

EXPENDITURE RESPONSE OF LOCAL GOVERNMENT TO
EXTERNAL GRANTS-IN-AID

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PREFACE

This dissertation seeks to determine what effect outside grants-in-aid have on expenditure levels of major local government services. Since there is no control group of representative governments or some other prior standard with which to compare the empirical results, it was necessary to develop an "a priori" abstract theoretical model and then compare the actual response, generated statistically, with the response which was developed from abstract deductive inference. The theoretical model used assumptions common to microeconomic theory.

Five major functional expenditure areas were examined: Education, Highways, Public Welfare, Health, and Public Housing and Urban Renewal. In two functions, Highways, and Public Housing and Urban Renewal, the theoretical and empirical response were identical. In the remaining three functions, the severe fiscal problems associated with meeting expanding needs with limited local tax resources seemed to be the deciding factor which determined the actual response.

I would like to take this opportunity to express my appreciation for the assistance and guidance given me by the following members of my committee: Dr. Ansel Sharp, Dr. Robert Sandmeyer, Dr. Gerald Lage and Dr. John Franzmann. These men not only made many helpful comments in written form, but also met with me personally on a number of occasions to discuss many of the problems which I encountered during the research. In addition I would like to thank Mrs. Maria Nease for her typing excellence and my wife Marcia who helped in proofing all the revisions, and who gave her

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CHAPTER I

INTRODUCTION

Considerable research has been done in the field of public finance concerning the determinants of combined state-local government expenditures.¹ Investigations have also been undertaken to explain the variation in local government expenditures.² This study will concentrate on a topic closely related to expenditure determinants and variations in expenditures; namely the expenditure response of local governments to external grants-in-aid.

Expenditure response of local governments to external grants-in-aid may be explained in terms of stimulation and substitution effects. It is generally accepted that external aid has a stimulating effect when per capita local spending from local resources increases on a particular service as a result of an increase in per capita outside aid to that function, and it has a substituting effect when per capita local spending from local resources declines on a particular service as a result of an increase in per capita outside aid to that function.³ These generally accepted definitions of stimulation and substitution effects were used in this study although research concerned with expenditure response of the receiving government to outside grants has concentrated on the effect of federal aid on combined state-local government spending. This investigation focused on the response of local government spending, and more attention was devoted to state aid rather than federal aid as the external

source of funds. It should be noted, however, that where federal aid to states was redistributed by states to local governments, this aid was considered a component part of state aid.

That external grants play a significant role in the financing of various local functional activities was revealed by the data presented in Table I, which shows aid amounts extended to five functions that are specifically examined in this thesis. Local expenditures totaled nearly \$60 billion in 1967,⁴ and over one-third of this amount, \$20.7 billion, came from intergovernmental transfers (\$19 billion state and \$1.7 billion direct federal grants). The distribution of these outside aid revenues revealed that three functions received most of the intergovernmental funds. Over \$16.4 billion of the \$20.7 billion, or about 80% of total aid resources, went to Education, Highways, and Public Welfare activities. In the case of Health as well as Public Housing and Urban Renewal functions, much smaller local outlays were involved in absolute terms; however, the proportion of these functional expenditures financed with external funds was quite substantial.

Purpose of Thesis

Werner Hirsch, in a recent article, examined the various research efforts which attempted to explain the factors affecting expenditures of state and local governments. In connection with his examination he noted the following: "State and federal aid poses some interesting questions which these studies have not yet illuminated, i.e., whether federal and state subsidies are substituted for or supplements to local sources."⁵ An attempt to answer the question raised by Hirsch was the focus of this study. In other words, what is the expenditure response of local governments to external subsidies?

1967 EXPENDITURES AND INTERGOVERNMENTAL REVENUES (in millions)

	Total Local Expenditures	State Inter-governmental Revenue	Percent of State Inter-governmental Revenue	Direct Federal Inter-governmental Revenue	Percent of Federal Inter-governmental Revenue	Percent of All Aid to Expenditure
Education	\$27,000*	\$11,000*	40.7%	\$ 580	2.1%	42.8%
Highways	\$ 4,533	\$ 1,861	41.1%	\$ 33	.7%	41.8%
Public Welfare	\$ 3,958	\$ 2,897	67.3%	\$ 19	.5%	67.8%
Health	\$ 580	\$ 185	31.9%	\$ 16*	2.8%	34.7%
Public Housing and Urban Renewal	\$ 1,441	\$ 67	4.6%	\$ 667	46.3%	50.9%
Other Local General Expenses	\$22,010	\$ 2,990	13.5%	\$ 424	1.9%	15.4%
Total	\$59,522	\$19,000	31.9%	\$1,739	2.9%	34.8%

*Estimates are minor deviations from actual amounts in order to correct for inadequate data or expenditures associated with non-aided activities.

Source: U.S. Bureau of Census, "State Payments to Local Governments," Washington, 1967; and U.S. Bureau of Census, "Governmental Finances, 1966-67," Washington, 1968.

The expenditure response is of considerable importance to grantor agencies. Outside aid is extended in order to achieve economic and political objectives of external governments. Therefore, if the aid fails to elicit the desired response, the grantor would like to know the direction and possible magnitude of any expenditure deviation. For example, the subsidizing government may be anticipating a stimulation response, while the actual response becomes one of substitution.

In this writer's approach to the expenditure response question, the hypothetical responses were developed on an abstract theoretical basis as they emanated from the three broad classifications of aid: general non-matching, specific non-matching, and specific matching grants. Then, the empirical responses generated from a statistical analysis were estimated on leading functional activities.

Organization

Chapter II was an examination of the abstract theory of the expenditure response and a development of the hypothetical response associated with the main types of aid--these main aid types being general non-matching, specific non-matching, and specific matching grants. Chapter III contained the empirical tests of the expenditure response on major functional activities of local governments. These tests were performed in a statistical framework. In Chapter IV the primary theoretical and empirical implications of the research were summarized.

FOOTNOTES

¹The following works are of primary importance: Roy W. Bahl and Robert J. Saunders, "Determinants of Changes in State and Local Government Expenditures," National Tax Journal, Vol. XVIII (March, 1965), pp. 50-57; Solomon Fabricant, The Trend of Government Activity in the United States Since 1900, (National Bureau of Economic Research, 1952), Chapter 6; Glenn W. Fisher, "Determinants of State and Local Government Expenditure: A Preliminary Analysis," National Tax Journal, Vol. XVII (March, 1964), pp. 55-74; Ernest Kurnow, "Determinants of State and Local Expenditure Re-examined," National Tax Journal, Vol. XVI (September, 1963), pp. 252-255; Elliott R. Morss, "Some Thoughts on the Determinants of State and Local Expenditure," National Tax Journal, Vol. XIX (March, 1966), pp. 95-104; Seymour Sacks and Robert Harris, "The Determinants of State and Local Government Expenditures and Intergovernmental Flows of Funds," National Tax Journal, Vol. XVII (March, 1964), pp. 75-85.

²The following works are of primary importance: Robert F. Adams, "The Fiscal Response to Intergovernmental Transfers in Less Developed Areas of the United States," Review of Economics and Statistics, Vol. XLVIII (August, 1966), pp. 308-313; Harvey Brazier, City Expenditure in the United States, (National Bureau of Economic Research, 1959); Jerry Miner, Social and Economic Factors in Spending for Public Education, (Syracuse, 1963).

³See: Jack W. Osman, "The Dual Impact of Federal Aid on State and Local Government Expenditures," National Tax Journal, Vol. XIX (December, 1966), p. 362; David Smith, "The Response of State and Local Governments to Federal Grants," National Tax Journal, Vol. XXI (September, 1968), p. 354.

⁴1967 expenditure data is used since the Bureau of Census only produces a complete Census of Governments on five year intervals. The new Census will appear in 1973.

⁵Werner Hirsch, "The Supply of Urban Public Services," In Issues In Urban Economics, edited by Harvey S. Perloff and Lowden Wingo, Jr., (Washington: Resources for the Future, Inc.), 1968, pp. 500-501.

CHAPTER II

THEORETICAL EXPENDITURE RESPONSE OF LOCAL GOVERNMENT TO EXTERNAL AID

Analysis of the theoretical expenditure response of local government to external aid requires an understanding that the outside government will set the grant standards and that these standards will reflect the priorities of the subsidizing government. Grantor preferences may take into consideration the fiscal deficiencies of local community financing, and/or the spillover benefits of the local spending which accrue to outsiders. The communities, when making their expenditure decisions, do tend to ignore the external benefits inherent in certain public activities. They will spend up to the point where marginal local public costs equal marginal internal public benefits. The nation or state extending the aid may consider the local public output to be less than optimal when local governments operate under this self-interest maximizing condition. Therefore, the grantor state or central government would specify aid conditions which would attempt to induce a greater expenditure from recipient communities.¹ A matching grant is the type of aid usually offered to encourage an increased quantity of certain local services.

Even though the subsidizing government stipulates the grant conditions, the receiving government has the option of accepting or rejecting the aid. If it accepts the subsidy, it does so with the intention of improving its welfare position. Yet, in order to introduce

the preference patterns of local governments into a theoretical framework of expenditure response, one must take into consideration how the local expenditure decision is determined.

This decision involves a political process, and it is assumed that local officeholders will try to carry out the spending programs that will assure them the largest number of votes.² Even though the individuals in a community would have differing demands for public goods and for particular aided goods, they do make these demands known to public officials through the regular voting process and through personal contact with local authorities. Mayors, councilmen, school board members--whoever the decision makers might be--are continually trying to determine and interpret the will of the dominant voting blocs in their jurisdiction. By this process, the officials in the community develop their perception of a community welfare function which they feel fairly represents the welfare of the community. To the extent that the authorities make acceptable decisions consistent with dominant voter preferences, they continue to remain in office. If the citizens disagree with the local officials, these officials may be voted out of office at the next election.³

The indifference curves used in this study do not represent the true preference map of all the citizens. This map is not the actual social welfare function of the community, because there is no acceptable method of aggregating voter preferences without resorting to interpersonal utility comparisons. Instead, the writer substituted the preferences of the governing body as a proxy for community preferences. It is the governing authorities' welfare function that is being maximized as they adjust to various aid arrangements. Utilization of this technique does not entirely avoid the preference aggregation problem, as the governing

body often has more than one decision making participant.⁴ This fundamental difficulty cannot be eliminated. Nevertheless, it is beneficial to use indifference curves, and a conceptual welfare function in examining the response to subsidies which act to augment local budgets or to cheapen the price of public goods purchased by local governments.

Even though the analysis adheres to the fundamental assumption of local officials' acting in the best interests of their constituents, exceptions to this could occur in the "real world." Local officials guided by community self-interest in making grant decisions might be thwarted by special interest groups demanding another solution. Also, it is possible that the authorized local decision makers might take a "broad" view concerning programs subsidized by aid which could encompass the spillover benefit objectives of the grantor agency. In this situation, aided activities could be expanded beyond the level predicted by a model that ignored external interests. And finally, there is the possibility that the necessary information about community needs is lacking, and this could lead to inaccurate welfare adjustments.⁵ The final result could be a non-optimal resource allocation. It should be noted, however, that one of the general assumptions in this study is the presumption of perfect knowledge on the part of local authorities that would disallow the "bad" decision to occur in the theoretical model.

Classification of Aid

Aid may be classified in several ways: by its functional distribution (education, highways, welfare, for example),⁶ by administrative procedures in its distribution--e.g., formula grants which are approved by administrative decisions, or by a process which classifies

grants by conditions associated with their use.⁷ The theory presented in this chapter uses the latter classification.

In grouping grants by conditions surrounding their use, virtually all aid could be included in the following categories:

1. General Non-Matching Grants. This is a grant that is given to local governments with no strings attached. It is an external addition to local income which the recipient can spend as it chooses. Many forms of shared taxes would also fall in this grouping.

2. Specific Non-Matching Grants. This is a conditional type grant (sometimes called "bloc grants")⁸ which differs from general non-matching aid on the basis that the grantor government specifies how the aid must be spent. Generally, the restrictions take the form of a stipulation that the funds must be directed toward a particular activity. Some shared taxes might be included here if the upper level government required the returned tax receipts to be allocated to a specific activity.

3. Specific Matching Grants. Aid of this type is not only restricted to a specific program, but the grantor requires the local government to put up a portion of the total amount expended on the project from its own internal tax sources.

A further sub-classification of the three broad grant categories can be made by dividing the subsidies into "open-end" and "closed-end" aid. The "open-end" aid is a grant given without any expenditure limits. Public Welfare is an example of "open-end" aid. Functional spending here depends on the number of recipients needing help, and the level of assistance which is decided upon by the local administering authority. Because of these contingencies, Congress has not set a statutory limit on this aid.⁹ The "closed-end" grant, such as the Federal Special Milk

Program,¹⁰ has a ceiling on the subsidy which is set by Congress for each individual state. While conceptually there are theoretical differences between "open-end" and "closed-end" aid, the "closed-end" grant is by far the most common. In this study differences will be discussed between both types of subsidies as the theoretical model is set forth.

General Assumptions

For the purposes of this investigation the following general assumptions are:

1. There is perfect knowledge on the part of all economic agents. This assumed that nothing will hamper the decisions of governmental authorities in their response to aid. Given all the factors, the decision response to aid will result in a movement that will maximize the welfare of the citizens, to the extent that authorities recognize this welfare.
2. The indifference curves are normally shaped. In graphical analysis, they are depicted as sloping downward toward the right, and they are convex to the origin. Not only is substitutability implied, but the substitution rate declines as more of the aided good is consumed.
3. Local taxes necessary to finance local public expenditures are included in the community income restraint. As the trade-offs are examined from the subsequent graphs, the vertical axis, called Y, will include public spending on all other public goods plus all private spending. The Y good is actually community income for all other uses. Good X, to be shown on the horizontal axis, represents the aided good or service. An increase in expenditures on X might involve an increase in local tax burdens to finance the expenditure. This implies a decline in

private spending or a decline in expenditures on other public goods, or even a combination of increased taxing and reduced spending on other public commodities. Conversely, a reduction in expenditure on X implies a possibility of tax relief, and/or increased expenditure on other public services.

