Faculty Working Papers

A BROADER MEASURE OF WEALTH AND EFFORT FOR EDUCATIONAL EQUALITY AND TAX EQUITY

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Summary:

The wide inequality in expenditure per pupil among school districts which contributes to the problems with admissions tests and other costly social problems arising in the poorest districts, as well as the tax inequity among taxpayers with equal ability-to-pay absorbing widely different amounts in taxes, are both shown here to be perpetuated by the narrow concepts of district wealth and tax efforts currently in use. This article proposes a new and broader conceptualization of wealth and tax effort that includes human capital wealth and financial wealth (i.e., permanent salary income, net interest, dividends, and some capital gains). To combine income and assets, a method is proposed of adding property to the capitalized income flow and shown to be conceptually equivalent to the income flow method which converts assets to an annuity. Simulations using these measures in Illinois, which is typical of most states who plan to retain some scope for local initiative and support, show that at *each* foundation level ($1,260, $1,500, and $1,600 to reflect the state's real growth and inflation), the broader measures of wealth and effort, in contrast to the narrower measures, bring the four lowest expenditure deciles up to the foundation level within about four years. This much reform would constitute a significant step toward greater equality of educational opportunity, equity in the measurement of tax effort, and more equal protection of the laws.

A Broader Measure of Wealth and Effort for Educational Equality and Tax Equity

Walter W. McMahon*

There is wide inequality in expenditures per child among school districts within most states. The inevitable inequality in educational opportunity that results has serious implications for the later lives of the pupils involved, and contributes to the later problems society must face. But in addition to the excessive inequality on the expenditure side there is also inequity on the tax side. Horizontal inequity exists, defined as a situation where two taxpayers who have the same ability-to-pay, as measured by their income and wealth, and who can live in different school districts, pay widely different amounts in school taxes.

It is the theme of this paper that both the inequality in expenditure per child and tax inequity are aggravated by a common key factor: the narrow definition of wealth based only on property wealth that is still used in most states to measure both local ability-to-pay and local effort. Broadening the measures of wealth and effort to include human capital wealth (generating salary income) and financial wealth (generating interest and dividend income) will be shown to reduce the inequality in the expenditures per pupil, especially in the lowest expenditure deciles. The primary social concern must be with the school districts where the expenditure per pupil is in the lowest decile or quintile; there the problem is the most serious with the interegenerational transmission of poverty and with related costly social problems. The broader measures of wealth and effort can also contribute to equity on the tax side.

It is further the theme of this paper that <u>even if complete independence of expenditures per child from property wealth were achieved, there still</u>

would remain a dependence of expenditures per child on wealth in the form of human and financial capital (i.e., on salary income, interest income, dividend income, and capital gains). This fact, and the related failure to measure effort on an equitable basis, could still be held by the courts to be a denial of the equal protection of the laws.[1]

The reason that the narrow definition of wealth used in most state aid systems causes the state aid to be less effective than it could be in reducing the vast inequality in expenditure per child is that local tax and expenditure behavior reflects citizen behavior. This in turn is influenced by total wealth (including income), not just property. Wealth in Elizabethian times consisted almost exclusively of land and buildings, but in modern industrialized societies other forms of capital and the incomes they yield have become much more important. It is not surprising, therefore, that studies in Illinois and elsewhere reveal that for each given level of property wealth, higher income school districts tend to levy higher property tax rates (J. Cronin, D. Hou, and W. Carson (1977, p. 22)). This behavorial propensity is consistent with the heavy dependence of variation in expenditures on per capita income among states and over time found by W. McMahon (1970). When these property tax rates are then used as the (narrow) definition of effort, it misleadingly reveals the richer districts to be exerting the greater effort, and hence in greater need of state aid, while the poorer districts are shown to be exerting the lower effort. This has led R. L. Johns (1976) for example to revise his earlier more favorable opinion of "reward for effort" provisions in state allocation systems. The problem is that the higher property tax rate

triggers more state aid, so that among each set of districts with equal property wealth, more aid flows to the higher income districts!

Over time, furthermore, in those districts in which income grows, tax rates rise, triggering still more state aid. In districts with equal assessed valuation, but lower income growth, the tax rates are relatively lower so in these lower expenditure per pupil districts, less state aid is received over time. The rich get richer, and the poor get poorer. Broadening the measure of wealth and effort to capture the broader ability-to-pay, while continuing to use property as the local tax handle (with broadened circuit breakers to protect the few low income people living in high income school districts), will reduce this element of inequality. The broadened measures of wealth and effort treat any two taxpayers living in different districts with equal total wealth (broadly defined) equally. With effort measured on a more equitable basis, the result is greater horizontal equity.

A prototype model applicable to all states (except Hawaii where all school expenditure is financed by the state) will be presented in Part I. It illustrates the inequality in expenditure per pupil, the inflexibility of the constants in most state aid formulas, and the effect of reform. Part II defines the new measures of wealth and effort, focusing on the conceptual basis for combining income and property into a single measure of wealth. Part III considers the income data that has now become available from the U. S. Bureau of the Census for all states. Part IV analyzes the effects of the new measures of wealth and effort on educational equality and

tax equity, using data for Illinois. Illinois is typical of the problem faced by all district power equalizer reward-for-effort states. Part V summarizes the conclusions.

I. A Conceptual Model

The prototype model applicable to most state aid systems useful for analyzing the net effect of a given change in state aid criteria on the inequality in expenditure per pupil is illustrated in Figure 1. This model will be implemented later using specific state aid data.

