183-73

INSTITUTE FOR RESEARCH ON POVERTY DISCUSSION PAPERS

AN IMPROVED METHOD FOR ESTIMATING LOCAL FISCAL CAPACITY

John S. Akin

UNIVERSITY OF WISCONSIN - MADISON

AN IMPROVED METHOD FOR ESTIMATING LOCAL FISCAL CAPACITY

by

John S. Akin

November 1973

The research reported here was partially supported by funds granted to the Institute for Research on Poverty at the University of Wisconsin, by the Office of Economic Opportunity pursuant to the provisions of the Economic Opportunity Act of 1964. Support was also received from the New York State Commission on the Quality, Cost and Financing of Elementary and Secondary Education for the author's dissertation research from which this research grew. The author thanks Harvey E. Brazer, Gerald E. Auten, and Cynthia S. Cross for their ideas, stimulation, suggestions and hard work which are reflected in this paper. That much of what appears here is to a large extent the result of a closely coordinated effort with these three individuals must be acknowledged. The author, however, assumes responsibility for all errors.

ABSTRACT

This paper examines the concept of fiscal capacity or aggregate ability-to-pay for public services and suggests a method for empirically estimating fiscal capacity for localities. The measure suggested is an index of several types of property values combined with income of residents. The hypothesis underlying this estimate is that local fiscal capacity must measure income and wealth of residents as well as ability to tax both the income and wealth of non-residents.

An Improved Method for Estimating Local Fiscal Capacity

Introduction

Local fiscal capacity estimation is an attempt to aggregate ability-to-pay over a local governmental unit. As is generally the case with an aggregate measure some information is lost in the process of aggregation. The aggregate measure provides summary information, however, which is useful for purposes for which the disaggregated data has little utility. In the same way that raw information about wages, rents, and interest may be less useful than GNP figures for one who desires to compare rates of growth of nations, a description of every income and wealth source in a community may be of little use to a grantor of funds interested in comparing the ability of local units to raise revenues. What is often describable is a single measure which can serve as a means for comparison of ability to raise local tax revenues of various local governmental units. To the extent possible, therefore, fiscal capacity estimation attempts to provide a simple measure summarizing a complex aggregate--the ability-to-pay of a local government. Many applications for such a measure are in federal and state grant formulas. The ability to measure local fiscal capacity is of utmost importance if such programs as revenue sharing are to provide funds to those localities least able to raise them locally. On the basis of recent court and legislative actions in the field of education, it appears inevitable that more acceptable measures of local school district wealth than simple property value will be of importance for policy.[1] In order to finance education in such a way as not to discriminate on the basis of school district wealth, or to examine the consequences of such financing, we must be able to measure school district wealth (i.e., ability-to-pay).

Past Efforts

Past efforts to measure fiscal capacity can be characterized in a three-way classification system: income measures,[2] property value measures,[3] and measures using a combination of factors (usually including income and property values as the main factors). The combination measures include those based on specific tax structures such as the ACIR's representative tax system[4] as well as several measures based upon the Model Tax Plan of the National Tax Association.[5,6]

The shortcomings of all these estimation methods are numerous enough to suggest that better measures can be derived. Data problems are not so serious as to rule out the use of income as one factor in an index, but the problems of obtaining either median, mean, or income distribution data for local units, for any except census years, are almost unsolvable, and seem to dictate against the use of income alone as a measure of fiscal capacity. This is not to suggest that an income measure does not have shortcomings even if data were readily available. The use of income alone ignores the fact that most local taxes are not income based. It also fails to weigh the fact that much fiscal ability in a unit may result either from direct taxes upon non-residents or from the shifting of taxes to non-residents. Non-resident workers, land and business owners, shoppers and travelers demand and use local public services; and, through taxes on such bases as sales, property, and commuter income, can be taxed for these services used. At the local level, that people may live in one unit, work in another unit, shop in a third unit, and spend vacations traveling through and seasonally residing in still other units is of extreme importance. No measure of the income of residents of a community can provide a fiscal capacity measure which realistically considers these factors.

The use of property values as a measure of fiscal capacity at the local level, while probably having fewer shortcomings than the use of income alone, is also unsatisfactory. The massive problems of assessment and equalization of local assessments to full value render all full value figures suspect. But even if we assume that in states with competent equalization procedures the numbers are close approximations to the actual magnitudes, the use of property value as a measure of fiscal capacity is beset with problems. The most obvious flaw in this measure is that the true final source of tax dollars is income. Taxes are paid from income in all cases, and it is highly unrealistic to assume that high income always exists where property values are high, or that poor property owners should and will sell property to pay taxes. And while the value of certain types of property, such as resort and industrial, does provide some gross measure of ability to tax outsiders, this aspect of fiscal ability certainly is not well captured by total full value of property. To the extent that residential property is prevalent in a community, the ability to shift tax burdens outside (or the tendency of citizen voters to believe them shifted) will be lessened. The existence of commercial, industrial, and seasonal property allows the tax price of given supplies of public goods to be decreased for residents and fiscal ability of the unit correspondingly increased.

From the preceding discussion it can be inferred that a realistic fiscal capacity measure must be a function of both income and real wealth in a community. But in many cases the variables used in a fiscal capacity index have been chosen arbitrarily. For instance, the ACIR method chooses "widely used" actual tax bases rather than measures designed to reflect income and wealth of the community. While the politically oriented might be expected to believe that utilized tax bases are the bases relevant to measurement

of ability-to-pay it is probable that economists in general would disagree; reasoning that the underlying wealth and income of the community, as well as the price of a dollar's worth of public goods to the voter-residents, determines the true ability of districts to raise tax revenues.

Besides the choice of variables, the most important difficult in deriving composite indices of fiscal capacity is putting weights upon these taxable resources. In past studies either highly arbitrary measures or simple arithmetic averages have been used. Representative or model tax systems which attempt to apply rates to actual tax bases suffer from the facts that (1) both bases and rates are chosen with no theoretical basis and (2) little or no account is taken interaction of bases in a community. That heavy taxation of one base tends to lead to lighter taxation of others for a given set of resources is simply ignored.

