1966

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Recommended Citation

Bahl, Roy W. and Robert J. Saunders. 1966. "Fabricants Determination After Twenty Years: A Critical Reappraisal." American Economist 10 (1) (03): 27-41. https://doi.org/10.1177/056943456601000104.

FABRICANT'S DETERMINATION AFTER TWENTY YEARS: A CRITICAL REAPPRAISAL*

by roy w. bahl & robert j. saunders**

Interstate differences in per capita expenditures have been attributed to variations in: (a) the quality and scope of public services; (b) the demographic, economic, and social structure of state populations; (c) historical traditions regarding the distribution and scope of governmental operations, and to (d) a random component. Although some synthesis of these alternatives, which are not mutually exclusive, no doubt explains interstate expenditure differences, data limitations have led to repeated empirical tests of the relationship between the characteristics impiled in (b) above and levels of per capita state and local expenditures.

These analyses (all of which have employed a multivariate regression technique) have revealed that substantial portions of the variations may be explained by a number of readily indentifiable factors. At the local level, Brazer, Hawley, and Scott and Feder have applied linear regression models to variations in per capita city government expenditures and have isolated several "determinants" of municipal spending levels.(1) Solomon Fabricant attempted to explain state-to-state per capita spending differentials by using the same technique on aggregated current outlays for all state and local governments.(2) In analyzing 1942 expenditure data, Fabricant examined per capita income, per cent of population living in urban areas, and population density. He was able to explain 72 per cent of interstate variations in the level of total expenditures, and from 29 to 85 per cent for various functional classes. More recently, Fisher(3) has expanded Fabricant's model to include additional demographic, economic, and socio-political variables, while Sacks and Harris(4) have concluded that federal and state aid are major determinants of interstate expenditure variations.

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*Paper presented at the Seventy-Eighth Annual Meeting of the American Economic Association, New York, December 1965.

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1. Harvey Brazer, *City Expenditures in the United States,* Occasional Paper 66 (New York: National Bureau of Economic Research, 1959). Amos H. Hawley "Metropolitan Population and Municipal Government Expenditures in Central Cities," *Journal of Social Issues,* VII (1951). Stanley Scott and Edward Feder, *Factors Associated with Variations in Municipal Expenditure Levels,* (Berkeley, California: Bureau of Public Administration, Feb., 1957).
2. Solomon Fabricant, *The Trend of Government Activity in the United States since 1900.* (New York: National Bureau of Economic Research, 1952).
3. Glenn W. Fisher, "Determinants of State and Local Government Expenditures: A Preliminary Analysis" *National Tax Journal, XIV* (December, 1961), pp. 349-355. Glenn W. Fisher, "Interstate Variation in State and Local Government Expenditure," *National Tax Journal, XVII* (March, 1964), pp. 57-74.
4. Seymour Sacks and Robert Harris "The Determinants of State and Local Government Expenditures and Intergovernmental Flows of Funds," *National Tax Journal XVII* (March, 1964), pp. 75-85.

Interpretation of the results of these analyses raises at least two major questions. The first relates to the relatively small amount of attention which has been paid to the problem of multicollinearity. Interpretation of the findings of the studies mentioned has been based largely on the statistical significance of regression coefficients which have been taken to imply the importance of independent variables. But while statistical inference offers a method of ascertaining significance, it offers no corresponding method for determining importance when there is a high degree of interdependence among independent variables. If two independent variables are highly interrelated (collinear) their standard errors tend to be large,([5]) and a simple t test may lead to the conclusion that one or the other of their coefficients is not significantly different from zero. This can happen for one of two reasons: (a) it is actually not related to the dependent variable and thus not important, or (b) it is closely related to the dependent variable but collinearity has caused its standard error to blow up. Consequently, only after a detailed consideration of the intercorrelations among the independent variables can an attempt be made to infer the true importance of any explanatory factors. Where there is substantial correlation among independent variables, measures of separate effect such as partial correlation, elasticity, and beta coefficients have little meaning when interpreted out of context.

The second major question concerns the possible scope of interpretation of previous statistical analyses. In most cases, linear regressions have been applied to cross-section data validly leading to descriptions of *differences* in per capita state and local expenditures, but contributing little to an understanding of *changes* in these expenditures.