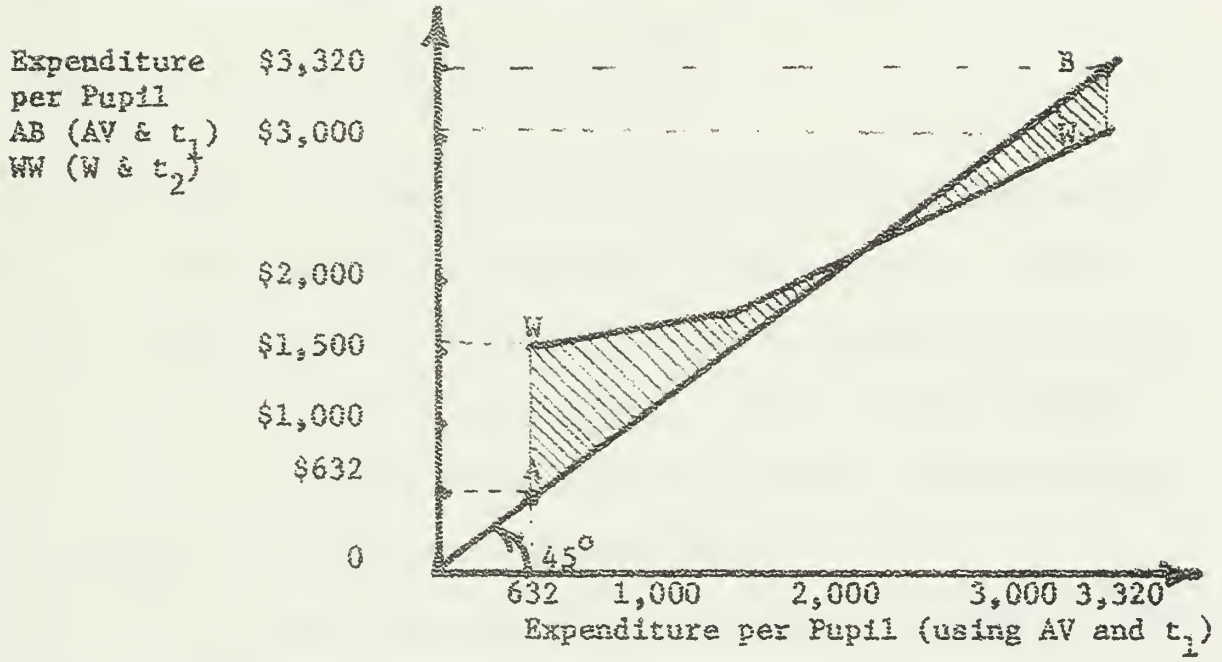
Educational Inequality

The problem of the excessive inequality currently found in expenditure per pupil among school districts is illustrated along the 45° line in Figure 1. The improvement that it would be desirable to achieve is illustrated by line WW. To establish the 45° base line, total current expenditure per pupil in weighted average daily attendance (WADA) including state aid as it is now calculated is first measured on both axes, so that the inequality in current expenditures per pupil is displayed from point A to point B. Current expenditure includes total current operating expenditure from local sources plus state aid using the current real property based measures of wealth and effort. WADA weights each elementary pupil in ADA by 1.00, and each high school pupil by 1.25, to adjust for differences in costs at the different levels.

There is currently vast inequity in the expenditure per pupil. It ranges in Illinois for example from $632 per pupil per year for the lowest group (of 5%) to $3,320 per pupil for the highest (Point B). The range

Figure 1

Effects of Reforming State Aid Programs



is somewhat smaller from the lowest to the highest decile of districts. This is a range of over 5 to 1! The system cries out for reform.

This current expenditure per pupil includes state aid calculated using Equation (1) which is shown below. It uses the districts operating tax rate (t_1) as the measure of effort (up to a maximum rate required for the maximum entitlement) in the reward-for-effort part multiplied by the Guaranteed Assessed Value per pupil (GAV) less the district's actual assessed value per pupil (AV) typical of district power equalizer formulas, or the "resource equalizer" as it is termed in Illinois.[2]

(1) State Aid (Included in line AB) = t_1 [GAV - AV]

(2) State Aid (Included in line WW) = t_2 [GAW - W]

(3) $$\text{Where } t_2 = \frac{t_1(AV)}{W}$$

With the broader measure of wealth (W) used in equation (2), the measure of effort t_2 becomes the effective tax rate on total wealth. Effort, under the broadened concept of wealth is defined in equation (3) as total local tax receipts from school taxes (t_1AV) relative to total ability-to-pay (W). Since wealth (W) contains an income factor, the new measure of effort automatically contains an income factor.

Expenditure per pupil using the broader measures of wealth and effort to compute the state aid components, when measured on the vertical axis (no change in what is measured on the horizontal axis) is hypothesized to be more equal after the change as shown by line WW. The reason for this expectation is that for each given AV, the low income, low expenditure per pupil districts will be revealed as having relatively lower wealth (W) in relation to the guaranteed level, as well as higher effort (t_2) in relation to this lower wealth, both of which would operate to entitle them to more state aid. It can be argued on efficiency grounds, in addition to equity, that it is desirable that equalization should have the largest effect on the expenditure per pupil in the lowest expenditure districts, as shown. For the costs to society later of sustaining unemployable persons on welfare, as well as the costs of the criminal justice system, the problems with college and professional school admissions, and the problems with the interorganizational transmission of poverty, are high and originate disproportionately in these districts.

The problem with inflation, as it gets built-in to assessed property values (AV), is that through Eq. (1) it causes state-aid to diminish, and automatically puts a larger burden on local property taxpayers. This can be eliminated if the constant guaranteed wealth per child in the formula (GW in Eq.(2)), is re-expressed as a constant fraction of state-wide wealth. State-wide wealth expressed in money terms will increase with inflation, as well as with economic growth, and hence state-wide ability-to-pay. The effect of doing this will be to cause line WW and its projected intercept on the vertical axis, to shift vertically upward, especially in the portion to the left of the 45° line. If the local contribution is a function of the local ability to pay, it only seems reasonable that the state's contribution to the common schools should also take into account the effect of inflation and of economic growth on the state's resources.

Tax Equity

The third problem, equity on the tax side, is addressed by broadening the measures of wealth and effort for the simple reason that wealth that incorporates human capital and financial assets (i.e., an income factor) is a better measure of the true ability-to-pay than is a measure of wealth that is limited to real property. All taxes go back to the individual taxpayers ability-to-pay, who are basic to both the state's and the district's fiscal capacity, irrespective of whether the tax handle used is consumption (for state sales taxes) or real property (for property taxes).[3] Each school district has access to income through the tax handle of real property. This is reflected in the fact that

property tax rates are currently higher in the higher income districts, a situation which would not be changed by use of broader more equitable measures of wealth and effort.

Although this addresses the matter of horizontal equity as between two persons with equal wealth living in different districts, it does not get at the problem of horizontal equity between two persons with equal wealth within any given school district. For this, a broader tax circuit breaker is needed. This would extend property tax exemptions to low income persons living in higher income, higher property tax, school districts, similar perhaps to the one used in Michigan. Although tax circuit breakers are beyond the scope of this paper, their relevance to equity within districts, as distinguished from equity among districts with which this paper is concerned must be noted.