Factors determining the willingness of individuals to pay for government services should be, among others, income, wealth, and the price of these services to resident taxpayers (as determined by the relative ability to shift taxes outside the locality). These factors are the "ability" factors or "capacity" factors in demand for public services. Other variables may exist in the community which lead to higher or lower demands for public services at any given level of ability. These "need" or "taste" factors do not represent ability-to-pay and should not be included in a fiscal capacity index. All that the index should measure is financial ability, not "needs" or "tastes" for public goods and services.[7]

Methodology

I have stated that different tax bases must be weighted to varying degrees in deriving an estimate of fiscal capacity. A practical method of non-arbitrarily

assigning weights to the (also hopefully non-arbitarily chosen) bases is necessary. Since the desired result is a measure of fiscal capacity representing the revenues one can realistically expect a local unit to raise from its given taxable resources, the most obvious choice of weighting methods is multivariate regression analysis of actual tax revenues on tax bases. The coefficients on the independent variables can realistically be regarded as empirically derived norms of actual taxing behavior. These parameters represent the "average" addition to actual tax revenues expected when additions are made to the taxable resource in question. The weights given to bases in this methodology reflect not only the value of tax bases but also the behavior norms reflected in actual taxing experience.[8,9] Therefore, the use of regression techniques on data representing actual revenue collections of the units analyzed gives weight to the reality of the democratic process. The norms that ensue reflect the actual results of the political taxing and revenue-raising process in the local units of the state in question.[10] The use of the method allows fiscal capacity to reflect what can in reality be expected, given the political system and attitudes that exist. It shows the normal amount of revenues that can be expected to be raised be a local unit, given the existence of the various bases used in the index. For estimation, fiscal capacity will be defined as the per capita total revenues that would be expected to be raised by all local governments serving a locality, given the area's median family income, real property value and its distribution among types of property (proxies for wealth and the ability to tax non-residents), and state-wide norms of fiscal effort upon these taxable bases, as determined by linear multivariate regression analysis.[11] The actual empirical estimates of fiscal capacity are obtained by weighting the various independent variables with weights obtained by ordinary least squares regression of actual

revenue collections of the unit on these variables. In other words, predicted values of actual revenue collections for each local area based upon this estimating equation are the fiscal capacity estimates.

Impossibility of Subdividing Fiscal Capacity

The above definition of fiscal capacity has explicitly stated that fiscal capacity must include the ability to raise revenues of all governmental units located in a geographic area. It is impossible to estimate fiscal capacity for a specific purpose, such as education, in a taxing area, short of arbitrarily dividing tax bases among various uses. This procedure ignores the fact that the resources being taxed for school purposes must also support all other public services provided in the same geographic region. Total fiscal capacity in a geographic area can be estimated, but it is impossible to determine that certain resources are taxable for specific public purposes, and not for others. Even if resources can be taxed directly only for certain purposes, substitution will tend to occur among taxable resources until voters are satisfied with the total burden and its distribution among bases. It is therefore my contention that ability to raise revenues, given taxable resources, cannot be satisfactorily divided among functions. Total capacity resulting from given resources is the only feasible capacity to measure.[12]

The Model Estimated

For estimation purposes it is assumed at the outset that federal and state taxes apply uniformly throughout any state and that, because the school districts here analyzed are all within New York State, these taxes may be ignored. The model which is actually estimated is as follows:

Local Fiscal Capacity [LFC] = Predicted Local Tax Revenues $[\hat{LREV}]$[13] =

f (Resident Income, Resident Wealth, Ability to Tax Non-Residents)

The actual independent variables used in estimation are:

A) Resident Income = 1) Median Family Income [MFI][14]

B) Resident Wealth = 1) Residential Taxable Property (equalized to full market value by the state) [Resid];[16] and

2) Miscellaneous Taxable Property (equalized full value) [Other][15]

C) Ability to Tax Non-Residents = 1) Commerical Property (equalized full value) [Comm];[15]

2) Industrial Property (equalized full value) [Indust];[15] and

3) Seasonal Property (equalized full value) [Season][15]

The estimating equation, thus, takes the form:

$\widehat{LREV} = f$ (MFI, Resid, Other, Comm, Indust, Season).

Governmental Unit Analyzed

Because of the necessity of using local units which include all the governments servicing a given population, it is necessary for analysis to choose one unit of government, and to include those areas of other local governmental units which are wholly or partially within the area covered by the chosen unit, in order to aggregate such things as total revenue collections. Because of the policy importance of fiscal capacity estimates for school districts--the decision-making unit for school taxation and expenditure--they are the local governmental unit analyzed in this paper. But, because New York State school districts are not in most cases coterminous with other local units of government, choosing a sample of school districts to analyze is an extremely difficult problem. One hundred

four districts for this study are chosen by overlaying school district maps on other local government unit maps, and by choosing only districts which can be approximated by the summation of various otherlocal governmental units. It is necessary in some cases to allocate some fraction of the revenues, property values, expenditures, etc. of local units only partially included in school districts. It is also necessary in many cases to take a population weighted average of median family income in order to obtain one median family income figure for each school district.[16]

Results of Regression Analysis

The results of the regression of actual tax revenues raised in the 104 school district areas of New York State on the six independent variables are presented in Table 1. The correlation matrix is included with these results.

The correlation matrix indicates an expected high correlation between PRESID and MFI. The two are theoretically, as well as empirically, highly correlated, and it is impossible by statistical methods to determine how much of the total variance explained by the two variables is attributable to each. For these reasons both median family income and per capita residential property value are retained as independent variables in the final model, even though the "t" statistic for residential property value per capita is not high. Although the proportion of variance in fiscal capacity explained by income and the proportion explained by residential property per capita cannot be separated with a high degree of confidence, the total effect of the two combined is assumed to be accurately explained by the two variables in combination. For our purposes the allocation of fiscal capacity between the two variables is not of utmost importance. The estimate of their combined effect can be accepted with confidence.[17]