4. Local governments are assumed to operate with balanced budgets. Consequently, debt financing is excluded from the analysis. This simplifies the theory and is not too unrealistic. In fact, many states often prohibit borrowing in excess of anticipated revenues to finance current expenditures.

5. A "tax illusion" is assumed to exist. This means local governments do not include the disutility of any increase in taxes paid by the local citizens to the grantor government which may be necessary in order to finance the grants.¹¹ If the people were taxed in a manner proportional to the grant received, disregarding any redistribution effects, then it could be argued that aid would shift the budget line outward while the external tax would shift the restraint line back to its original position. No response would be forthcoming from the local community. However, if the citizens and the local officials who represent them take outside taxes as given (i.e., the taxes from external governments are predetermined and unidentifiable with the specific grant), then the taxpayer and his decision proxy, the local officials, may make adjustments concentrating primarily on local benefits and consider tax burdens as unchanged.¹²

6. Tastes and preferences are assumed to be constant. This indicates that the indifference curves do not change shape as grants are received. It does not mean that all curves are identically shaped or equidistant from each other as they are placed on the utility surface.

7. The aided public goods are assumed to be normal goods. This implies that increases in community income, either from external or internal sources, would be used to expand all local government activities. This assumption should not be taken to mean that discrete and separate tax or expenditure decisions cannot occur. It is possible for the community to increase taxes and apply the entire tax increase to one functional activity. However, when all separate tax and expenditure decisions are aggregated, it is anticipated that a variety of government services would show increased output.

General Non-Matching Grants

The analysis for a non-matching grant which contains no expenditure restriction is the least complicated of all grants to describe. If it is assumed as in Figure 1, that the local community is in initial equilibrium at point L prior to aid, it would be consuming OX_1 of X and OY_1 , in dollars of all other goods. Now, a grant is received from the overlying government of AB dollars, shifting the community income line outward to BB' . Since none of the goods available to the receiving government are inferior (see Assumption 7), this type of grant, being an income subsidy without strings attached, allows the community to spend as it chooses. This should result in an increase in the consumption of both X and Y. The representative income-consumption line, OO' , shows that funds from this type of grant are divided between the aided good and all other alternatives. The subsidy permits the local community to move along its actual income-consumption expansion path to a higher indifference curve, and in so doing, the aid will effectively maximize the welfare of the locality. This form of aid is expected to bring forth the substitution

expenditure response, since the recipient community can spread these external funds to a variety of public services rather than spending them all on one particular function.

Since these grants provide the ultimate in expenditure flexibility to local authorities, they are not designed to encourage the localities to direct their spending toward programs that have large external spill-over benefits. Therefore, only small amounts of this aid are extended to local governments as compared to grants that put restrictions on the aid. In 1967, \$1.5 billion was provided for general support, and this was merely 2.5% of total state intergovernmental expenditures.¹³

Specific Non-Matching Grants

Income subsidies are sometimes made available to local governments on condition that the funds must be used to purchase quantities of a specific public commodity. An excellent example of this type subsidy is federal impact aid to local school districts. These funds were given to compensate local communities for the presence of large scale tax exempt federal activities in the area.¹⁴ Since this aid does not require any matching on the part of the recipient government it may be possible to substitute these external funds for local resources and redirect current spending toward other alternatives, which of course might also include the X program. Therefore, the initial equilibrium position of the local community prior to aid is of considerable importance in determining the extent to which substitution of outside funds for internal resources can occur.

To examine the phenomena, one may assume that the local government is consuming OX_1 of X and OY_1 of other alternatives in the absence of aid

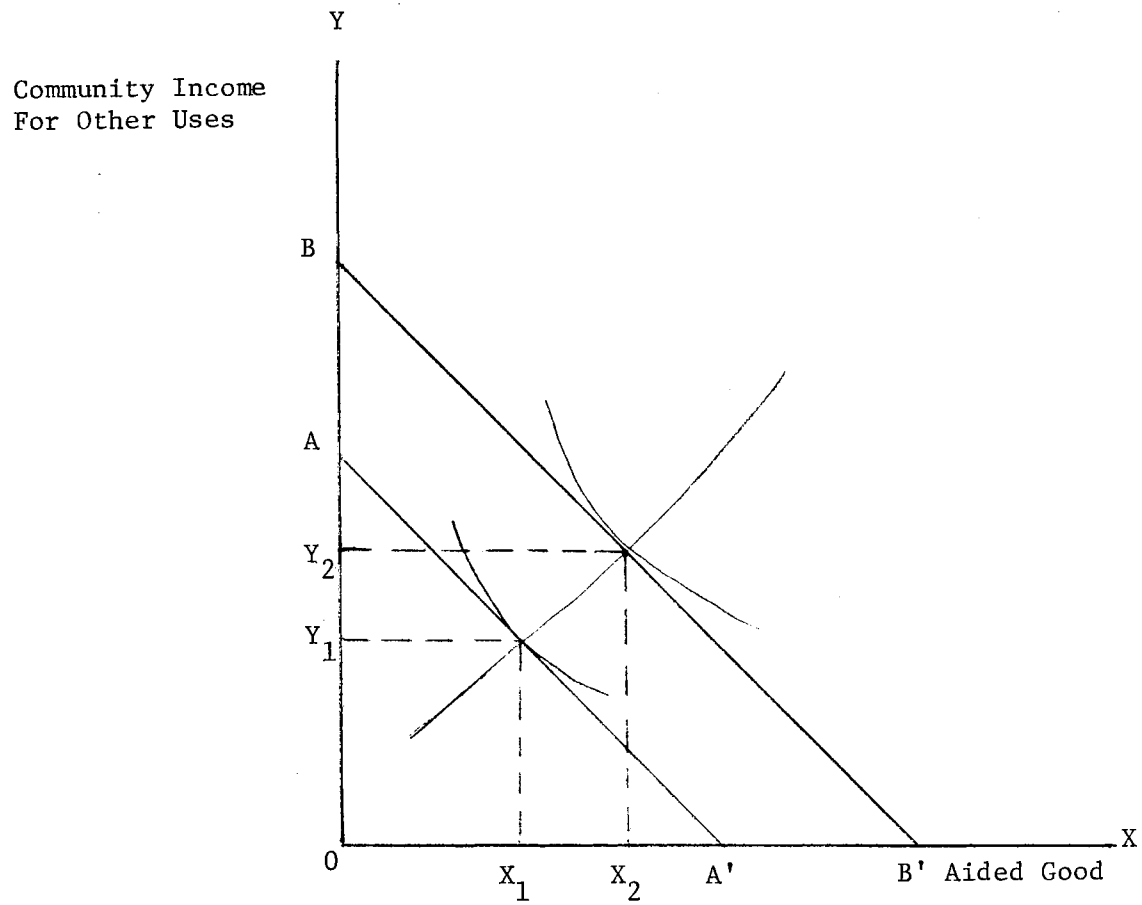


Figure 1. General Non-Matching Grant

(see Figure 2). Then, the grantor government offers a specific non-matching grant, AB (this is "closed-end" aid in the sense that no purchases of X with outside funds can be made in excess of A'B') which must be spent entirely on X. Since the aid does not change the effective price per unit of the public good, for units in excess of AG units, the new budget restriction becomes AGB'. This implies that all governments presently consuming X in excess of the minimum AG could look on the subsidy as an external addition to income. The local government which started at point L would move to position M. In this case the grant is generating a simple income effect, so that the receipt of aid, AB, releases an equal amount of internal funds, which is then allocated between all alternative public activities including good X. The actual expenditure response would be one of substitution. A response which is identical to the one shown for general non-matching aid.

Two qualifications to the above result should be noted. One relates to a situation where the community uses none of its own funds to purchase the public good (an initial equilibrium at point A). In this instance, since it is necessary to spend at least the grant funds on X, there could be no leakage of grant funds to pay for other local activities.¹⁵ If a local government were consuming zero quantities of the aided commodity, it would consider the subsidy as a "free gift" of the X commodity. In this circumstance the grant would be generating a neutral expenditure response.

The second qualification would be in regard to a subsidy that is quite large relative to current expenditures on X. For example, if aid in the amount of AC is given, the restraint line becomes ANC'. The portion of the AC grant that provides AN units of X commodity could be

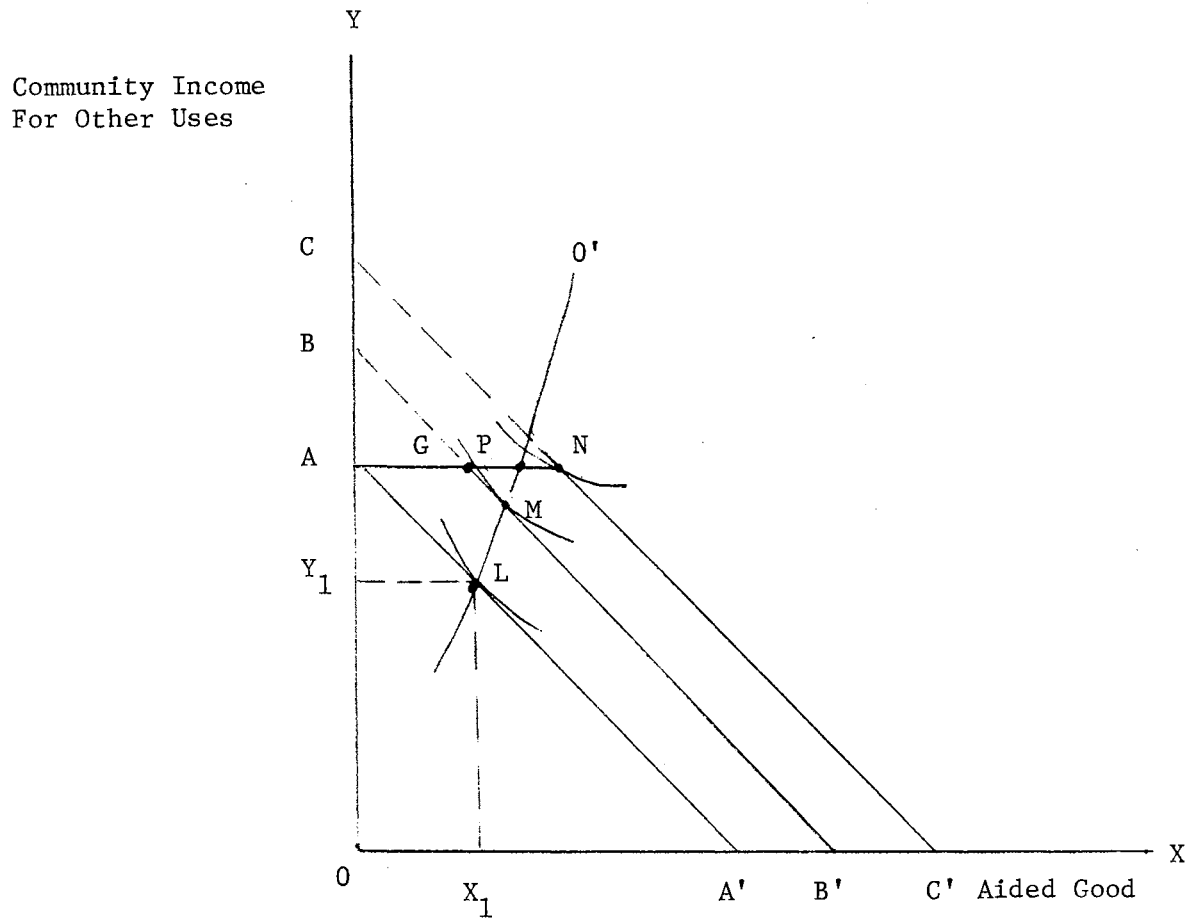


Figure 2. Specific Non-Matching Grant

considered an income subsidy in the sense that it releases local funds in the amount AY_1 to be spent as the community chooses. If Assumption 7, that an addition to income is allocated to all available alternatives, is accepted, the result would be that spending on X and Y would both increase. The income effect of the aid would dictate a position at P (assuming initial equilibrium at L); yet, the "free gift" effect of aid would not be fully exhausted. If more X can be consumed at a zero price, up to the limits of the grant, then the local community would continue to consume X out to point N.

The movement from point L to point N implies an expenditure response of substitution, the same response as was initially illustrated. Actually, this latter case is dependent on the grant's being quite large in relation to current local spending on X and, also, on the likelihood of the local government's having a low marginal propensity to consume X (steep OO' income-consumption line).¹⁶

While specific non-matching aid will usually generate expenditure responses similar to general support grants, these subsidies can often be used to encourage certain desired practices. For example, the external government may make the aid contingent on the recipient community adopting special budgetary and planning procedures. In other words, the aid may act to induce local authorities to become better fiscal managers.¹⁷

Specific Matching Grants

Grants of this type are designed to encourage increased local spending on certain goods and services to obtain the external benefits associated with these commodities. Local governments, when making their expenditure decisions, tend to ignore the external benefits that may be

derived from the public program; so matching funds are offered by the external government in order to insure a more optimum level of the local service. If grants are to be extended in an ideal fashion, then those programs which have greater spillover benefits should be funded with a larger proportion of grant monies.

External subsidies of the matching type appear as a price change in the eyes of the local decision makers. Even though the price paid to the producers of the good does not actually change, the situation is analogous to a price change in the sense that the local community can purchase more of the aided commodity with the same outlay from internal sources than could otherwise be purchased.¹⁸ The matching subsidy acts to lower the relative cost of implementing a specific program, and this enhances the attractiveness of the program to the local government.¹⁹ This attractiveness is based on the overall price (cost) effect. The price (cost) effect is divided into a substitution effect which makes the price of X lower relative to the prices of other alternatives, thereby causing more X to be consumed;²⁰ and a real income effect which causes the community to purchase more of all available services, including X, as the average price of all programs are lowered when the price of one program declines.