II. The Concept of Wealth as a Measure of Well-Being

There are basically two methods for combining net assets and current income into a single measure of well-being, both of which result in a measure of wealth that is superior to either taken alone. The first is to convert the market value of assessed property into an income flow, or annuity per period, which is added to current income to produce a more comprehensive measure of well being, Y*. The second basic approach is to obtain the present value of the current and expected income stream from human capital and financial wealth, which is added to the market value of assessed property to obtain the present value of the total stock of wealth, W. The crucial aspect of this second process is the inclusion of an estimate of expected future income. However under simplifying

assumptions, the second measure will be shown to give assets and income the same relative weight, and hence to be equivalent to Y* for our purposes.

Income Flow, Y*, Including an Asset Factor

The first measure, obtained by converting assets into an income flow, was originally suggested by Weisbroad and Hensen in their American Economic Review article as a measure of the family's economic position. It is:

(4) $Y^*_t = Y_{pt} + R_n 3A_t$

where: Y_{pt} = current personal income,

A_t = net assets, the "3" used where assets are assessed at 33% of market value,[4]

R_n = the annual rate of return on an n-year annuity, the present value of which is one dollar.

Using this as our first broadened measure of "wealth", assets valued at market are conceived of as being used to purchase an annuity yielding a flow of incremental income, the yield at rate R_n. This is added to current income to obtain adjusted income Y^*_t. It is not being suggested however that assets should be, or are, so used. The objective instead is to develop a conceptually correct method of combining the two into a single measure of economic well being and hence of ability-to-pay.

To analyze the conversion factor R_n, there are two aspects to be considered. The first is the rate of discount to be used, which is analogous to the rate of return that a typical taxpayer could obtain on the assets if they were invested. Consistent treatment seems to dictate the use of a common discount rate, r, for all taxpayers. This rate, it could be argued, lies within a limited range of alternatives from 5% to 9%, 5% being the

rate on savings accounts in banks and savings and loan associations, and 9% being the average rate of return on common stocks. The rates of return on certificates of deposit, government bonds, and insurance policies which are purchased by many households fall within the 5-9% range. This is not a serious problem, so we will merely be conservative and choose a 5% discount rate, a common rate of return for many families and small businesses.

The second aspect of the conversion factor R_n involves selecting the time period over which the annuity is to be computed. In principle any time span from zero to infinity could be chosen, but it would be more reasonable to convert assets to an annuity covering a time span equal to the remaining lifetime of the average taxpaying unit in a school district. The average age of persons 21 years old and over is 44 years of age, according to the U. S. Bureau of the Census (1973, p. 32). To treat all school districts consistently, this will be taken as the average age of adults in each school district. Since the life expectancy of a 44 year old taxpayer is 28 years, as can be seen in Table 1, 28 years of life remains as the time span over which the annuity is to be paid.[5]

The asset conversion rate may now be computed using the formula shown in Table 1, for which the derivation is given in Appendix A. For a life span of 28 years and a 5% discount rate, R_n is given in the last column of Table 1 as .067. This will be the factor used to convert assets to an income flow, for the first, broader, measure of wealth.

Table 1. Annuitization Rates (R_n) For Different Life Expectancies

$$R_n = r[1 - (1+r)^{-n}]^{-1}: \text{ See Appendix A}$$

Age	Expectation of Life in Years*	Number of Years Annuity to be Paid	Asset Conversion Rate R_n** r=.05	r=.08
38	33.4	33	.062	.087
39	32.5	(33)	.062	.087
40	31.6	32	.063	.087
41	30.7	31	.064	.088
42	29.8	30	.065	.089
43	28.9	29	.066	.090
44	28.0	28	.067	.090
45	27.2	27	.068	.091
46	26.3	26	.070	.092
47	25.5	(25)	.071	.094
48	24.7	25	.071	.094
49	23.8	24	.072	.095
50	23.0	23	.074	.096
51	22.3	22	.076	.098
52	21.5	21	.078	.100

*For white males only. Source: Statistical Bureau of the Metropolitan Life Insurance Company. Similar tables are available for females and blacks, but a single table provides consistency among districts.

**See W. Groggin (1974) for an earlier application of this to financial need analysis.

Wealth, W, Including Human and Financial Capital

The second measure of wealth is constructed by adding current income, the present value of expected income, and property to obtain permanent net worth, or wealth:

(5) $W_t = Y_{pt} + Y^{\ell}_{pt} + 3A_t$

where:

Y_{pt} = current personal income from human capital and financial assets,

Y^{ℓ}_{pt} = the present value of expected future income from these,

A_t = net property, again multiplied by 3 where property is appraised at 1/3 of market.

Expected future income, the new element, is really the capitalized value of the current income stream. That is, it can be viewed as related to current income in a simple way such as:

(6) $Y^{\ell}_{pt} = BY_{pt}$,

where B is a capitalization rate. Substituting this into Eq. (5) for Y^{ℓ}_{pt}, wealth becomes

(7) $W_t = (1 + B)Y_{pt} + 3A_t$

If this is divided through by (1 + B), the result is:

(8) $(\frac{1}{1+B})W = Y_{pt} + (\frac{1}{1+B})3A_t$.

This is similar to the definition of Y* in Eq. (4). That is, the two new measures of wealth differ only by the multiplicative factor 1/1+B. If $R_n = \frac{1}{1+B} = .067$, $Y^* = R_n W$.

Miller and Hornseth (1967) have prepared for the Bureau of the Census estimates of the present value of lifetime earnings based on cross-sectional Census data for males by age, race, and educational level. These average

lifetime earnings for each population subgroup can be expressed as a ratio to the average annual current earnings within each subgroup to obtain an estimate of B for each group. These estimates given in Table 2 can be used to convert current income into estimates of the present value of expected future income.

For taxpaying adults in the United States, whose average age is age 44, the ratios of expected earnings to current earnings is 14.2 for whites and 12.5 for blacks. This is as shown in Table 2 in the row for age 44 and the columns for 12 years of education. Weighting these to reflect the larger percentage of whites than blacks, the mean ratio of future to current earnings is 13.9. This second measure of wealth as given by Eq. (5) therefore becomes:

(9) $W_t = (1+13.9)Y_{pt} + 3A_t$.

Dividing through by 14.9, this becomes:

(10) $Y^*_t = .067W_t = Y_{pt} + .067\ 3A_t$,

which is identical to the first measure of wealth in Eq. (4)! That is, $.067 = R_n = \frac{1}{1+B}$. R_n and B have a reasonable relation to one another in that R_n reflects the number of years over which the annuity is to be paid, and B reflects the number of years over which income is to be summed, or capitalized.

This result indicates that both of the new measures of wealth give the same <u>relative</u> weight to income and assets. A second result is that the "flow" measure, Y*, and the "stock" measure of wealth W, differ only by the multiplicative constant 14.9. Therefore only the "stock" measure of wealth, W, need be used hereafter.