TABLE 1

RESULTS OF ORDINARY LEAST SQUARES REGRESSION ANALYSIS,
PER CAPITA LOCALLY RAISED GOVERNMENTAL REVENUES

Dependent variable Locally raised governmental revenue (LREV) (dollars per capita)	Independent variables: Constant term	Median family income (MFI) (dollars)	Residential property (RESID) (dollars per capita)	Commercial property (COMM) (dollars per capita)	Industrial property (INDUST) (dollars per capita)	Seasonal property (SEASON) (dollars per capita)	Other property (OTHER) (dollars per capita)
Regression coefficient	-29.223	.027	.003	.042	.025	.016	.175
"t" statistic[a]	- 1.287	5.623	0.493	6.965	5.673	2.936	6.749
Mean of variable	1.000	6,249	3,144	918	959	610	301
Coefficient of partial determination		1.74	.014	.210	.235	.198	.290

Coefficient of multiple determination (R^2) = .836

Number of observations = 104

Matrix of Simple Correlation Coefficients

	LREV	MFI	RESID	COMM	INDUST	SEASON	OTHER
LREV							
MFI	.4447						
RESID	.4661	.7149					
COMM	.6110	.4613	.3253				
INDUST	.2332	-.0387	-.0793	.0543			
SEASON	.4784	-.1854	.0846	-.0290	-.0218		
OTHER	.6152	-.1661	.1018	.1503	.0032	.7757	

[a]Coefficient divided by standard error

The only other high simple correlation coefficient is that between PSEASON and POTHER. Such a high correlation between the two independent variables (multicollinearity) may result in more or less arbitrary distribution between them of their joint effect, as reflected by their respective coefficients. In other words, statistical analysis may indicate that one of the variables in question has a more significant relationship and the other a less significant relationship to the dependent variable than is in fact the case. It may then be decided, on the basis of some test of significance such as the student "t", that the coefficient on the less significant variable is not significantly different from zero. This significant variable may as a result be deleted from the estimating equation. But, in the actual equations that include both PSEASON and POTHER, the "t" values on each are high and obviously indicative of coefficients whose values are different from zero. For this reason the multicollinearity is considered to be of minor importance and is ignored. Even though the relative quantitative impact of the two variables may be questionable, their combined effect is believed to be captured accurately by their coefficients.

All of the actual regression coefficients are consistent with the assumed model and all are statistically significant except the coefficient on per capita residential property (RESID). The per capita amount of locally raised governmental revenue varies directly with income and taxable value of each of the five classes of property. On the average, holding the other variables constant, a one-dollar difference in median family income is associated with a marginal difference of 2.7 cents in per capita tax receipts. For the property value variables we find a considerable range in the relationships indicated by the net regression coefficients, from a 17.5 cent response

in the same direction for "Other" property[18] to an increase in per capita tax receipts of only 0.3 cents for each dollar increase in per capita taxable value of residential property.

Coefficients of partial determination, which are obtained by multiplying the beta coefficient by the simple correlation coefficient, provide approximations to the proportion of variance explained by each independent variable. The coefficient of partial determination for a variable can be said to represent the percentage of variation in the dependent variable explained by the independent variable in question, after all other independent variables have been taken into account. It must be realized, however, that any process of allocating total explanatory power among the independent variables must arbitrarily divide that part of the explained variance which is due to combinations of the variables. While the coefficient of multiple determination can indicate how much of total variance is explained by all of the independent variables combined, part of this determination is due to joint effects of variables. Accurately dividing this joint explanatory power is simply impossible. The approximations of relative explanatory power contained in the coefficients of partial determination suggest that, from most to least powerful, the variables should be ranked in the following order:

Variable	Coefficient of partial determination (from Table 2)
POTHER	.290
PINDUST	.235
PCOM	.210
PSEASON	.198
MFI	.174
PRESID	.014

The variables ranked in order of relative approximate variance explaining power conform closely to expectations. Industrial, commerical, and seasonal

property are much more powerful (by the coefficient of partial determination criterion) in terms of explaining variance in actual tax collections than is residential property. Median family income explains less of the variance than do each of the non-residential property types, but explains more than does residential property. These results can be interpreted as indicating that local units are most willing to tax the income and wealth of non-residents when this is possible; and that resident income has a greater impact upon taxing behavior than does resident property. One could even suggest that the major reason that local residential property represents taxing capacity is because it serves as a proxy for resident income.

In combination the income and the five property value variables account for or explain 84 percent of the variance in per capita local tax receipts (as compared to 71 percent explained by an equation using only median family income and total property value per capita as independent variables, and in which we did not distinguish among classes of real property).[19] Thus we can be confident that the estimating equation explains a high percentage of the variance among local governments operating within school districts in locally raised governmental revenue per capita. When actual revenues raised is regressed simply on property value per capita or on income (MFI) the R^2's are only .70 and .20 respectively. Districts in the sample varied by as much as 84 places in rank orderings based upon these three alternative measures of fiscal capacity. That ranks can differ by such a magnitude only serves to emphasize the importance of correctly specifying fiscal capacity.[20]

Concluding Statement

This paper must end with a note of warning. Fiscal capacity is only one side of the fiscal coin. Thus, defining fiscal capacity and identifying and

measuring the factors that give rise to differences in it among local governmental units only examines one aspect of the total local fiscal situation. Because one school district has more or less ability-to-pay than another does not indicate that it is better able to satisfy its fiscal "needs." A district that has twice the fiscal capacity of another may in reality be in a worse fiscal situation if its "needs"--somehow defined--are three times as great. It therefore cannot be inferred that districts having more fiscal capacity are less in need of fiscal aid. Only when local fiscal needs are compared with local fiscal capacity can the total picture relating to the sufficiency or insufficiency of local taxable resources be seen. While the measurement of fiscal needs has not been attempted in this paper, these need estimates are of equal importance to fiscal capacity estimates.[21] Any system of education finance which distributes aid to districts on the basis of relative fiscal capacity alone may in reality produce perverse results. Only if the assumption is made that needs are identical in all districts can a measure of fiscal capacity alone be useful for determining the desirable distribution of funds. If finance systems designed as a reaction to the recent school finance court decisions do not take account of the varying needs of students, these systems may represent little or no improvement over existing systems. It should be noted, however, that even if local revenue raising capability alone is the standard upon which aid is to be based; providing aid on the basis of type of district, such as large city or rural, may result in perverse redistribution in many cases. Examination of each type of district will show that both "rich" and "poor" districts exist in every class. For example, a system of aid that diverted funds

from downstate suburbs to large cities in New York, while redistributing in the correct direction on the average, would be taxing Somers, with fiscal capacity of $251 per capita, in order to provide funds to Yonkers, whose fiscal capacity is $329 per capita. From the limited view of the revenues side only (given the assumption of equal per capita needs) it can be stated that aid should be based upon the characteristics of each school district, rather than upon average characteristics of types of districts, if the aid is to be directed to districts with less local ability-to-pay.

