevertheless, made major methodological contributions to this area of school finance research. Recent research conducted at the Center comparing equity in Illinois with equity in Indiana and Iowa did support the position that progress had been made on the goal of fiscal or wealth neutrality, but that there were considerable differences from state to state.(18)

Studies of individual states continue to outnumber the multi-state studies, if only because of the complexity and cost of doing multi-state studies. Studies of reforms of individual states such as those of Missouri and Colorado by Odden,(19) Pennsylvania by Harris,(20) Rhode Island by Ward,(21) Virginia by Salmon and Shotwell,(22) Ohio by Harrison,(23) and Michigan by Phelps,(24) indicate less than completely satisfactory results. Two studies, both covering four-year time periods, are of particular interest to the longitudinal efforts undertaken in this study. A study of New Jersey by Goertz indicated that both in terms of revenue disparity between districts and in terms of fiscal neutrality, New Jersey was worse off at the end of the four-year time period than at the beginning of that time period. Of particular importance was the finding by Goertz that, "In the last three years, the average per pupil valuations in the poorest districts increased 15 percent, while those in the wealthiest ones rose nearly 40 percent. As a result, the state has been running hard just to stay in place."(25) This is a matter of some importance. If local school districts were becoming more alike with regard to property valuations with the passage of time, less dollars would be needed from the state level to equalize differences between local school districts. However, if the opposite is true, then more state dollars are needed just to preserve whatever equalization of educational opportunity currently exists in the system.

A second study of Pennsylvania by Fowler and Freir was also conducted over a four-year period of time and was, therefore, of special interest to us.(26) Their findings are remarkably similar to those of Goertz; e.g., the state was worse off after the reforms with respect to both disparity and wealth neutrality than before the reforms. However, Fowler and Freir note that their findings on fiscal or wealth neutrality do vary depending on whether property valuations or income is used as the measurement of local district wealth. If income is used as a wealth specification, then the state did show gains on wealth neutrality over the four-year period. This becomes a complicated issue in Pennsylvania because the state changed its official definition of local ability to support education from property valuations alone to a combination of property valuations and income. The measurement of fiscal or wealth neutrality through time is, therefore, difficult. Some of the concerns of the Goertz and the Fowler and Freir studies have been built into this evaluation in Illinois. The complexities of measuring the equity effects of school finance reform are such that the "jury" Guthrie refers to may have to wait quite some time to reach a definitive verdict. However, that jury is probably not much impressed with the present admittedly incomplete evidence we have concerning the success of the K-12 finance reforms of the early 1970s.

Design, Measurements, Population, and Equity Indexes

Assumptions of a philosophical nature, discussed in section one, are not the only ones made in this kind of research. Some empirical assumptions must also be made. For example, it is assumed that quality of educational services can be adequately measured by the number of dollars provided per pupil. The courts have frequently made just such an assumption, but that is still subject to dispute. Certainly other operational specifications of "quality of education" or "level of professional services provided" are possible. However, validity questions concerning indexes composed of such things as length of teacher service or pupil-teacher ratios are just as serious as validity questions concerning expenditures or revenues. At the extremes it seems a viable empirical assumption; e.g., surely an education costing twice as much is "better" than one at the lower figure. However, differences between school districts of only a few hundred dollars per pupil might well be due to factors not related to the quality or level of services provided.

Assumptions must also be made in terms of what kinds of dollars are going to be used to represent this quality of services or level of services. Many studies use audited expenditures. There are advantages to this expenditure approach. This is so because there are differences, at least at a given point in time, between expenditures and revenues, in particular estimated revenues, which are the kind of revenues used in this study. But revenues also have their advantages. Expenditures

often include monies from different sources. Unless the monies are "targeted," this pooling of resources is almost inevitable. If the goal is to evaluate a particular kind of grant-in-aid, this pooling of funds is a serious problem. Since grant-in-aid evaluation is the stated purpose of this research, the funds used here are revenues, not expenditures, and particular kinds of revenues at that. We have excluded all revenues from special purpose state categorical grants, also all federal funds. The revenues utilized are thus of only two kinds: (1) those derived from the general state aid, and (2) those derived from local taxation. Further, the local revenues are not the actual collections, but rather an estimate derived from multiplying the tax rate times the assessed valuations. Studies using other money figures, for example, current expenditures per pupil, might well get different results, but such studies would then be hard to use in evaluating the effectiveness of a general purpose grant-in-aid.

The pupil measurement in "revenues per pupil" is also subject to debate. A case can be made for using "ADA" (average daily attendance), since that is the measurement used in evaluations in other states. However, when a state officially recognizes any dimension of "needs," either of individual student or individual district "needs," through a weighting attached to the pupil count, then a case can also be made for using the weighted pupil. That might be weighted average daily attendance or weighted average daily membership, or some other kind of weighted student. Serious problems arise in longitudinal research when a state changes drastically its definition of what constitutes a weighted pupil. For example, longitudinal research in Indiana is greatly complicated by the adoption in that state of a relatively elaborate student weighting system.(27) By contrast, in Illinois, the student weighting has remained relatively constant over the period of time in question. Weights are provided in Illinois for high school attendance and for the concentration of title one eligibles. This latter weighting is usually thought of as a district weighting for "poverty impaction." In Illinois the exact weighting for the concentration of poverty students in a district has changed over the nine years under analysis, but some experimentation with the data leads us to believe that these changes are not severe enough to have much effect on the statewide equity indexes used. Consequently, the "pupil" used in this study is the Illinois TWADA (title one concentrated weighted average daily attendance). With the possible exception of Minnesota, there is not another count like it in the United States.

Longitudinal studies are most assuredly not the most flexible things in the world. In order to achieve comparability of data one is often locked into research design decisions made some time in the past. However, with resources provided by the Illinois State University Graduate School, we have made two departures in this study which we think have proven to be of some importance. First, previous reports combined the revenues locally raised and the general state-aid, and then reported

equity indexes using this combined figure. Over six years ago a comparative analysis of Illinois, Michigan, and Kansas by Thomas W. C. Yang did provide an analysis based on the notion of separating these monies, but the approach was not continued.(28) Separating the state monies from the funds locally raised in this report also leads us to analyze the two underlying components of locally raised funds, e.g., tax rates and assessed valuations. Movements of these two variables through time are most interesting and are described in the findings section. A second innovation, in which we have only made a bare first step in this report, consists of then using the entire time series of equity indexes as the dependent variable in a design which attempts to describe and predict movements in that time series of equity measurements. This line of research, which we hope to expand in the future, should lead us into the more analytical dimensions of "why" equity indexes have varied through time in Illinois. As is often the case, however, one cannot enter the "why" if one does not know the "how," at least not empirically. One can discuss the "why" philosophically, of course. We will return to this important "why" question in the limitations section of this report.

There is no sampling used in this study, therefore significance tests for the purpose of statistical inference probably are not necessary or appropriate. However, the population utilized is not a complete one. One problem is missing data, but district consolidations and reorganizations are more important problems. However, consolidations and reorganizations have not been so frequent in Illinois in the last nine years, certainly not compared to previous time periods, and while that fact itself constitutes a major policy problem for the state, it does help the longitudinal design. The population for which the indexes described below are computed is therefore roughly 1,100 school districts divided into three subpopulations: elementary, high school, and unit (K-12) districts. The Center has experimented with ways of combining the financial data for these three subpopulations when computing "fiscal or wealth neutrality."(29) However, there is not total agreement on the validity of these combining procedures, and we have therefore continued the practice of reporting equity indexes for each subpopulation. Admittedly, reporting equity indexes for each subpopulation makes it much more difficult to visualize the equity situation for the state "as a whole." Having discussed design, measurement, and population, we now turn to a description of the equity indexes themselves.

As in prior years, we shall begin with the disparity indexes, e.g., indexes which show the variation in revenues per pupil between school districts. We have continued to label these "permissible variance" despite our growing dissatisfaction with the concept. There are two of these. The first is the "coefficient of variation," that is, the standard deviation divided by the mean and multiplied by 100. Berne has found this to be a reliable measure of disparity.(30) We have used other disparity measurements at the Center including the "federal range ratio."(31) However, comparability over the full nine years and

the wide acceptance in public finance circles of the coefficient of variation dictates the continued usage of that descriptive statistic. As has been pointed out previously, however, not all "authorities" in school finance are of the opinion that the total variation in revenues or expenditures should be reduced toward the mean. Garms and others(32) are of the opinion that if individual student needs and individual district needs are taken into consideration, the requirement that successful reform must reduce the overall revenue disparity between districts is called into question. Some courts have tried to avoid this tangle by requiring the reduction in the variance of expenditures not directly linked to educational needs of pupils. That is, "targeted" revenues directed to individual student needs are considered "legitimate" sources of revenue variation. However, it is far from clear just what revenue differentials would be considered "legitimate" by an Illinois court and what would be considered "illegitimate."

There is another school of thought which holds that expenditure variation above the median, or some other point in the distribution, should not be reduced and that, in fact, the only legitimate concern of the state government is with the expenditure per pupil variation below some measure of central tendency. This group argues that "bringing up low-spending districts" should be the primary concern of the state, and that higher-spending districts should be allowed to move out in front as much as they want to go. In terms of the political philosophical considerations we were discussing in the first section of this report this position is probably closer to the notion of "equality of opportunity" than to the notion of "equality of condition." A number of older school finance scholars held to this policy position, not the least of which was the late Paul Mort of Columbia University.(33) Professor Eugene McLoone of the University of Maryland has been an advocate of this position in the modern era.(34) McLoone had devised several indexes to look at the bottom half of the expenditure or revenue distribution only. The one used in this study is based upon the total revenues below the median, divided by the total revenues below the median, plus the amount of revenue required to bring all students to the median revenue per pupil. Thus the larger the fraction, the closer the approach to the desired state of affairs. This is the only equity index in which larger values are preferred to smaller values. In the case of the "coefficient of variation" smaller values are more desirable, and that is also true with the fiscal or wealth neutrality indexes described below.