Translation of the above effects into the probable expenditure response of local governments necessitates knowledge of the level of expenditure on the aided good prior to the grant, the elasticity of demand for the subject commodity, and any special restrictions on the aid which would tend to force the aid response in a predetermined direction. It will be shown later in the chapter that the responses can differ if the local community is not consuming any of the good, from the

one that might result if positive quantities of the commodity are being consumed prior to the aid. Sometimes the grant might require a minimum effort before matching funds become available. A restriction in this form might be the most important factor in the determination of whether a stimulation or substitution response would be forthcoming. Finally, demand elasticities can be quite important. If demand is elastic, this would imply that local government expenditure from own sources would be increasing (this is the stimulation expenditure response), while an inelastic demand would indicate that local outlay from internal sources is declining (a substitution expenditure response). Although little research has been conducted on demand elasticities, Mark Haskell explained the forces that might influence elasticities and David Smith attempted to determine, statistically, whether demand for an aided activity was price elastic.²¹

Haskell perceived the following as influencing the elasticity of demand:

1. States which spend a large portion of their budgets on the aided good would be presumed to have an elastic demand for the commodity. The idea here comes from "consumer demand theory" which indicates that demand for goods which take a large portion of consumer income is more likely to be elastic than for those goods which consume little of a purchaser's income.²²

2. For normal goods (these are the ones examined in this thesis) the demand for governmental services is an increasing function of per capita income. The higher the level of the income of its citizens, the more likely that a local government would take a larger quantity of the specified good after a given price reduction. Solomon Fabricant, who

wrote somewhat earlier on this matter, seems to recognize the existence of the high income phenomena--i.e., the marginal valuation of governmental services to a community may increase as the income per resident increases.²³

3. Elasticity of demand may vary with philosophical views concerning the role of government. A community which is composed of residents with "individualistic" notions of local government may prefer to work out their own programs. Demand for goods, aided externally, might be more inelastic. On the other hand, those localities which have a greater number of "welfare state" oriented persons might be willing to take a larger quantity of subsidized goods for a given price reduction.

David Smith conducted a study with the avowed purpose of measuring the elasticity of demand for federally aided commodities. This research produced elasticity estimates for per capita state-local functional expenditures on Education, Highway, Public Welfare, and Health and Hospital activities. Using multiple regression techniques, and federal aid as a proxy for price reductions, Smith regressed per capita state-local spending, generated from internal revenue sources, in each of the above functions on per capita federal aid to that function. Other relevant variables were also included. The equation was converted to log form so as to directly compute the elasticity coefficients. These elasticity parameters indicated that demand for Education is completely price inelastic, while Highway and Public Welfare demands were highly inelastic. The Health and Hospital coefficient was negative which, according to Smith, implied inelasticity. Smith took the position that matching grants are designed to stimulate local effort from own sources on aided goods and, therefore, that elasticity studies should show a

stimulation response--i.e., expenditures from internal sources should increase. The fact that his coefficients showed the demands to be price inelastic indicated that substitution was taking place, and expenditures from own sources was declining.

By failing to include the federal aid in the dependent variable, and then regressing total per capita state-local expenditures on federal aid, Smith systematically biased his coefficients downward by exactly one.²⁴ This resulted in the interpretation that functional demands were inelastic. Since per capita federal aid is the proxy for the price effect, it must be included in the dependent variable to trace its impact on spending. If it is included then the coefficients will increase by one, and the conclusion would be that demands for the aided services are actually price elastic. For some reason there is a dearth of research on estimating elasticities on grant aided goods. This is doubly surprising when one considers the importance that demand elasticities play in the theory of expenditure response to intergovernmental aid.

In this study, geometric analysis on several types of matching grants will be shown as some of the matching forms are more common to one functional activity than to another. In an effort to simplify the exposition it will be assumed throughout that the aid response is the one that occurs in the initial period. In other words, beginning equilibrium is shown in the absence of aid (all expenditures are financed internally), and the final equilibrium is depicted with the aid included. This technique allows the theoretician to concentrate on the basic aid response. But in dealing empirically with the subject, data from later time periods are often used because it is more readily available. This would, in no wise, negate the theoretical conclusions, but the investigator would need to consider this fact when comparing theoretical and empirical results.

Simple Matching Case

The simple matching case, of the "open-end" variety, is shown in Figure 3. With initial equilibrium at R, a matching grant is made available for the X commodity. This aid reduces the apparent price of X and rotates the local budget restraint from AA' to AA". If demand is price inelastic, a movement from X_1Y_1 to X_2Y_2 would illustrate the local government response and put the new equilibrium at point S. A demand that is price elastic would put the community at a point like S'. At either equilibrium position the local government welfare is being maximized. An inelastic demand is synonymous with the substitution response and since an elastic demand implies the stimulation response, the actual expenditure response for the functional activity would depend on the dominant elasticity for all local governments.²⁵ With so many communities suffering fiscal deficiencies due to limited tax bases, fear of taxpayer flight, and rapidly rising service demands, it may be more likely that local governments would seek aids to reduce this fiscal gap or expand service levels with outside funds.²⁶

On the surface it would seem that most aid recipients would settle for some position between V and U, a substitution or neutral response, because of the aforementioned problems in local financing. Of course, an hypothesis of this type must be tested empirically. Because the outside governments will usually permit the grantee to use internal funds currently being spent on the aided good to meet the local matching portion of the grant, the community could continue spending AY_1 on X and receive RU aid thereby increasing service levels (Y_1R+RU), or the community could maintain an OX_1 service level and allow the external funds to fully substitute for local effort.²⁷ Point S is a compromise position which

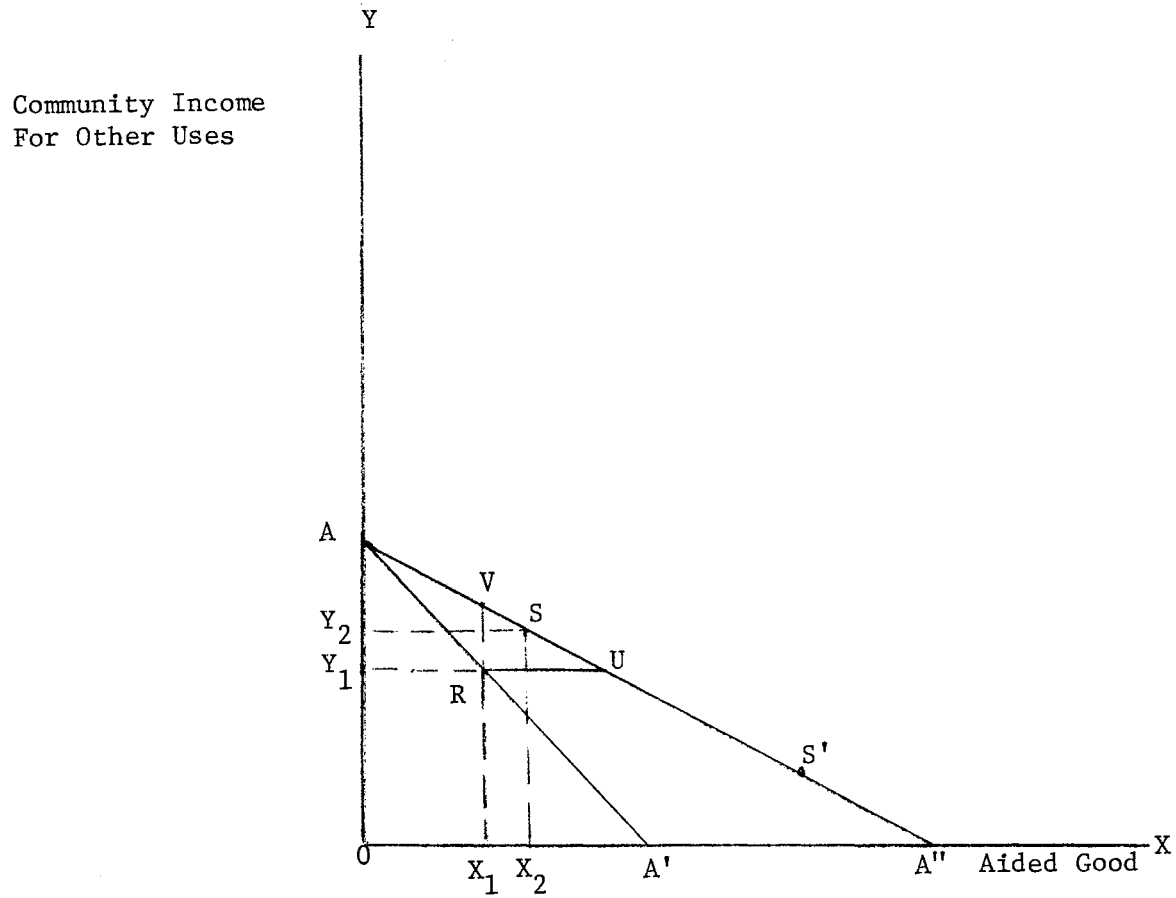


Figure 3. Simple Matching Grant (Open-End)

emphasizes the stimulating qualities of the combined income and substitution effect of the cost reduction associated with the outside subsidy.

Rather than offer the aid in an "open-ended" fashion, which allows the receiving government to devote all its income to X consumption, the grantor will often set a limit on the aid--for example, the amount AB as shown in Figure 4. This would be a "closed-end" matching grant; and as depicted, the amount of outside aid is so restricted that community demands which are highly price elastic would receive subsidies only out to point U on the AUB' budget line. Of course, those localities with highly inelastic demands may not be affected by the limitation put on aid. They could move to a position like S, and their expenditure response would be identical to which it would have been under the "open-end" matching arrangement in Figure 3.

The "closed-end" grant does present a problem for the empirical researcher who is attempting to relate demand elasticities to substitution-stimulation responses. The actual data may show that substitution is occurring, thereby implying that demands are inelastic when in reality the premature cut-off of aid funds prevents a stimulation expenditure response. Closing off the aid would result in a "second-best" solution in terms of welfare maximization for those governments preferring greater quantities of X under the new subsidized cost ratio than can be obtained with the limited amount of external funds. In the graph, a corner solution is shown for communities having elastic demands for X (preferences at S'). They would move to point U where the indifference curve would intersect the corner of the budget constraint.

Matching aid is sometimes made available for separate and specific projects, and this aid is referred to as Project Aid. For example,

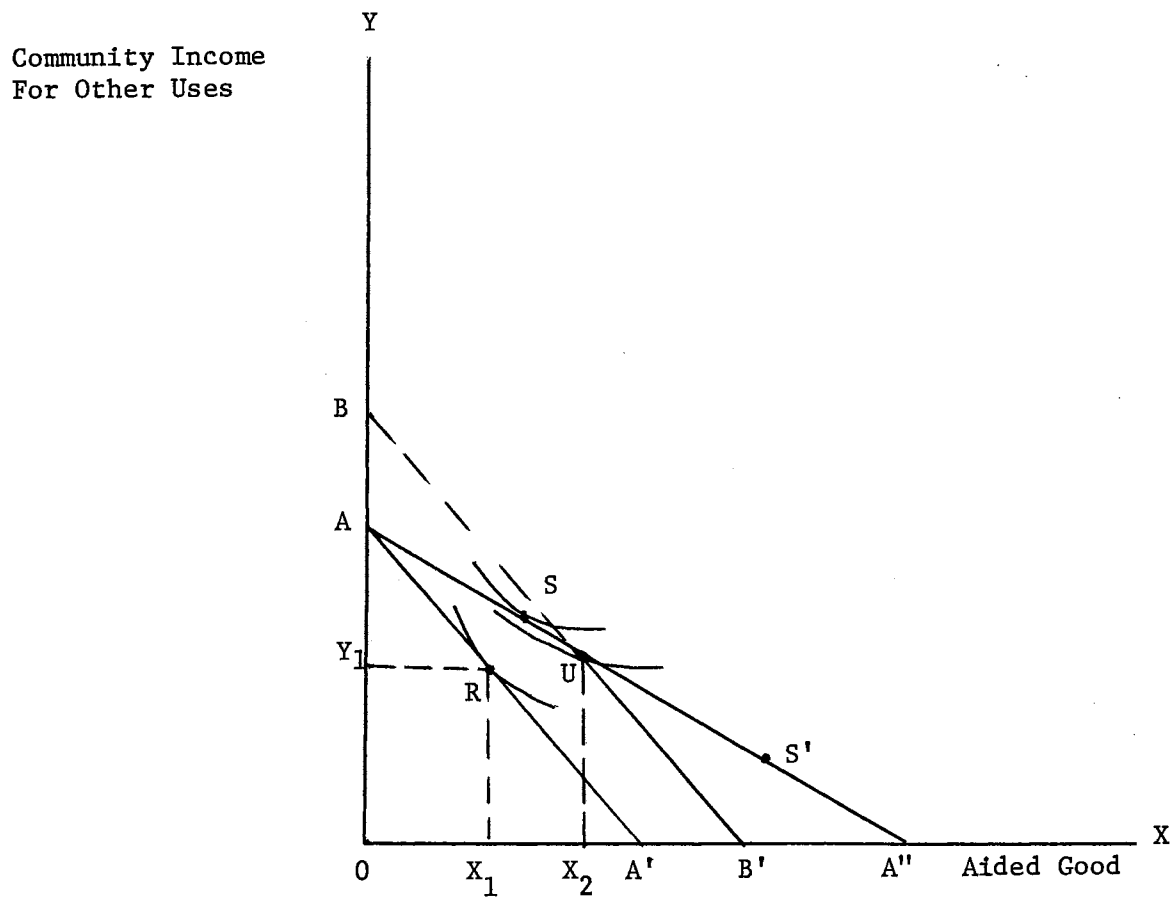


Figure 4. Simple Matching (Closed-End)

Urban Renewal and Public Housing grants are generally offered subject to grantor approval of local government proposed programs. Congress annually appropriates the funds for Urban Renewal and Public Housing functional aid, then the Department of Housing and Urban Development administers the grants on a matching basis for the approved projects throughout the nation.²⁸ Many communities do not fund these activities at all, while others only provide in their budgets a very low level of expenditure. In fact, to properly depict the expenditure response to this form of aid it is better to show the local community in pre-grant equilibrium at a position of zero consumption. A typical graphical presentation is shown in Figure 5.