SCOPE AND METHODOLOGY

The general objectives of this paper are twofold: (a) to consider the effects of multicollinearity on the interpretation of earlier findings, and (b) to attempt an interpretation of the present findings in both a static and a temporal context.

Operationally, the analysis is carried out on three levels: (a) three multivariate regressions on a cross section of 1942 per capita state and local expenditures with up to nine independent variables; (b) similar cross-sectional analyses of per capita expenditures on 1962 data with up to 12 independent variables, and (c) regressions on changes in per capita expenditures between 1942 and 1962.

A comparison of the static models of 1942 and 1962 should indicate the extent to which the same or a similar set of variables explain interstate differences through time. Sacks and Harris, in using such a method, found that the predictive value of Fabricant's three original variables had declined between 1942, 1957, and 1960. However, their explanation for this decline is inconsistent with the findings of the present analysis.

THE VARIABLES

This study, as was true of Fabricant's, is primarily concerned with per capita expenditures for current operation. Consequently, per capita state and local operating expenditures will be used as the dependent variable throughout the analysis.

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5. J. Johnston, *Econometric Methods* (New York: McGraw-Hill Book Co., Inc., 1963), p. 204.

Fabricant's three "standard" variables — per capita income, population density, and per cent of poulation urban — are analyzed using both 1940 and 1960 data. The method of measuring the latter two of these variables is open to some question. Population density of cities has been found to be significantly related to the level of per capita municipal expenditures. However, Fabricant's form of the variable (state population as a per cent of state land area) does not give a valid comparison of interstate urban density differentials and therefore its meaning is uncertain. The comparability between 1940 and 1960 of the per cent urban variable is also subject to question since the census definition of urban population changed during this period. Because the old definition was used by Fabricant, it will be retained in the present study.

Per capita federal grants to states is included in the analysis to examine the Sacks-Harris hypothesis that intergovernmental flows of funds significantly affect the level of per capita governmental expenditures. It is further hypothesized that the magnitude of interstate differentials in per capita expenditures may be approximated by the magnitude of federal grants relative to revenues received from internal sources. Thus, given the level of general revenue, the higher the level of federal grants the higher will be the level of per capita spending.

Spangler has suggested that there is a direct relationship between rate of population growth and per capita state and local expenditures because of what he terms "...the disruptive effects of expansion."(6) His significance tests are not conclusive evidence, however, since the per cent increase in population between 1950 and 1960 is correlated significantly with both per capita income and per cent of population urban in 1960. Further, Spangler's thesis is consistently refuted by empirical analyses at the local level.(7) Nevertheless, to measure the effect of population growth rate on expenditure levels, the per cent increase in population over the previous decade and the degree of urbanization are used in both the 1942 and 1962 models. Finally, the per cent of labor force employed in agriculture and the per cent employed in manufacturing represent general measures of socio-economic differences among states.

Additional variables employed in the 1962 analysis are the per cent of families with incomes greater than $10,000; the per cent of families with incomes less than $3,000, and the Advisory Committee on Intergovernmental Relations index of the yield of a representative tax system.(8) Fisher found differentials in the income distribution to be significantly associated with interstate spending differences. However, the high correlation between income distribution and income level variables may have obscured the true direct effect on government expenditures in his analysis. In analyzing the importance of the Advisory Committee's suggested measure of fiscal capacity, Fisher found it to be generally more important in the case of education and highway expenditures than in the case of other functions more typical of municipalities.

INTERSTATE DIFFERENCES IN PER CAPITA TOTAL CURRENT EXPENDITURES — 1942

Fabricant, in explaining over 70 per cent of the variation in per capita current expenditures, concluded that income was the most important of the three independent variables while ". . . urbanization is by itself a minor factor, much less important than income and not more important than density."(9)

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6. Richard Spangler, "The Effect of Population Growth Upon State and Local Government Expenditures" *National Tax Journal XVI* (June, 1963), pp. 193-196.

7. Brazer, op. cit., p. 29, Scott and Feder, op. cit., p. 1.

8. Advisory Commission on Intergovernmental Relations, *Measures of State and Local Fiscal Capacity and Tax Effort* (Washington, D.C., 1962).