In addition to the two disparity or "permissible variance" criteria, two additional indexes of "fiscal or wealth neutrality" have been used. The first involves the Gini index. As in previous research reported by the Center, this index is based upon a bivariate set of measurements rather than a univariate set of measurements.(35) That is, it becomes a measurement of association rather than a measurement of variation. Berne refers to this as a "wealth weighted" Gini

coefficient.(36) This usage is to be contrasted with the conventional usage in the discipline of economics, which is based upon a single variable and is therefore another measure of variation. Traditional applications have been made by McLoone, Michelson, Grubb, Alexander, and others.(37) Since the Gini coefficient has been used in many different ways in school finance research, it is necessary to ascertain, in each piece of research, just what kind of application has been made.(38)

Basically, what we have done with this "wealth-weighted Gini" is to rank the school districts from low to high upon some specification of wealth. In this study we have used only property valuations per pupil; however, in previous studies we have used both property valuations per pupil and income per pupil. Other wealth specifications could also be used--for example, some poverty impaction measurements. Once this wealth ranking of districts is completed, a cumulative percentage distribution of pupils is then formed, starting from the poorest district and working to the top. A similar cumulative distribution is established for state and local revenues or expenditures. The two cumulative percentage distributions (wealth and expenditures) are then plotted on an X-Y axis. If local wealth were not a factor in expenditure determination in a given state, the X-Y plot of the two cumulative percentages, wealth and state and local revenues, would, in fact, be a straight line. That is, the poorest 10 percent of students would get 10 percent of the available "pie" of state and local monies, the poorest 20 percent would get 20 percent, and so on. A distribution of state and local funds would prevail that would be "neutral" of local resource disparities, and this is exactly what is necessary in any operational definition of "wealth neutrality."

When the poorest 10 percent of the students receive less than 10 percent of the funds, the poorest 20 percent less than 20 percent of the expenditures, and so on, the plotting of the cumulative percentages will result in a curve which departs from the straight line representing absolute wealth neutrality. The "Lorenz curve" is interesting in and of itself, but researchers usually prefer a numerical value which will describe the extent of the departure of the curve from the straight line. There are several ways of computing such a mathematical value, referred to as a Gini index, Gini coefficient, or coefficient of concentration. Appendix A to this paper, prepared by Ramesh B. Chaudhari, sets forth one possible calculation procedure. Readers interested in examining the computer program for such a calculation should address themselves to Dr. Chaudhari.(39) The Gini values should be interpreted in the following manner: the smaller the value of the coefficient, the closer the state of Illinois has moved to the goal of wealth neutrality; that is, larger values indicate a greater departure of the curve from the straight line. As long as the curve does not cross the line, the interpretation is straightforward. Unfortunately, we have found in recent usage of this procedure that the curve does cross the line, and this makes interpretation difficult. We devised the "wealth-weighted Gini" in order to move from the district

as a unit of analysis to the student as a unit of analysis. In the "wealth-weighted Gini," larger districts have more effect on the index than smaller districts. In more recent years we have also found that this same effect can be accomplished by a "weighted regression" approach which is described below. Since a "weighted regression" is more well known than the somewhat unorthodox "wealth-weighted Gini," we are considering retiring the Gini in favor of the more conventional approach. However, the Gini has some graphical features which may yet lead us to retain it.

The more conventional approach to "wealth neutrality" or "fiscal neutrality" is the linear least squares regression in which either revenues per pupil or expenditures per pupil are regressed on some measurement of wealth per pupil--normally, property valuations per pupil or income per pupil. Michelson and Feldstein provide examples.(40) The variables are often transformed into their logarithms and this transformation renders the coefficient an "elasticity." Berne has found that this simple elasticity is a reliable measure of wealth neutrality.(41) This is the whole or gross elasticity, however, and not a net or partial elasticity, which would be necessary if a concept of "conditional" wealth neutrality were being used rather than "simple" wealth neutrality. The standardized regression coefficients should be interpreted as follows: the smaller the value of the coefficient, the closer the state of Illinois has moved to the goal of wealth neutrality. In this report, as in previous reports, we have used both income and property valuations as separate specifications of district wealth.

In recent years we have also used both a weighted and an unweighted approach to the regression procedure. In the unweighted regression each school district has the same effect on the equity index, e.g., Chicago has the same effect as the smallest district in the state. In the weighted regression approach, the larger districts have more of an effect on the index than do the smaller districts. In a sense, the weighted regression approach transforms the analysis from the district as the unit of analysis to the student as the unit of analysis. Thus the weighted regression approach may be able to take the place of the Gini calculations, since it was for precisely this purpose (that is, using the student as the unit of analysis) that the wealth-weighted Gini was devised in the first place. In terms of practical political matters it may be necessary to continue reporting results both in unweighted and weighted terms. That is because when weighted procedures are used what happens to a few large school districts in Illinois determines what happens to the equity index. In terms of the votes in the General Assembly, however, what happens to all school districts, regardless of size, is still important. For the foreseeable future we shall continue to report findings in both weighted and unweighted terms.

Findings

Since the findings are more elaborate than in previously reported studies, in this series we have broken them down into three components. In the first component, termed "aggregate" analysis, we are using the same procedures as in the previous reports--that is, combining the state general aid with the funds locally raised. In the second analysis, termed "disaggregated" analysis, we are looking at the two components: (1) state general aid and (2) funds locally raised separately. Finally in the third analysis, termed "determinants of equity: first step," we are looking at only one possible determinant of the changes in the value of the equity indexes.

Aggregate Analysis. The analysis which is comparable with previous reports is found in Charts 1 through 7. The data for these charts are found in Tables 1 through 7 of Appendix B. In each case, the equity index for the year prior to the major reform in Illinois in the summer of 1973 (1972-73) has been plotted first, and then each succeeding year up to and including 1980-81 has been plotted. Following the procedures used in other reports, the "permissible variance" charts are discussed first, followed by the "fiscal neutrality" charts. Chart 1 indicates a clear "U-shaped" function, that is, the reform was followed by a counterreform. Table 1 indicates that progress was made in terms of reducing the revenue per pupil disparity between Illinois districts up to 1976-77; however, thereafter revenue disparities increased in all three subpopulations: elementaries, high schools, and unit districts. With regard to unit districts and elementary districts, the beneficial effects of the 1973 reform had been completely lost by 1980-81; that is, a counterreformation had wiped out all the gains of the 1973 reform. The benefits of the 1973 reform have not been completely lost as far as high school districts are concerned, but the trend is in that direction. This is a serious matter. If a Serrano-type challenge to the state's general purpose grant-in-aid system were to be brought now in an Illinois court this particular kind of evidence would be on the side of the plaintiff, not the defendants. We have expressed misgivings about simple revenue or expenditure disparities in several places in this report but simple disparities are, nevertheless, important in judgments about the equal protection of the law. Chart 2 and Table 2 show the results of the McLoone Index approach. This should register the progress of the lowest spending districts. The chart does not show the clear "U-shaped" curve of the coefficient of variation. One cannot therefore say that the reforms of 1973 have been completely wiped out where the lowest spending districts are concerned. For unit districts and high school districts, the lowest spending districts were better off in 1980-81 than they were in 1972-73. For elementaries, there has been little change since 1972-73. The series is irregular, however. In unit districts there is a suggestion of a deterioration of the index

from a high in 1975-76, and in high school districts a slight deterioration since 1978-79. The evidence here would not be as damaging to defendants in a Serrano action, but it would not be terribly supportive, either.

Chart 3 and Table 3 show the results of the Gini index, that is, the "wealth-weighted Gini." This is the first of the fiscal neutrality indexes. The "U-shaped" curve is again apparent, that is, reform followed by counterreform. For unit districts, the best showing on fiscal neutrality would appear to have been in 1975-76 or 1976-77. Two time series are shown for unit districts since the Chicago school district affects the value of this equity index so greatly. ("W/C" is without Chicago.) The best showing for the high school districts was in 1977-78 and the best showing for the elementaries was in 1976-77. As mentioned in the procedures section of the report, there are some problems in the interpretation of the Gini index when the curve crosses the line. These instances are indicated by asterisks in the table. The evidence on this chart is not quite as damaging to defendants in a Serrano action, since in none of the three subpopulations has the index returned to the values it held in 1972-73. That is particularly true for high school districts. However, it is clear that movement toward the goal of wealth neutrality has been followed by movement away from wealth neutrality. Chart 3 and Table 3 use only property valuations as a measure of wealth and it should be remembered that the Gini index as calculated gives more weight to large school districts.

The next four charts and four tables begin the series using the regression approach rather than the Gini index as a technique for measuring simple or "absolute" wealth neutrality. The first two charts use property valuation as the measurement of wealth and the second two charts use personal income, extracted from the 1970 census of population and housing, as the measurement of wealth. More will be said of the income measurement in the limitations section of the report. Chart 4 and Table 4 again show the now anticipated "U-shaped" curve; e.g., reform followed by counterreform. The best showing for unit districts appears to have been 1976-77 and the same applies to elementary districts. The best showing for high school districts was 1977-78. The effects of the 1973 reform have been completely lost for elementary districts by 1980-81, but the effects of the 1973 reform have not been completely lost for the other two kinds of districts. Chart 4 and Table 4 use an unweighted approach, that is, each district has the same weight in the calculation of the index. By contrast, Chart 5 and Table 5 use a weighted regression approach; that is, the larger school districts have the greater effect on the calculations. Again the theme is "reform followed by counterreform," but when the weighted procedure is used it is clear that much of the gains of the reform in the summer of 1973 have been preserved at least in unit districts and in high school districts. Defendants in a Serrano-type action in Illinois could probably make a better case with regard to fiscal neutrality than they could with regard

to simple disparity. At least with regard to unit districts, when the weighted procedure is used, it will probably be some time before the beneficial effects of the 1973 reform will be lost.