In the absence of aid, the local community would be in equilibrium at point A, consuming zero quantities of aided commodity X. The cost ratio between X and other alternative programs is shown by the slope of the line AA'. Starting at point A does indicate a lack of interest on the part of the local community to support X entirely from own resources. However when aid is made available, special interest groups may be strong enough to get the local government to reconsider its position and submit a request for project funding. If the overall project size is equal to OX_2 , and the grant is 50-50 matching (slope of AB' would be one-half the slope of AA') then the recipient community would put up AY_1 funds from internal sources to purchase OX_1 and would receive external aid which would be used to buy X_1X_2 of X. The result is a strong stimulation expenditure response due to the fact that the community was at a zero consumption level of X prior to the aid.

The simple matching grant will lead local governments to consume a larger quantity of the aided good than would be the case if they were to

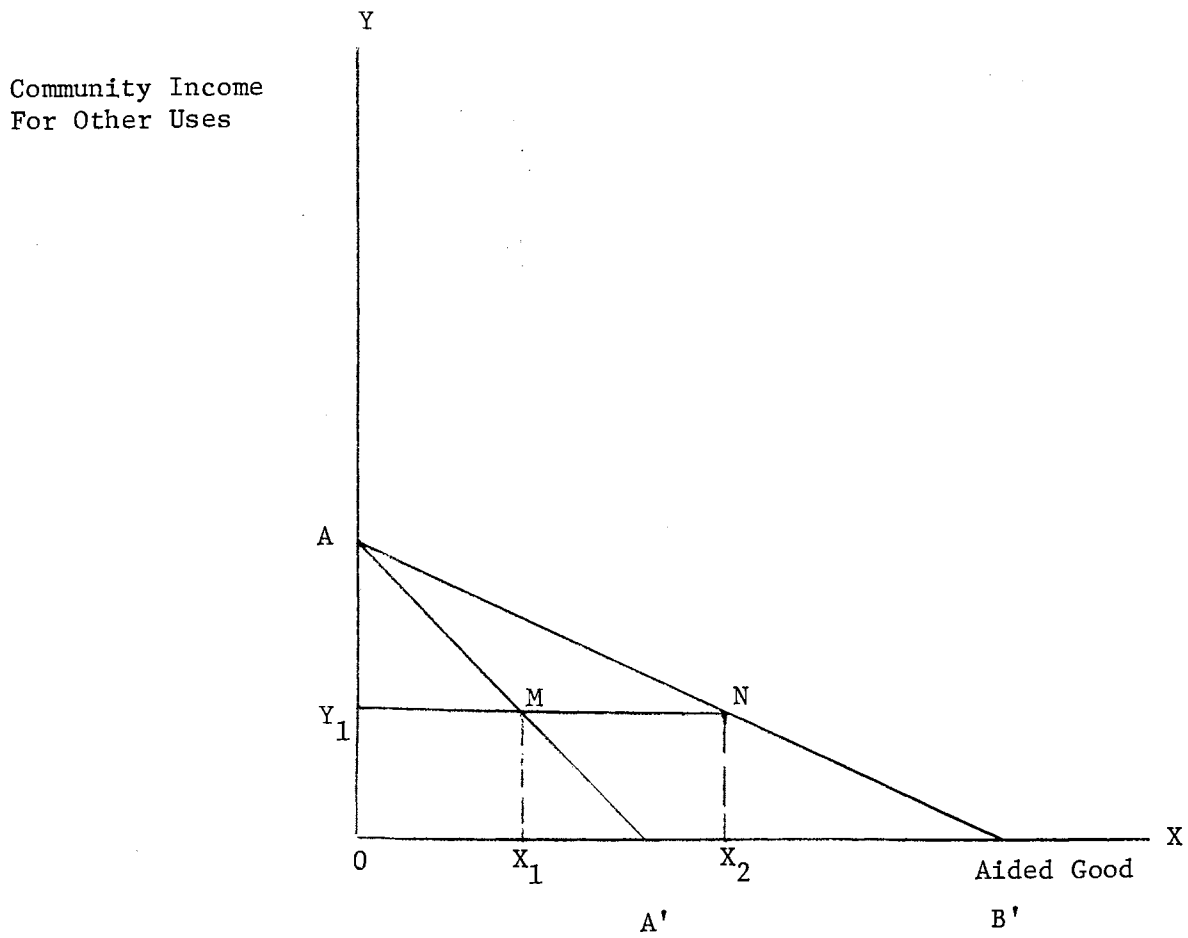


Figure 5. Project Aid

receive aid of an equal dollar amount in the form of a general non-matching or specific non-matching grant. In order to illustrate this point consider Figure 6. Suppose the initial point of equilibrium is depicted by point Q. As the result of a 50-50 matching grant, the budget line rotates to AA". Assume that the local government moves to a new equilibrium at point S. The increase in consumption of the aided good, from OX_1 to OX_3 is the result of the combined income and substitution effect. The income effect can be isolated by assuming a non-matching grant of equal size, distance AB in Figure 6, had been made in lieu of the matching grant. After the grant the local government would now be in equilibrium at some point like T. This means that the local government increases consumption of the aided good from OX_1 to OX_2 , and this is due entirely to the income effect. The remainder of the expansion in consumption of the aided good, OX_2 to OX_3 , has to be the result of the substitution effect which is present in the case of matching but absent in the case of non-matching grants.

Foundation Aid

Another form of matching aid which is used quite extensively for public school financing is an arrangement whereby the state requires the school district to put forth a fixed fiscal effort before the subsidy becomes available. The external grant would actually be the difference between the minimum level of per pupil expenditure, decreed by statute, and the per capita educational revenues furnished by the local government. The expenditure effort on the part of the local jurisdiction is often circumscribed by state laws. A common practice is to specify that a certain millage rate must be applied to the local property tax base and

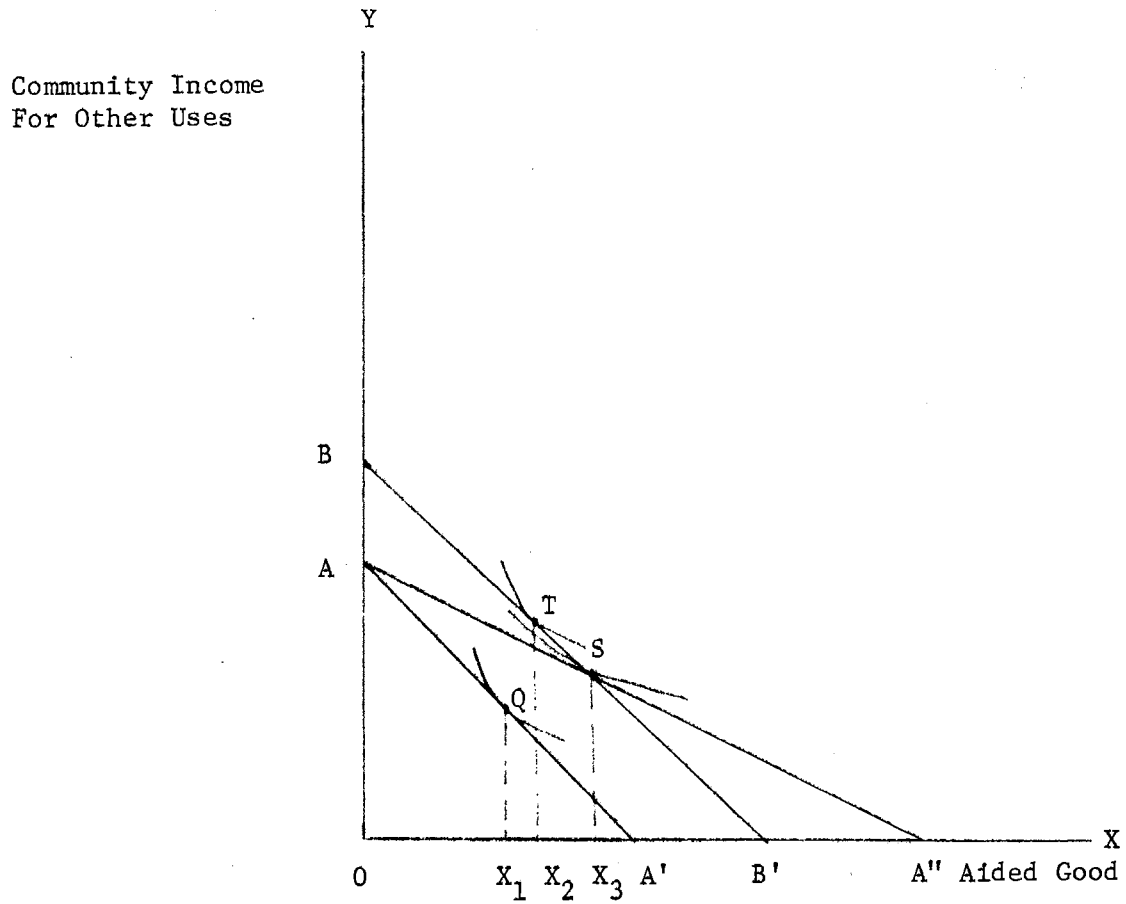


Figure 6. Comparison of Full Price Effect and the Income Effect

the resulting revenues mandated to public schools, before a local community is eligible for foundation aid. Since foundation aid seeks to secure a minimum level of education expenditures for all pupils, aid formulas containing foundation grants are found in every state of the union.

As indicated in Figure 7, a community with very limited resources would most likely consume some quantity of X like OX_1 . This would be below the minimum fiscal effort, OX_2 , required of the community for aid eligibility. In order to receive aid, the local government must spend Y_1Y_2 additional on X. Then the state will provide aid necessary to bring the education level up to the statutory minimum. This minimum is represented by unit level OX_3 , with the state providing resources to purchase X_2X_3 . A total budget restraint is traced out by the line $AMNB'$. Note that line segment NB' is parallel to initial budget line AA' , indicating that no further matching is available beyond OX_3 . A variation of this approach is sometimes used to make available additional matching funds. In this situation, the slope of the NB' line would decline and follow a less steep path like NB'' (resultant slope of NB'' would indicate the matching ratio).

While the above analysis is correct for those local communities with serious resource deficiencies, most of the recipients would likely have adequate resources that permit educational expenditures substantially in excess of the statutory minimum. These communities would tend to view the grants similar to an external income subsidy, since no additional local effort is required to receive the aid. If in Figure 7 it was assumed that beginning equilibrium is to the right of the minimum specified level of OX_3 (for example, at OX_4) then the outside grant,

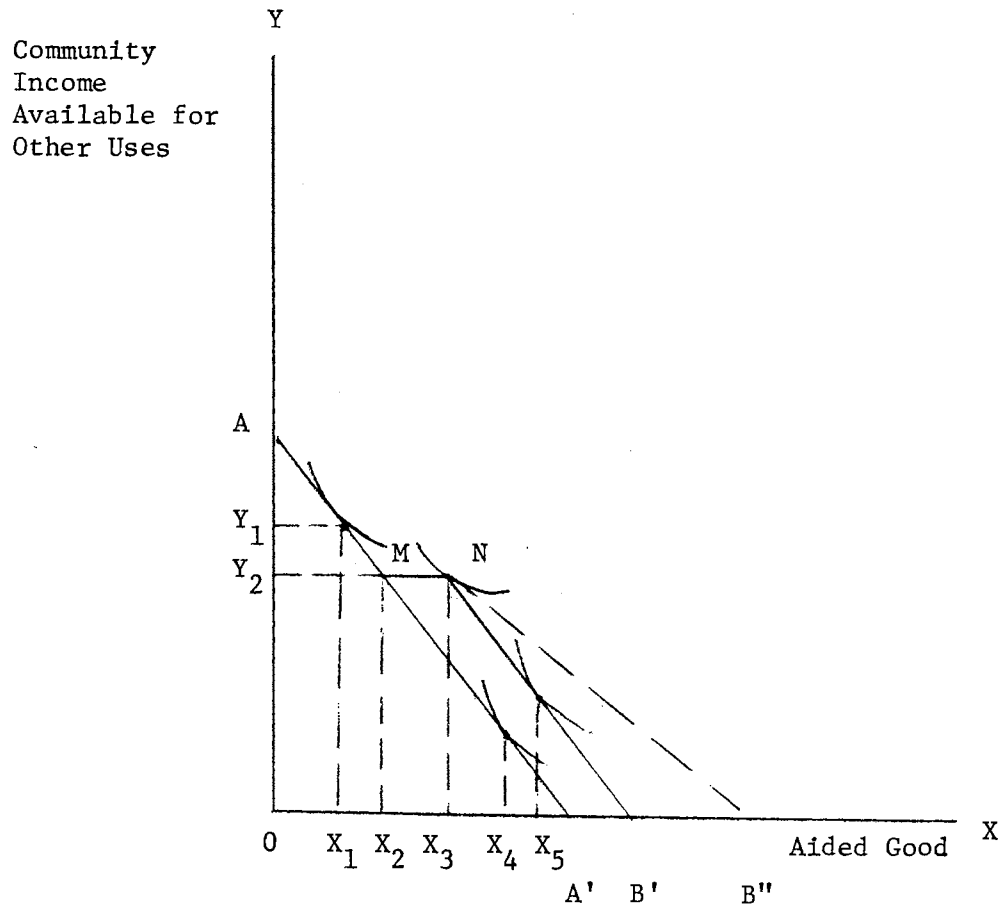


Figure 7. Foundation Aid

which provides MN of X from external sources would release local funds currently spent on X, and they could be reallocated as the local community chooses. A likely new equilibrium position for this representative government could exist at OX_5 , given the overall budget constraint of AMNB'. The final solution in this case is similar to those predicted for general and specific non-matching aid--i.e., an expenditure response of substitution.³⁰

While the latter analysis indicates that the substitution response would occur for the majority of those receiving education aid,³¹ a stimulation response would be expected in the case of resource-poor communities which started at OX_1 . Price elasticity of demand would not be a factor with this form of matching aid. Actually, the matching amounts are determined by the community's resource level and the state laws' dictating how much of the resources must be devoted to the public good.