NOTES

[1]See, for example, Serrano v. Priest (1971) 5 Cal. 3d 584, 487 P. 2d 1241; and Rodriquez v. San Antonio Independent School District (1972) 337 F. Suppl. 280 (W. D. Tex.), prob juris noted 92 S. Ct. 2413.

[2]See as examples D.S. Gehrig, "The Financial Participation of the Federal Government in State Revenue Programs," Social Security Bulletin, Vol. III, No. 1 (January, 1940); Harry Landreth, "The Measurement of Local Fiscal Capacity" (unpublished Ph.D. dissertation, Harvard University, 1960); E.B. Oppermann, "The Potential Usefulness of Uniform Tax Burden Distributions as Measures of the Tax Capacities and Tax Efforts of State and Local Governments: An Empirical Study" (unpublished Ph.D. dissertation, Indiana University, June, 1965); Paul Studenski, Measurement of Variations in State Economic and Fiscal Capacity, Bureau Memorandum No. 50 (Washington, D.C.: The Social Security Board, 1943); and P.H. Wueller, Fiscal Capacity of the States: A Source Book (Washington, D.C.: Social Security Board, Bureau of Research and Statistics, September, 1937).

[3]See as examples, Francis G. Cornell, A Measure of Tax Paying Ability of Local School Administrative Units (New York: Teachers College, Columbia University, 1936); E.P. Cubberly, School Funds and Their Apportionment (New York: Teachers College of Columbia University, 1905) and W.T. Harris, "The Political Economy of School Finance," Educational Review, Vol. XXIX (May, 1905), pp. 486-509; Francis G. Cornell and Roe L. Johns, "Alabama's New Index of Local Ability to Pay for Education," The School Executive (June, 1941), pp. 22-23; John K. Norton, "Major Issues in School Finance," Research Bulletin of NEA, Vol. IV, No. 5 (Washington, D.C.: National Education Association, 1926); and Harlan Updegraff, Rural School Survey of New York State (Ithaca: Joint Committee on Rural Schools, 1922).

[4]Advisory Commission on Intergovernmental Relations, Measures of State and Local Fiscal Capacity and Tax Effort (Washington, D.C.: U.S. Government Printing Office, 1962), and ACIR, Measuring the Fiscal Capacity and Effort of State and Local Areas (Washington, D.C.: U.S. Government Printing Office, 1971). The 1971 report attempts to use essentially the same method as the earlier report on a state-wide basis for measuring the fiscal capacity of local areas. The only local units for which fiscal capacity is estimated are 218 SMSA's and 747 counties. A measure of fiscal capacity for units smaller than the county is not attempted, probably because of data collection problems. It is interesting that national average rates are used by the ACIR even in estimating local fiscal capacity. It would seem that, even if one accepts the ACIR method, it would be necessary to use the tax bases and rates prevalent in the state itself in estimating local fiscal capacity, since the tax bases used in states do vary considerably. For instance, gambling taxation is very important in Nevada, yet over the nation the average tax levy on wagering will not be very high.

[5]National Tax Association, "Preliminary Report of the Committee Appointed by the National Tax Association to Prepare a Plan of a Model System of State and Local Taxation;" Proceedings of the National Tax Association, 1919 (New York: National Tax Association, 1919), pp. 401-470.

[6]See also Arvid J. Burke, "Local Fiscal Ability," Special Staff Report in State of New York, Joint Legislative Committee on School Financing, Final Report, Legislative Document (1963), No. 11 (Albany: March 12, 1963). This is a staff study for the Diefendorf Committee; Leslie L. Chism, The Economic Ability of the States to Finance Public Schools (New York: Teachers College, Columbia University, 1936); Lloyd L. Hogan, Measurement of the Ability of Local Governments to Finance Local Public Services (Albany: The University of the State of New York, The State Education Department, Bureau of Educational Finance Research, May, 1967); Mabel Newcomer, An Index of the Tax Paying Ability of State and Local Governments (New York: Teachers College, Columbia University, 1935); John K. Norton, The Ability of the States to Support Education (Washington, D.C.: The National Education Association, 1926); John K. Norton and Margaret Alltucker Norton, Wealth, Children, and Education (New York: Teachers College, Columbia University, 1937); and G.D. Strayer and R.M. Haig, The Financing of Education in the State of New York, Educational Finance Inquiry, Vol. I (New York: MacMillan, 1923).

[7]In the actual statistical estimation of fiscal capacity which follows only "capacity" type independent variables are included. To the extent that these variables--which represent ability to raise taxes--are correlated with "need" and "taste" variables the fiscal capacity estimates will perhaps overestimate the effect of pure "ability" by attributing to their power to explain variance in tax revenue raising ability which is actually due to "tastes" or "needs." Because statistical methods cannot effectively separate explanatory power among variables, I have chosen to omit "taste" and "need" variables and assume that all explanatory power of capacity variables represents capacity effects. Through this methodology "taste" and "need" effects which are correlated with "capacity" variables are assumed to be due totally to the "capacity" variables.

[8]The Advisory Commission on Intergovernmental Relations, in an attempt to capture this "average" behavior, has used weighted average tax rates applied to actually-taxed bases. One principal shortcoming of this method is that it uses bases chosen without respect to any economic rationale--many of the bases are highly correlated and tend to represent taxable capacity because of their mutual high correlation with income (the base from which most taxes are in reality paid). The other main fault is that these bases are weighted independently on the basis of actual taxing practice. For example, income is very lightly weighted due to the fact that state-local income taxes are in general very low. No account is taken of the fact that property taxes essentially tax income, and that it is income, not property itself, that represents the fiscal capacity. That local taxes tend to be substitute

[8](cont.) methods of taxing income, and that weights derived without consideration of this interaction phenomenon are therefore suspect, is not recognized by the ACIR in its estimation process. See ACIR, Measuring the Fiscal Capacity and Effort of State and Local Areas (Washington, D.C.: U.S. Government Printing Office, March 1971).