Charts 6 and 7 and Tables 6 and 7 use personal income rather than property valuations as a measure of local district wealth. Here we clearly have an exception to the theme of reform followed by counter-reform. The unweighted regression approach shows an irregular time series, but the progression is clearly downward indicating smaller coefficients and therefore continual progress toward a goal of wealth neutrality. When a weighted approach is used in Chart 7 and Table 7 some deterioration occurs after 1977-78 in elementaries and high schools but progress continues for unit districts. Clearly in a Serrano-type action the best showing for defendant would be using income rather than property valuations as a measurement of wealth. There are serious problems, however, with the use of income data in Illinois, as explained in the limitations section.

In summary, the conventional type of analysis we have been using for several years at the Center reveals a theme of reformation followed by counterreformation. If any given year has to be selected in the time series, it would appear the counterreformation set in about 1977-78. Whether the effects of the reform of 1973 have been completely lost or not depends upon the selection of the equity index one uses. If simple disparity between districts is used, then the results are rather grim. If, however, wealth neutrality is used, then all the gains have not been lost. At the end of the time period it can be said that revenues are not as much a function of local wealth as at the beginning of the time period, but it does appear that the tide is beginning to run against this gain as well. It is also noteworthy that in this Illinois study, as in the Pennsylvania study by Fowler and Freir, that the findings do vary depending on whether income or property valuations are used as the measurement of wealth. In Illinois, as in Pennsylvania, the reform appears more successful if judged in terms of income rather than property valuations.

Disaggregated Analysis. In the next five tables, Tables 8 through 12, local revenues and general state aid are separated for purposes of analysis. In a sense, however, this is a continuation of the "fiscal neutrality" analysis, since we first ranked all districts in terms of assessed valuations per pupil as of 1973-74. Only four of the deciles are shown; 1 is the poorest decile in the state and 10 is the richest decile in the state in terms of property valuations per TWADA; 5 and 6 are in the middle of the distribution. The disaggregated analysis has been carried out for unit districts only over an eight-year period of time. We hope to continue the analysis for high school districts and elementary districts at some future time.

Table 8 shows the percentage increases in local revenues over three time periods. It is clear that the richest districts increased their local revenues much faster than the poorest districts. Those in the first decile increased their local revenues per TWADA by 48.8 percent between 1974 and 1981, but those in the tenth decile increased their local revenues by 73.8 percent between 1974 and 1981. Table 9 shows the percentage increases in general state aid. General state aid per TWADA increased to rich districts by 9.9 percent between 1974 and 1981. By strong contrast, general state aid increased to poor districts by 117.4 percent between 1974 and 1981. This indicates strong state support to the poorer districts in Illinois, but closer inspection of the data reveal that most of this flow of state money to poor districts occurred during the period from 1974 to 1977. In the 1977 to 1981 period the increase was only 30.4 percent for poorer districts, while richer districts increased by 16.7 percent. In the prior 1974 to 1977 period the state had increased state aid by 66.6 percent to poorer districts. Clearly the commitment of the state to equalization goals was much stronger in the first four years than in the second four years, and this helps to explain the "U-shaped" curves which were described in the first part of the findings. Table 10 puts the two revenue components back together again for an analysis similar to that conducted in the first part of the findings. This time, however, the activities of the richest and poorest districts stand out. Poor districts gained more than rich districts in combined revenues during the first four years and rich districts gained more than poor districts in the second four years. This also helps to explain the "reform followed by counterreform" theme.

If the richer unit districts were increasing their revenues faster than the poorer unit districts in the second half of the period, it could only partially be explained by increasing state aid to the richer districts. That leads us to Tables 11 and 12, which look at two components of increases in local revenues. In Table 11, increases in local valuations are examined. Here we found exactly what Margaret Goertz found in New Jersey: richer districts are increasing their valuations faster than poorer districts--27.7 percent compared to 32.1 percent over the 1974-81 period. At least the Illinois situation does not appear to be quite as bad as in New Jersey, but this is only for unit districts in Illinois. When the dual districts are analyzed, the situation may be worse. In any event, at a time in which unit districts were becoming less alike in terms of property valuations, Illinois was increasing its flow of general state aid to the wealthier districts. Something clearly seems out of order here. Finally, in Table 12 we looked at the changes in operating tax rates per $100 valuations over the time period in question. In some respects this is the most interesting of the tables. Earlier studies by the Center had suggested that richer districts might profit more by the "reward for effort" provision of the Illinois general purpose grant-in-aid formula that was in existence in one form or another during this time period. Table 12 at least suggests, though it does not prove, that this was indeed the

case. The poorest districts increased their tax rates by 18.9 percent over the time period, but the richest districts increased their tax rates by 28.9 percent. By the end of the next fiscal year the "reward for effort" aspect of the Illinois grant-in-aid formula will be completely phased out. It will be interesting to see if rich districts continue to move their tax rates up faster than poor districts when the state aid motivation factor is gone.

The more favorable showing of the property valuation richer unit districts in Illinois in the last half of the eight-year time period is now rather clear. They did somewhat better on state aid; they also did better on increased property valuations; and they did much better on passing local tax referenda and therefore increasing their operating tax rates for education. A clearer picture also emerges of the nature of the "counterreformation" in Illinois. It was at least in part the richer districts deciding to tax themselves more for education. This fact poses some hard policy choices for reformers in Illinois which we shall explore in the final seciton of this study.

Determinants of Equity: First Step. Monitoring the equity condition of the state is certainly important, particularly over long periods of time. However, the research goal should be to move beyond the pure description of movements in these equity indexes to an analysis of "why" the indexes move as they do. Conventional wisdom suggests several possibilities. The degree of equity among school districts is usually thought to be a function of such variables as: (1) the number of school districts in the state, (2) the distribution of wealth within the state, and (3) the degree to which the state supports K-12 education from state revenue sources as opposed to local revenue sources. Using the fifty states, measured at one point in time, Russell S. Harrison concluded: "State aid is typically the most important factor shaping the distribution of expenditures among school systems in each state. Where there is greater relative use of state aid, there is consistently less inequality of expenditures. Where there is little state aid, there is a lot of inequality."(42) As a first step in exploring determinants of equity indexes, therefore, we elected to test the Harrison hypothesis using the equity indexes for nine points in time in Illinois. We explored only one possible determinant, e.g., the relative dependence on state aid as opposed to local funding. Operationally we defined this as the general state aid as a percentage of revenues locally raised plus the general state aid.

The simple product moment correlations are displayed in Table 13. On the whole, the Harrison hypothesis is sustained. For example, where the Gini index is concerned, or where the weighted regression (property) is used, there is a strong negative relationship in both high schools and unit districts between percentage state aid

and the value of the equity index. When state aid is high relative to local funding, the index declines; that is, there is an improvement of the equity situation. This appears to be less so for elementary districts. The same is true for the coefficient of variation in elementary and high school districts, but not for unit districts. The expected negative signs--that is, the higher the percentage state aid, the lower the equity indexes--appear in most places in the table. However, there are some unexplained positive signs; for example, in the weighted regression (income) for elementaries and the unweighted regression (income) for high school districts.

Further statistical analysis of this one determinant reveals more complexity than was first thought to be the case. For example, the linear assumption made in Table 13 is highly questionable. The state aid variable was therefore entered in quadratic form. When the square of the independent variable was used, no improvement in fit occurred for elementary districts or unit districts but there was an improvement in fit for high school districts. This was particularly true for the unweighted regression (income), where the positive linear relationship had been noted. We are continuing to explore these curvilinear relationships. Plotting some of the data reveals an added complexity in that in at least some cases both the dependent variable (the equity index) and the independent variable (percentage state aid) curve through time. Such complex relationships are obviously not well handled by the simple product moment correlation. It would appear that longitudinal studies (that is, studies through time) are more complicated than the cross-section, one-point-in-time data with which Harrison worked. For the present we must simply caution the reader that the simple relationships in Table 13 are understated, at least for high school districts. Further studies of the curvilinear determinants of the indexes are obviously in order.

Limitations, Qualifications, and Suggestions for Further Research

One serious limitation springs from the nature of the income data a researcher is forced to use in Illinois. Unlike most other midwestern states, Illinois does not collect annual income data on school districts. The only income data available at present are the personal income data from the 1970 federal census of population and housing. The number of "blue ribbon" commissions that have recommended that the state income tax form include a line for school districts are myriad, but so far nothing has happened. Fortunately, the Sociology Department at Illinois State University has a program funded under the able direction of Dr. Vernon Pohlmann which should be able to process the 1980 federal income data so that in a reasonable length of time, we will have school district income data for both 1980 and 1970. When that

happens, it is strongly recommended that the fiscal neutrality indexes used in this study be recomputed using the new school district income data. One might want to add the 1970 and 1980 income together and divide by 2 and use that as a rough estimate of the income existing in a district throught the decade. Obviously, we must have some further research on why one gets different results when one uses different measurements of school district wealth.

A technical limitation must also be mentioned. The current research does not include monies received by the school district because of the replacement of the corporate personal property tax. We debated this for some time, but came to the conclusion that, since the assessed valuation figures we were using did not have the corporate personal removed, there would be no way to then add the replacement without in effect double counting. When the new equity indexes for 1981-82 are computed and added to this time series, then it will be appropriate to include the replacement monies in the design. We are thinking at present that perhaps this payment from the state should be analyzed separately in order to show its contribution to the equity situation. It should perhaps be stressed again that our estimates of local revenues are just that--estimates--and not the actual collections.