Minimum Support Level Aid

A type of aid very similar to Foundation Aid is a grant that also sets forth a minimum local effort on the part of recipient governments before the external government will release matching funds. With Foundation Aid, the outside government supplies a lump sum amount to match local government spending and thereby guarantees that all residents receive a minimum uniform amount of the public commodity (this quantity is OX_3 in Figure 7). However, with Minimum Support Level Aid the emphasis is on the minimum amount of the service that the local community must supply from its own resources in order to be eligible for outside assistance. In other words, the overall total level of public service

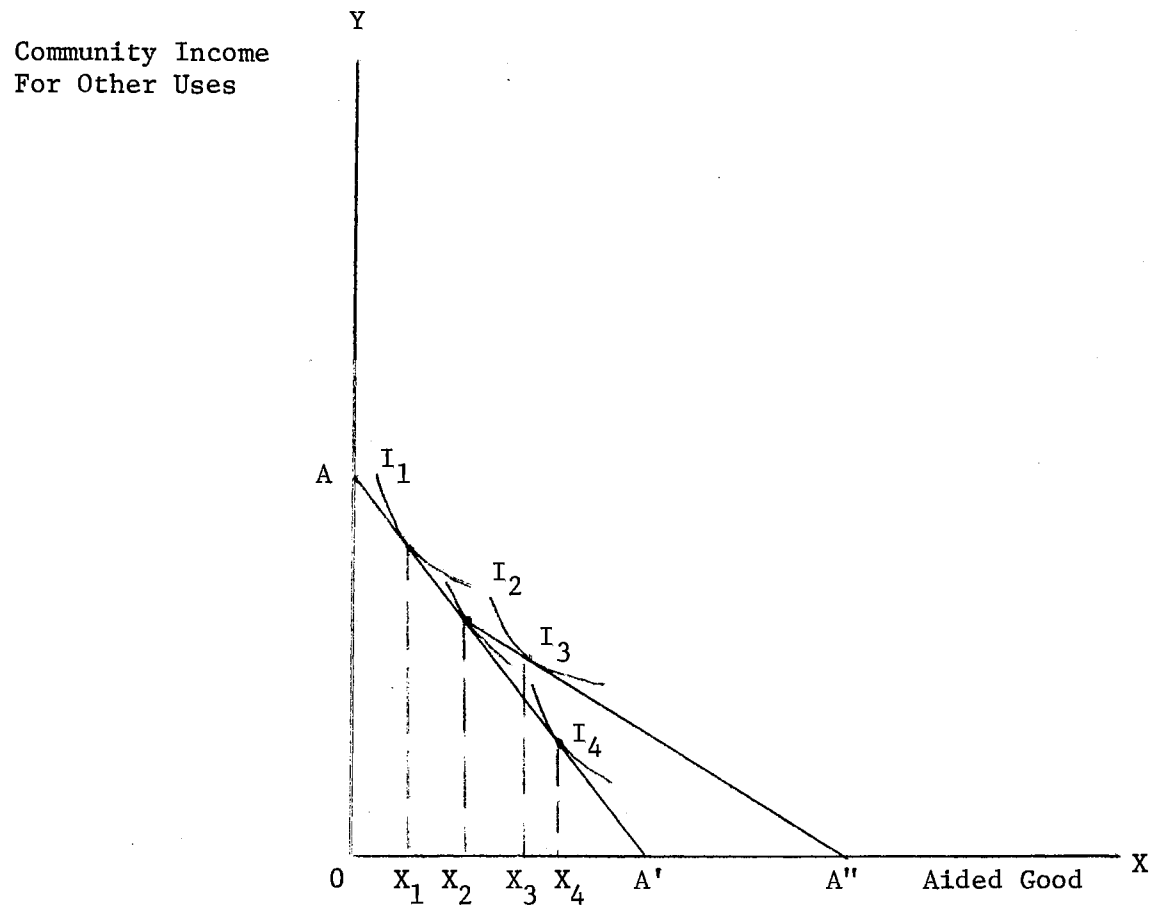


Figure 8. Minimum Support Level Aid

is not specified, as in Foundation Aid, but only the level where the external government will begin to offer matching funds.

Actually, the pre-grant level of expenditure has a strong bearing on the final expenditure response to Minimum Support Level Aid so the graphical analysis will outline several possibilities. The first case, shown in Figure 8, is where the local government is in initial equilibrium at OX_1 , and the minimum support level is specified at OX_2 . Beyond this level the outside government is offering matching funds on a 50-50 basis, as indicated by the slope of line RA'' being one-half the slope of line segment RA' . Since the local community is consuming less than the minimum service level it will have to expand outlay from its own resources to the amount OX_2 before it receives any grant funds. It must be noted that the community in question is on indifference curve I_1 and it would be moving to a lower level of community welfare if it increased spending on X to the OX_2 level. Even if the community accepted some grant funds, and, for example, moved to level OX_3 , the indifference curve, I_3 , tangent to the budget restraint at this level is still below curve I_1 which indicates the recipient would suffer some loss in overall community satisfaction by accepting aid. Actually, the local government would be better off by refusing the aid and remaining at service level OX_1 . It is likely that the above description is somewhat representative of those communities in our nation that do turn down outside aid.

In the second case, the local community might be consuming X at the minimum support level of OX_2 and an improvement in recipient welfare would occur by accepting outside funds. If the local government moved to OX_3 of X (grantee and grantor are each providing one-half of the funds necessary to purchase X_2X_3) then this would be a movement up

from the I_2 to the I_3 indifference curve and a subsequent increase in welfare.

In the third and final situation, the local government may be in pre-grant equilibrium beyond the minimum support level of aid (OX_2), say, at OX_4 . Depending on the price elasticity of demand, the grantee community would move to a position of the RA" line which would provide a quantity of the X good equal to or greater than OX_4 . Essentially, this expenditure response would be identical to the simple "open-end" matching case previously described.

While the final expenditure response to Minimum Support Level Aid will be a function of the elasticity of demand providing the recipient government is consuming X at a rate equal to or greater than OX_2 , the initial equilibrium level will determine whether the response is only one of stimulation or whether it encompasses other response possibilities as well. A strong stimulation response is predicted whenever the initial equilibrium is exactly at the minimum support level. And, if initial equilibrium is in excess of the minimum service level the response could range from substitution to stimulation (this range does include the neutral response). In the case where initial equilibrium is below the minimum support level then it is assumed that no expenditure adjustment would take place voluntarily.

In summary, the actual expenditure response of local governments to matching aid is a function of: the demand elasticities for the aided commodity, the specific restrictions associated with aid arrangements, and, the initial equilibrium position of aided governments prior to aid which may result in a response predicated more on the full price (cost) effect or may result in a response more related to the income effect only,

of the price (cost) change. Depending on the strengths and interactions of the above conditions, functional matching aid may elicit an expenditure response from local governments that may range from a substitution response to a stimulation response.

FOOTNOTES

¹George F. Break, Intergovernmental Relations in the United States, (Washington: The Brookings Institution), 1967, pp. 71-72.

²Otto Davis and George H. Haines, Jr., "A Political Approach to the Theory of Public Expenditure: The Case of Municipalities," National Tax Journal, Vol. XIX (September, 1966), pp. 249-271.

³James Buchanan, Public Finance in the Democratic Process, (Chapel Hill, 1967), p. vi.

⁴James A. Wilde, "Expenditure Effects of Grant-In-Aid Programs," National Tax Journal, Vol. XXI (September, 1968), p. 340.

⁵Selma Mushkin and John F. Cotton, Sharing Federal Funds for State and Local Need, Grant-In-Aid and PPB Systems, (New York, 1969), p. 95.

⁶Advisory Commission on Intergovernmental Relations, State Aid to Local Governments, (Washington: October, 1969), p. 4.

⁷Mushkin, p. 33.

⁸Advisory Commission on Intergovernmental Relations, Fiscal Balance in the American Federal System, (Washing: October, 1967), p. 138.

⁹Advisory Commission on Intergovernmental Relations, The Role of Equalization in Federal Grants, (Washington, 1964), pp. 148-157.

¹⁰Ibid, p. 113.

¹¹Wilde, p. 346.

¹²Buchanan, p. 5.

¹³U.S. Bureau of Census, 1967 Census of Governments, Vol. VI, No.4, Washington: U.S. Government Printing Office, 1969, p. 14.

¹⁴Advisory Commission on Intergovernmental Relations, State Aid to Local Governments, p. 39.

¹⁵Wallace E. Oates, Fiscal Federalism, (New York: Harcourt Brace Jovanovich, Inc.), 1972, p. 77.

¹⁶Wilde, p. 342.

¹⁷Oates, p. 77.

¹⁸See: Mark A. Haskell, "Federal Grants in Aid: Their Influence on State and Local Expenditures," Canadian Journal of Economics, (Canada, November, 1964), p. 587, and David L. Smith, "The Response of State and Local Governments to Federal Grants," National Tax Journal, Vol. XXI (September, 1968), p. 351.

¹⁹Mushkin, p. 31.

²⁰Some confusion may result because the horizontal axis is expressed in units while the vertical axis is community income. The substitution portion of the price effect might mean a decrease in spending on Y axis goods which are close substitutes for X, and yet, the full price change is not exhausted on X. This would indicate that the net effect on Y goods could still result in an overall increase in Y consumed.

²¹Haskell, pp. 585-591.

²²Richard H. Leftwich, The Price System and Resource Allocation, (New York: Holt Rinehart and Winston, Third Edition, 1966), p. 41.

²³Fabricant, Soloman, The Trend of Government Activity in the United States Since 1900, (New York: National Bureau of Economic Research), 1952.

²⁴To see this, assume that: $Y = \text{Total Expenditures (internal and external funds)}$. $A = \text{External Aid}$. The total expenditure equation would be: $Y = a + bA$. The expenditure equation from internal funds only, which Smith used would be obtained by subtracting A from both sides of the above equation: $Y - A = a + bA - A$ which is equal to $Y - A = a + (b-1)A$.

²⁵A neutral response is also possible if demand exhibits unitary elasticity.

²⁶George F. Break, Intergovernmental Relations in the United States, Washington: The Brookings Institution, 1967, pp. 112-113.

²⁷In an interview with Wesley Howe, City Manager of Fayetteville, Arkansas, he indicated that it was possible to use current spending on an aided commodity for the local government's matching portion of total project funds. Investigation of major aid program provisions does not reveal any prohibition on this practice. In fact, for it to be otherwise would actually be penalizing those governments that are supporting programs prior to aid.

²⁸Morris Beck, "The Role of State Aid in Local Government Finance," in Tax Institute of America, Federal-State-Local Fiscal Relationships, Princeton, 1968, p. 382.

²⁹See Mark Haskell, "Federal Grants in Aid: Their Influence on State and Local Expenditures," who outlines this analysis using demand curves, while A. D. Scott, "The Evaluation of Federal Grants," Economica, Vol. XIX (November, 1952), pp. 377-394, describes the phenomena using indifference curves.

³⁰ A neutral response is theoretically possible if the local government is in initial equilibrium at OX_2 .

³¹ Advisory Commission on Governmental Relations, The Role of Equalization in Federal Grants, Washington: U.S. Government Printing Office, 1964, pp. 217, 220, 221. Basically the maximum amount of federal aid is limited to a maximum of two-thirds of total project costs.

CHAPTER III

EMPIRICAL TESTS OF EXPENDITURE RESPONSE ON LOCAL GOVERNMENT FUNCTIONAL EXPENDITURES

Introduction

This chapter will offer an insight into the actual expenditure response by local communities as they receive subsidies in the form of grants-in-aid from external governments. The insight to be gained will be a better understanding of the actual amount of per capita local spending forthcoming from local sources on major public functional activities as a consequence of receiving outside aid.

The basic outline of this chapter is as follows. First, the empirical framework will be presented, which includes the statistical model used to estimate actual expenditure responses and other important empirical considerations. Secondly, it will be shown how the theoretical grant types in Chapter II are related to the functional expenditures of local governments. Thirdly, the empirical analysis will be explained and evaluated on a function by function basis. Finally, this chapter will set forth the similarities and differences of research results with other studies in the same field.

Empirical Framework

Model

The empirical study will be an aggregated statistical analysis of the multivariate linear regression type that will estimate the average actual aid response of stimulation or substitution for all local governments in the nation. To obtain the aggregate response it is necessary to combine all county, township, municipality, school and special district expenditures in each state so that the state total forms the per capita expenditure data for the functional regression equations. The important variables which affect local expenditure decisions will also be part of the estimating equations, but the target variable will be per capita outside federal-state aid. The regression will generate a coefficient for this aid variable, and this coefficient will become the estimator of the change in per capita local expenditures that is forthcoming in conjunction with per capita state-federal aid to a particular local function. It is this coefficient that empirically estimates aid response.