[9] For a discussion of the decision not to normalize by the inclusion of variables other than those representing tax bases see Appendix A.

[10] To attempt local fiscal capacity estimation for a sample of districts drawn from more than one state would be questionable because of the high degree of variation among states in the types of services provided by localities as opposed to being provided at the statewide level.

[11] The use of property by types is an attempt to estimate the ability of a locality to place tax burdens on non-residents. If local data were generally available for variables more correlated with ability to tax non-residents, these variables could be substituted.

[12] It is possible, however, once total local fiscal capacity is measured, to estimate the amount of this capacity that needs to be used for other public purposes in given types of localities, and to define the residual after this "needed" amount is spent as fiscal capacity available for education (or analogously for any other public purpose).

[13] Included are all revenues collected by all governmental units encompassed by a school district geographic area. Included are tax revenues, license fees, and franchise fees of all local governmental units (including special districts which provide such services as garbage removal and fire protection).

[14] Median family income for 1959 is used because it is the only income data generally available for all units smaller than counties. Current income data would obviously be preferable but simply is not available for the analyzed 1967-68 fiscal year. The use of income data which is eight years old implies an assumption that median family income has changed by equal percentages in each district since the date of data collection. Based upon an examination of changes in income levels for certain New York localities between the 1950 and 1960 U.S. Censuses this assumption appears to be fairly realistic. See John S. Akin, "Estimation of Local Fiscal Capacity," Unpublished Ph.D. Dissertation, University of Michigan, 1971, pp. 37-42. Because of the obvious disadvantages of using census data from 1959 for measuring income, an attempt was made to use the income estimates for school districts which were recently published by the National Educational Finance Project (see Dewey H. Stollar and Gerald Boardman, Personal Income by School Districts in the United States (Gainesville, Fla.: National Educational Finance Project, 1971)). We found very obvious and gross errors in this data and were unable to use it. We found per capita adjusted gross income estimates derived from

[14](cont.) these data obviously incorrect for seven of our 104 sample districts. For example, when AGI per pupil was multiplied by the number of pupils to obtain total AGI per district and this number was divided to get AGI per capita, the number resulting for Albany school district was $509 and for Minisink school district it was $218. If the people in these districts are surviving on incomes of this level, much of the food, clothing, and shelter that they are consuming must be coming from self-production and be excluded from income. AGI per capita of $218 is clearly impossible.

[15] Official New York State records of property values in each municipality are available on electromagnetic tape for computer analysis. Full value of 26 types of taxable property is included. The main property data problems are that village data are not available on the same tape, and that the 26 property types must be consolidated into a more manageable number of general types for statistical analysis. Village data are available on printouts. Full value is available for the types of property which have been sampled by State assessors. In the districts used for which village data are needed, sampling has been done of the types of property making up at least 80 percent of full value. Other minor property types are given only assessed valuations. We estimate full values for these types of property by subtracting full value of sampled types from total value for the village, obtained from State of New York, Department of Audit and Control, Division of Municipal Affairs, Special Report on Municipal Affairs by the State Comptroller, Transmitted to the Legislature March 18, 1969 (Albany: March 18, 1969), and proportionately raising the assessed values of non-sampled properties until their total equals the full value residual. The consolidation process resulted in the following five classes of taxable property:

1) Commercial Property (COMM) = Commercial property, apartments, combinations, and other commercial property;

2) Industrial Property (INDUST) = Vacant lots in urban industrial or commercial areas, industrial property, utilities, railroad non-ceiling property, and oil wells;

3) Residential Property (RESID) = Abandoned farms, vacant land in residential areas, single-family residence, multiple-family residences (2 or 3), operating farms, muck farms, and estates;

4) Seasonal Property (SEASON) = Seasonal residences and resorts;

5) Miscellaneous Property (OTHER) = Rural vacant land, privately-owned forest lands, and special franchises (utility capital located on public property).

[16]These 104 school districts were derived for analysis of the fiscal system of the State of New York by Harvey E. Brazer, John S. Akin, Gerald E. Auten, and Cynthia S. Cross. The effort of data collection and sample selection was shared jointly by the above mentioned individuals. For a more complete description of the data and the sample see Harvey E. Brazer, John S. Akin, Gerald E. Auten and Cynthia S. Cross, Fiscal Needs and Resources: A Report to the New York State Commission on the Quality, Cost and Financing of Elementary and Secondary Education, Ann Arbor, 1971, and John S. Akin, Estimation of Local Fiscal Capacity, unpublished doctoral thesis, University of Michigan, 1971.

[17]When an estimating equation using only the five property types (including RESID), without median family income, was used, the results were as follows:

$$\begin{array}{l} \text{LREV} = 73.06 + .023\ \text{RESID} + .055\ \text{COMM} + .025\ \text{INDUST} + \\ \text{"t" values} = (4.69)\ (5.62) \qquad (8.74) \qquad (4.93) \end{array}$$

$$\begin{array}{l} .014\ \text{SEASON} + .140\ \text{OTHER} \qquad R^2 = .7827 \\ (2.33) \qquad (4.87) \end{array}$$

When the variable MFI was substituted for RESID the results were:

$$\begin{array}{l} \text{LREV} = -32.21 + .028\ \text{MFI} + .041\ \text{COMM} + .025\ \text{INDUST} + \\ \text{"t" values} = (-1.48)\ (8.57) \qquad (6.97) \qquad (5.67) \end{array}$$

$$\begin{array}{l} .016\ \text{SEASON} + .176\ \text{OTHER} \qquad R^2 = .8357 \\ (3.01) \qquad (6.92) \end{array}$$

When both MFI and RESID were included the results were:

$$\begin{array}{l} \text{LREV} = -29.22 + .0268\ \text{MFI} + .0025\ \text{RESID} + .042\ \text{COMM} + \\ \text{"t" values} = (-1.29)\ \ (5.62) \qquad (0.49) \qquad (6.96) \end{array}$$

$$\begin{array}{l} .025\ \text{INDUST} + .016\ \text{SEASON} + .175\ \text{OTHER} \qquad R^2 = .8361 \\ (5.67) \qquad (2.94) \qquad (6.75) \end{array}$$