9. Fabricant, op. cit., p. 127.

TABLE 1

REGRESSION EQUATIONS[a] OF PER CAPITA CURRENT EXPENDITURES ON SELECTED INDEPENDENT VARIABLES: 1942

Equation Number	Constant Term	Per Capita Income	Population Density	Per Cent Urban	Per Capita Federal Grants	Ratio of Federal Grants to General Revenue	Determination b Coefficient of
A	3.3246	.0822 (.0178) .8752	-.0396 (.0132) -.3524	.1271 (.1516) .1723	NI	NI	.7225
B	.6035	.0235 (.0218) .2728	-.0346 (.0192) -.6910	.7691 (.3134) .9651	NI	NI	.2737
C	.6593	.0391 (.0108) .4278	-.0197 (.0097) -.1713	.3813 (.1050) .4355	1.9975 (.3256) .4621	NI	.8553
D	-4.1065	.0200 (.0233) .2320	-.0305 (.0210) -.6089	.7634 (.3234) .9580	1.1753 (2.0154) .1475	NI	.2172
E	31.9147	NI	NI	.3373 (.0652) .3853	4.5767 (.3964) 1.0586	-3.0895 (.5911) -.5722	.8801

a. Standard errors of regression coefficients appear in parenthesis below each coefficient. Beta coefficients appear below the standard errors.

b. All coefficients of determination are adjusted for sample size.

This conclusion was based on the significance of the regression coefficients (see Table 1, equation A) and the relative size of elasticity coefficients. An examination of 1942 data reveals the three standard variables to be highly intercorrelated (see Appendix Table A) with the lowest degree of association between income and density ($r = .53$) and the highest between income and urbanization ($r = .80$). Thus it is not surprising that Fabricant did not find urbanization to be a significant explanatory variable. This lack of statistical significance, however, does not necessarily imply a lack of importance. In fact, zero order correlation coefficients indicate that both income and urbanization are more closely related to expenditures than is density.([10])

Fabricant contends that any influence of the urbanization variable is primarily due to its close association with income and that its direct influence on expenditures is relatively small.([11]) He appears to be referring to the relative magnitudes of the net regression coefficients when he states that: "At a given level of income (and density), even fairly pronounced differences in degree of urbanization are associated with only slight differences in per capita expenditures."([12])

This conclusion may not be justified on two counts. First, the highly interdependent nature of the explanatory variables makes it impossible to hold any two independent variables constant while examining the third. Even if income and density could be held constant, the above net regression coefficient for urbanization would not describe the isolated effect of relative urbanization on expenditures because it is computed under conditions where all three explanatory factors vary simultaneously.

Secondly, it is open to question on a priori grounds. In states with relatively homogenous levels of income and density, there appears to be no reason to assume that per capita expenditure levels will not be responsive to interstate differentials in the degree of urbanization. While the isolated effect of urbanization on expenditures cannot be tested empirically — because it is impossible to abstract from the interrelations with income and density — it is possible to reduce the variability of the income and density factors. By grouping 15 high income-high density states,([13]) the coefficient of variation for income is reduced from 32.7 per cent (for 48 states) to 15.7 per cent, and that for density from 140.8 per cent to 84.1 per cent.([14])

When the three standard variables are regressed on per capita expenditures of the 15 states, urbanization is found to be statistically significant while the regression coefficients of neither income nor density differ significantly from zero. A comparison of the beta coefficients([15]) of the 15-state and 48-state models (see Table 1) implies a greater relative importance of the urbanization variable when it is examined in the more homogeneous income — density context. The conclusion that at given levels of income and density, the degree of urbanization exerts only a minor direct influence on expenditure levels is, therefore, not supported by these results.

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10. The simple correlation coefficients between per capita expenditures and the independent variables are as follows: Per capita Income ($r = .83$), Population Density ($r = -.23$), Per cent Urban ($r = .62$).
11. Fabricant, op. cit., p. 128, ff.
12. Fabricant, op. cit., pp. 127-28.
13. California, Connecticut, Illinois, Indiana, Delaware, New Hampshire, New Jersey, New York, Massachusetts, Maryland, Michigan, Ohio, Pennsylvania, Rhode Island, Wisconsin.
14. In the continuous form, the coefficient of variation is the standard deviation expressed as a per cent of the mean.
15. The beta or standardized regression coefficient is subject to all the limitations of a net regression coefficient when multicollinearity is present.

