The Determinant Studies of Public Expenditures of State and Local Governments–A Critical Survey

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Contents

I. Introduction

Since Solomon Fabricant attempted, by using regression analysis,[1] to explain statistically the variation in per capita state and local government expenditures in 1942, there have been a lot of quantitative studies of state and local government expenditures by both economists and political scientists.

Some studies attempted to refine the theoretical models; some studies tried to improve the explanatory power of the models adding new independent variables; and some others

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were involved in the methodological improvement.

Despite the methodological limitations, the positive theory of state and local governme-nts which is, to use Musgravian terminology, a sociology of fiscal politics[2] seems to have contributed empirical knowledge to the theory of public finance which is heavily oriented to the normative approach. The social, economic and political determinant studies of state and local government's expenditure are concerned with the level of public budget of respective governments which is also one of the two major functional areas of the subord-inate governments dealt with by the normative theory.[3] Unfortunately, however, there does not seem to exist any theoretical interrelationship between the two approaches.

If a theory of public finance is to be realistic and policy-oriented, there should be a feedback between the two approaches. The empirical theory is useless or just an academic novelty if it does not have any meaningful normative implications. On the other hand, the normative theory can not ignore the positive aspect entirely if it attempts to deal with policy problems.[4]

The purpose of this paper is to review the past quantitative studies of state and local government expenditures from critical point of view, to make some critical comment on the methodological and conceptual problems, and to suggest some future research directions.

II. A Review of the Past Major Studies

(1) State and Local Expenditure Studies

Mainly for three reasons, as suggested by Roy W. Bahl, there was great proliferation of determinant studies in recent years.

The major explanation is the absence of a theoretical base from which the

(2) Richard A. Musgrave, *The Theory of Public Finance*, Macgraw-Hill Book Co., Inc, New York, 1959, p. 4.

(3) Wallace E. Oates "The Theory of Public Finance in a Federal Systems," *Canadian Journal of Economics*, 1, 1968, pp 37-54; Musgrave, op. cit., pp. 181-183; and Benjamin Chinitz and Charles M. Tiebout, "The Role of Cost-Benefit Analysis in the Public Sector of Metrop-olitan Areas," Julius Margolis, ed., *The Public Economy of Urban Communities*, Resources for the Future Inc. 1965, pp. 252-254. They argue, in terms of the Musgravian budget functions, that only Allocation is justified and effective at lower level governments and Distribution is effective to a considerable extent depending upon the inter-governmental fiscal arrangement, and that Stabilization is neither justified nor effective at all at the lower levels.

(4) Otto A. Davis and George H. Haines, Jr., "A Political Approach to a Theory of Public Expenditure: The Case of Municipalities," *National Tax Journal*, Vol. XIX, 1966, pp. 259-260. They express a same view.

determinants of expenditure variations among governmental and spatial units
may be inferred. Accordingly, economists have taken a positivistic approach in
an attempt to explain what is naturally the techniques are empirical. Second,
the existence of large amounts of more or less comparable and published data
have greatly facilitated the development of the positive approach. A third reason
for the rash of determinant studies is the appeal and simplicity of the regression
technique. Given the availability of a variety of suitable computer packages,
a multiple regression analysis is easily carried out and gives the illusion of
being a sophisticated quantitative technique. [5]

There are many articles and books which dealt with this topic. We concentrate,
however, our attention to some major works done since the publication of Fabricant's
book in 1952.

Fabricant, by using three independent variables, i.e., per capita income, population
density, per cent of population living in urban places, in multiple regression analysis,
succeeded in explaining 72% of the interstate variation in per capita 1942 state and local
government expenditures. He applied a regression analysis to a cross section data of state
and local government spending in 1942, aggregated by state to avoid the problems of
interstate differences in the division of functional responsibility between state and local
governments. [6]

Fisher tried to explain the variation in per capita state and local government expendit-
ures in 1957 using the same model with the three same basic variables. [7] One of his
findings is that the amount of variation explained by these three variables is less for 1957
than it was in 1942, a year for which Fabricant had performed a similar analysis.
Fisher's coefficient of multiple determination (R^2) was 0.53, compared to Fabricant's
0.72.

It was hypothesized that the higher the per capita income, the more urbanized, and
the higher the density, the greater the per capita state and local government total
expenditure. It was found that the three socio-economic variables were significant determ-
inants of state and local government expenditures.