Table 2. Ratios of the Present Value of Expected Lifetime Earnings to Current Earnings

$Y^{\ell} = BY$ where Y = earnings.

Table assumes productivity increases of 1% and a discount rate of 5%.

Age	B Ratios					
	8 Yrs. Education		12 Yrs. Education		16 Yrs. Education	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
40	16.0	14.6	16.5	14.2	18.3	14.7
41	15.5	14.2	15.9	13.8	17.4	14.1
42	15.0	13.7	15.2	13.3	16.5	13.5
43	14.5	13.3	14.7	12.9	15.7	13.0
44	13.9	12.8	14.2	12.5	14.8	12.5
45	13.4	12.3	13.7	12.0	14.1	12.1
46	12.8	11.7	13.1	11.5	13.3	11.6
47	12.1	11.4	12.6	11.1	12.6	11.1
48	11.6	11.0	12.0	10.7	11.9	10.6
49	11.1	10.4	11.5	10.2	11.2	10.1
50	10.6	9.8	10.9	9.7	10.5	9.6

Source: Miller and Hornseth (1967)

Business Income

Personal money income within a school district does include business income received by residents of the district but does not include either the farm or unincorporated enterprise income sent to non-residents that is earned on property located in the district. An estimate could be made of this business income by school district based on multiplying the assessed valuation of business property within each school district by the average rate of return on the relevant classes of business property. An alternative would be to base estimates of business income on the special county personal income data that is classified by place of work, as now published by the U. S. Department of Commerce (Technical Information Service, Springfield, Virginia). But a reasonable case can be made for not using a separate measure of business income when using personal income in the new measure of wealth. For business property in the district will continue to be taxed, and the business income received by residents is included in personal income. Any further taxation of business income of non-domestic business property located in the district is probably better left to the state to tax, rather than local school districts, anyway. So beyond this, we will not include business income in the broader measure of wealth, although some may prefer to make a further recognition of business property by giving heavier weight to property than is indicated by Eq. (9).

III. Data Sources

Data on equalized assessed valuations, operating tax rates, number of weighted pupils in average daily attendance (WADA), etc. have been obtained from the Illinois Office of Education computer tape used for

computing Annual State Aid 1976-77 (Copy Library ESA7677) as originally compiled by Martha Smith at the Illinois Office of Education. This tape was also used to generate the amount each district pays in taxes, and, adding the state aid computed by the COBOL program, the amount spent per pupil in each district, net of categorical aid.

Since many of the questions that have arisen in the past about inclusion of an income factor in state aid formulas have had to do with the income data, it is appropriate to focus in the remainder of this section on the measurement of income.

The Income Data

Accurate income data by school districts for 1966 was developed by Stollar and Boardman (1971) using individual income tax returns tabulated by school districts by the use of zip codes. W. McLure (1972, p. 79) has illustrated for Illinois, using this data, the fact that income and property wealth are distributed very differently.

The data on personal income analyzed in this report are from the 1970 Census, as published in the 1970 Census: Illinois School District Profiles by the Illinois Office of Education (1974). These data come from the fourth count tape of the 1970 Census as provided by the U. S. Bureau of the Census. It is quite accurate for all but the very small districts with fewer than 300 pupils as has been pointed out by Fohlman (1974, p. vii). For these, contiguous districts can be observed from the maps obtained from the Department of Local Government Affairs and an average with the slightly larger area computed.

These data are updated to 1975, the base year used for both income and equalized assessed values to generate 1975-76 state aid, by use of the percent change in per capita income for the county in which each school district is located. Total per capita Personal Income by Counties for all states is published by the U. S. Department of Commerce in each April issue of the Survey of Current Business (1977, p. 34). This is now standard practice, so this information therefore will continue to be available for annual adjustments to each school district in the nation from this well recognized source until 1980 Census data becomes available.

There is a significant new addition nationwide to the data on personal money income by township made by a new publication issued by the U. S. Bureau of the Census (1977) that reports personal money income for each township in the nation for 1974. It is based on the township information all taxpayers recorded on their 1974 Federal Income Tax return for use by Revenue Sharing in IRS. Personal Money Income is very close to Personal Income.

To assign these per capita income data to school districts is possible using the township maps available to locate each school district in

relation to the appropriate township(s) in a way somewhat analogous to the assignment of assessed valuation to school districts now done by County Clerks.

The average per capita incomes in continuous homogeneous areas is not likely to be drastically different, so omission of small tracts will not have much effect. Errors in assigning cities to the wrong school districts can be avoided by use of the maps.

IV. Analysis of the Effects of Broadening the Measures of Wealth and Effort

The broader measures of wealth and effort were first generated, and compared, for each of the 1028 school districts in Illinois. The state aid formula, typical of variants used in district power equalizing (DPE, also percentage equalizing) states that provide for state sharing of locally determined expenditures up to a point, was then applied using each pair of wealth-effort measures inserted in the computer program currently used by the Illinois Office of Education.

Total current expenditure per pupil in WADA then was computed for each measure of wealth and effort, i.e., for

(1) Equalized Assessed Valuation (AV) and effort (t_1), exactly as used currently,

(2) Wealth (W) including the income factor, and effort (t_2), as above, and

(3) Wealth as an income flow (Y*), and effort ($t_3 = \frac{t_1 AV}{Y^*}$).

That is, the locally financed amounts ($t_1 AV$) were added, but categorical aid and Federal aid were not, in order to obtain total current expenditure per pupil "before" and "after" this one (paired) change in the state aid

formula. To allow for growth of the state average wealth per child due both to real economic growth and to inflation (that is, to allow for growth in the constant in the formula), this set of computations was first made for the current $1,260 per child expenditure foundation level, then for $1,500, and finally for a $1,600 foundation level. The tables showing the results for such a large number of districts are too voluminous to reproduce here.[8]

The total amount of state aid required by W and Y* was also computed (and will be discussed), the ratio of these to the total aid for the entire state using AV and t_i was computed, and the resulting multipliers were used to force the aid total using W and Y* to equal that for AV, thereby converting the aid using the new measures to the same scale as AV. It is immediately apparent by inspection that the aid generated using Y* and W is identical for each district. This serves as a check, and enables the income flow measure of wealth Y* to be dropped from the discussion. Wealth, W, (when normalized) is higher than AV in the human capital intensive districts, and AV is larger than W in the property-intensive districts.