The general form of the multiple regression model will be as follows:

$$\frac{E_t}{P} = a + b_1 \frac{A}{P} + b_2 X_2 + b_3 X_3 + \dots \dots \dots b_n X_n$$

where $\frac{E_t}{P}$ = per capita local expenditure including outside aid.

$\frac{A}{P}$ = per capita federal-state aid.

$X_2 \dots \dots X_n$ = relevant variables pertinent to the particular function.

Separate regressions will be run on each function: Education, Highways, Public Welfare, Wealth, and Public Housing and Urban Renewal. The aid

coefficient generated in each estimating equation will be interpreted as follows:

- $b_1 > 1$: Federal-state aid is stimulating to per capita local expenditure, in that spending from local resources is increased.
- $b_1 = 1$: Local expenditure is not stimulated. This is a neutral response, and outside aid is fully exhausted on the function.
- $0 \leq b_1 < 1$: Spending from own funds decline, indicating that outside aid is used as a substitute for local resources.
- $b_1 = 0$: Aid funds are completely substituted for local resources.
- $b_1 < 0$: This is not an expected outcome. However, this would imply that local spending from own funds decrease by an amount greater than the aid itself. This service would then be analogous to an inferior private good.

Statistical Considerations

Step-Down Regression Technique. A very useful device in multivariate linear regression is a step-down procedure which eliminates any independent variable that is not significant in explaining the variation in the dependent variable. It is possible with this type program to enter all the variables into a computer, and then have the computer reject any variable which does not have an appreciable effect on the error term (this is the residual or unexplained variation). For this research the author has used the University of Arkansas Correlation-Regression Program (CORREG) which analyzes the variables for significance (5% in this study) and rejects those which are insignificant.¹

Many of the variables have been selected on the basis of "a priori" economic reasoning and most of them have appeared in one or more studies by others in the field. However, the computer may eliminate some of them if they exceed the significance level. The rejections could be caused by

intercorrelation with other variables in the equation or by intercorrelation with the error term. The writer will accept these rejections, because if the variables are retained it is possible that they may cause the coefficient of the target variable, per capita federal-state aid, to become distorted. It is important to keep any bias in this key variable to an absolute minimum as the aid coefficient is being used to estimate changes in per capita local spending.

It cannot be too greatly emphasized that the primary basis for using a step-down multiple regression model is simply to generate a stable aid coefficient which can be a dependable estimator of the stimulation-substitution expenditure response. In the studies that are made to find the determinants of local public expenditure levels or changes in local expenditures, the attention of the researcher is devoted to minimizing total variation in the specified equations. A high R^2 is strictly a secondary objective in this study. The prime goal is to produce an aid coefficient with minimum bias.

Use of Cross Sectional Data. The use of cross-section analysis rather than time series is somewhat controversial. It is argued that time series studies are much better for predictive purposes, because one is looking at expenditure changes over time for one particular governmental unit which may have its own unique political and economic characteristics. Prediction, then, comes from that unit's own historical data.² With time series studies the variables which are important for one local government may be unimportant for others.

The cross-sectional approach does permit one to look at nationwide data and isolate significant variables common to all governmental units. Implicit in this approach is the idea that the average local government

in Oklahoma is similar to the average local government in New York, Florida, etc. Also, data are more readily available for cross-sectional analysis of local spending than is time-series data. For cross sectional work, the data does not have to be corrected for changing conditions over time such as cyclical effects, changing attitudes of governments or citizens preferences, changing governmental boundaries, and changing governmental responsibilities. All the above factors played a part in the writer selecting a cross-section approach for this thesis.

The cross-section expenditure data are taken from 1967 government statistics. The U.S. Census Bureau publishes detailed financial information on governments at five year intervals. The 1967 data represent the latest figures. The 1972 report on governmental finances will not appear until late in 1973.

Use of Unique Independent Variables in the Functional Equation. This study departs from most others in the field by the specification of special independent variables for certain functional activities that do not appear as variables in other functions. For example, when estimating the aid response for the Education function a "need" variable will be used (percentage of State population between 5 and 18 years of age) which is uniquely applicable to education but is not pertinent for highway expenditures or public welfare. The purpose of selecting special variables for the various functions is exactly the same as the objective stated for the use of step-down multiple regressions--i.e., to secure an aid coefficient which seems stable for predicting a local government expenditure response.

Of course, general variables common to all functions will be used as these variables are expected to influence spending for any public

activity at the local level. These general variables will be set forth when the first functional empirical analysis is explained (see Education Variables Selected). The unique variables will be presented as they become necessary for each function.

The set of variables selected for this study are basically a representative collection of influences taken from a larger group used in prior studies. In addition to being used by others they seem to cover an adequate cross-section of demand and supply influences which affect local public spending.

Use of Outside Aid as an Independent Variable. It is the contention of some economists that specifying outside aid as an independent variable creates some distortion which could result in faulty interpretations.³ Thomas Pogue and L. G. Sgontz have condensed the pertinent criticism into four statements which indicate potential conditions existing between aid and expenditures. These are as follows:

1. Expenditures are determined, in part, by aid payments with expenditures having no effect on aid payments.
2. Aid payments are determined, in part, by expenditures with aid payments having no effect on expenditures.
3. Aid payments and expenditures are jointly determined.
4. At least some of the factors determining expenditures also influence aid, and the set of variables does not include all of these common determinants. Instead, some of the factors which influence both aid and expenditures are included in the error term.⁴

If any of the final three conditions occur, then the aid coefficient may be biased. An unbiased and independent condition exists between aid and expenditures if statement one is valid. Statement two implies the direct opposite of the position taken in this study--i.e., the local expenditures have a causal effect on outside aid. It is felt that

inverse causation is rather unlikely, but statement three could be a distinct possibility. This is particularly the case when specific matching grants are involved. The implication is that grantee and grantor response is dependent on the action of the other party. The fourth point may have validity if the aid variable is really a proxy for some other variables not included, but which are the causal factors in per capita expenditure variation. This means that aid is correlated to the unexplained variation which exists in the error term of the regression.

Any existing coefficient bias is assumed to be positive if (in statement two) aid is an increasing function of expenditures and if (in statement three) expenditures are an increasing function of aid and aid is an increasing function of expenditures. Also, positive bias would result for statement four if non-included variables which tend to increase per capita expenditures tend to increase aid simultaneously.

One method of showing the possible existence of this bias is provided by Pogue and Sgontz. They regress aid on other independent variables used in expenditure studies and find that these variables explain a significant amount of the variation in aid payments. This, in effect, shows a biased condition because of multi-collinearity. While it is recognized that multi-collinearity may exist, it is virtually impossible to completely eliminate it in any uncontrolled experimental analysis. However, every attempt will be made to reduce this inter-correlation by retaining for the equations those variables which exhibit the highest degree of independence.

It is usually specific matching aid that most critics have in mind which questioning the use of aid as an independent variable. They stress the fact that recipient governments must put up a portion of the project's

funds from their own resources in conjunction with aid. This seems to indicate the possibility of joint or reverse determinency between expenditures and aid--i.e., aid is fully or partially determined by expenditures. For example, if a 50-50 matching grant is assumed, it is expected that aid would always be fifty percent of local expenditure, and the correlation coefficient would equal unity between aid and the community's matching portion.⁵ While it is true that a one-to-one correspondence exists statistically in this particular case, yet, if it can be shown that the local funds were raised as a result of the outside grant, the external aid can still be considered as an independent force.

In order to justify the inclusion of aid as an independent variable, it is important to know the procedure by which matching aid is made available to recipient governments. This aid is generally allocated either by apportionment programs in a fashion similar to the way federal highway aid is extended to states or on a "project" basis. Either way, the recipient governments know the conditions under which the aid is available. This means that aid is basically a function of the federal or state legislative process and that local governments have adequate knowledge of the processes and requirements for receiving aid. To illustrate, apportionment formulas for the 1960 appropriations were set up in the Highway Act of 1958. This gave two years' advanced knowledge before the funds were actually disbursed.⁶ Again, the Department of Health, Education and Welfare has indicated that aid is a function of the legislative process: ". . . the total amount that the Federal Government can distribute under each formula is determined in advance by specific Congressional appropriation."⁷ If aid is determined autonomously by forces beyond the control of receiving governments, then it is these

forces which determine aid and not the matching expenditure from local sources. It is the belief of this writer that the primary force determining matching aid is the legislative process of grantor governments. If this is correct, then outside aid can be included as an independent variable in the functional equations. In other words, statement one of the previous four statements concerning aid bias will be accepted as the most appropriate for use in this study. The other three statements will be assumed to cause only minor bias if they influence the dependent variable in any manner.

The question of outside aid being included as a component of the dependent variable needs additional clarification. As stated in the introductory chapter, aid is a component of the dependent variable as a natural consequence of the use of local direct per capita spending on each aided function. For statistical analysis some feel that this is somewhat undesirable. In fact, Morss has sought to show by a simple two variable regression equation--first, regressing total per capita state-local expenditures on federal aid; then subtracting the aid from the independent variable; and finally, regressing this on per capita aid--that the results of the second regression are insignificant. The aid coefficient declines from 1.25 to .25, and the zero order correlation coefficient declines from .30 to .02.⁸ While some loss in explanatory power is expected if the aid component is dropped from the dependent variable by use of multiple regression analysis rather than a two variable model, it is possible to maintain significance when aid is either included or excluded from the dependent variable.⁹ The aid coefficient does decline by exactly one, but this is merely a mathematical phenomenon which is to be expected.¹⁰ The loss of explanatory power which results

from specifying the equation in the latter form may not be that serious:
". . . to base one's conclusion on simple regression analysis is not adequate. One must use multivariate analysis, otherwise erroneous conclusions are reached."¹¹

Classification of Expenditures by Theoretical Grant Types

The theory chapter outlined the abstract expenditure responses anticipated from individual local governments which receiving certain types of aid--i.e., general non-matching, specific non-matching, and specific matching aids. However, the empirical study uses data relating to functional grants and functional expenditures on the five major local services of Education, Highways, Public Welfare, Health, and Public Housing and Urban Renewal. These functional responses, generated statistically, are in reality aggregative responses of all local governments. In order to relate the empirical response to the abstract response it is necessary to identify the dominant type of aid common to the functional activity and then assume that the aggregate response is the sum of all individual responses. It is difficult to determine with absolute preciseness what the predominant grant type is for each function as the Census Bureau data are not prepared to supply this information. Yet, there are references throughout the literature which gives clues as to the main grants associated with the above functional activities, and the writer has had to depend on these references to make predictions concerning grant dominancy.

General Non-Matching Grant Type

None of the functional expenditure categories is dominated by this form of subsidy. Therefore, the empirical research will not run tests in this area. It should be noted that the theoretical response for general non-matching aid is identical to the one anticipated for specific non-matching subsidies except for several minor qualifications, and the study does contain one function, Highways, which is dominated by specific non-matching aids. A statistical regression will be performed on this Highway function.

Specific Non-Matching Grant Type

Highway Function. All states except Alaska, Hawaii, and West Virginia made grant-in-aid payments to the localities almost entirely in the form of shared highway-user revenue.¹² Most of the payments are on some formula basis that involves a measure of "local needs": such as, road mileage, land area, gasoline sales, motor vehicle registrations, or resident population. Even with these "need" factors included, the state aid is still given on a shared basis; so the aid would be considered as specific non-matching for purposes of this research. Direct federal aid to local communities for local road construction or maintenance is virtually negligible and need not be considered as an influence on local spending. The federal aid goes principally to the states who then construct extensions to the highway systems within municipal jurisdictions.

Specific Matching Grant Type

Education Function. The dominant aid to this function is "foundation" type state aid; however, ". . . the number of variations on the foundation

program theme defies summary description and an evaluation of their impact."¹³ This aid is available to bring educational levels up to a minimal standard; therefore, these grants provide a stimulative effect to those communities which, resource-wise, are extremely poor. Most local jurisdictions spend much more than is called for by minimum foundation programs, and no incentive is provided by foundation aid for expenditures beyond the minimum.¹⁴ It should be noted, as outlined in the theory chapter, that the aid response associated with the foundation aid grant depends to a large extent on the initial equilibrium level of spending prior to aid. And this equilibrium will determine whether the response is subject to the full price effect or is influenced primarily by the addition to local income which the external aid provides.

Public Welfare, Health, and Public Housing and Urban Renewal Functions. All of these activities are funded mainly by the federal government, and the aid programs would fall under the specific matching type grant.¹⁵ In the case of Public Welfare, all federal aid goes initially to the states, but in fifteen of the states this outside money is channeled through state treasuries to the local governments, and these local jurisdictions are then responsible for the matching portion of the assistance programs.¹⁶ In the other thirty-five states, the control, administration, and most of the expenditures are direct state responsibilities. As for health grants, it is difficult to assess the actual proportion of aid that is raised entirely from state sources or entirely from federal revenues.¹⁷ Yet, the writer has examined the programs reported as being included in Census Bureau data on State Intergovernmental Transfers, and many of these transfers include the notation: "federal funds are distributed in fixed ratio to local expenditure."¹⁸

Since the majority of federal health programs are of the matching type, this aid will be included as specific matching. When Public Housing and Urban Renewal programs are examined, these programs are found to be project grants available on a matching basis. The local governments are eligible to receive direct transfers from the federal government for these activities at the discretion of federal fund administrators.¹⁹

In summary, the above functions are dominated by simple matching grants with the exception of the Public Housing and Urban Renewal function, which receives its outside aid principally on a matching basis of the project type.