(5) Roy W. Bahl, *Quantitative Public Expenditure Analysis and Public Policy*, Paper presented
    at Sixty Second Annual Conference on Taxation of the National Tax Association, Sept. 29,
    1969, p. 4.
(6) *Ibid.* p.10.
(7) Glenn W. Fisher, "Determinants of State and Local Government Expenditures: A Preliminary
    Analysis," *National Tax Journal*, XIV, 1961, pp. 349-55.

There was, however, still much variation left unexplained by the above three variables. The following studies, therefore, attempted either to refine the model or to search other new variables in order to improve the explanatory power of their model. Most of the studies done in the past except for Kurnow's study were concerned with the search for new variables.

Ernest Kurnow used "joint effects" regression model instead of "additive effects" model. His study relied on multiple regression but used a model which seemed more adequate on *a priori* grounds and was able to account for more of the variability in per capita state and local expenditures than either the Fabricant's or Fisher's study. The regression relationship used by Fabricant and Fisher was in the form:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3$$

where,

> Y = per capita expenditure
>
> X_1 = state per capita personal income
>
> X_2 = density
>
> X_3 = degree of urbanization

This model assumes that the relationship among the variables is "additive". That is, the impact of the independent variables upon per capita expenditures is found by adding the separate effects of the individual factors. An additive model implies that the change in per capita expenditure resulting from a unit change in one of the predictor variable is the same, no matter what the level of the two other predictors might be. According to Kurnow, the validity of such an assumption is open to question. For instance, the state with higher per capita income would most likely incur a larger increase in per capita expenditure. So he used a model which allows for such combination of effects:

$$Y = a X_1^{b1} X_2^{b2} X_3^{b3}$$

where Y, X_1, X_2 and X_3 have the same definitions as above. [8]

In order to prove his hypothesis, he applied his model to the Fabricant's and Fisher's data and compared the results. It was found that his joint model was superior to the former in the sense that his model resulted in a significantly higher R^2 of .88.

Another significant characteristics of Kurnow's study is that he tried two new variables,

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[8] Ernest Kurnow, "Determinants of State and Local Expenditures Reexamined" *National Tax Journal*, 1963, pp. 252-253.

federal grants-in-aid, and student-teacher ratio. [9] The justification for using aid variables is that one of the significant changes in the character of state and local finances since 1942 has been the greater reliance upon federal grants-in-aid. While he recognizes that there is an element of circularity involved in the use of federal aid as a predictor since it also appears as a component of per capita expenditure, he argues that decisions on federal aid are made by congress and, hence, insofar as the states are concerned, such assistance may be looked upon as an exogenous variable.

Another variable was included in his model as a rough indicator of the quality of services, the hypothesis being that all other things being equal, per capita expenditures should be greater, the higher the quality of the service supplied by a state or local government. [10]

Aside from the question of adequacy of the variable as an index of service quality, it may be an improvement, for most studies avoid the quality question by simply assuming that the quality of services is equal among the government units.

Seymour Sacks and Robert Harris used three basic variables plus state and federal aid which raised much controversy thereafter. First, they compared regression results of 1960 data with those of Fabricant's 1942 and Fisher's 1957 on the basis of three basic factors, as shown in Table 1.

Then, they asked, "given a certain amount of stability in the regression coefficients, why is there a marked decline in the proportion of variation in expenditures that can be explained by the three 'basic factors'?" They answered the question by finding new variables, i.e., state and federal aid. As a justification of using federal aid as a variable they stated as follows: [11]

> The main impetus and source of funds for many functions upon which
> states and localities spend money is from federal aid. To try to explain
> expenditures for those functions in which the federal government has taken a
> major interest without allowing for federal aid, is to omit perhaps the major

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(9) Kurnow's comparison with the studies by Fabricant and Fisher was done on the basis of original three variables. So his point was proved. That is, the increase in explanatory power of his model is due to the new model itself.

(10) *Ibid*, p.253.

(11) Seymour Sacks and Robert Harris, "The Determinants of State and Local Government Expenditures and Intergovernmental Flows of Funds" *National Tax Journal* Vol. XVII, 1964, pp. 78-79.

Table I. Coefficients of Multiple Determination (R²) For Regressions of Per Capita General
Expenditures on Population Density, Per Cent Urban, and Per Capita Income, 1942,
1957 and 1960.