Some other limitations scattered throughout the report might also be mentioned again. It should be stressed that no state categorical or federal monies are included in the design. Studies based on expenditure disparities that included these monies might yield different results. There are no adjustments in these data for geographic cost-of-living differentials. However, in other studies at the Center we have made adjustments of that nature based on the McMahon-Melton geographic cost-of-living indexes, and these adjustments did not make major differences in the equity trends noted.(43) The measurements of wealth neutrality or fiscal neutrality are "simple" or "absolute"; that is, the relationship between wealth and revenues has not been held "conditional" on some other variable--for example, tax rates. We have also experimented elsewhere with "conditional" wealth neutrality measurements, but they too do not seem to change much the overall equity movements, at least through long periods of time.(44) Finally, pupil specifications other than the one used (TWADA) might yield different results, such as either totally unweighted pupils, ADA, or some other pupil weighting that might be developed to include other educational needs along the lines of the Indiana developments.

The most serious need for further research exists in the "why" of the matter. We have made some initial efforts in that direction, not only in the kind of empirical work reported in the final part of the findings section, but also in some studies of the "politics of educational finance" now under way at the Center.(45) What we have really been reporting for some time to the General Assembly are much like vital signs of a patient's health. Like blood pressure, temperature, pulse rate,

and so on, we can indicate in what general direction the patient is moving relative to equity matters, but the procedures are not refined enough to be able to tell much about what is really ailing the patient. In each of the nine years under study, not just single changes but multiple changes were made in the fundamental legislation governing the state general grants-in-aid. Some of these changes had adverse equity effects and some did not. By reading the Center's descriptions of these changes(46) and by simultaneously looking at the charts in this report, one can make some intelligent "guesses" at legislative changes which adversely affected the equity indexes. For example, it seems fairly clear that the "add-on" to the Strayer-Haig side of the Illinois grant-in-aid formula during much of this period had the effect of putting money into property wealthier districts. It also seems likely that the removal of the "roll-back" tax provisions in the early days of the formula reform had the effect of allowing the wealthier districts later to increase their local revenues faster than the poorer districts. What is interesting, however, is that, no matter what the complex of legislative changes in any given year, there seems to be a steady movement toward equity before 1976-77, and a steady movement away from equity after 1976-77. In the forthcoming fiscal year the Center will undertake some research on legislative changes that might reverse the trend yet again, and restore a movement toward equity goals. This research is supported by the National Conference of State Legislatures. Finally, it is obvious that the "disaggregated" analysis yielded some very interesting results and should be expended to the dual districts. In that process we may be able to cast more light on whether districts are becoming more unalike with regard to property valuations. If they are, then there will be an even greater need for more state spending to equalize these differences in local district wealth.

Policy Implications: Hard Choices

Blending together this mixture of philosophical values and empirical facts is difficult since controversy surrounds the values and uncertainly shrouds the facts. However, this concluding section will make an effort to do just that. First of all, we are confronted here with shades of grey. "The world is simple for idiots and textbook writers," commented one sage. That observation might well have been extended to reformers as well. Reformers seem to operate best in a world like the old C grade Hollywood westerns--all the good guys in white hats and all the bad guys in black hats. In this area of school finance reform the observation of Pogo seems more accurate: "We have met the enemy and they is us."

Before we look for the sackcloth and ashes or the black arm-bands in order to mourn the passing of the reform of 1973, we ought to look closely at the nature of the "rich" districts which certainly

seem to have done much better since roughly 1976-77. Many of those districts will turn out to be downstate rural areas with high farmland valuations but with areas of low income within them, often small towns. It would be difficult to classify such an area as wealthy or rich. The hard fact is that after decades of study in school finance we still don't have much of a definition of what constitutes a "wealthy" school district, and that makes it difficult to talk intelligently about a concept of "wealth neutrality." When we finally get some good income data from Illinois school districts, as discussed in the previous section, then perhaps the reform of 1973 will turn out not to have failed quite as much as this report seems to suggest. However, this report does turn up some very difficult policy problems, and we cannot sweep them under the rug of incomplete data or faulty definitions.

The data for at least the unit districts suggest that people in wealthy districts increased their tax burden more than people in poorer districts. This presents the state with a major dilemma. Does the state of Illinois, acting through the General Assembly, want to deny people the right to tax themselves more for education at the local level if they want to do just that? It certainly denies local control if such legislation is passed. Of course in many states, such as California, just such legislation has been passed in the form of constitutional amendments, so that no district, wealthy or not, can tax more than a stated percentage of true market value. The real victims of "proposition 13" type movements are the wealthier school districts in the state. If Illinois had passed some of the property tax relief proposals presented in recent years to the General Assembly, then it would not have been possible for wealthier districts to increase their taxes faster than poorer districts. Whatever gods look down on the hectic activities of men must surely be provided considerable merriment from this fact. Conservative proposals to place strict limits on local property taxes lead to socialist goals of leveling down educational services. If there is a valid distinction between the notions of "equalizing educational opportunity" versus "equalizing educational conditions," then it is hard to reconcile taxation limits with equalizing educational opportunity. However, taxing and spending limits do seem to contribute to equalizing educational conditions.

If political philosophy provides any guidance at all in these matters, it would seem that the progressive position ought to be that of "leveling up" rather than "leveling down." "Leveling up" requires more state spending, particularly if the wealthier districts continue to move out in front either by taxing themselves more or by the fact that assessed valuations in wealthier districts seem to increase faster than assessed valuations in poorer districts. So, while there might be some uncertainty among progressives as to whether they should or should not support tax and spending limitations at the local level, there cannot be much uncertainty about opposing tax and spending limitations at the state level. If a very tight limit on state spending were

enacted, perhaps in the form of a certain percentage of the personal income within the state, as is the case in Michigan and other states, then the ability of the state to do very much about equalizing educational opportunity will be greatly hampered. Confirmation of the Harrison hypothesis earlier in this study supports this conclusion.

As we have written so often, equalizing educational opportunity is a goal not compatible with providing general tax relief. Our conservative colleagues seem to realize this very well, and, in their drive to provide tax relief or in their general commentary on public education, they dismiss the notion of equalizing educational opportunity as quickly as possible. Political labels are notoriously misleading of course, and it is still possible, we hope, to be conservative on many topics and progressive on education. However, we do suggest that it helps to clarify educational finance issues by thinking in terms of conservative, liberal, and socialist positions on school finance matters.(47) Perhaps this is inevitable. Empirical facts never speak for themselves; they always have to be interpreted. More importantly, there seems no way to move from analysis of the facts to action without moving through the realm of values, often values of a political nature.

Therefore, it seems to us that anyone taking a progressive stance in education, as opposed to either a socialist or conservative stance, has to advocate greater state expenditures in the poorer school districts of the state. The hard choice then comes if the state is unwilling or unable to increase the flow of state dollars to those poor districts. Should limits then be applied to the richer districts? Here the progressives and the socialists will likely part company. The socialists will answer yes, and most of the progressives, no. The conservatives' lives are not troubled by such a hard choice since they are generally not concerned with such equity questions anyway, and many of them believe that the state is already far too much involved in trying to equalizing differences in local wealth. Some conservatives doubtless would like to return to a situation in which most of the cost of education was borne at the local level rather than the state level.(48) This would, of course, make for much greater inequalities in expenditure between districts due to the great inequalities in local wealth. Just how such conservatives would reconcile this position with the equal protection and education clauses of most state constitutions is not clear to us, but then individuals who argue from this point of view do not seem to be much concerned with legal equity notions as well as fiscal equity notions.

Finally, a word about the role of the courts. We believe that the conditions for a successful Serrano-type action are growing in Illinois. The state, in defense, may wish to argue that the growing inequities are caused more by local tax actions than by state legislation. Potential litigants may wish to wait a few more years and see if the trends we have documented in this study continue or whether the General Assembly will act to reverse these trends and return the state to a course of action that will once again lead to the accomplishment of equity goals. The conclusions, however, of a very fine Rand Corporation

study concerning the politics of school finance in California should be kept in mind:

> In the absence of a politically consequential constituency for school finance reform, a new court order for more school finance reform probably will be greeted with legislative and general governmental resistance. New taxes to support reform clearly conflict with the popular voice. . . . In the 1980s, fiscal retrenchment has created a critically new policy environment in which equity will be more difficult to define and legislative compliance will be more difficult to achieve.(49)

Throughout the ages, reform and counterreform have alternated with one another. All we may have documented in Illinois is the swing of this social pendulum, back and forth, down through the corridors of time.

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43. Hinricks and Hickrod, op. cit.

44. Schmink, Halinski, Hickrod, and Hubbard, op. cit.

45. This work is under the direction of Mr. Joseph Kanosky, Center for the Study of Educational Finance, DeGarmo Hall, Illinois State University, Normal, Illinois, 61761. See Kanosky, Joseph M., "Reform and Counter-Reform: Political Activity in Amending the 1973 Illinois School Finance Reform," paper presented to the 1981 meeting of the American Educational Research Association.

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47. See Wirt, op. cit., also William Profriedt, "Socialist Criticisms of Education in the United States," Harvard Education Review, November, 1980. For a conservative position see the writings of Eugenia Froedge Toma.

48. The classic statement of this is Charles M. Tiebout, "A Pure Theory of Local Expenditures," in Charles S. Benson, (ed.), Perspectives on the Economics of Education, 1963, Houghton Mifflin.