The Effects of Federal Aid

Recent empirical analyses have focused on the relationship between the level of per capita expenditures and the level of federal grants to states. When used as an independent variable, per capita federal aid has, without exception, significantly increased the per cent of variation explained.

Equation C of Table 1 shows that, by introducing federal aid into Fabricant's original three-variable model, the amount of variation explained is increased by almost 13 per cent and all four independent variables are significant. Again, urbanization is apparently more than ". . . a minor factor, much less important than income and not more important than density."(16) In fact, as shown in equation C, Table 1, a comparison of beta coefficients implies that urbanization is of approximately the same importance as federal aid and income, and of greater importance than density. One possible explanation for the change in relative importance of the income and density variables is their association with per capita grants. Previous studies have shown that federal aid is significantly related to levels of income and density, and not correlated significantly with urbanization. Consequently, some of the importance of income and density in the original three-variable models may be attributable to the omission of the federal grants variable.(17)

When the 15 high income-high density states are examined separately, the addition of the federal grants variable increases explained variation only slightly. As in the three variable case for the 15 states, urbanization is the only significant explanatory factor.

The Effect of Additional Independent Variables(18)

Fisher attempted to explain a greater percentage of 1960 expenditure variations by expanding the number of explanatory variables. In the present study, the number of independent variables is increased to demonstrate proxy relationships between the original four variables and other social, economic, and demographic factors. When all nine variables are included in the model, only three — federal grants to states, the ratio of federal grants to total general revenues, and urbanization — are statistically significant. When examined alone, these three explanatory factors account for approximately 88 per cent of the variation in state and local expenditures, or 16 per cent more than was explained by Fabricant's three-variable model. Of the variation explained, 92 per cent may be attributed to per capita federal aid and the ratio of federal grants to total general revenue. Although these two variables are highly intercorrelated ($r = .74$), equation E of Table 1 shows that given the level of federal grants, the ratio of federal grants to total revenues is inversely related to the level of per capita expenditures. This implies that in states which have relatively equal levels of general revenue, those which contribute smaller proportions to total revenue from internal sources spend significantly higher amounts per capita.

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16. Fabricant, op. cit., p. 127.

17. See James A. Maxwell, "The Equalizing Effect of Federal Grants", *Journal of Finance*, Vol. IX, May, 1954, p. 209, and M. A. Haskell, "Federal Grants and the Income Density Effect", *National Tax Journal*, March, 1962, p. 105.

18. In addition to the income, density, urbanization, and federal aid variables, the ratio of federal grants to total general revenue, per cent increase in population between 1930 and 1940, per cent increase in per cent urban 1930-1940, per cent employed in agriculture, 1940, and per cent employed in manufacturing, 1940, were added to the model.

TABLE 2

REGRESSION EQUATIONS[a] OF PER CAPITA CURRENT EXPENDITURES ON SELECTED INDEPENDENT VARIABLES: 1962

Equation Number	Constant Term	Per Capita Income	Population Density	Per Cent Urban	Per Capita Federal Grants	Ratio of Federal Grants to General Revenue	Coefficient of Determination b
A	81.5049	.0757 (.0120) .7766	-.0636 (.0265) -.2912	.0494 (.0973) .0554	NI	NI	.4579
B	-52.4505	.0858 (.0230) .7746	-.0827 (.0346) -.6469	1.6674 (.6102) .7189	NI	NI	.4406
C	73.8401	.0645 (.0113) .6616	-.0224 (.0268) -.1026	.0532 (.0875) .0597	.5025 (.1491) .3669	NI	.5622
D	-50.0028	.0763 (.0226) .6887	-.0454 (.0407) -.3547	1.1593 (.6638) .4999	1.3102 (.8526) .3452	NI	.4989
E	273.5469	NI	NI	NI	3.0131 (.2126) 1.5910	-.11.6950 (.9157) 1.4370	.8113
F	253.5887	NI	NI	NI	4.0189 (.6527) NC	-12.0228 (2.2737) NC	.7662

a. Stondard errors of regression coefficients appear in parenthesis below each coefficient. Beta coefficients appear below the standard errors.
b. All coefficients of determination are adjusted for sample size.