Expenditure Category	1942*	1957+	1960+	1960 Mean#
All General Expenditures	.72	.53	.53	$286.52
Higher Education	N.C.	.37	.45	19.61
Local Schools	.59	.62	'.60	83.55
Highways	.29	.34	.37	61.41
Public Welfare	.45	.14	.11	23.97
Health and Hospitals	.72	.46	.44	18.66
Police	.81	.74	.79	8.62
Fire Protection	.85	.67	.74	4.56
General Control	.59	.45	.52	11.53

N.C.=Not computed.

*For 1942 general expenditures include expenditures for current purposes only. Capital outlays which are excluded were negligible.

+ For 1957 and 1960 capital outlays are included in each expenditure category.

Unweighted mean per capita expenditures of the 48 coterminous states for each function.

determinant of the expenditure levels. Moreover, since federal programs are often characterized by requirements of matching funds, it is not sufficient to subtract federal aid out of expenditures and deal only with non-aided expenditures. This can be dealt with only by including federal aid as an additional independent variable over and above the basic three factors in multiple regerssion analysis. While not true from the taxpayer's point of view, federal aid can be regarded as "outside money" from the point of view of the state and local government, and its availability should be expected to have a direct impact on raising state and local expenditure levels.

As for state aid, if a state chooses to aid local governments, direct state government expenditures should be lower while local government expenditures would be higher, and state and local expenditures combined should be unaffected. They gave, however, the alternative hypothesis that state aid to local governments actually increases the combined amount of state and local government spending for several reasons. First reason is that the existence of state aid allows them to derive some revenues from the alternative income, sales or excise tax bases used by the state. Second, state aid may also act to increase expenditures by reducing the competitive forces for adjoining local governments to keep their taxes as low or lower than their neighbors' for fear of losing industry. Finally, state

aid programs may be of incentive types explicitly designed to increase local expenditures. [12] In short, state aid also has stimimulative impact on local government expenditure like federal aid, thereby increasing the state and local expenditures combined.

Their result was improvement of the explanatory power of their model compared to those of Fabricant and Fisher. R^2 was increased to 0.667 when they add state aid to the three basic variables. When they add federal aid to the three basic variables it increased to 0.813. However, adding both federal and state aid to the basic model, they get a higher coefficients of multiple determination of 0.869.

One interesting point of their findings is that it is not clear that both population density and per cent urban should unreservedly be considered as determinants of expenditures. They are significant for only a few functions. For total general per capita expenditure, population density and per cent urban were found statistically insignificant.

The relative importance of factors influencing per capita total general expenditures, 1960, of state and local governments was in the order of per capita income, federal aid, and state aid. [13]

Roy W. Bahl, and Robert J. Saunders turned their attention to the relationship between the *changes* in the level of state and local governmental expenditures for the year 1957 and 1960 and the *changes* of the independent variables instead of the relationship between the *absolute level* of expenditures and the *absolute level* of independent variables. Their independent variables are the changes in three basic variables plus change in federal aid and change in public school enrollment. Their attention to the changes instead of the absolute level is relevant and good methodological improvement. However, the general explanatory power of their model is poor, the coefficients of multiple determination being less than 0.50. It seems that the unexplained variation is due to the other missing variables. For instance, price change accounts for a considerable proportion of the total variation. There is another methodological shortcoming. The period of study from 1957 to 1960 seems to be relatively short to give a meaningful measurement of change in government spending while they pick up population change from 1950 to 1960. [14]

Up to this time, most of the expenditure determinant studies have been concerned with

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(12) *Ibid*, pp. 79-81.
(13) *Ibid* pp. 82-84.
(14) Roy W. Bahl, and Robert J. Saunders, "Determinants of Changes in State and Local Government Expenditures," *National Tax Journal*, 1965, pp. 50-57.

only economic and demographic variables. However, Fisher tried to explain the variation of per capita state and local government expenditure, 1960, employing economic, demographic, and socio-political variables. He added two socio-political variables, index of two-party competition and per cent of population over 25 with less than 5 years schooling, 1960, to the usual economic and demographic variables. Compared to his previous study, he got good results in terms of R^2. However, the beta coefficients for two-party competition, one of his new variable, was found statistically insignificant with high standard error except for highway expenditures. [15]