State Aid By School District

The state aid for each district assumes that:

1. Strayer-Haig districts, receiving only 1% of general state aid in Illinois at present, once having chosen the Resource Equalizer (R) are not allowed to switch back. Currently districts are allowed to choose Strayer-Haig, and a few do.

2. The maximum increase of +25%/yr., in the formula at present, explains why aid often is the same irrespective of the measure of wealth used when the foundation level is raised.
3. A new maximum decrease of 20% of 1974-75 aid is inserted as a "hold-harmless" type provision to phase out the Strayer-Haig formula in the calculation of aid and to phase in the new measure of wealth.

Phasing Out the Strayer-Haig Formula. To discuss the first and third provisions above first, it is be noticed that upon switching to W, about 57% of the districts voluntarily switch in the first year from the Strayer-Haig. The remaining Strayer-Haig districts go to zero aid in five years, unless choice of the "resource equalizer" is better for them. This is in line with the recommendation of the Citizens Commission on School Finance (1977, p. 16, 24). However some "resource equalizer" (DPE) districts using the new measure of wealth W also receive less aid.

The maximum 20% reduction operates as a hold-harmless-type provision that would minimize the impact of decreases, and give local higher income districts time to increase their local support. But simultaneously, it operates to treat Resource Equalizer and Strayer-Haig districts equally, while phasing out the Strayer-Haig formula.

Raising the Foundation Level. Raising the foundation level first to $1,500, then to $1,600 per pupil, while simultaneously going to the broader measures of wealth (W) and effort (t_2) reduces the number of higher income districts receiving decreases in their aid and makes the shift to an income factor in wealth and effort more palatable. There is need to raise the foundation level both because inflation has raised assessed values and

growth has raised per capita income since 1973 when the $1,260 foundation level was enacted, yet Guaranteed Wealth per student is a constant in the formula. This constant in each computation acts to reduce the amount of state aid required for full funding of the formula each year! The best way to get around this while leaving with local districts a degree of responsibility for financing is to make Guaranteed Wealth per pupil a function of the state's growing wealth W expressed in current dollars. The latter is simply the sum of the wealth of all school districts, so no additional data collection is necessary.

Table 3. Guaranteed Wealth Per Pupil

	Foundation $1,260	Foundation $1,500		Foundation $1,600	
	AV	AV	W	AV	W
Elementary Districts	$ 66,000	78,947	1,644,556	$ 84,210	1,754,100
High School Districts	120,000	142,857	2,976,190	152,380	3,174,100
Unit Districts	43,000	51,724	1,077,431	55,172	1,149,200

It can be noticed that at the higher foundation levels a few additional districts switch over voluntarily from Strayer-Haig (S) to the Resource Equalizer (R) formula. Cook 73, for example, when the measure of wealth was changed from AV to W would stay on Strayer-Haig. But when the foundation level is raised, although with the old measure of wealth AV it would stay on Strayer-Haig, with the new measure W it would switch to the Resource Equalizer. Other examples of this are Cook 94, and Peoria 328. Districts receiving the Maximum 20% decrease in aid constitute only about 5% of the total when the foundation level is raised! Cook 299, the Chicago School System, for example, would receive a decrease from $443,812,602 aid currently to $336,289,841 shifting to the new measure of wealth W at the old

$1,260 foundation level but stays exactly the same at $443,812,602 if the foundation level is raised at the same time. The adverse impact that remains for 5% of the districts is largely confined to the remaining Strayer-Haig districts who do not shift as that formula is phased out.

Releasing the Constraints on Changes in Aid. To observe the full scope of the effect of switching to the new measure of wealth, the very important constraint that allows a maximum increase in aid of only 25% and a maximum decrease of 20% must be removed. The Adams 1 district, for example, is at its 25% ceiling increase for 1976-77 irrespective of any changes in the measure of wealth, or in the foundation level. When this constraint is removed, and the foundation level increased to $1,600 its aid increases from $574,357 to $867,995 using AV and t_1 and to $1,049,208 using W and t_2. It would be best to phase in the $1,500 foundation level (using W and t_2) first, and then make the $1,500 level a function of the growing state-wide average for money wealth for reasons that will become apparent.

Total State Aid

Total state aid summed for all districts and calculated as at present using Equalized Assessed Values (AV) as the measure of wealth, the operating tax rate (t_1) as the measure of effort, and the current $1,260 foundation level is $1,388,038,298.

Switching to the new measure of wealth (W) and simultaneously raising the foundation level to $1,600 with +25% and -20% Maximum change constraints increases the state-aid bill by .1% to $1,389,669,235. It is unrealistic to consider the total aid using W and t_2 at the current $1,260 foundation

level because it is a little less than the total for aid using AV and t_1 since some Strager-Haig distticts receive less, and because an increase in aid (by about $103,000,000) and in the foundation level (to $1,500 or $1,600) is currently being contemplated. Aid via AV at the $1,600 foundation level is $1,422,971,677, 2.5% above the current level. It might be better if these limits could be changed to +33% and -33%, for state aid is only part of the total expenditure, and they have a very important effect in keeping expenditures down in the low income districts.

When the +25% and -20% limits are released to see the full effect of the changes to W and t_2, total state aid is:

Table 4. Effects on Total State Aid

	1,500 Foundation Level		1,600 Foundation Level	
	State Aid	% Increase over 1977 Actual	State Aid	% Increase over 1977 Actual
Via AV and t_1	$2,034,427,442	46.6%	2,260,575,934	62.8%
Via W and t_2	$1,910,612,449	37.5%	2,126,819,888	53.2%

This would only come about after several years had passed. During this time rising prices and rising per capita incomes would reduce the amounts required to below the levels shown above. It would be better if the constraints could be changed to ±33% while shifting to W, t_2, and a $1,500 foundation level with Guaranteed Wealth as of the end of this three year transition period re-expressed as some constant percent of average current doller per capita income (Wealth) in the State of Illinois, instead of appearing as a constant in the formula.