The data presented in Appendix Table A suggest two non-mutually exclusive explanations of the importance of the urbanization variable: (1) it reflects a proxy relationship between per cent of population living in urban areas and other socio-economic and demographic variables. States having greater proportions of the population living in urban areas tend to have higher per capita incomes, higher population densities, smaller proportions of the labor force employed in agriculture and greater proportions employed in manufacturing. (2) It possibly reflects a direct relationship between urbanization and the level of per capita expenditures. When the 15 high income-high density states are considered, the simple correlation coefficient between urbanization and income is reduced from .80 to .51 and the simple correlation coefficient between expenditures and urbanization ($r = .54$) is higher than between expenditures and any other independent variable.

INTERSTATE DIFFERENCES IN PER CAPITA TOTAL CURRENT EXPENDITURES — 1962

Fisher and Sacks and Harris have attempted to re-evaluate the importance of Fabricant's determinants by analyzing data for more recent years. Fisher examined 1957 and 1960 data while Sacks and Harris analyzed 1960 data. Both studies concluded that the variables which contributed significantly to the regressions in 1942 are generally the same as those which were significant for 1957 and 1960. The results of the present study are in agreement with the above in that the magnitudes and signs of the regression coefficients are similar to those of the 1942 model (see equation A, Table 2).([19])

When the 15 high income-high density states are separated, the coefficient of variation for income is reduced from 20.7 per cent (for 48 states) to 11.7 per cent. The results of the present three-variable regressions are similar to those of the 1942 analysis of 15 states in that urbanization becomes an important explanatory factor, but differ in that income and density are also significant. In fact, the relative size of the beta coefficients in equation B, Table 2 implies that the variables are of approximately equal importance.

The Effects of Federal Aid — 1962

To the extent that per capita expenditures for different functions are influenced by the same factors, the intercorrelations among expenditure categories will be higher or lower. That is, if the determinants of per capita highway expenditures are also the determinants of per capita education outlays, then highway and education expenditures would themselves be highly correlated. Table 3 reveals that the interrelations between the expenditure categories declined between 1942 and 1962, which indicates that the same set of variables does not account for as much of the interstate variations in all functions in the later years.

19. However, in the present study, as in Fabricant's original analysis, the dependent variable form used is per capita current expenditures while both Fisher and Sacks and Harris used per capita total general expenditures.

TABLE 3

COMPARISON OF INTERCORRELATIONS AMONG SELECTED PER CAPITA EXPENDITURE CATEGORIES: 1942 and 1962(a)

	Local Schools	Highways	Police and Fire
	(.92)	(.63)	(.68)
Total Current	.85	.32	.61
		(.53)	(.51)
Local Schools	....	.17	.46
			(.13)
Highways		....	-.16

(a) The simple correlation coefficient for 1942 is shown in parenthesis above the corresponding 1962 coefficient.

Sacks and Harris, in attempting to explain the marked decline in the proportion of variations in expenditures that can be explained by the three basic factors, cited the increasing importance of intergovernmental flows of funds.(20) By introducing per capita federal aid in the 1962 model, explained variation is increased from .46 to .56; however, as shown in Table 4, the addition of the same variable in the 1942 model increased explained variation from .72 to .86. Given the importance of federal aid in 1942, Sacks and Harris's hypothesized explanation for the declining importance of the three basic variables seems untenable.

TABLE 4

A COMPARISON OF MULTIPLE DETERMINATION COEFFICIENTS FOR 48 STATES AND 15 STATES: 1942 and 1962

	1942		1962	
	48 states	15 states	48 states	15 states
Fabricant 3 Variable Model	.7225	.2737	.4579	.4406
Fabricant 3 Variable Model and Per Capita Federal Aid	.8553	.2172	.5622	.4989
All Variables (a)	.8874	n.c.	.7860	n.c.

(a) Nine independent variables for 1942 and 12 for 1962.

Equation C of Table 2 shows that when four independent variables (the three basic factors and per capita federal grants) are regressed on 1962 expenditures, only income and federal aid are found to be significant. When federal aid was introduced into the 1942 model, the importance of the income variable declined markedly whereas the introduction of federal aid into the 1962 model was accompanied by no such substantial decline in the importance of income.(21)

20. Sacks and Harris, op. cit., p. 78.

21. See Equation C, Table 1 and Equation C, Table 2.

This result is consistent with recent empirical analyses which have shown a definite trend toward the greater equalizing effects of federal grants.(22) In 1942 the level of federal aid was positively related to the level of income, but the distribution of grants among the states has since altered markedly in favor of the poorer states. Consequently, in 1962, no significant correlation is observed between per capita federal aid and per capita income.