Another interesting contribution was done by Ira Sharkansky. Recognizing that by combining state and local expenditures and thereby overlooking interstate differences in the rules of state responsibilities we tend to lose the opportunity to discern what the rules of state responsibility mean for the level of state or local government spending, and focusing only on the expenditure, 1963 of state governments, he employed a measure of the state role as one of its independent variables (the percentage of state and local expenditures spent by state agencies). Further, he added *previous expenditures* as one of independent variables, with the following justification: [16]

> Previous expenditures should exert multiple influence upon current expenditures. The spending of past years helps to commit a state to certain levels of taxes and Federal aid, and serves to define the portion of state and local spending performed by state agencies. Thus, previous expenditures may be at the base of whatever simple relationships exist between current spending and other independent variables. Previous spending also may reflect the existence of habit, routine or earlier accommodations among decision-makers who participate in the expenditure process. Established patterns tend -to repeat themselves in many fields of behavior. Aside from this force of habit, however, the level of previous expenditure may work its influence through the formal procedures of budgeting and appropriations. As described by Aaron Wildavsky's study of Federal budgeting (which helps to explain many state practices), the techniques of incremental budgeting place great weight on previous expenditures in the determination of current expenditures.

Wildavsky and other's study of budgetary process of federal government indicate that

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(15) Genn W. Fisher, "Interstate Variation in State and Local Government Expenditure, "*National Tax Journal*, 1964, pp. 57-74.

(16) Ira Sharkansky "Some more Thoughts about the Determinants of Government Expenditures," *National Tax Journal*, 1967, pp. 172-173.

this year's budget is based on last year's budget, with special attention given to a narrow range of increases or decreases, although it is certainly true that there are some "disturbances" such as special events, crises, technological developments, and actions of clientele groups. [17] At the lower level government, Sharkansky tested Wildavsky's theory.

His findings turn out to be very significant. He explained 94% of the total variation. It was found that previous expenditures showed significant positive relationships with each measure of current expenditures. [18]

There are more other studies which are especially concerned about the aid variable. These, however, will be dealt in later section.

(2) City Expenditure Studies

There have been three large scale statistical analyses of city expenditures, the first by Hawley, the second by Brazer, and the third by Bahl. The findings are similar in many respects: (a) intercity income differences are a significant determinant of intercity spending variations, (b) the level of city spending is more closely related to the central city proportion of SMSA population than to the absolute size of the population of the city itself, and (c) the density of population significantly affects the level of per capita spending. [19]

Harvey Brazer applied analysis of variance and multiple regression to the per capita expenditure of 462 cities, 1951. First, he applied analysis of variance method and found that although variation in expenditure levels was high within the individual states, the variance between states was significantly greater. His conclusion is that the results leave virtually no doubt of a systematic association between per capita expenditure for all categories and the state in which a city is located. [20]

Second, using population in 1950, density of population in 1950, rate of growth of population 1940-1950, median family income in 1949, employment per 100 population in manufacturing (1947), trade and services (1948), and intergovernmental revenue per capita, 1951, as independent variables in regression model, he analyzed total general

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(17) Aaron Wildavsky, *The Politics of the Budgetary Process*, Little-Brown, Boston, 1964 and also Otto A. Davis, M.A. H. Dempster, and Aaron Wildavsky, "A Theory of the Budgetary Process" *The American Political Science Review* Vol. IX, September, 1966 pp. 529-531.

(18) Ira Sharkansky, *op. cit.*, pp. 174-179.

(19) Roy A Bahl, *Quantitative Public Expenditure Analysis and Public Policy, op. cit.*, p.12.

(20) Harvey E. Brazer, *City Expenditures in the United States*, National Bureau of Economic Research, 1959, p.10.

operating expenditure, common functions, police, fire, highways (non-capital), recreation (non-capital), general control, and sanitation (non-capital). He explained 76% of the total variation in total general operating expenditures with density, rate of growth, and aid variables. Finally, he classified cities into seven classes: (a) core city of major metropolitan area; (b) core city of minor metropolitan area; (c) high-income residential suburb or satellite city within metropolitan area; (d) low-income residential suburb; (e) industrial suburb; (f) independent city; and (g) major resort city. Applying analysis of variance and regression methods, he concludes that there is a systematic association between per capita expenditures and the classification of the cities.