The inclusion of both variables added almost nothing to the R^2, compared to inclusion of MFI alone, but the use of both variables is preferable because of the high intercorrelation between the two variables and the fact that what is being explained by either alone includes part of the effect of the other variable. It is also best to leave PRESID in the equation because otherwise total property value in the unit will not be ascertainable from the information which the data provide. When substituted for PRESID, MFI seems to pick up essentially all the explanatory power of PRESID plus some explanatory power not evident in PRESID. When PRESID is added back to the equation without removing MFI the coefficient on PRESID is small and the "t" statistic indicates that the coefficient on PRESID is not significantly different from zero. MFI is the better choice if only one of the two variables is to be included. Due to the facts that PRESID picks up much of MFI's power of explanation in its absence; that the two have a simple regression coefficient of .71; that on theoretical grounds, we could assume both variables to be important in explaining fiscal capacity, and related in the sense that one in mainly a

[17](cont.) stock built up of the flow represented by the other; and that information on total property value would be missing without this variable, the decision to leave PRESID in the equation was made. Because of the small coefficient on PRESID, however, it is MFI that explains most of the variation in fiscal capacity for given levels of the other property types per capita.

[18] This extremely high indicated response ratio may be accounted for by the inclusion in "Other" property of "Special franchises" which are subject to property taxes at local rates on their assessed value as assessed by the State, and the inclusion of "Private forest land," which is not only taxed but also usually co-exists with state-owned forest land upon which an in-lieu-of tax is paid by the State at prevailing local rates.

[19] This compares to R^2's of .20 for MFI and .70 for <u>total</u> property value per capita (TPROP) as lone independent variables.

[20] See Appendix A for the various fiscal capacity estimates by school district and by district type when districts are classified as Big 5 cities.

[21] For an estimate of fiscal needs for these districts see Brazer, et al., <u>Fiscal Needs and Resources: A Report to the New York State Commission on the Quality, Cost and Financing of Elementary and Secondary Education</u>, Ann Arbor, 1971, for one attempt to quantify needed education expenditures in a sample of New York State School Districts.

Appendix A

ESTIMATES OF FISCAL CAPACITY PER CAPITA, 1967-68

County and district	(1) Actual local revenue (PLREV)[a] (dollars per capita)	Rank	(2) Estimated fiscal capacity (FC)[a] (dollars per capita)	Rank	(3) Property value per capita (PTPROP)[a] (dollars)	Rank	(4) Median family income (MFI)[a] (dollars)	Rank
			"Big Five"					
Albany								
Albany	192	70	255	37	5,075	49	5,778	55
Erie								
Buffalo	209	62	215	61	3,823	76	5,713	59
Monroe								
Rochester	276	37	285	28	5,608	38	6,361	32
Onondaga								
Syracuse	253	45	259	35	4,876	53	6,247	37
Westchester								
Yonkers	257	44	329	21	6,200	31	7,471	16
Mean	237		268		5,116		6,314	
Standard deviation	36		42		887		706	
			Upstate suburbs					
Albany								
Cohoes	157	88	179	89	2,773	98	5,573	66
Green Island	190	72	240	48	4,409	61	6,161	39
Menands	531	8	625	4	15,260	3	8,250	9
Watervliet	121	100	191	76	2,698	100	5,901	50
Erie								
Grand Island	298	28	266	32	5,049	50	7,972	12
Kenmore	275	38	306	26	7,360	24	7,648	13
Lackawanna	485	10	488	7	13,967	4	6,058	44
Tonawanda	239	52	223	54	4,407	62	6,746	22

Appendix A (cont.)

Monroe								
E. Rochester	264	42	238	50	5,490	40	7,470	17
Irondequoit-E. Irondequoit	210	61	261	34	5,921	34	8,572	6
Niagara								
N. Tonawanda	240	51	217	59	4,266	65	6,554	28
Onondaga								
Solvay	375	19	351	19	9,328	14	6,597	27
Rensselaer								
Rensselaer	185	76	221	55	3,943	74	5,590	65
Saratoga								
Waterford	150	92	214	63	4,206	67	6,149	41
Mean	266		287		6,363		6,803	
Standard deviation	125		125		3,906		1,002	

Downstate suburbs

Nassau								
Floral Park	280	35	352	18	8,799	17	8,532	7
Garden City	623	3	499	6	12,163	7	13,875	2
Glen Cove	345	25	280	29	7,764	19	6,510	30
Hempstead	402	15	353	17	7,509	23	7,455	18
Suffolk								
Babylon	288	32	250	42	6,098	33	7,642	14
Lindenhurst	291	31	186	85	4,600	58	6,705	24
Shelter Island	555	6	697	2	23,108	1	4,914	85
Westchester								
Bronxville	622	4	695	3	13,269	6	19,876	1
Hastings-on-Hudson	389	16	307	25	7,078	25	9,030	5
Mount Vernon	281	34	314	23	5,713	37	6,873	21
New Rochelle	346	24	340	20	7,013	26	8,131	10
Pelham	417	14	420	12	9,880	13	10,820	4
Pleasantville	447	11	362	16	9,223	15	8,470	8
Rye-Rye Neck	536	7	479	9	11,272	8	11,205	3
Somers	251	47	269	31	7,735	20	7,351	20
Tuckahoe	438	12	373	14	10,841	10	6,731	23
White Plains	428	13	485	8	10,261	12	8,012	11
Mean	408		392		9,548		8,949	
Standard deviation	119		142		4,218		3,511	

Appendix A (cont.)