The Effect of Additional Independent Variables (23)

When all 12 independent variables are regressed on per capita operating expenditures, only per capita federal aid to states and federal aid as a per cent of general revenue are found to be significant. The inclusion of only these two variables in the model results in an explained variation of approximately 81 per cent (see equation E, Table 2). When only 15 high income-high density states are considered, the same two explanatory factors result in a coefficient of determination of .77 (see equation F, Table 2). Table 5 shows that these high income states receive relatively lower amounts of federal aid per capita, and tend to finance a greater proportion of expenditures from internal sources.

TABLE 5

A COMPARISON OF THE LEVELS OF SELECTED INDEPENDENT VARIABLES: 48 STATES AND 15 SELECTED STATES

	Average Per Capita Federal Aid	Ratio of Federal Aid to General Revenue	Average Per Capita Income
48 States	$51.07	16.47%	$2101
15 States	$33.36	11.54%	$2509

The implicit relationship between the above two variables and per capita expenditures was found to be as follows:

$$E = f\left[F, -\left(\frac{F}{I} + 1\right)\right]$$

where

F = per capita Federal grants to states
I = general revenues from internal sources
I + F = total general revenue
E = per capita current general expenditures

This relationship is significant in that it suggests a difference in the relative effect of federal aid on high income as opposed to low income states. It follows from equation (1) that an increment in per capita federal aid to a state which raises, on the average, a relatively large proportion of revenues from internal sources (a high income state) will result in a higher level of expenditures than

22. Maxwell, op. cit., and Haskell, op. cit.

23. In addition to the nine variables of the 1942 analysis, the 1962 cross section includes per cent of families with income under $3000, per cent of families with incomes over $10,000, and the index of the yield of a representative tax system.

will an equal injection of federal aid into a low income state. Consequently, matching requirements of federal grants would absorb larger proportions of state-local tax revenues in poor than rich states. Total expenditures in the poor states would not increase by as large an amount since in order to finance services eligible for federal aid, state legislatures may tend to divert state money from services not eligible for federal aid.(24)

THE TEMPORAL PATTERN OF INTERSTATE VARIATIONS

One possible method of investigating the temporal pattern of state and local per capita expenditures is to compare the results of static analyses. For example, Sacks and Harris found that the three basic variables could explain a smaller amount of expenditure variations in 1960 than in 1942. While static cross-sectional analysis — such as those of Fabricant, Fisher, and Sacks-Harris — may go far toward identifying the determinants of differences in expenditure levels, one may infer little from them about the determinants of changes in expenditure levels. In the short run, it may well be that a knowledge of the factors which are associated with movements in per capita expenditures has the greatest utility for financial planners and administrators.(25) One approach to statistically analyzing the pattern of movements in per capita expenditures involves regressing *changes* in the independent variables on *changes* in per capita expenditures.(26)

Determinants of Changes in Per Capita Expenditures

Approximately 24 per cent of the variation in changes in per capita expenditures (between 1942 and 1962) can be explained by 1940 to 1960 changes in the three basic variables. Only changes in per capita income are found to be statistically significant.

When changes in eight independent variables(27) are regressed on changes in per capita expenditures, the only two explanatory factors which at any time prove to be significant are changes in per capita income and changes in per capita federal aid. These two variables explain 35 per cent of the variation in the dependent variable or 97 per cent of the amount explained by all eight independent variables.(28) This finding is consistent with the results of the 1962 cross-sectional analyses in which federal aid and income were the only significant explanatory factors in the four-variable model.

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24. Maxwell, op. cit., p. 58.

25. See Roy W. Bahl and Robert J. Saunders, "Determinants of Changes in State and Local Government Expenditures", *National Tax Journal, XVIII,* March, 1965, pp. 50-57.