Two more studies deserve our mention. One is a study by Otto A. Davis and George H. Haines, Jr. They built a political model of public expenditure on the assumption of consumer-voter's "self-interest" and politician's "desire to attain and remain in power." Then they selected five independent variables, population density, per unit property owners, market value of personal property, market value of industrial property, and median family income which were supposed to reflect the taste determining factors of the alternative expenditure-taxation mix. The results of their regression analysis of municipal government expenditure 1959 in the Pittsburgh Metropolitan Region are not so good, showing relatively low multiple correlation coefficient. [21]

Another study is by Bernard H. Booms. Employing regression and co-variance analysis to 73 cities sampled from Ohio and Michigan, he tested the hypothesis that there is a systematic relationship between city governmental form (city-mayor vs. city- manager form) and the level of city government expenditures. His findings imply that at equal levels of independent variables, manager cities will spend $ 16.49 less per capita for common public expenditures than mayor cities on the average. He concludes that interpreted in light of the stated hypotheses these results suggest that (a) the form of government has an effect on the level of per capita expenditures and that (b) if one can accept an assumption of equal (quality and quantity) output levels, then in some sense manager cities might be considered more "efficient" in that they supply the same per capita levels of public services at lower costs per capita. His reasoning about the factors making the differences seems, however, to be weak in terms of empirical evidence. [22]

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(21) Otto A. Davis and G.H. Haines, Jr. *op. cit.*, pp. 259–275.

(22) Bernard H. Booms, "City governmental Form and Public Expenditure Levels" *National Tax Journal*, Vol. XIX, 1966, pp. 187–199.

(3) Inter-and Intra-Metropolitan Studies

The advantages of intrametropolitan analysis are primarily (a) that certain environm-ental factors may be held constant by examining data for only a single SMSA, (b) that disparities in the quality of service might be smaller within a given metropolitan area than among metropolitan areas, and (c) that the division of fiscal responsibility between the state and local government may be held constant.[23]

It may be that the metropolitan area is more relevant and meaningful unit of observa-tion for it is an integrated economic unit although it is divided into several political entities. It may be very interesting to compare the level of expenditures of the constituent governments within a metropolitan area in order to find out the existence of externalities. It is very interesting to find out why there exist differences in the expenditure level among the government within a same economic entity and what makes the differences.

There are several studies on the fiscal behavior in a specific metropolitan area and among metropolitan areas. But we limit our review to only one study.

Campbell and Sacks attempted to explain the fiscal behavior of metropolitan areas by using regression analysis to 1957 data. The charateristics of their study are (a) that analysis of the determinants of the variations in fiscal behavior among the units within each class—central city, outside central city, and metropolitan areas as a whole—and the analysis of the determinants of the differences in fiscal behavior between central cities and their outside areas were done in a comparable and systematic way, and (b) that they tested on interesting new variable in addion to other independent variables, what they call welfare dummy, on the assumption that this variable reflects the differences in the assignment of functional responsibilities between states and local governments, although it is recognized that it is a very crude approximation. The results of their regression were very good, R^2 being .690 for per capita expenditure of central city, .779 for outside central city, and .830 for the SMSA as a whole. The welfare dummy was found a significant determinant of SMSA expenditures, as they expected.[24]

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(23) Roy A. Bahl, *op. cit.*, p.13.

(24) Alan K. Campbell and Seymour Sacks, *Metropolitan America*, The Free Press, New York, 1967, pp.69–189.

III. Comments

(1) Purposes, Models, and Variables

Elliot R. Morss raised question about usefulness of regression analysis, especially using of aid variable, and made warning about the frequent use of regression analysis regardless of the purpose of the study. [25]

It is true that the regression analysis until now have been used without due regard to the purpose of the study. It was implicitly assumed that any variable which improved the explanatory power, that is, increased R^2 when put into the regression equation, was good.

However, as Morss pointed out, the objective of regression analysis is not merely to increase R^2. Such an aim is hard to justify unless it serves some higher purposes. And the significance of each variable should be interpreted not only in the context of R^2 but also in terms of purposes these analyses are to serve.