Independent cities

Broome								
Binghamton	371	21	248	44	4,840	54	6,251	36
Vestal	244	48	253	39	5,076	48	7,430	19
Cattaraugus								
Olean	195	69	204	69	3,947	73	5,636	62
Chautauqua								
Jamestown	279	36	193	74	3,991	70	5,607	64
Chemung								
Elmira	269	40	215	62	4,264	66	5,767	56
Clinton								
Plattsburgh	216	57	190	77	3,758	82	5,616	63
Dutchess								
Poughkeepsie	274	39	252	40	4,999	51	5,893	51
Fulton								
Gloversville	165	84	167	97	3,089	96	5,432	74
Johnstown	181	77	199	71	3,373	86	5,660	60
Watertown	221	54	202	70	3,782	80	5,480	70
Montgomery								
Amsterdam	158	87	175	93	3,124	95	5,477	71
Niagara								
Lockport	320	27	249	43	4,939	52	6,645	25
Newfahe	203	64	189	82	3,789	79	6,341	33
Niagara Falls	296	29	240	49	4,637	57	6,630	26
Oneida								
New Hartford	161	85	273	30	5,804	35	7,630	15
Utica	211	60	219	57	3,916	75	5,873	54
Otsego								
Oneonta	171	81	179	90	3,349	89	5,436	73
Schenectady								
Schenectady	220	55	227	53	3,981	71	5,925	48
Steuben								
Corning	215	58	240	47	5,094	47	6,540	29
Warren								
Glens Falls-Abraham Wing	282	33	231	52	5,156	46	5,744	57
Mean	233		217		4,245		6,051	
Standard deviation	58		30		774		642	

Appendix A (cont.)

Other

Cattaraugus								
Randolph	168	82	192	75	2,860	97	5,332	78
Cayuga								
Moravia	154	89	172	96	3,822	77	4,789	90
Chautauqua								
Southwestern	199	66	184	86	3,794	78	6,078	42
Westfield	204	63	199	72	5,253	43	5,508	69
Delaware								
Andes	212	59	191	78	6,489	28	4,262	98
Dutchess								
Pawling	257	43	255	38	6,345	29	6,290	35
Essex								
Crown Point	198	68	177	91	2,710	99	4,893	87
Keene	511	9	419	13	8,176	18	4,185	101
Moriah	192	70	184	88	3,424	85	4,639	92
Newcomb	786	2	615	5	7,625	21	5,902	49
Ticonderoga	224	53	242	46	4,533	59	6,064	43
Willsboro	242	50	257	36	5,158	45	4,535	94
Fulton								
Wheelerville	586	5	464	10	13,602	5	6,495	31
Genesee								
Elba	179	79	184	87	4,740	56	5,447	72
Greene								
Cairo	322	26	251	41	6,148	32	4,839	88
Durham	292	30	234	51	7,008	27	4,148	103
Herkimer								
Town of Webb-Inlet	807	1	865	1	18,017	2	5,122	82
Jefferson								
Alexandria	252	46	211	68	4,766	55	5,007	83
Hounsfield	139	95	174	94	3,262	92	5,212	79
Lyne	266	41	188	83	5,399	41	4,558	93
Thousand Islands	218	56	214	64	5,327	42	5,137	81
Lewis								
Harrisville	174	80	174	95	2,642	101	4,257	99
Livingston								
Livonia	198	67	243	45	5,550	39	5,889	52
Oneida								
Bridgewater	132	98	161	100	2,634	102	5,714	58
Waterville	139	95	176	92	3,312	91	5,525	68

Appendix A (cont.)

Orange								
Highland Falls	58	104	167	97	1,745	104	6,301	34
Minisink Valley	135	97	221	56	5,237	44	5,169	80
Orleans								
Holley	144	94	190	79	3,948	72	5,968	47
Oswego								
Altmar-Parish	180	78	188	83	3,340	90	4,771	91
Otsego								
Edmeston	120	102	156	102	3,360	87	4,320	97
Gilbertsville	129	99	127	103	3,618	84	3,938	104
Rensselaer								
Schodack	158	86	212	67	3,628	83	6,000	46
St. Lawrence								
Clifton-Fine	357	23	317	22	7,593	22	5,357	77
Saratoga								
Corinth	188	74	213	65	4,387	63	5,641	61
Schoharie								
Schoharie	114	103	160	101	3,142	94	4,805	89
Steuben								
Troupsburg	149	93	110	104	2,080	103	4,179	102
Sullivan								
Eldred	360	22	426	11	10,423	11	4,494	96
Fallsburg	384	17	290	27	6,294	30	5,885	53
Tompkins								
Lansing	381	18	367	15	11,246	9	6,185	38
Newfield	189	73	166	99	3,350	88	5,397	76
Ulster								
Saugerties	151	91	212	66	4,282	64	6,031	45
Warren								
Johnsburg	242	49	263	33	4,161	69	4,505	95
Washington								
Fort Ann	121	100	219	58	3,242	93	5,400	75
Putnam	374	20	309	24	9,054	16	4,201	100
Whitehall	166	83	189	80	3,776	81	4,910	86
Wayne								
Sodus	154	90	189	81	4,194	68	4,930	84
Wayne	187	75	216	60	5,737	36	6,158	40
Williamson	199	65	197	73	4,521	60	5,567	67
Mean	244		244		5,312		5,207	
Standard deviation	155		130		3,042		703	

Appendix A (cont.)

County and district	(1) PLREV	Rank	(2) FC	Rank	(3) PTPROP	Rank	(4) MFI	Rank
Total sample								
Mean	270		270		5,931		6,249	
Standard deviation	141		128		3,464		2,030	
New York City								
	346[c]		309		5,782		6,371	
Less than 10,000 population								
Mean	272		274		6,212		5,730	
Standard deviation	164		156		4,076		2,198	
10,000-24,999 population								
Mean	232		250		5,212		6,877	
Standard deviation	112		86		2,636		1,705	
25,000-49,999 population								
Mean	312		271		6,110		6,857	
Standard deviation	122		104		3,231		2,120	
50,000-99,999 population								
Mean	295		292		5,785		7,033	
Standard deviation	81		89		2,088		1,063	
100,000 population and over								
Mean	244		275		5,490		6,536	
Standard deviation	35		41		1,212		833	

[a]For sources of data see Appendix B

[b]Figures may not add due to rounding

[c]Includes local property taxes for higher education. All other data for New York City exclude taxes, expenditures, and state and federal aid for higher education.

APPENDIX B

Sources of Data

All property value data except those for villages were obtained directly from the New York State Office for Local Government, Division of Equalization and Assessment, in the form of a magnetic computer tape entitled 1965 Market Value by Property Type for Cities and Towns. The property values of each type for all units included within the school district were summed to obtain total full property values of each type. Fractions of property values for units were used where only a fraction of the unit was included in a district. These fractions were obtained by subtracting the full value of all wholly contained units from total full value in the school district, then determining what fraction the remainder of school district property was of the partially contained unit. Our districts were chosen such that fractions of more than one unit never had to be used. Where the district was wholly contained within but not coterminous with a town, the town's portion of the property was allocated to the school district, based upon the fraction of total town full value contained within the school district.