26. The linear regression equation will be of the form $Y = a+b_1\Delta X_1+b_2\Delta X_2+\ldots+\ldots b_n\Delta X_n$. A regression coefficient should be interpreted as the *change* in expenditures which is accompanied by a one unit *change* in the independent variable. In the one year cross-section model, a regression coefficient is interpreted as the *difference* in expenditures which results from a one unit *difference* in the independent variable.

27. In addition to changes in the three basic factors and federal grants, the independent variables are change in the ratio of federal grants to general revenue, 1942-1962; change in per cent employed in agriculture, 1940-1960; change in per cent employed in manufacturing, 1940-1960, and per cent increase in population, 1940-1960.

28. The regression equation is $Y = a + .051\ X_1 + .436X_2$ where X_1 is the change in per capita income and X_2 is the change in per capita federal aid. The beta coefficients were .433 and .365 respectively, which in this case gives a good indication of relative importance since the relationship between the two variables was almost zero ($r = .031$).

The inability of the model to explain a greater proportion of interstate variations in changes in per capita expenditures may be due to the length of the interval considered. Recent findings suggest that the variation explained may be increased considerably by using a shorter time span.([29])

A Comparison of 1903, 1942 and 1962 Models

Fabricant hypothesized that the 1942 relationships among his basic variables would be relatively the same if computed using 1903 data.([30]) Since he found per capita income to be the most important of the explanatory variables in 1942, he concluded that the chief cause of rising per capita expenditures during the 1903-1942 period was rising income.

However, as was shown above, Fabricant's failure to include federal aid as an independent variable may have exaggerated the importance of income (see equations C and A, Table 1). In fact, the four-variable model of the present analysis produces a more accurate estimate of the average level of 1903 per capita expenditures than does Fabricant's three-variable model. Fabricant overestimated mean 1903 expenditures by $4.94 while the four-variable model underestimated 1903 expenditures by only $3.62. Because adequate data are not available, the average amount of federal aid in 1903 was assumed to be zero.

Using the same two 1942 models to predict 1962 expenditures, it may be seen from Table 6 that the inclusion of federal aid results in a substantially better estimate. This again supports the finding that the omission of federal aid in Fabricant's 1942 model tended to distort the relative importance of the independent variables.

A COMPARISON OF THE ESTIMATES OF 1962 PER CAPITA EXPENDITURES OBTAINED BY FABRICANT'S 1942 THREE-VARIABLE MODEL AND THE 1942 FOUR-VARIABLE MODEL OF THE PRESENT STUDY

	3-Variable Model	4-Variable Model
Actual	$235.47	$235.47
Estimated	178.82	206.11
Difference	56.65	29.36

CONCLUSIONS

The present study indicates that Fabricant's conclusions regarding the determinants of interstate variations in per capita expenditures may be questioned on two counts: (1) his failure to adequately consider intercorrelations among the independent variables led him to underestimate the importance of urbanization, and (2) his failure to include federal aid led him to overestimate the relative importance of per capita income.

Sacks and Harris concluded that the decline in the importance of the three basic variables between 1942 and 1960 may be attributed to the increasing importance of intergovernmental flows of funds. The results of the present study, which show that per capita federal aid was of approximately the same relative importance in 1962 as in 1942, appear to refute this hypothesis.

In regard to the temporal pattern of per capita expenditures, it was found that changes in income and changes in federal grants were positively associated with changes in expenditures.

29. See Bahl and Saunders, op. cit., p. 51-52.

30. Fabricant, p. 135-137.

APPENDIX TABLE A

ZERO ORDER CORRELATION COEFFICIENTS[a] BETWEEN ALL POSSIBLE COMBINATIONS OF INDEPENDENT VARIABLES, 1942: FOR 48 STATES AND FOR 15 HIGH INCOME-HIGH DENSITY STATES