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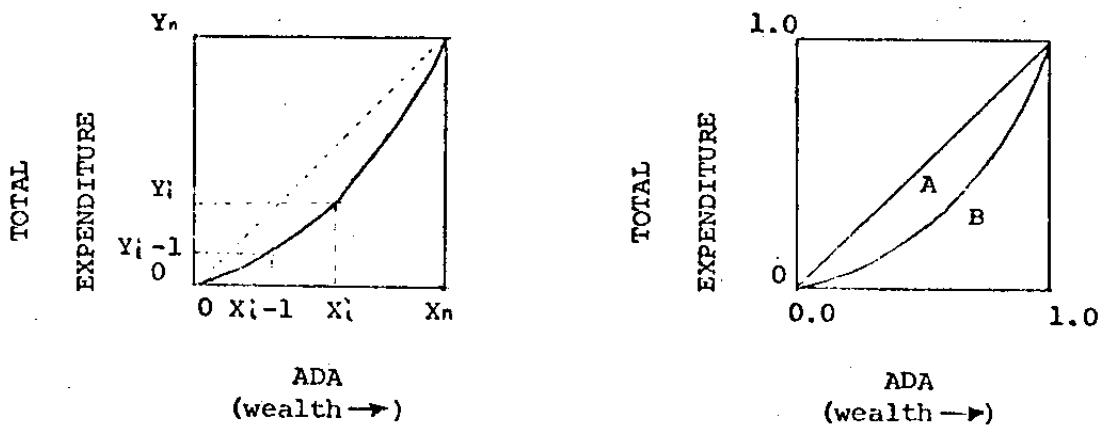
APPENDIX A

COMPUTATION OF GINI COEFFICIENT

COMPUTATION OF GINI COEFFICIENT

The districts are sorted in ascending order of wealth per pupil. The cumulative proportions of pupils in the districts are represented by the horizontal axis and the cumulative proportions of total operating expenditures accounted for by these districts are represented by the



vertical axis. The curve thus plotted would be a straight line if the operating expenditures per pupil were the same in all districts. A sagging curve represents lesser expenditure in poorer districts. The measure of this inequality as defined by Gini Coefficient G is given by the formula:

$$G = \frac{\text{Area A}}{\text{Area (A+B)}}$$

or after further simplication

$$G = \frac{0{\cdot}5 - \text{Area B}}{0{\cdot}5}$$

$$= 1 - 2\text{Area B} \qquad (1)$$

Area B is the area under the curve and if n is the number of districts, and

X_i = cumulative proportion of ADA for the ith district

y_i = cumulative proportion of $ for the ith district

$$\text{Then Area B} = \sum_{i=1}^{n} \frac{(x_i - x_{i-1})\ (y_{i-1} + y_i)}{2}$$

$$\text{or 2 Area B} = \sum_{i=1}^{n} (x_i y_{i-1} - x_{i-1} y_{i-1} + x_i y_i - x_{i-1} y_i)$$