Targeting

In the short run, targeting state aid to the lowest expenditure per pupil districts would do the most to reduce the inequality of educational opportunity. The greatest concern is with the lowest decile or quartile of the districts. As indicated above, these are apt to be the source of many of the costly problem cases (e.g., for the welfare system, the courts, and for college admissions). Targeting of state aid computed via AV and via W, both at the $1,600 foundation level, is compared in Table 5 below. Table 5 has half of the cases in the top expenditure category, and spreads out the lower half for observation:

Table 5. Targeting of State Aid
($1,260 Foundation Level, +25%-20% Increment Constraints Removed)

Expenditure Per Pupil in WADA (1)	State-Aid ADA via AV (2)	State-Aid ADA via W (3)	Increment in Aid AV to W (4)	n (5)
0-$ 960	534	754	+220	4
961- 1050	345	923	+578	4
1051- 1090	713	1074	+361	3
1091- 1133	551	1051	+500	7
1134- 1186	629	915	+286	17
1187- 1238	699	1039	+340	43
1239- 1294	792	1008	+216	84
1295- 1370	899	1038	+139	128
1371- 1600	993	1023	+ 30	215
1600 and up	1192	1060	- 32	523
Mean Aid	1040	1040	0	

It is clear that neither version targets the aid very well to where the need is greatest, although W does better than AV. In fact aid using AV as the measure of wealth and the operating tax rate as the measure of effort gives larger amounts of aid to the higher expenditure per pupil districts, as can be seen in Table 5, Column (2). This is a basic deficiency in the formula (the absence of some floor level) that must be looked into. However this short run (3-6 year) view ignores the incentive effects on local effort of the reward-for-effort feature. The 100 lowest expenditure districts are unique; very low AV per capita and yet above average income per capita representing some untapped ability-to-pay.

The low expenditure per child districts are below the operating tax rate maximum needed to guarantee the $1,600 foundation level of aid. Currently only 20.4 percent of elementary districts (or 92 districts) with 46.01% of ADA, and 4.05% of unit districts (or 18 districts) with 42.01% of ADA reach the full funding maximum operating tax rates in 1975-76 according to Dan Hou and Warren Carson (1977, p. 29).

Whatever the problems, however, with this lack of a floor expenditure level, it is clear that shifting to the broader measures of wealth and effort does improve the targeting of aid to the lower expenditure per pupil schools, and gives a needed incentive to a few high income, low AV, low t_i districts. Both operate to neutralize the regressive targeting from use of assessed values that can be seen in Column (4) of Table 5.

Analysis of the Broadened Measure of Effort

A truer measure of effort is the total dollars of local taxes collected expressed as a percentage of the best available measure of ability to pay, i.e.

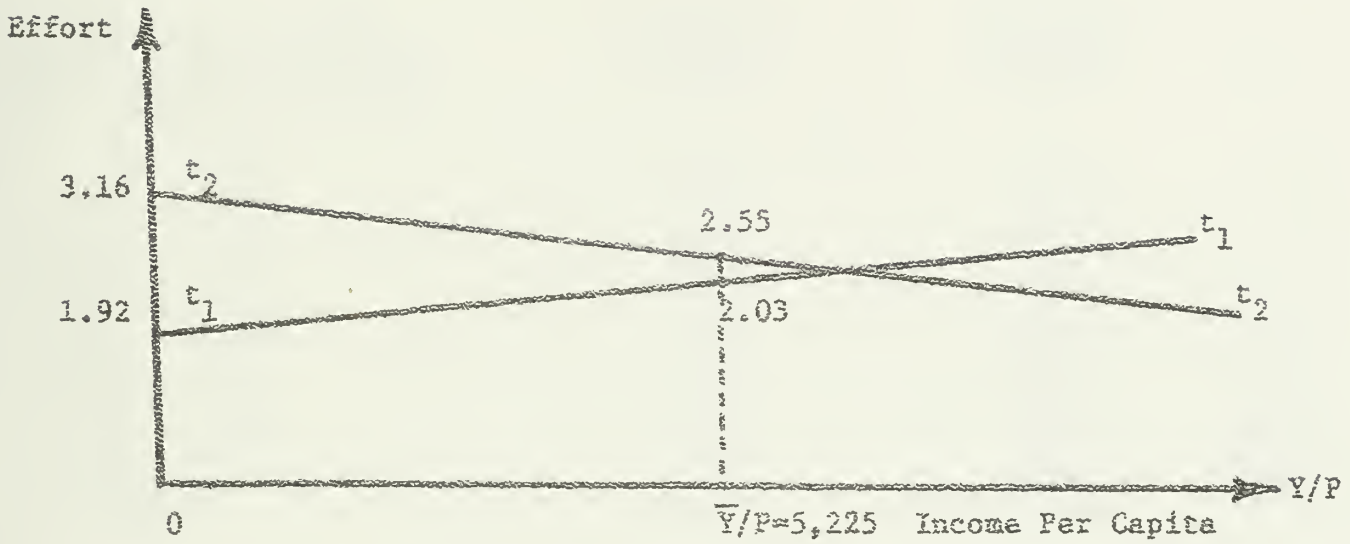
$$\text{Effort} = t_2 = \frac{t_1 AV}{W} = \underline{\text{the effective tax rate}}.$$

This is to be contrasted to the current measure of effort which is:

$$\text{"Effort"} = t_1 = \frac{t_1 AV}{AV} = \underline{\text{the operating tax rate}}.$$

Switching to the new measures of effort does reveal that the lower per capita income districts are in fact making a larger effort in relation to their ability-to-pay, and the high income districts are making a lower effort, as can be seen in Figure 1 below. Switching to the new measure of effort would send more aid to the low income-per-taxpayer school districts which also tend to have lower operating tax rates, and hence receive less aid, staying below the foundation level.

Figure 2. Effort



t_1 = .000018 Y/P + 1.92 (.00001) F = 2.37

t_2 = -.000117 Y/P + 3.16 (.00003) F = 18.46

These districts that have the lower operating tax rates and lower income to the left in Figure 2 also have lower expenditures per child as can be seen in the t_1 column in Table 6 below. They are currently incorrectly said to be making less "effort," and they get little aid. They are however not making less effort (except for the 4 lowest districts) when effort is measured in relation to their ability-to-pay (W) as their effective tax rate! This can be seen in Column t_2 of Table 6, and in the top line t_2 in Figures 2 and 3.