If researcher's aim is "prediction", then he is almost free to use whatever combination of variables he feels will give him the best prediction. If his purpose is to provide "guidelines for normative decisions," then the variables that have relevant interest with the decision subject should be included, regardless of their explanatory power. However, if his objective is to understand what causes expenditure levels to be what they are and what causes them to change, he should be careful in choosing variables. In this case the use for regression equations are as "causal models." [26]

In this context, Morss raised a controversial issues about the use of federal and state aid as an independent variable: [27]

> Putting it slightly differently, little is to be gained from simply regressing the dependent variable on itself or on parts of itself. Where there is no interdependence between the parts one will find a one-to-one relationship,

(25) Elliot R. Morss, "Some Thoughts on the Determinants of State and Local Expenditures," *National Tax Journal*, vol. XIX, 1966, pp.95–103.

(26) *Ibid*, pp.96–100, and also see Hubert M. Blalock, Jr. *Causal Inferences in Nonexperimental Research*, University of North Carolina Press, Chapel Hill, 1961, p.43.

(27) E.R. Morss, *op. cit.*, p.97, and also see Thomas F. Pogue and L.G. Sgontz, "The Effect of Grants-in-Aid on State-Local Spending," *National Tax Journal*, 1968, pp.190–199; Wallace E. Oates, "The Dual Impact of Federal Aid on the State and Local Government Expenditures: A Comment," *National Tax Journal*, 1968, pp.220–223, and Glenn W. Fisher, *op. cit.*, pp.71–73. They raised same question about the validity of aid as an independent variable.

an "independent" variable and as a part of the "dependent" variable (Morss and Pogue &
Sgontz's criticism).

Osman rejected those critcisms on the basis of empirical grounds except for the problem
of multicollinearity in his later article.[29]

The problem of multicollinearity, however, is a common econometric problem. There
are rare cases in reality when no intercorrelation exists among the independent variables.
Therefore, the regression coefficients are to a certain degree biased, overestimated or
underestimate depending on the correlation.

Another point is that given the present quantitative technique it is very difficult to ask
for clear causal relationship from the regression analysis.

Therefore, if due caution be paid to interpretation of the regression results, the use of
aid variable seems to be justified.

In the future studies more attention should be directed rather to the refinement of the
theoretical model and to the search for more relevant variables. Because of easiness, most
of the past studies employed very simple additive single-equation model:

$$Y = a + b_1 x_1 + b_2 x_2 + \cdots\cdots + b_n x_n + e,$$

or joint effect model which is log-linear

$$Y = a x_1^{b_1} x_2^{b_2} x \cdots\cdots x_n^{b_n}, \text{ or}$$

$$\log Y = \log a + b_1 \log x_1 + b_2 \log x_2 + \cdots\cdots + b_n \log x_n$$

For various study purposes we can employ other alternative models such as:

(a) Interaction model.[30]

$$Y = a + b_1 x_1 + b_2 x_2 + b_{11} x_1^2 + b_{12} x_1 x_2 + b_{22} x_2^2 + \cdots\cdots + b_n x_n$$

(b) Simultaneous equation

$$x_1 = a_1 + b_{12} x_2 + b_{13} x_3 + \cdots\cdots + b_{1k} x_k + e_1$$

$$x_2 = a_2 + b_{21} x_1 + b_{23} x_3 + \cdots\cdots + b_{2k} x_k + e_2$$

$$\cdot \qquad\qquad \cdot$$

$$\cdot \qquad\qquad \cdot$$

$$\cdot \qquad\qquad \cdot$$

$$x_k = a_k + b_{k1} x_1 + b_{k2} x_2 + \cdots\cdots + b_{k, k-1} x_{k-1} + e_k$$

A recent study by Horowitz used a simultaneous equation model in order to recognize

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(29) J.W. Osman, *op. cit.*, pp.437–447.

(30) N.R. Draper and H. Smith, *Applied Regression Analysis*, John Wiley & Sons, 1966, pp.
128–131.

which is hardly informative. In cases where there are interactions between the parts, the relationships, although not one-to-one, may well prove to be equally uninformative.

Inasmuch as states and localities must spend virtually all the federal aid they receive, it is not surprising to find that aid and expenditures move together in a "statistically significant manner." Indeed, using aid to explain expenditures is analogous to using taxes to explain expenditures in the sense that both aid and taxes are sources of funds. The fact that these variables turn out to have substantial explanatory power serves as little more than verification of the quite obvious fact that government receipts and expenditures are closely related.

Jack W. Osman and David L. Smith have found that there exists a dual impact of federal aid on state and local government spending. Per capita expenditure for a function would rise (a) with increases in per capita federal aid to that function, and (b) with increases in per capita aid to all other functions.