$$= (x_i y_0 - x_0 y_0 + x_1 y_1 - x_0 y_1$$

$$+ x_2 y_1 - x_1 y_1 + x_2 y_2 - x_1 y_2$$

$$+ x_n y_{n-1} - x_{n-1} y_{n-1} + x_n y_n - x_{n-1} y_n)$$

$$= (x_2 y_1 - x_1 y_2) + (x_3 y_2 - x_2 y_3) + \ldots$$

$$+ (x_n y_{n-1} - x_{n-1} y_n) + x_n y_n$$

$$= \sum_{i=2}^{n} (x_i y_{i-1} - x_{i-1} y_i) + 1 \qquad (2)$$

$$= 1 - \sum_{i=2}^{n} (x_{i-1} y_i - x_i y_{i-1})$$

substituting the value of area B in eq 1

$$G = \sum_{i=2}^{n} (x_{i-1} y_i - x_i y_{i-1}) \qquad (3)$$

APPENDIX B

Charts

Tables

Chart 1

PERMISSIBLE VARIANCE CRITERION
COEFFICIENT OF VARIATION

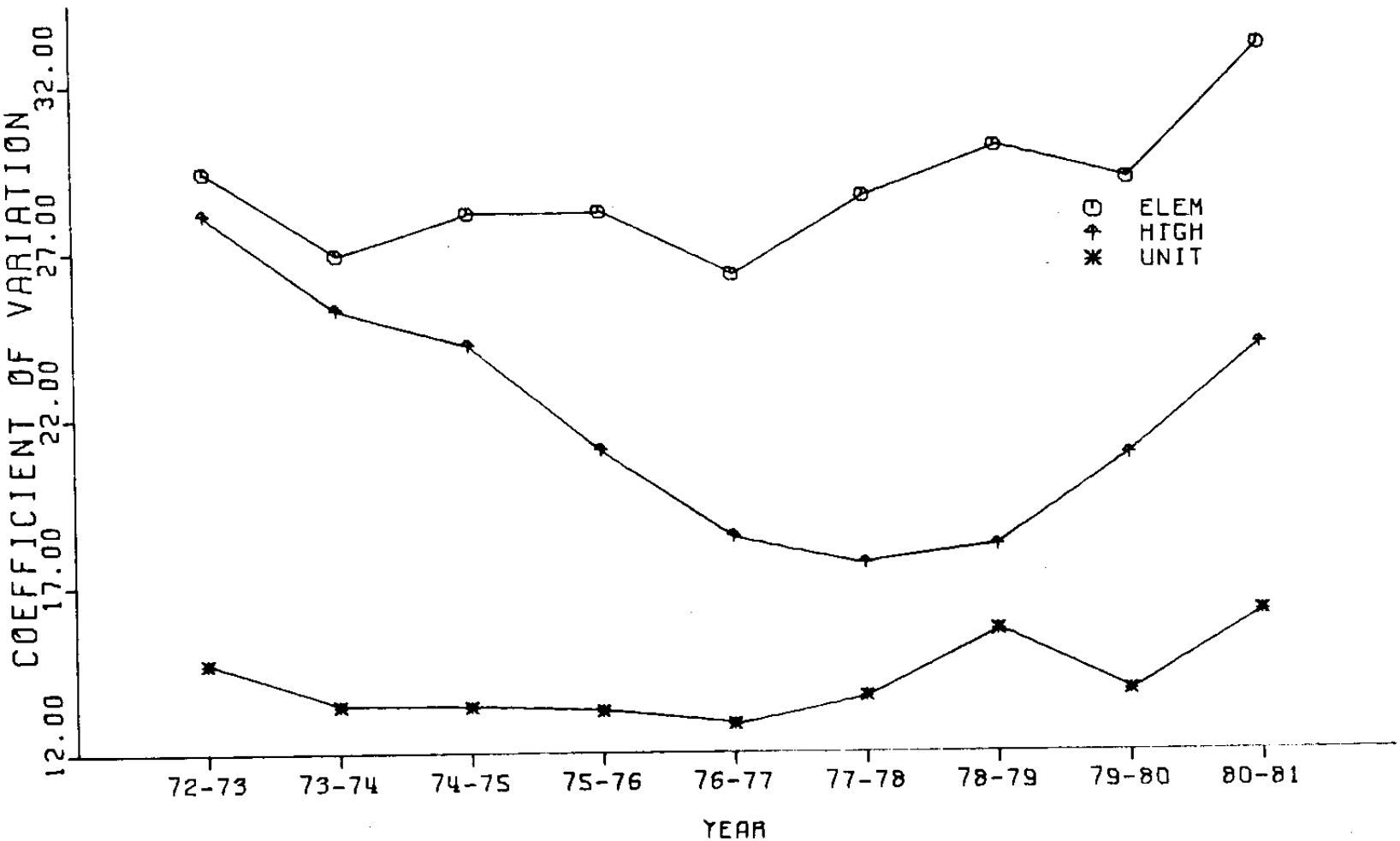


Chart 2

PERMISSIBLE VARIANCE CRITERION
MCLOONE INDEX

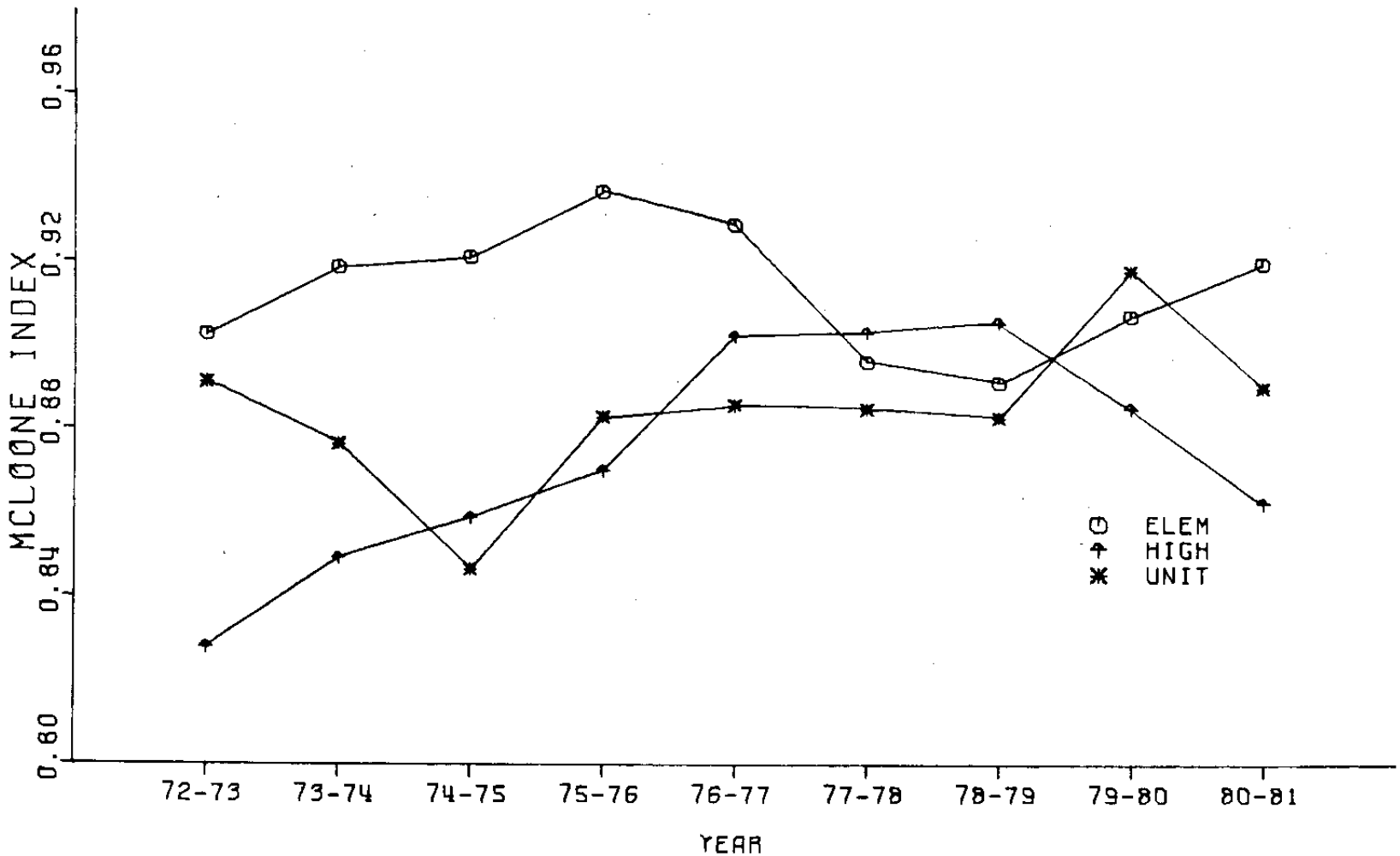


Chart 3

FISCAL NEUTRALITY
GINI INDEX
USING PROPERTY VALUATION PER TWADA

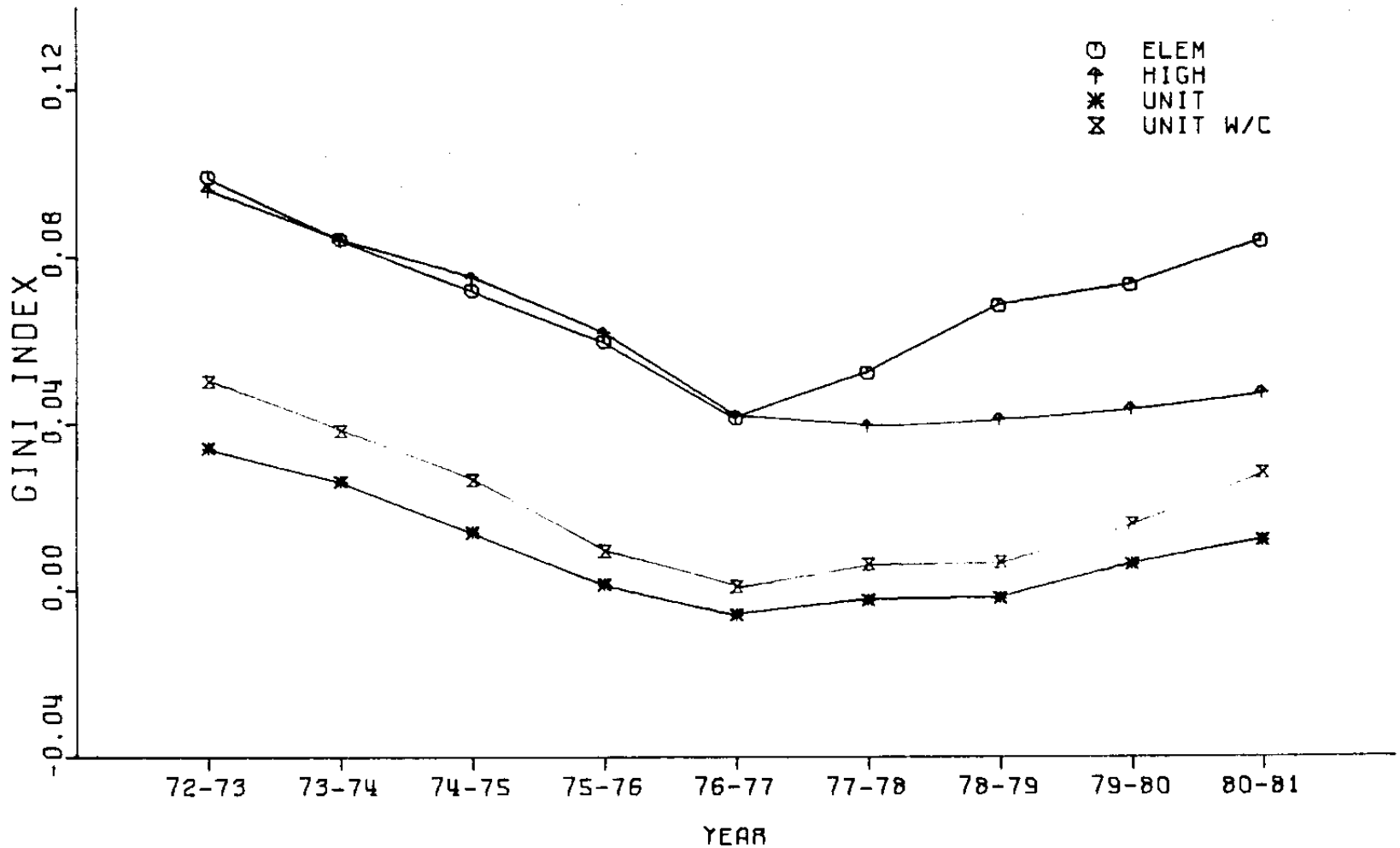


Chart 4

FISCAL NEUTRALITY CRITERION
REGRESSION APPROACH
USING PROPERTY VALUATION PER TWADA

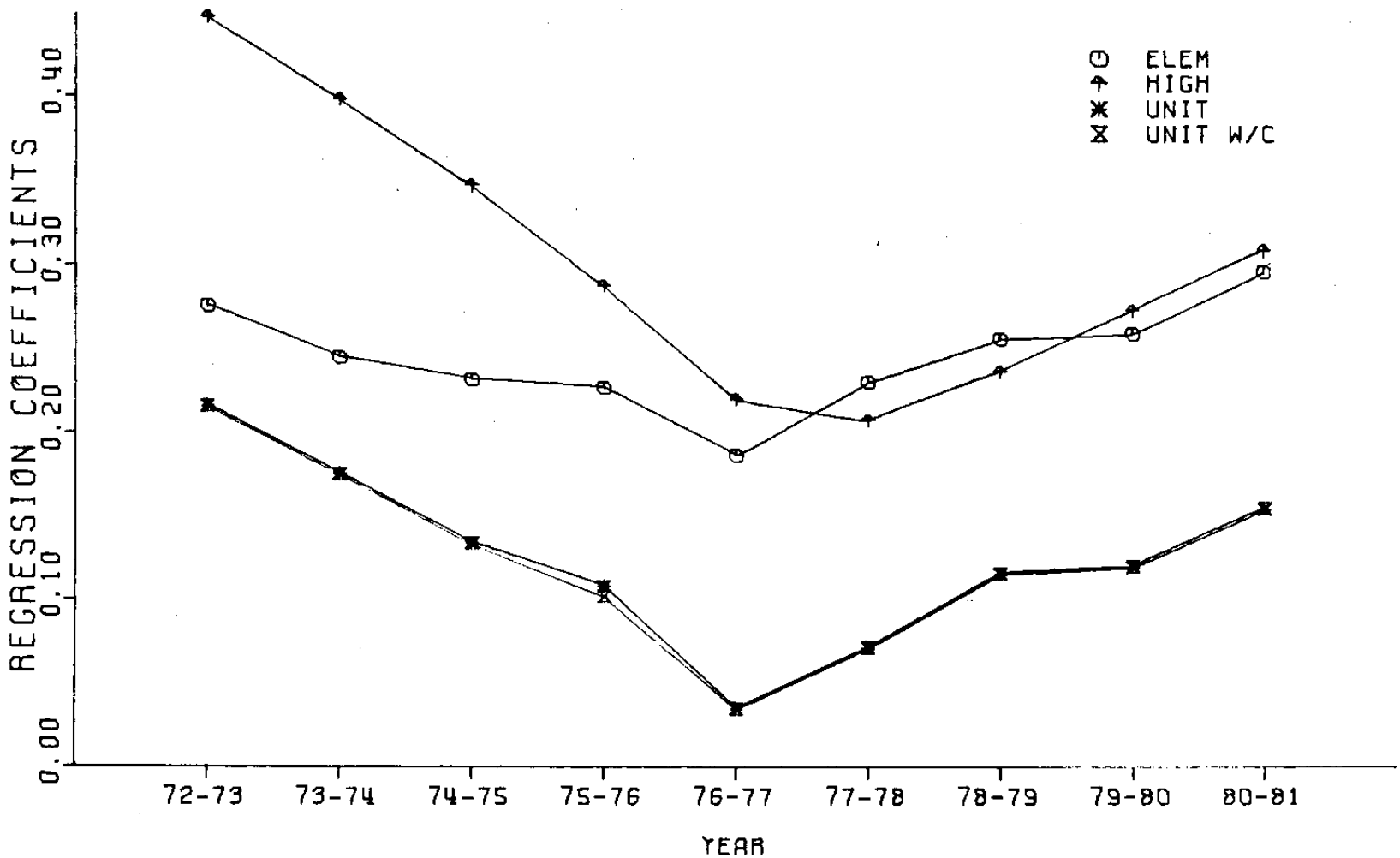


Chart 5

FISCAL NEUTRALITY CRITERION
WEIGHTED REGRESSION APPROACH
USING PROPERTY VALUATION PER TWADA

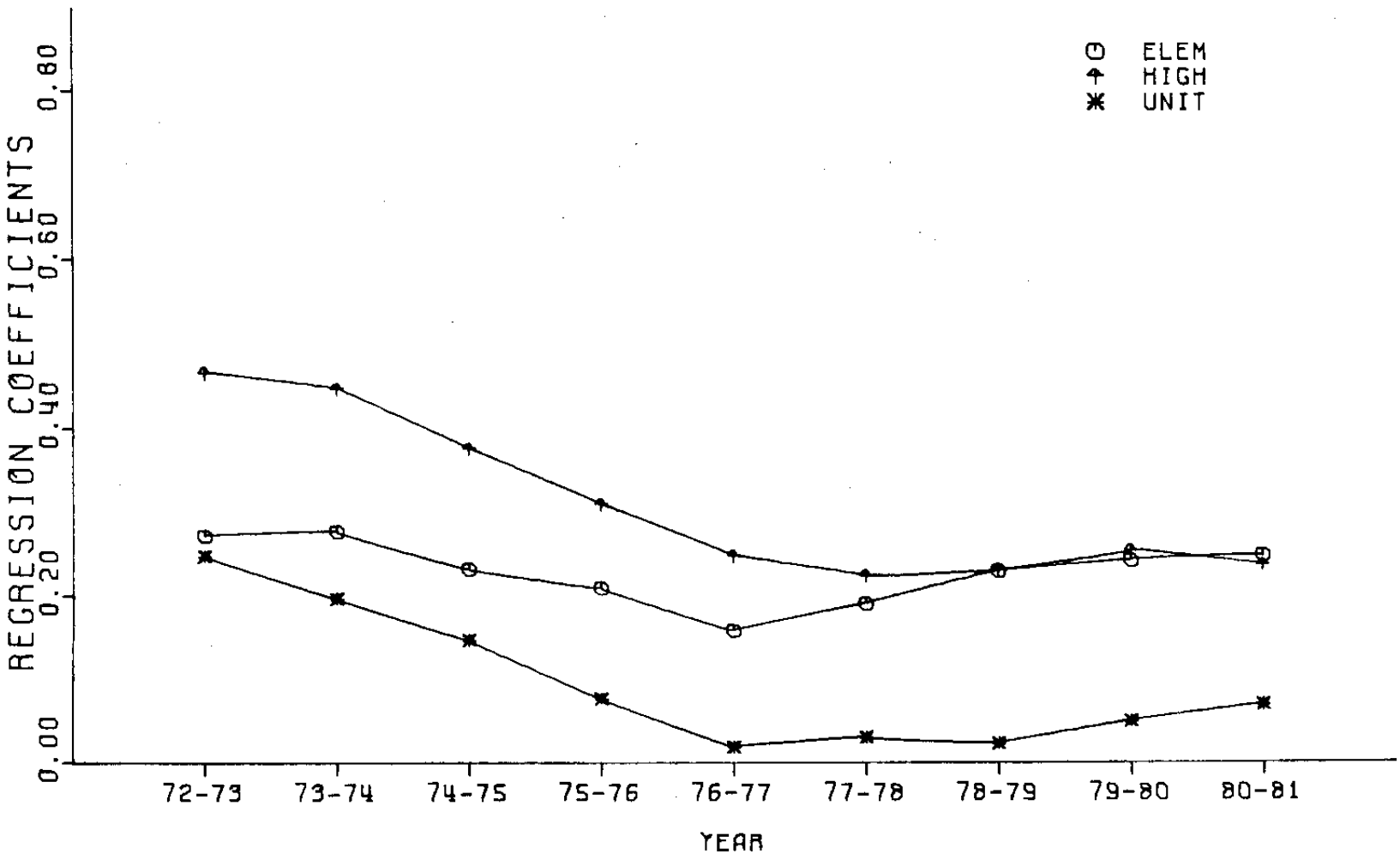


Chart 6

FISCAL NEUTRALITY
REGRESSION APPROACH
USING DISTRICT INCOME PER TWADA

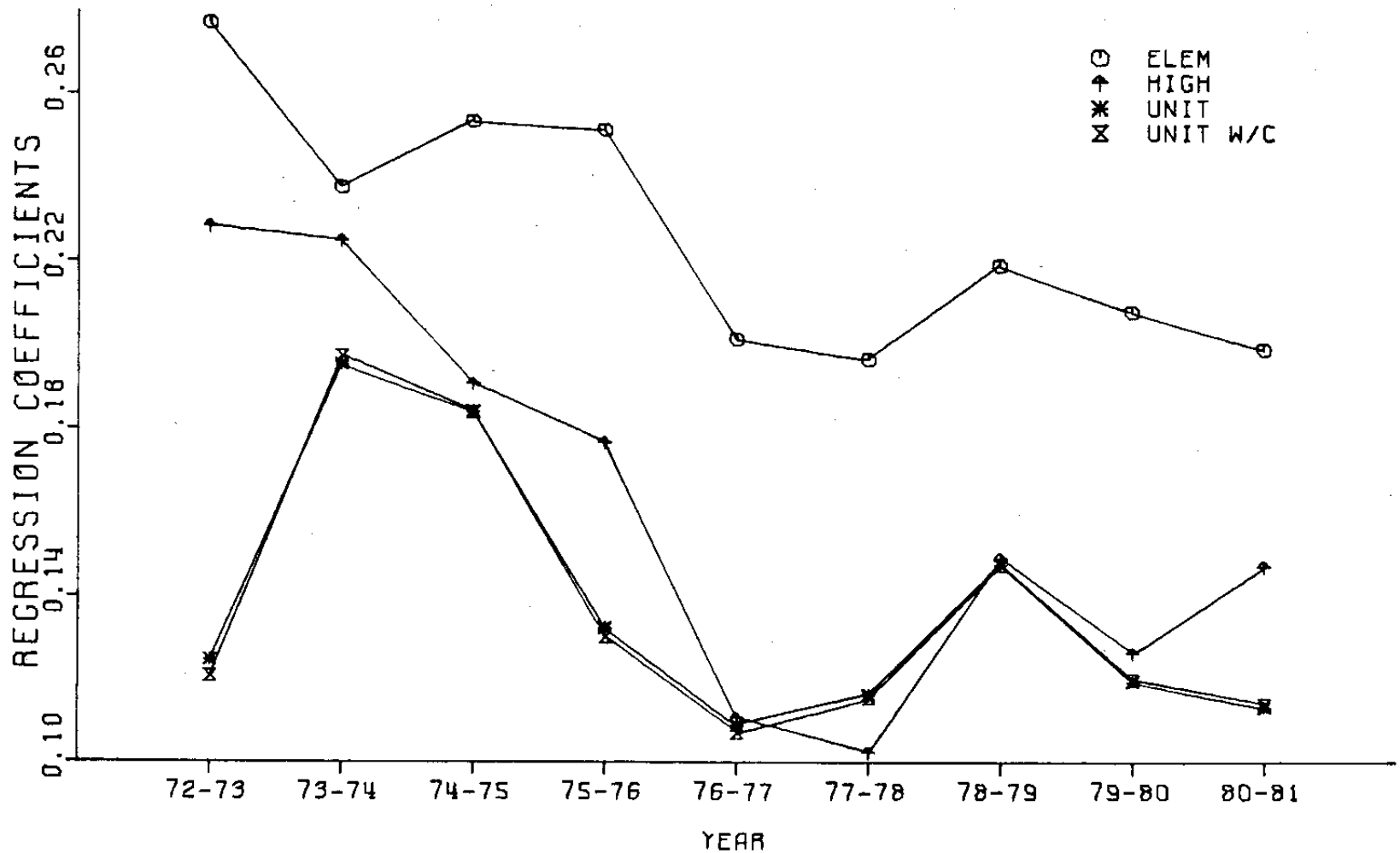


Chart 7

FISCAL NEUTRALITY
WEIGHTED REGRESSION APPROACH
USING DISTRICT INCOME PER TWADA

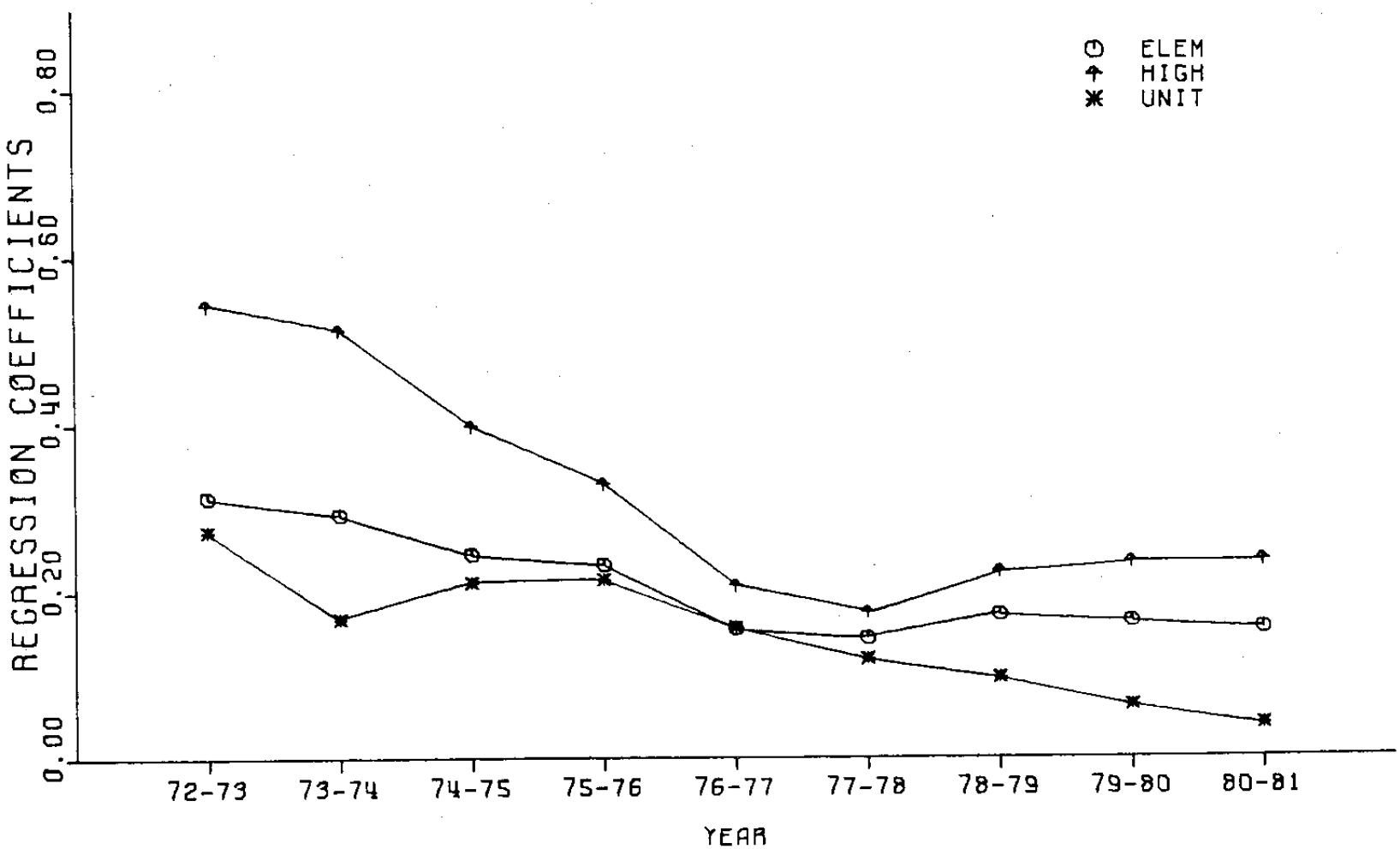


TABLE 1

PERMISSIBLE VARIANCE CRITERION
COEFFICIENT OF VARIATION

Year	Districts		
	Elem.	High	Unit
1972-73	29.44	28.19	14.70
1973-74	26.97	25.33	13.44
1974-75	28.23	24.26	13.41
1975-76	28.27	21.12	13.29
1976-77	26.37	18.53	12.89
1977-78	28.75	17.70	13.72
1978-79	30.22	18.23	15.71
1979-80	29.24	20.94	13.87
1980-81	33.25	24.22	16.25

TABLE 2

PERMISSIBLE VARIANCE CRITERION
McLOONE INDEX

	Unit		High		Elementary	
	Index	Median	Index	Median	Index	Median
1972-73	0.9030	$ 798	0.8281	$ 928	0.8915	$ 764
1973-74	0.9191	862	0.8494	996	0.8767	851
1974-75	0.9216	910	0.8590	1,099	0.8469	944
1975-76	0.9373	939	0.8703	1,159	0.8833	1,011
1976-77	0.9294	1,049	0.9026	1,271	0.8862	1,117
1977-78	0.8966	1,134	0.9036	1,388	0.8853	1,208
1978-79	0.8916	1,220	0.9061	1,566	0.8832	1,329
1979-80	0.9078	1,343	0.8855	1,774	0.9186	1,423
1980-81	0.9205	1,465	0.8628	2,031	0.8905	1,643

TABLE 3

FISCAL NEUTRALITY
GINI INDEX
USING PROPERTY VALUATION PER TWADA

Year	Districts			
	Elem.	High	Unit	Unit W/C
1972-73	0.0995	0.0961	0.0345	0.0506