Empirical Analysis

Education Function

Variables Selected. A total of twelve independent variables were used in the regression tests run on this function. (See Appendix for tabular summary of all variables and their accompanying symbols.) Nine of these were general variables common to all the functions tested and the remaining three were unique to education expenditures only. In the first regression test run on all the functions, only six general variables were used, however, the step-down process eliminated all variables with the exception of per capita external aid on three of the five functions tested. Before running additional tests the writer carefully selected three more general variables and in some cases several additional unique variables were inserted in the model. It was felt that several more variables should be used in order to secure an aid coefficient that could be dependent on to predict aid response.

The general variables will be presented in detail for the Education Function and will then be referred to in name only or by appropriate symbol as the analysis unfolds for the other four functions. Unique variables will be justified and explained as they are required in each functional regression.

The independent variables common to all five aided functions (the first six were the original set selected) are considered the general variables. (1) Per Capita Income, (2) Population Density, (3) Percentage of the State Population living in Urban Centers (cities over 2,500 in population), (4) Combined Federal-State Aid Per Capita, (5) Percentage of State Employment Engaged in Manufacturing, (6) Median Years of Schooling Completed (used as a proxy for attitude of the citizens toward public expenditure), (7) Per Capita Market Value of Real Property, (8) Index of Political Party Competitiveness, and (9) Percentage of Functional Expenditure Financed by Outside Aid.

The first three factors form the familiar "Fabricant troika" which have consistently explained in excess of 50 percent of the total variation in state-local expenditures since being first applied to 1942 expenditure data.²⁰ Complementary research has continued to show the importance of these three variables as late as 1960.²¹ One of the later studies has included state and federal aid as additional variables along with the "Fabricant" variables, and the explanatory power of those expenditure equations increased quite measurably.²²

1. Per Capita Income. This variable is a strong determinant of demand in many macroeconomic and microeconomic models. It has been included (or some form of it such as family income) in virtually every empirical study of public spending. Income represents an ability to

exercise a command over goods, both public and private. The higher the income of the citizens, the greater is their ability to pay taxes which are required to finance local public goods. With higher incomes, it is reasonable to expect people to desire a higher level of public services. It is therefore assumed that a strong positive relationship would exist between the level of per capita income and the level of per capita local public expenditures.

2. Population Density. This variable, based on the number of persons per square mile in each state, was first identified by Fabricant as a determinant of per capita state expenditures in 1942. Fisher used this same variable in replicating the Fabricant study in 1957. The density variable is often associated with slightly lower public expenditures, and as Fabricant has noted ". . . when public facilities can be used more intensively the cost of meeting specified levels of public service per head is lessened."²³

Fabricant did envision this variable to serve as a "proxy" for scale economies, (declining long-run average cost as output increases) and it may be possible that per unit costs may fall as public sector output expands. However, to estimate economies of scale correctly, the emphasis must be placed on cost analysis which concentrates on production functions, differential resource costs, and basic quality differences. Determinant studies do not lend themselves well to making economies of scale estimates as demand variables are usually included in estimating equations.²⁴

For some functions, the Density variable may be negatively related to expenditures because of underutilization of capital resources and because of lags in capital expansion in relation to increases in output.

Examples of this can occur in the Education and Highway functions. When school buildings become crowded before new ones are built, capital costs per unit of education output could be relatively less. In localities of dense population, highway construction costs might not rise as rapidly as expected relative to the rate at which an increasing population would use the highways for transportation.

In some functional areas expenditures might increase as populations become more dense. This may be the case with regard to Public Welfare, Health, and Public Housing and Urban Renewal functions. Brazer in his classic study on city expenditures indicated that a rising concentration of low income persons in city areas could create a need for a widening variety of welfare services and result in an increasing rate of welfare spending.²⁵ In summary, it is possible that some functions will show positive associations with density, while other functions will be negatively related to population concentration.

3. Urbanization. This is measured as a percentage of the state population living in cities exceeding 2,500 population. Brazer seems to believe that as the populations move from a rural to an urban environment many services become economically feasible and necessary. Fabricant and Fisher in their studies found that a greater proportion of a state population living in urban places was closely associated with greater per capita public expenditures.²⁶

Several examples may serve to illustrate why increasing urbanization may cause local community expenditures to increase. As people migrate from rural to urban areas, not only are new types of services needed such as traffic control and street lighting, but other services previously handled on an individual basis must now be provided collectively. Cost

increasing forces based on improved service scope and quality can be a factor, particularly for Public Welfare, Health, and Education functions. Urban highway costs can also rise as right-of-way costs increase. Rising prices of limited urban land may push up the cost of urban renewal and public housing projects. These are just a few of the many factors which account for a possible direct relationship between urbanization and local government expenditures.

4. Per Capita Federal-State Aid. This is the target variable for the study and it is a powerful determinant of public spending for the same reason as per capita income. Outside aid is the most lucrative source of local revenue with the exception of local taxes, and therefore the ability of local governments to consume public commodities is greatly enhanced. Just as disposable income is the major determinant of personal consumer spending it is expected that local governments will spend more as their income increases--whether from internal or external sources. This is exactly the implication of Assumption 7 in Chapter II. Therefore, a direct and strong positive relationship is assumed to exist between per capita federal-state aid and per capita public expenditures on any aided commodity. Most stimulation-substitution studies have included this variable directly or indirectly into their analysis.²⁷

5. Degree of Industrialization. This variable is obtained by computing the percentage of the total labor force in the state engaged in manufacturing activities. In the Brazer research it is contended that high wages in the private sector forces local governments to compete for the existing supply of workers, and therefore the communities in the high wage states, as a consequence of industrialization, must pay higher wages and salaries than do those communities located in states where

manufacturing is less concentrated.²⁸ With the wage bill being a major portion of local government expenditure it is expected that per capita expenditures on most functional services would be higher as the degree of industrialization increases.

6. Median Years of Schooling Completed. Citizen preferences for public spending should affect the overall level of local governmental expenditure including those functions which receive outside aid. Jerry Miner proposed this variable for his study on Social and Economic Factors in Spending for Public Education,²⁹ and he reasons as follows: As the general level of education rises in the community, the citizens are capable of assessing and understanding the importance or providing public services. While their decisions will still be made on the basis of self-interest, persons with more education may appreciate the wisdom of performing services in a collective manner. Benefits of the public expenditure relative to the tax burdens imposed may loom more important to those with more schooling. Therefore, Miner expects the relationship between this variable and per capita local expenditure to be positive.

7. Per Capita Market Value of Real Property. This variable and the two remaining general variables to follow were added immediately after the first regression test was completed. As was previously stated, the first regression did not produce an adequate aid coefficient which could be used to estimate the expenditure response. The writer was compelled to search for other factors which were expected to influence local government expenditures.

A measure of wealth of the citizens is actually a measure of the capacity and the ability to finance local public services. It has been used in a number of determinant studies notable of which are Miner,

George Bishop, and Sacks and Helmuth.³⁰ The basic problem with this variable is its high intercorrelation with per capita income. It is quite difficult to separate out the effect of wealth on spending from the effect of income, on expenditure levels.

Data used to determine this variable are actually an estimate made of market values rather than assessed valuations of property.³¹ It is the market values that seem to represent more correctly the ability of the citizens to support essential public services. The assumed relationship between property values and functional expenditures is expected to be positive.

8. Index of Potential Political Party Competitiveness. This variable was included as it is believed that the state where the party in power runs the risk of losing that power may have a tendency to support public activities at higher levels than those states where there is little inter-party competition. The index used differs from some in the sense that other indexes postulate differential expenditure patterns in states that are one-party controlled by Democrats, from states that are one-party controlled by Republicans. This index does not make that distinction. Only in a state with highly competitive parties would the expectation be that local expenditures might increase.

The actual index used is one proposed by Austin Ranney, and it covers a time span from 1946 to 1963. This is not too far removed from the 1967 period used for this study; so the conditions are assumed to be the same. The competitive measures are as follows: (1) the average percentage of the state popular vote won by Democratic or Republican gubernatorial candidates; (2) the average percentage of the seats in the state senate held by Democrats or Republicans; (3) the average

percentage of the state house of representatives seats held by Democrats and Republicans; and (4) the percentage of all terms for governor, senate, and house, in which the Democrats or Republicans had control. With all four percentages carrying equal weight, an index was computed ranging from 1.000 (total Democratic success) to .000 (total Republican success), with an index number of .500 representing perfect two-party competition.³²

For this dissertation it was assumed that local governmental political competition in a state would follow closely state competitiveness on the average. It is actually state competition that is being measured by the index. The more competitive (the closer the index approached .500), the more likely it would be for elected officials to promote higher levels of public services including those which received direct federal and state aid.

9. Percentage of Functional Expenditure Financed by Outside Aid. The rationale for including this variable comes from the research conducted by Sacks and Harris, Ira Sharkansky, and Jack Osman.³³ This variable is very similar in nature to per capita federal-state aid in that it is a measure of outside resources which support local expenditure (intercorrelation problems will exist with this variable and per capita outside aid). However an added factor is present here. It is expected that the greater the percentage of public spending that is financed by external sources, the less incentive there will be for the local citizens to hold down expenditure levels. Citizens are assumed to offer more resistance to public sector spending when they bear the tax burden directly. Therefore, a positive relationship is anticipated between this variable and all functional expenditure.

10. Percentage of Population Between 5 and 18 Years of Age. This variable, along with the next two, are the unique variables that were selected as being particularly significant for the Education function. The percentage of people in the school age category is a prime measure of "need" for education as this group makes up the chief educational input.³⁴ A positive relationship is expected between this variable and education expenditures. A number of writers who have researched education activities have indicated that a "need" variable of this type is influential in determining educational expenditures. Several of the more notable writers are Werner Hirsch, Jerry Miner, George Bishop, and Edward Renshaw.³⁵

11. Percentage of State Population Non-White. The hypothesis for this variable's influence is aptly expressed by Miner. On the cost side the dominant white majority controls school expenditures. This group often permits the black schools to deteriorate and will assign to these schools less experienced and lower paid teachers. On the supply side, then, the black schools will be operated on a lower cost per pupil, so for this reason the variable would likely be negatively related to education expenditure in states with above average black populations. Also, in terms of demand for education, the minority groups being the lower income groups often oppose increases in educational spending as they associate increased spending with increased tax burdens. This demand consideration again implies a negative relationship. If demand and supply effects are combined an overall inverse relationship is expected to occur between local per capita expenditures for education and the percentage of the state population that is non-white.³⁶

12. Percentage of Students Enrolled in Non-Public Schools. There are several viewpoints concerning the impact of this variable on education expenditures. Jerry Miner took the position that public school spending will decline as more children attend parochial schools. He bases his belief on the assumption that parents of these children cannot be counted on to give support to bond issues which increase property taxes.³⁷ Another study conducted by H. Thomas James from Stanford University presented an alternative hypothesis. In his analysis he anticipated that with relatively large numbers of children in private schools, a very small increase in tax rates would be necessary to expand public expenditures per pupil quite significantly. On a per pupil basis, the numerator would be increasing while the denominator would be falling. The net result would be positive relationship between the % NPS and per capita expenditures for education.³⁸ Considering the above opposing view, the writer cannot make a definite "a priori" statement concerning the impact of the % NPS and per capita expenditures for education.

Empirical Findings For The Education Function. Local government observations for every state were included in the analysis with the exception of Hawaii. In Hawaii, the state itself provides all public education.

There were three regression tests performed on this function. In the first test, nine independent variables were used, with two (S. COMP and DENSITY) being eliminated at the 5 percent level of significance. This elimination took place in the step-down process. All twelve independent variables were included in the second test, and all were eliminated in the step-down with the exception of % AID and A/P. These two variables were excessively intercorrelated. Their simple correlation

coefficient was .842. For this reason % AID was discarded before running the final regressions (% AID was also eliminated on regressions run on other functions for this same intercorrelation reason). In the last regression run on the Education function the step-down eliminated S. COMP, DENSITY, and MVP. The amount of total variation explained by the remaining eight significant variables, above, was 82 percent, the same R^2 as generated in the first regression.

TABLE II
STATISTICS PERTAINING TO PER CAPITA LOCAL GOVERNMENT
EXPENDITURE FOR EDUCATION

Independent Variable*	Regression Coefficient	Standard Deviation	Standardized Regression Coefficient	Partial Correlation Coefficient
Y/P	.030	.006	.608	.591
IND	-2.110	.528	-.346	-.460
% NW	-.866	.295	-.327	-.381
A/P	.312	.092	.305	.376
% S. AGE	4.368	1.384	.283	.399
% NPS	1.208	1.310	.084	.155
TP COMPT	-.086	.221	-.051	-.050
URB	.065	.161	.039	.130

*See Appendix for meaning of symbols.

By ranking the variables in Table II in order of their importance, the most important influence on per capita educational expenditures, as based on the standardized regression coefficient and the partial correlation coefficient, is per capita personal income of the citizens in the

state. Per capita income is specified as a capacity variable representing the ability of the people to provide the necessary funds to support public schools. An increase of \$.03 per capita expenditure on education is forthcoming for each \$1.00 increase in per capita personal income.

The percentage of labor engaged in manufacturing is the second most important variable. This variable is supposed to influence public sector wage rates on the basis that the more industrialized states would also have above average wage rates which would encourage service employees on public payrolls to demand and receive higher wages. If this carried over into the education function where payroll costs are a substantial portion of educational expenditures, it would be anticipated that these states would have higher education costs. Actually, the relationship between this industrialization variable and per capita education expenditures is negative. This implies the opposite conclusion in that an increase in industrialization is associated with a decline in per capita education spending. To investigate this discrepancy, an inspection of the simple correlation coefficients indicated that the percentage of labor engaged in manufacturing is highly correlated, in a positive way, with the density variable (population per square mile). The density variable is negatively associated with education expenditures; and even though this density variable was rejected, it is possible that the negative sign on the industrialization variable could be due to the intercorrelation with density. In this case, the industrialization variable is positively related to the error term. Because of the importance of this variable to the regression equation, it is being retained in the analysis even with the wrong sign.