For villages only assessed property value data were available for certain minor classes of property. These were the types of property which were not sampled in the most recent state-wide property assessment sample. In the village data the major proportion of total full value for each village is accounted for by sampled types of property. The problem is to adjust to full value the assessed values of the remaining, less important in dollar-value terms, classes of property. We subtracted the full value accounted for by sampled types of property from total full value taxable

for schools as recorded in State of New York, Department of Audit and Control, Division of Municipal Affairs, Special Report on Municipal Affairs by the State Comptroller, Transmitted to the Legislature March 18, 1969 (Albany: March 18, 1969). An assessment ratio for the non-sampled types of property was then obtained by dividing total assessed value of the non-sampled classes by the remaining unexplained full value. All of the non-sampled types were then divided by the assessment ratio and the resulting estimated full values of these property types were used in our analysis.

REFERENCES

Advisory Commission on Intergovernmental Relations. Measures of State and Local Fiscal Capacity and Tax Effort: A Staff Report. Washington, D. C.: Advisory Commission on Intergovernmental Relations, October, 1962.

_____. Measuring the Fiscal Capacity and Effort of State and Local Areas. Washington, D. C.: U. S. Government Printing Office, March, 1971.

Akin, John S. "Fiscal Capacity and the Estimation Method of the ACIR," forthcoming, National Tax Journal, May 1973.

Bahl, Roy W. A Regression Approach to Tax Effort and Tax Ratio Analysis. Washington, D. C.: International Monetary Fund, February 2, 1971.

_____. A Representative Tax System Approach to Measuring Tax Effort in Developing Countries. Washington, D. C.: International Monetary Fund, May 10, 1971.

Bowman, John H. "City Suburban Differentials in Local Government Fiscal Effort: A Comment." National Tax Journal, Vol. XXII, No. 3 (September, 1969).

Bowman, John H.; Hovey, Harold A.; and Stocker, Frederick D. Fiscal Equity: A Study of Comparative Revenue Payments, Fiscal Capacity, and Public Expenditure Benefits and Needs in Seven Areas in Missouri. Part I: Summary and Conclusions. Columbus, Ohio: Battelle Memorial Institute, January, 1970.

_____. Final Report on Fiscal Equity: A Study of Comparative Revenue Payments, Fiscal Capacity, and Public Expenditure Benefits and Needs in Seven Areas in Missouri. Part II. Columbus, Ohio: Battelle Memorial Institute, January, 1970.

Brazer, Harvey E.; Akin, John S.; Auten, Gerald E.; and Cross, Cynthia S. Fiscal Needs and Resources: A Report to the New York State Commission on the Quality, Cost and Financing of Elementary and Secondary Education (November, 1971).

Chism, Leslie L. The Economic Ability of the States to Finance Public Schools. New York: Teachers College, Columbia University, 1936.

Cornell, Francis G. A Measure of Tax Paying Ability of Local School Administrative Units. New York: Teachers College, Columbia University, 1936.

_____. A Summary Report on an Analysis of New York State School Aid Correction. Prepared for the University of the State of New York, The State Education Department. White Plains: Educational Research Services, Inc., December, 1966.

Cornell, Francis G., and Johns, Roe L. "Alabama's New Index of Local Ability to Pay for Education." The School Executive (June, 1941).

Cubberly, E. P. School Funds and Their Apportionment. New York: Teachers College of Columbia University, 1905.

Gehrig, D. S. "The Financial Participation of the Federal Government in State Revenue Programs." Social Security Bulletin, Vol. III, No. 1 (January, 1940).

Grunloh, James J. Alternate Measures of Fiscal Capacity. Working Paper DRA 6. St. Louis, Mo.: Institute for Urban and Regional Studies, Washington University, August, 1967.

Hogan, Lloyd L. Measurement of the Ability of Local Governments to Finance Local Public Services. Albany: The University of the State of New York, The State Education Department, Bureau of Educational Finance Research, May, 1967.

Landreth, Harry. "The Measurement of Local Fiscal Capacity." Unpublished Ph.D. dissertation, Harvard University, 1960.

Mort, Paul R. State Support for Public Education. Washington, D. C.: The American Council on Education, 1933.

Mushkin, Selma J., and Cotton, John F. Functional Federalism: Grants-in-aid and PPB Systems. Washington, D. C.: State-local Finances Project of the George Washington University, November, 1968.

National Tax Association. "Preliminary Report of the Committee Appointed by the National Tax Association to Prepare a Plan of a Model System of State and Local Taxation," Proceedings of the National Tax Association, 1919. New York: National Tax Association, 1919.

Newcomer, Mabel. An Index of the Tax Paying Ability of State and Local Governments. New York: Teachers College, Columbia University, 1935.

Norton, John K. The Ability of the States to Support Education. Washington, D. C.: The National Education Association, 1926.

Norton, John K., and Norton, Margaret Alltucker. Wealth, Children, and Education. New York: Teachers College, Columbia University, 1937.

Oppermann, E. B. "The Potential Usefulness of Uniform Tax Burden Distributions as Measures of the Tax Capacities and Tax Efforts of State and Local Governments: An Empirical Study." Unpublished Ph.D. dissertation, Indiana University, June, 1965.

Stollar, Dewey H., and Boardman, Gerald. Personal Income by School Districts in the United States. Gainesville, Fla.: National Educational Finance Project, 1971.

Strayer, G. D., and Haig, R. M. The Financing of Education in the State of New York. Educational Finance Inquiry. Vol. I. New York: Macmillan, 1923.

Studenski, Paul. Measurement of Variations in State Economic and Fiscal Capacity. Bureau Memorandum No. 50. Washington, D. C.: The Social Security Board, 1943.

Tax Institute, Inc. Financing Education in the Public Schools. Princeton: Tax Institute, Inc., 1956.

_____. The Limits of Taxable Capacity. Princeton: Tax Institute, Inc., 1953.

Wueller, P. H. Fiscal Capacity of the States: A Source Book. Washington, D. C.: Social Security Board, Bureau of Research and Statistics, September, 1937.