Table 6. Inadequate Per Pupil Expenditure a Function of Low Operating Tax Rates But Not Low Effort

Exp./Pupil in WADA Via AV, $1,260 Foundation +25%-20% Limits Released	Operating Tax Rate t_1	Effective Tax Rate t_2	n
0 - $ 960	1.24	1.27	4
961 - 1060	1.22	2.02	4
1051 - 1090	1.42	1.64	3
1091 - 1133	1.45	1.97	7
1134 - 1186	1.46	1.78	17
1187 - 1238	1.68	2.08	43
1239 - 1294	1.89	2.19	84
1295 - 1370	1.99	2.11	128
1371 - 1600	2.06	2.11	215
1600 & up	2.11	1.95	523
Mean	2.027	2.027	

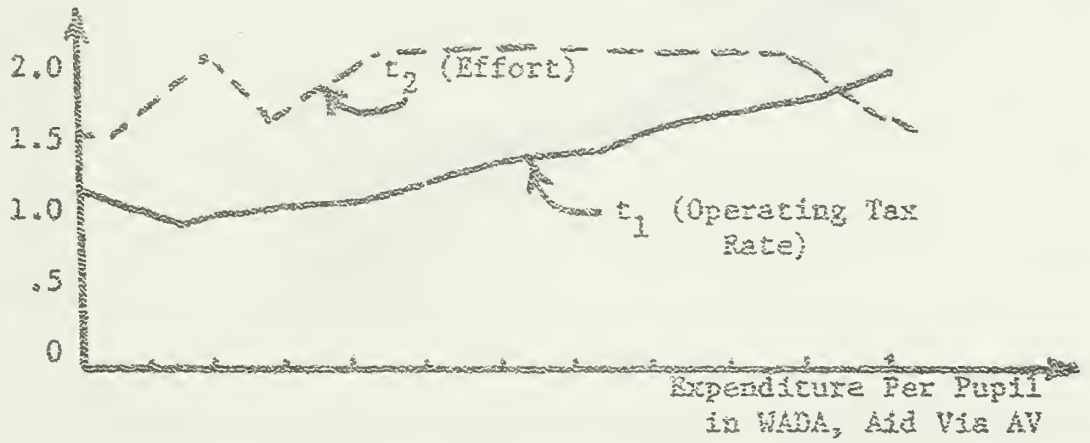


Figure 3. Effort in Relation to Expenditure per Child

There are various other ways of applying income weightings to the operating tax rate as has been discussed by Dan Hou and Warren Carson in J. Cronin, Hou, and Carson (1977, pp. 21-44) that could supplement the switch from the operating tax rate t_1 to the effective tax rate t_2. Noting the problems above with the 78 expenditure-per-child districts,

still below the $1,260 foundation level in Table 6, a special income weighting of the effective tax rate in the lowest decile to guarantee a floor expenditure per child would appear to be a very important one to consider.

Analysis of the Effects on Educational Equality

Initial effects in the first year on greater equality of expenditure per child from shifting to the broader measures of wealth (W) and effort (t_2) is negligible, largely because of the +25%-20% increment limits. However, when these limits are released, the full adjustment to the change is revealed by the shaded area and the line WW in Figure 4.

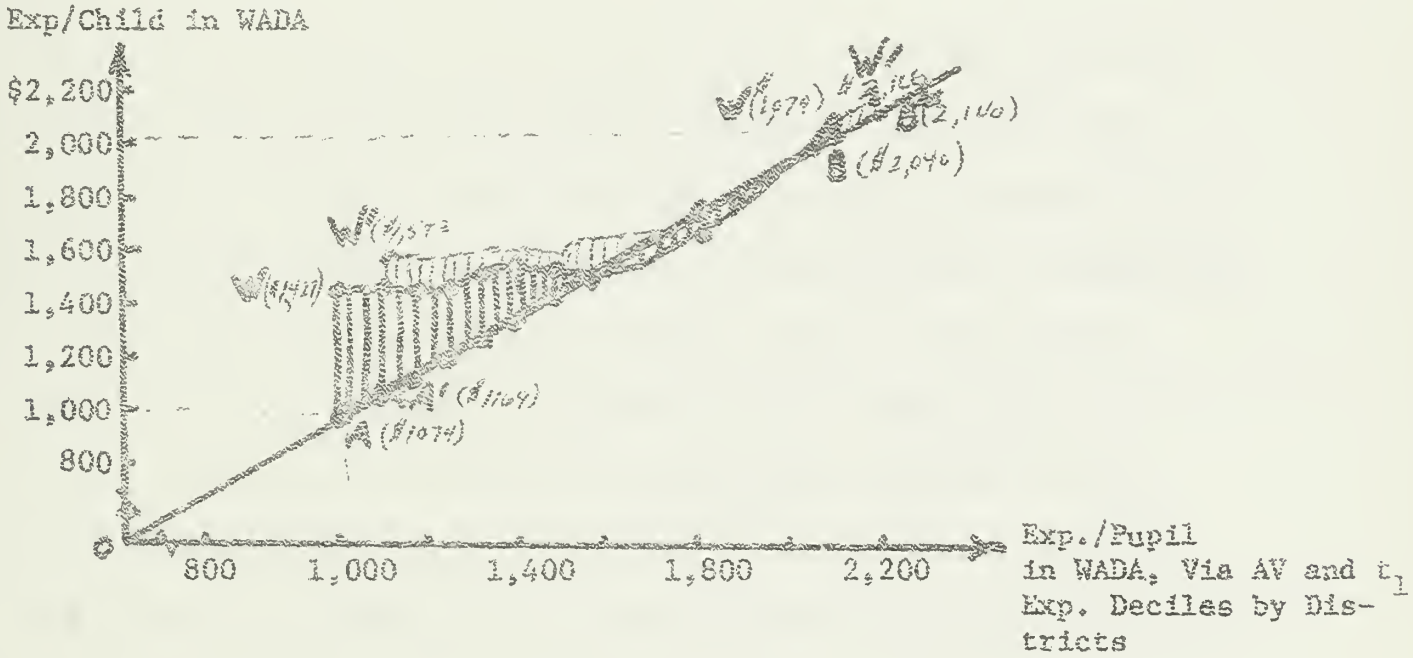


Figure 4

Both the base line AB (using AV and t_1) and the result of the change to W and t_2 shown in line WW in Figure 4 are both computed at the $1,500 foundation level. The reduction in inequality in expenditure per pupil due to the shift to the broader measures of wealth and effort, especially in the lower expenditure per pupil ranges where the reform is needed most, is considerable. The $1,600 foundation level shifts line AB to A'B', and WW to W'W' upward and to the right.

Analysis of the Effects on Tax Equity

State aid based on equal effective tax rates, t_2, among districts at any given level of wealth W would be conducive to horizontal equity, or equal treatment of equals. Districts with higher effective tax rates at each wealth level could reduce them and districts with lower effective tax rates (and more ability-to-pay) at that level of wealth could lower them unless they wished to maintain non-wealth related differences based only on differences in tastes. Except for these, the result would be in the direction of equal local tax collections in all districts that have equal well-being as measured by W, which is horizontal equity in the strictest sense.