	Per Capita Income	Density Population	Urban Per Cent	Revenue Ratio of Federal Grants General	Per Cent Increase in Population, 1930-1940	Per Cent of Labor Force Employed in Agriculture	Per Cent of Labor Force Employed in Manufacturing	Per Cent increase in Per Cent Urban, 1930-1940
Per Capita Federal Grants to States	(-.0441) -.3063	(-.3891) -.2839	(-.2683) -.0745	(.7195) .7352	(.6505) .2180	(.1698) -.0356	(-.3542) -.4274	(-.2213) .2038
Per Capita Income		(.4618) .5285	(.5072) .7983	(-.2877) -.2961	(.2663) -.0533	(-.5929) -.8254	(-.0009) .4995	(-.1553) .5319
Population Density			(.8211) .7088	(-.5006) -.5266	(-.4962) -.2014	(-.7371) -.5910	(.5961) .7107	(.0054) -.3810
Per Cent Urban				(-.6494) -.5500	(-.3280) -.0129	(-.7836) -.8374	(.3402) .6493	(-.1859) -.6078
Ratio of Federal Grants to General Revenue					(.3543) .1175	(.4261) .4823	(-.2296) -.6750	(.1559) .6017
Per Cent Increase in Population, 1930-1940						(.2926) -.1544	(-.6586) -.1174	(-.1785) -.0688
Per Cent of Labor Force Employed in Agriculture							(-.5168) -.7179	(.4237) .7232
Per Cent of Labor Force Employed in Manufacturing								(-.2906) -.6648

a. The simple correlation coefficient for 15 states is shown in parenthesis above the corresponding 48 state coefficient.

APPENDIX TABLE B

ZERO ORDER CORRELATION COEFFICIENTS[a] BETWEEN ALL POSSIBLE COMBINATIONS OF INDEPENDENT VARIABLES, 1962: FOR 48 STATES AND FOR 15 HIGH INCOME-HIGH DENSITY STATES

	Per Capita Income	Population Density	Per Cent Urban	Yield of a Representative Tax System	Federal Grants Ratio of to General Revenue
Per Capita Federal Grants	(-.0115) .0720	(-.3750) -.3690	-.0705 -.0058	(.3626) -.3082	(.6084) .6194
Per Capita Income		(.2509) .4460	(.0757) .1773	(.2846) .4281	(-.5253) -.5799
Population Density			(.6442) .0967	(-.2440) .2406	(-.2894) -.5180
Per Cent Urban				(.2628) -.0755	(-.0178) -.1425
Yield of a Representitive Tax System					(-.2501) -.5262
Ratio of Federal Grants to General Revenue					
Per Cent Increase in Population, 1950-60					
Per Cent of Families with Incomes less than $3,000					
Per Cent of Families with Incomes greater than $10,000					
Per Cent of Labor Force Employed in Agriculture					
Per Cent of Labor Force Employed in Manufacturing					

a. The simple correlation coefficient for 15 states is shown in parenthesis above the corresponding 48 state coefficient.

(TABLE B Continued)

Per Cent Increase in Population 1950-1960	Per Cent of Families with Incomes Under $3,000	Per Cent of Families with Incomes Over $10,000	Per Cent of Labor Force Employed in Agriculture	Per Cent of Labor Force Employed in Manufacturing	Per Cent Increase in Per Cent Urban, 1950-1960
(-.4531)	(-.0246)	(-.0233)	(.1978)	(-.3092)	(.1943)
.2679	-.0721	.0552	.1793	-.5723	.2081
(.5432)	(-.6495)	(.8549)	(-.2792)	(-.3742)	-.3534
.4401	-.8640	.9268	-.5481	.3035	-.4240
(-.2339)	(-.5222)	(.1474)	(-.6489)	(.2857)	(-.0197)
-.0206	-.4050	.4585	-.5125	.6230	-.3476
(-.4550)	(-.3826)	(-.0165)	(-.4838)	(.1812)	(.5936)
.4990	-.2556	.2414	-.2181	-.0460	.6456
(.1866)	(-.1122)	(.4155)	(-.0708)	(-.5346)	(.3384)
.1307	-.2973	.4851	-.3779	.3247	.1943
(.0169)	(.2525)	(0.5227)	(.0435)	(.1841)	(.1597)
-.2537	.4872	-.5612	.4349	-.5202	.3202
	(.2028)	(.6407)	(.1452)	(-.5346)	(.3402)
	-.3816	.5333	-.3880	-.1886	.2233
		(-.6837)	(.5680)	(-.0577)	(-.1996)
		-.8412	.5380	-.2795	.3899
			(-.1925)	(-.4895)	(-.0774)
			-.6079	.2824	-.2944
				(-.2374)	(.0103)
				-.6146	.2915
					(-.0234)
					-.4707