1973-74	0.0848	0.0844	0.0265	0.0387
1974-75	0.0727	0.0756	0.0143	0.0268
1975-76	0.0604	0.0623	0.0018	0.0097
1976-77	0.0419	0.0422	0.0055*	0.0012*
1977-78	0.0528	0.0399	0.0020*	0.0066*
1978-79	0.0691	0.0416	0.0015*	0.0071*
1979-80	0.0740	0.0441	0.0066*	0.0163
1980-81	0.0845	0.0480	0.0123	0.0286

*Lorenz Curve crosses the line. Gini coefficient is not interpretable.

TABLE 4

FISCAL NEUTRALITY CRITERION
REGRESSION APPROACH
USING PROPERTY VALUATION PER TWADA

Year	Districts			
	Elem.	High	Unit	Unit W/C
1972-73	0.27679	0.44843	0.21691	0.21693
1973-74	0.24592	0.39949	0.17640	0.17642
1974-75	0.23293	0.34834	0.13493	0.13478
1975-76	0.22803	0.28896	0.10890	0.10302
1976-77	0.18782	0.22161	0.03544	0.03533
1977-78	0.23210	0.20868	0.07204	0.07198
1978-79	0.25807	0.23793	0.11687	0.11703
1979-80	0.26137	0.27476	0.12105	0.12124
1980-81	0.29831	0.31092	0.15603	0.15641

TABLE 5

FISCAL NEUTRALITY CRITERION
WEIGHTED REGRESSION APPROACH
USING PROPERTY VALUATION PER TWADA

	Districts		
Year	Elem.	High	Unit
1972-73	.2741	.4679	.2502
1973-74	.2797	.4488	.1988
1974-75	.2345	.3780	.1490
1975-76	.2117	.3115	.0778
1976-77	.1600	.2494	.0199
1977-78	.1923	.2254	.0317
1978-79	.2316	.2336	.0241
1979-80	.2447	.2566	.0506
1980-81	.2511	.2385	.0705

TABLE 6

FISCAL NEUTRALITY
UNWEIGHTED REGRESSION APPROACH
USING DISTRICT INCOME PER TWADA

	Districts		
Year	Elem.	H. S.	Unit
1972-73	.27738	.22835	.12495
1973-74	.23795	.22514	.19580
1974-75	.25418	.19112	.18470
1975-76	.25218	.17709	.13288
1976-77	.20221	.11094	.10917
1977-78	.19729	.10251	.11673
1978-79	.21992	.14970	.14825
1979-80	.20892	.12671	.11994
1980-81	.20000	.14780	.11361

TABLE 7

FISCAL NEUTRALITY
WEIGHTED REGRESSION COEFFICIENTS
USING DISTRICT INCOME PER TWADA

	Districts		
Year	Elem.	H. S.	Unit
1972-73	.31564	.54480	.27477
1973-74	.29524	.51499	.16953
1974-75	.24761	.40023	.21365
1975-76	.23509	.33092	.21715
1976-77	.15724	.20838	.15875
1977-78	.14539	.17587	.12030
1978-79	.17400	.22567	.09753
1979-80	.16583	.23705	.06409
1980-81	.15694	.23855	.04047

Note: Wealth variable in this table is derived from 1970 census data and is held constant throughout the time period.

TABLE 8

ANALYSIS BY DECILES OF 1973-74 WEALTH
LOCAL REVENUES/TWADA
FOR UNIT DISTRICTS

Decile	Dollar Amounts 1973-74	1976-77	1980-81	Percentage Increases 1977 over 1974	1981 over 1977	1981 over 1974
1	205*	224	305	9.3	36.2	48.8
5	517	610	899	18.0	47.4	73.9
6	520	624	967	20.0	55.0	86.0