There still is unlikely to be vertical equity, however, which is a much difficult matter on which to achieve agreement. The regressive nature of local property tax rates currently (expressed in relation to a more comprehensive measure of wealth that includes income) as suggested by the negative slope on the line t_2 in Figs. 2 and 3, would not be acceptable to the vast majority as vertical equity. Some degree of progressivity, as would be introduced by additional, nonlinear income weightings of the lowest two deciles would be more vertically equitable under the proportional sacrifice or minimum sacrifice doctrines of taxation theory.

VI. Summary of Conclusions

In general, a broadened measure of wealth and use of the effective tax rate causes relatively more aid to flow to the low income school districts who in fact are now making the largest effort (t_2). It also targets aid better to the low expenditure per pupil districts which are a matter

the greatest concern because of the costs later that society must bear when education in these districts is inadequate.

Although full state funding would do the most to secure greater equality in expenditure per pupil, the problem of decreasing the current inequality within a system of shared state-local funding is likely to remain the most pertinent one for the foreseeable future. The reason typically cited is illustrated by the words of the Illinois Citizens Commision on School Finance (1977 p. 14) that "substantial local control of public schools should be retained, which means that a substantial degree of local funding...(through use of) the property tax...must also be retained." Even if each school district in Illinois should go to a local income tax, the same problems addressed in this paper of inequality in expenditure and inequity among different districts will remain. However, to improve equity among taxpayers within each district, a broadened circuit breaker that extends exemptions to low income families irrespective of age would be desirable.[10]

A review of data sources establishes that accurate estimates of personal income per capita are available (except for a few districts of 300 pupils or less whose income can be ascertained by including them in a somewhat larger contiguous area). Income updates can be calculated by use of the data in the April issue of the Survey of Current Business which is easily available to every school district. Per capita income data by Townships has also recently become available through the U.S. Bureau of the Census (1977) from Internal Revenue Service sources. The data are adequate. Anyone who really believes that the lack of annual income data is the principal reason for opposing use of an income factor, in the words

of Hickrod and Hubbard, (1977, p. 8), "probably also believes in Santa Claus and the Tooth Fairy."

It is best to not try to include business income because the net income of unincorporated enterprises (proprietorships, partnerships, professional persons, farms) is included in personal income, and business property is included in assessed assets. A correction for any corporate income omitted could better be made by increasing income tax on corporations at the state level, a portion of which would be returned to the schools through state aid.

It is also a conclusion that whether "wealth" is measured as equalized assessed valuation at market plus a capitalized value of the income stream (W), or as income plus the income flow that could be purchased with the market value of these same assets, is irrelevant. Either measure could be chosen depending on which is the most politically convenient.

School aid policies and school district taxation policies can be separated. The use of an income factor in the school aid formula as part of the measure of well being or of effort can be considered wholly apart from the question of whether school districts should or do have the power to tax income.

Finally, the wide inequality in expenditures per child among school districts in Illinois, and the unacceptable implication for the society, have been shown to be partly dependent on the narrow measures of wealth and effort in use. By not changing the foundation level independently of this reform, the switch to a new measure of wealth and effort, together with an expenditure-per-child floor, would become more attractive to all the school districts in Illinois.

There is a better opportunity to reform the inequality in expenditure per child, especially the situation that leaves expenditure in so many districts below the foundation level, during this period of inflation-induced reforms and increasing state resources. The shift to broader measures of wealth and effort, together with adjustment limits allowing more rapid adjustment, will help to reduce the inequality in expenditures, especially by bringing up the lowest deciles where the concerns of society are most acute, while simultaneously improving tax equity.

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Appendix A

Derivation of the Asset Conversion Rate R_n

Each dollar of assets can be used to purchase an income stream of R_n costs per year (that is, be converted into an income stream at the asset conversion rate of R_n percent). If the income stream is to extend over n years, assuming the given rate of interest is rate r, its present value is:

$$(1) \quad \$1 = \frac{R_n}{(1+r)} + \frac{R_n}{(1+r)^2} + \frac{R_n}{(1+r)^3} + \ldots + \frac{R_n}{(1+r)^n}$$

Rearrange to obtain a finite geometric series inside the brackets:

$$(2) \quad \$1 = R_n[1 + (1+r)^{-1} + (1+r)^{-2} + \ldots + (1+r)^{-n+1}] - R_n + R_n(1+r)^{-n}$$

The geometric series may be replaced with its solution:

$$(3) \quad \$1 = R_n \left[\frac{1 - (1+r)^{-n}}{1 - (1+r)^{-1}}\right] - R_n + R_n (1+r)^{-n}$$

When (3) is solved for R_n:

$$(4) \quad R_n = \frac{1}{\frac{1 - (1+r)^{-n}}{1 - (1+r)^{-1}} - 1 + (1+r)^{-n}}, \text{ which simplifies to}$$

$$(5) \quad R_n = \frac{1 - (1+r)^{-1}}{(1+r)^{-1}\,[1 - (1+r)^{-n}]}, \text{ which simplified is:}$$

$$(6) \quad R_n = r\,[1 - (1+r)^{-n}]^{-1}, \text{ the asset conversion rate.}$$

Footnotes

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[1]In Cincinnati vs. Essex it was held (among other things) that the failure to measure effort on an equitable basis is a denial of the equal protection of the laws. At the time of writing, the case is being appealed.

[2]Actually TWADA, or Title I weighted WADA is used in all aid computations in Illinois.

[3]It is for this reason that the author suggests the need for modification of the seventh and last criterion suggested by Roe L. Johns (1976, p. 547) for an equitable school finance program. The six other criteria that he suggests are excellent, for the most part, in the author's opinion.

[4]31.1% is the sales based average ratio of market values to sales values in Illinois. Illinois Department of Local Government Affairs (1975, p. vii).

[5]This 28 year time span will be applied to business assets also. Sole proprietors, partners, stockholders, and business employees all have finite lives, even though the corporation as a legal entity does not.

[6]In Cook County, Illinois, for example, there are five major classes of property:

I.	Farms and unimproved land	22%
II.	Residences and apartments with six or less units	22%
III.	Large apartment buildings	33%
IV.	Not-for-profit ownership	30%
V.	Business and commercial	40%

Classes are to be assessed, according to the ordinance passed by the Cook County Board in 1974, at the percentages of market value shown in the last column.

[7]The methods of measurement are discussed in detail in the source cited, and therefore have been delted here for brevity.

[8]They are available however from the author for $8 a set to cover the costs of reproduction and mailing.

[9]These districts are labeled M in the W state aid column, $1,600 foundation level in the separate Tables 3 and 4.

[10]Circuit breakers are available to all homeowners and renters, not just those 65 and over, in Michigan, Maryland, Minnesota, Oregon, Vermont, and Wisconsin.