Federal aid not only has the effect of stimulating those function to which it has been directed, but also it could increase expenditures for functions which nominally receive no direct federal aid for three reasons: (a) federal aid to a given function could release resources for use in other functions, for debt retirement and/or for tax reductions; (b) the receipt of federal aid which, in general, will increase outlay for the function to which it is directed, also may lead to increased outlays for complementary functions; and (c) both effects are operating simultaneously. [28]

The criticims raised on the use of aid variable are on three points. First, it has been argued that intergovernmental aid may be distributed uniformly, and hence would become part of the constant term in the regression (Brazer, Heer, and Lipsey's objection). Second, it is held that intergovernmental aid is not really an "independent" variable. If the aid is in the form of matching grants, the amount received will be determined by the level of expenditure by the receiving government (Fisher, Pogue & Sgontz, and Oates' criticism). Third, since the recipient governments must spend most of the intergovernmental aid revenues, and in the usual case some added funds, the aid variable is entered both as

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(28) Jack W. Osman, "The Dual Impact of Federal Aid on State and Local Government Expenditures," *National Tax Journal*, 1966, pp. 362-372; David L. Smith, "The Response of State and Local Governments to Federal Grants," pp. 349-357, James A. Wilde, "The Expenditure Effects of Grants-in-Aid Programs," pp. 340-347, and J.W. Osman, "On the Use of Intergovernmental Aid as An Expenditure Determinant," pp. 437-447, all in *National Tax Journal*, 1968.

more explicitly the intercorrelation among the explanatory variables and their effects on public expenditures and employment. He stated as follows: "Due to the interdependence of the variables, some of their explanatory variables not only influence the level of public service but are influenced by it, either directly or indirectly. By using a system of simult-aneous equations, these more complex relationships are taken into account.[31]

(c) Recursive systems

$$x_1 = e_1$$

$$x_2 = b_{21}x_1 + e_2$$

$$x_3 = b_{31}x_1 + b_{32}x_2 + e_3$$

.

.

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$$x_k = b_{k1}x_1 + b_{k2}x_2 + \cdots\cdots + b_{k,k-1}x_{k-1} + e_k \quad \text{[32]}$$

Although these models are more complicated, they can deal with the problem of interaction between independent variables and the problem of reciprocal causation. As for variables, there should be an attempt to search for more relevant ones in terms of their explanatory power and causal relationship.

Brazer concludes as follows:

> It is worth reiterating, finally, that there is not facile means of explaining the tremendous range of differences in the levels of city expenditures. Even within states, and considering the probable contributions of differences in the nature of cities and of the ratio of city to metropolitan area population, the proportion of variance that remains unexplained, ranging from 20 to more than 90 per cent, is certainly large enough to challenge further research.

The unexplained variance can be reduced either by refining the theoretical model, by adding new relevant variables, by giving a plausible behavioral relationships between the variables, or by both. In this connection, residual analysis may be very useful. By comparing the actual value and the estimated value, we can have very meaningful insight into the interaction of the variables, thus enabling us to refine the regression model, and we can have some suggestive hypothesis about the relationship between the dependent

(31) Ann R. Horowitz, "A Simultaneous-Equation Approach to the Problem of Explaining Interstate Differences in State and Local Government Expenditures" *The Southern Economic Journal*, April, 1968, p.460.

(32) H.M. Blalock,Jr. *op. cit.*, pp.52-60.

variable and plausible candidates of new variables.

And also, as suggested by Morss and Bahl,[33] by using time series analysis to an individual area we can get meaningful insight into the fiscal behavior of governments. Morss and Bahl stated that by doing time series study we can achieve both objectives of understanding and prediction. We may add another point. Time series is also useful as a preliminary search for hypothesis and variables.

In relation to new variables, some points should be made. First, the implicit assumption of the past studies was that the decision-makers would have no effect on government fiscal behavior. Governors, mayors, and councilmen were assumed to be neutral, merely reflecting the consumer preferences. There, however, are some empirical evidence such as Eulau and Eyestone's study that they are not neutral.[34]

Second, most studies avoided explaining the capital expenditure. The difficulties were in the inconsistency of capital outlays. However, the capital outlay is not neutral at all in its effect on current expenditures. Some considerable part of current expenditures are due to past capital outlay. If we construct a library today, a few years later there would be a large increases in current budget because of staffing, maintenance, and other related costs. Some part of the costs may not be accounted for by other variables such as increases in population. Therefore, we need some variable which can represent the capital effect.