10	967	1,152	1,681	19.1	45.9	73.8

*Weighted average local revenue/TWADA in the poorest 10% districts ranked by 1973-74 wealth.

TABLE 9

ANALYSIS BY DECILES OF 1973-74 WEALTH
GENERAL STATE AID PER TWADA
FOR UNIT DISTRICTS

Decile	Dollar Amounts 1973-74	1976-77	1980-81	Percentage Increases 1977 over 1974	1981 over 1977	1981 over 1974
1	510*	850	1,109	66.6	30.4	117.4
5	414	511	601	23.4	17.6	45.2
6	370	431	511	16.5	18.6	38.1
10	121	114	133	- 5.8	16.7	9.9

*Weighted average state aid/TWADA in the poorest 10% districts ranked by 1973-74 wealth.

TABLE 10

ANALYSIS BY DECILES OF 1973-74 WEALTH
TOTAL REVENUES* PER TWADA
FOR UNIT DISTRICTS

Decile	Dollar Amounts 1973-74	1976-77	1980-81	Percentage Increases 1977 over 1974	1981 over 1977	1981 over 1974
1	715**	1,074	1,413	50.2	31.6	97.6
4	932	1,121	1,500	20.3	33.8	60.9
5	890	1,054	1,478	18.4	40.2	66.1
10	1,014	1,266	1,814	24.8	43.2	78.9

*Sum of local revenues and general state aid
**Weighted average total revenue/TWADA in the poorest 10% districts ranked by 1973-74 wealth

TABLE 11

ANALYSIS BY DECILES OF 1973-74 WEALTH
ASSESSED VALUATION PER TWADA
FOR UNIT DISTRICTS

Decile	Dollar Amounts 1973-74	1976-77	1980-81	Percentage Increases 1977 over 1974	1981 over 1977	1981 over 1974
1	8,614*	8,596	11,004	- .2	28.1	27.7
5	21,497	23,459	30,332	9.1	29.1	41.1
6	23,639	25,595	34,174	8.3	33.5	44.6
10	53,236	55,498	70,355	4.2	26.7	32.1

*Weighted average AV/TWADA in the poorest 10% districts ranked by 1973-74 wealth.

TABLE 12

ANALYSIS BY DECILES OF 1973-74 WEALTH
OPERATING TAX RATES
FOR UNIT DISTRICTS

Decile	Rates per $100 Valuations 1973-74	1976-77	1980-81	Percentage Increases 1977 over 1974	1981 over 1977	1981 over 1974
1	2.406*	2.627	2.861	9.2	8.9	18.9
5	2.408	2.607	2.970	8.3	13.9	23.3
6	2.201	2.431	2.849	10.4	17.2	29.4
10	1.905	2.162	2.456	13.5	13.6	28.9

*Weighted average OTR for the poorest 10% districts ranked by 1973-74 wealth.

TABLE 13

CORRELATION OF EQUITY INDEXES
WITH PERCENTAGE STATE AID*

Equity Index	Districts Elem	High	Unit
Coefficient of Variation	-.8116	-.8224	-.0658
McLoone Index	-.5545	+.8632	+.0797
Gini	-.2541	-.9829	-.8024
Regression (Property)	-.7032	-.1971	-.8866
Regression (Income)	-.0582	+.2262	-.6051
Weighted Regression (Income)	+.5421	-.9799	-.0479
Weighted Regression (Property)	-.2612	-.99-4	-.8893

*General State Aid as a percentage of revenues locally raised plus general state aid.