(2) Some Conceptual Problems

Another related problem is the assumption of equality in quality and efficiency of public services provided by governments. Because of the difficulty of measurement and the lack of relevant variable which approximates those factors, most studies assumed implicitly in explaining the expenditures that quality of public goods and services provided by local governments are equal.

Hirsch and Kurnow tried quality variable in their analysis, although it was not successful.[35]

The assumption of equal quality is unrealistic. Therefore, more effort should be devoted to the problem of measurement of quality and to the identification of relevant quality variables.

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(33) E.R. Morss, *op. cit.*, p.102 and also see Roy W. Bahl, *op. cit.*, p.26.
(34) Heinz Eulau and Robert Eyestone, "Policy Maps of City Councils and Policy Outcomes: A Developmental Analysis," *The American Political Science Review*, 1968, pp.124-143.
(35) Roy W. Bahl, *op. cit.*, pp.5-8, and also see E. Kurnow, *op. cit.*, pp.252-253.

(3) Interpretation

As for interpretation of the regression results, the following points must be made. Because of the unrealistic assumptions and of multicollinearity among the independent variables, we should be careful in interpreting the regression coefficients and R^2. For instance, past studies made a great mistake in interpreting the regression results as if there exist economies of scale whenever they found a significant negative relationship between per capita expenditures for a service and population.[36] There may or may not exist such economies of scale. If the assumption of equal quality of service is realistic, then we can intertpret it as an evidence of the existence of economies of scale. The assumption however, seems to be unwarranted.

Another problem is multicollinearity. Because of the intercorrelation among independent variables, the coefficients tend to be biased. Nevertheless, most studies are not rigorous in interpretation. As criticized by Oates and others, users of aid variable, especially Osman, have made erroneous interpretation of the impact of federal aid on the literal basis of the estimated regression coefficient of aid variable. Osman interpreted that if B_1 (coefficient of aid variable) is greater than one, then federal aid "stimulates" state and local expenditure.[37] If, and only if there is no multicollinearity, it is right.

IV. Conclusion

There are still unsolved methodological and conceptual problems in regression analysis of state and local fiscal behavior. Some of them are inherent limitations of quantitative technique general, such as multicollinearity and causal inferences. Some others are those that may be improved within the methodological limitations such as the refining of the theoretical model and search for relevant variables.

There are other useful models and variables which certainly enhance the explanatory power.

There are other purposes to which the regression analysis can be usefully applied. Bahl and Morss suggested some new directions of future researches such as prediction and normative analysis.

. Many local government are doing urban planning. If the master plans are ever to be

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(36) Roy W. Bahl, *op.cit.*, p. 8.

(37) J. Osman, *op. cit.*, pp. 362–372.

realistic, then they should be based on the solid projection of financial resources in the future. The forecasting of future expenditures as well as future revenues are essential for planning. In this area we do not have to face the difficult conceptual problems such as strict causal inferences. In this case time series analysis may be more appropriate. Bahl stated as follows: [38]

> But it should be possible to develop something more than a backdoor approach to public expediture norms for state and local governments. If it were, the reasoning for public policy purposes would work as follows: First, on a basis of the sociological, economic and demographic structure of the area, what should the level of public expenditures for a particular government or area be? Second, based on the fiscal capacity of the area and other considerations, what level of local government revenue is feasible? Third, the disparity between these estimates of normative expenditure needs and feasible govrenment receipts dictates a first estimate of desirable external financing. The first of these problem is the area in which quantitative public expenditure analysis may be useful for purposes of influencing state-local fiscal planning.

Cross-sectional multivariate regression results may serve as useful quidelines when one is attempting to answer certain normative questions. For good or bad, many welfare decisions are made on the basis of what is considered to be an "equitable norm." One value of a regression equation is that it facilitates the calculation of norms that can be far more sensitive than unweighted numerical averages. [39]

Despite the methodological limitations, the regression analysis can still achieve our specific positive research purposes. If it is applied to the field of local public finance, it can contribute much to the positive knowledge of public finance.

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(38) R.W. Bahl, *op. cit.*, p.22.
(39) E.R. Morss, *op. cit.*, p.99.