The third most important variable is % NW, and as anticipated, a negative relationship exists between the percentage of non-white residents in a state and per capita educational expenditures. A one percent increase in non-whites is associated with a \$.87 decline in local education spending on a per capita basis.

The target variable, A/P, has the correct sign and is the fourth most important influence in the regression equation. Since the coefficient indicates that \$.31 per capita is spent on education programs for each dollar of aid (per capita) received, the expenditure response would be considered one of substitution.

As for the other factors in the model, the percentage of the state population of public school age, the percentage of the population in non-public schools, the index of two party competitiveness, and the percentage of the population in urban areas were all considered significant in determining education spending at the local level. The non-public school variable shows a positive sign, and while this is not proof that the hypothesis concerning a positive relationship actually does exist (see discussion under variable 12), it does provide evidence that a direct relationship between % NPS and per capita public school expenditures is a strong possibility. A wrong sign occurs for TP COMPT, and this variable has a large standard deviation. The large standard deviation could be due to multi-collinearity problems,³⁹ or, as Pogue and Sgontz have suggested, a coefficient might be biased because of correlation with the error term. Since TP COMPT is of minimum influence to the regression (as noted by the size of the standardized regression coefficient), the elimination of the variable would be unlikely to affect the aid coefficient to any degree.

Empirical Finding Compared To Theoretical Expectation. The substitution response generated statistically seems to be quite compatible with the theoretical result. Specific matching aid of the foundation type dominates this function. In the theoretical model it was shown that a stimulation, neutral, or substitution response could occur for any one local school jurisdiction, however, foundation aid laws induced stimulation primarily for the few very poor communities. In an aggregate framework, the majority of all local school districts seemed to be supporting public education well in excess of the basic aid program, and this majority would likely consider the education subsidy as simply an addition to overall education revenues. New Jersey school aid is a typical example of the national pattern for foundation type subsidies. In that state, a form of equalization was present (reference to the 1964-65 school year) with the poorest districts eligible for per pupil aid of \$200.00; yet even the richest districts received a minimum grant of \$50.00 per pupil. The average aid per pupil amounted to \$92.24, and few communities qualified for the theoretical maximum. The net result was that all districts received at least the \$50.00 minimum while few received the maximum grant.⁴⁰ The effect was essentially an income subsidy on an aggregate basis to the whole school system.

The predominate theoretical effect would be the income effect rather than the full price effect, and relating the empirical result back to Figure 7 in Chapter II, it would seem that the average community would be represented by an initial equilibrium position, prior to aid, at a point shown as X_4 . After aid the average community would move to a point like X_5 which implies the substitution response.

Provided that the aid coefficient of .312 is an accurate representation of the aggregate effect of external aid on local government expenditure levels, state aid programs would have to be radically changed if the grantor agencies expect aid programs to induce recipient governments to increase their "own" source expenditure. This study indicates that local communities were simply substituting outside resources for local resources in order to pay for public education activities.

Highway Function

Variables Selected. There was preliminary testing done on this function using several variables that were subsequently discarded. These variables were consistently eliminated from the estimating equation in the step-down process. The final regression tests used a total of eleven independent variables. These included eight general variables, referred to in the Education function (percentage of functional expenditure financed by outside aid was not used as it was excessively inter-correlated with the target variable, outside aid) and the following three unique variables:

1. Ratio of Urban Expressway Mileage to Total State Expressway Mileage. While the writer has found no specific study that has used this variable in the above expressed form it is apparent that those researchers who have done extensive work in the field of local highway spending such as Phillip Burch, George Smerk, and L. R. Gabler and Joel Brest see that increases in highway expenditures in recent years have occurred more so in the cities than in rural communities. As the states and federal government have collaborated to build cross-town and by-pass expressways, the local governments have been compelled to provide for the relocation

and widening of local street connections.⁴¹ It is expected that this variable would be an important demand factor and the hypothesis is that a positive relationship would exist between the variable and per capita local highway expenditure.

2. Snowfall. Climate is considered by Burch as a very important factor affecting costs on the supply side of the Highway function.⁴² Snowfall should be an ideal climate proxy in the sense that those areas where snowfall is heaviest will also spend more, relatively, on local roads and highways. This expenditure should show up in the form of increased maintenance costs along with more expensive construction costs to protect road beds against freezing conditions. It is assumed that the statistical relationship between snowfall and per capita highway expenditures will be positive.

3. Road Use. This is a statistic, provided by the Bureau of Public Roads, which estimates the vehicle-miles of travel on the local rural and municipal network of public roads. The variable is introduced into the regression as a percentage of the vehicle-miles of travel in each state relative to the total U.S. vehicle-miles traveled. Phillip Burch indicates that road usage is a definite factor that can explain some of the variation in highway expenditure, and this variable should have a direct and positive influence in per capita local highway spending.⁴³

Empirical Findings For The Highway Function. The observations associated with the state of Alaska, Rhode Island, and Virginia were excluded from the highway regressions. These states do not extend grants for local highway purposes.

Several regressions were computed for this function before a stability condition was observed on the aid coefficient and the author

became satisfied that the model was adequately stated. In the final computer run the variables shown in the above table were significant at the 5 percent level with the DENSITY, MVP, and FREEWAY variables being eliminated in the step-down procedure. The eight significant variables accounted for 59 percent of the total variation in per capita highway spending. This is somewhat low, however, the A/P coefficient did not change during any of the regression tests by more than \$.09 from the \$.81 figure which was generated in the final run. It was this basic stability that convinced the writer that further testing was not required.

TABLE III
STATISTICS PERTAINING TO PER CAPITA LOCAL
GOVERNMENT EXPENDITURES FOR HIGHWAYS

Independent Variable*	Regression Coefficient	Standard Deviation	Standardized Regression Coefficient	Partial Correlation Coefficient
Y/P	.019	.006	.807	.386
URB	-.446	.162	-.534	-.319
A/P	.813	.191	.461	.537
TP COMPT	-.200	.153	-.255	-.204
S. COMP	2.488	1.550	.232	.249
IND	-.536	.379	-.181	-.160
MILEAGE	-.497	.613	-.115	-.123
SNOW	.051	.071	.097	.114

*See Appendix for meaning of symbols.

The first three variables shown in the table continued to occupy the same position in terms of their degree of importance (measured by the

standardized regression coefficient) throughout all statistical computations. It can be seen that the target variable, A/P is the third most important influence in the system of rankings. Wrong signs were encountered on the URB, TP COMPT, IND, and MILEAGE coefficients when compared to their postulated theoretical relationships to the dependent variable. Also, the standard deviations on these variables are quite high which implies a broad range of coefficient values. The coefficients may be somewhat distorted due to correlation with unspecified influences in the error term. It is this factor that may be responsible for the change in signs. The URB variable should be retained regardless of sign as it is the second most important variable in the entire equation. However, it is doubtful whether the removal to TP COMPT, IND, and MILEAGE will improve the regression as the standardized regression coefficient and partial correlation coefficient shows them to be of marginal importance. These ranking coefficients are about one-half the absolute size of those same statistics associated with the top three regression determinants. Further testing would seem to be unnecessary.

Based on this final regression, the empirical results show that \$.81 in per capita highway spending occurs when \$1.00 in aid is received from external sources. The implication is that a substitution response exists for the Highway function.

Empirical Finding Compared to Theoretical Expectation. As has been pointed out, the majority of state highway aid was extended to local governments on a formula basis with various "need" factors specified in the formula in determining the actual aid amounts given to each locality. Yet, once these "needs" were determined, the grants (actually gasoline excise taxes and license taxes collected locally and remitted to the

state) were shared by the state with local governments in the form of specific non-matching grants to be used for local road programs.

A theoretical response of substitution was considered to be the most likely response when specific non-matching aid is received by local communities (see Figure 2). However, it was shown that a neutral response (aid coefficient of one) might occur if two conditions exist. One condition is that the grant might be large relative to "own" source spending on the commodity, while the second condition takes in the possibility that "own" resource spending was initially zero prior to aid. The actual coefficient is close enough to unity to indicate that one of the above conditions might exist. There is absolutely no indication from highway expenditure data that local governments were not spending on local roads in the absence of aid and this seems to eliminate one of the above exceptions.⁴⁴ On the other hand, Table I (Chapter I) provided some evidence that aid subsidies were quite large relative to "own" source expenditure. Table I shows that over 40 percent of total local highway expenditures was financed by external grants. An aid coefficient close to one should be strongly suspected. The .80 coefficient is not only compatible with the theoretical response of substitution but is also close enough to unity to not conflict with the actual highway expenditure data.

Public Welfare Function

Variables Selected. The variables proposed for statistical testing on this function consist of the eight general variables (% AID discarded) and the following two unique variables.

1. Percentage of Families with Incomes Under \$3,000.00 Annually.

A "need" variable, such as LIF, can be an important influence on welfare spending. Many studies have incorporated this factor in their statistical analyses. Several of the more notable research efforts using this factor are the Glen Fisher study, and the Thomas Pogue and L. G. Sgontz model.⁴⁵ Fisher states that this is the primary "need" variable for per capita public welfare spending.⁴⁶ It is anticipated that as the percentage of families with incomes under \$3,000.00 increases in local areas the local per capita spending on the Public Welfare function will also increase.

2. Percentage of State Population Non-White. This variable was proposed as a unique variable for education spending where it was anticipated that an inverse relationship existed. It is assumed to take on a positive relationship in connection with Public Welfare activities. The reason for this is the fact that non-whites do experience higher unemployment rates and lower average incomes than other ethnic groups, and therefore, they qualify for a variety of public welfare programs. Some intercorrelation is likely to occur between this variable and the low income family variable, but the writer believes that both factors should be retained for the initial tests.

Edward Renshaw does use this variable in his education regressions but in his case the variable represents negative attitudes for public spending.⁴⁷ Need is the overriding consideration here rather than citizen preferences.

Empirical Findings For The Public Welfare Function. Only fifteen state observations were used in this sample. The states were California, Colorado, Indiana, Kansas, Maryland, Massachusetts, Minnesota, Nebraska,

New Jersey, New York, North Carolina, Ohio, Virginia, Wisconsin, and Wyoming. These were the only states where any measurable expenditures were reported on categorical welfare grants by local governments.⁴⁸

Local programs are primarily supported by federal aid given on a matching basis; however, the state governments are essentially responsible for public welfare since a state agency must provide the administrative machinery and specify recipient eligibility requirements in order to qualify for federal funds.⁴⁹ The majority of the states handle this function directly at the state level, but even these states often delegate to local governments the responsibility for administering the programs under state supervision. Even though the local government might contribute some influence to state decisions on welfare programs where the state controls and finances the activities and localities only administer them, it was felt that a local governmental expenditure study should only include those local governments that take part in raising the matching financial resources.

TABLE IV
STATISTICS PERTAINING TO PER CAPITA LOCAL GOVERNMENT
EXPENDITURE FOR PUBLIC WELFARE

Independent Variable*	Regression Coefficient	Standard Deviation	Standardized Regression Coefficient	Partial Correlation Coefficient
% NW	-26.015	13.636	- .439	- .482
A/P	.094	.057	.378	.429

*See Appendix for meaning of symbols.

In the first series of regression tests on the Public Welfare function various combinations of independent variables were used, but the step-down process consistently eliminated all but the aid variable. Per capita outside aid accounted for 96 percent of all the variation in per capita local public welfare spending, and the computed coefficient of 1.107 implied that \$1.11 in per capita expenditure was forthcoming when \$1.00 in welfare grants were received. It was decided that the one-to-one correspondence between the dependent and independent was so strong (outside aid is a component of total spending) that this was preventing other significant influences from appearing in the statistical model. Therefore, the writer subtracted aid from the total expenditures, and the dependent variable then became per capita local welfare expenditures from "own" sources only. Under this arrangement a simple two variable regression would result in the aid coefficient declining by exactly one (the aid coefficient would be \$.11 and retain the same interpretation with respect to total public welfare spending).

Again, a series of regressions were run against the revised dependent variable (a total of six different independent variable combinations were used). In the final regression (results shown in the table above) the % NW and A/P represented the best statistical results that could be achieved. The 5 percent level of significance did have to be reduced in order for % NW and A/P to be retained in the equation. The T statistic for A/P was 1.6427 which gave a probability of a larger absolute T value (sign ignored) of .1271, while the % NW T statistic was -1.9078, producing the probability of a larger absolute T value of .0817. The overall coefficient of determination on this final regression was 37%.

The % NW variable had a sign reversed from the one expected prior to the tests. This could be due to the fact that it is serving as a proxy for some negative influence included in the error term, with this negative power far outweighing the influence of the variable as a "need" proxy. Due to its significance, the variable must be retained in the equation. In the other regression tests no alternative variable had near the explanatory power as % NW.

With the explanatory power of the model reduced along with a reduction in the significance level of the independent variables, and with the fact that the sample is of very small size, the writer was tempted to eliminate the function entirely from the research. On the other hand, the statistics do offer some interesting implications. Therefore, the Public Welfare function is being retained but the empirical interpretations must be more tentatively regarded.

The coefficient indicated that local governments are mildly stimulated as a result of receiving grants-in-aid. A \$1.00 increase in per capita aid elicits a \$.09 increase in per capita spending from locally raised resources. If the interpretation is put in terms of total per capita expenditures, a \$1.00 increase in per capita aid is associated with \$1.09 increase in per capita public welfare expenditure. This final estimate is virtually identical to the first regression where \$1.00 in aid brings forth \$1.11 in total spending.

Empirical Finding Compared to Theoretical Expectation. It was shown that simple matching aid predominated the Welfare function, and as outlined in the theory chapter it was anticipated that a stimulation or substitution response could occur depending on the elasticity of demand. However, the theoretical "a priori" hypothesis postulated that a

substitution or a neutral response might be more likely, given the limited tax sources available to local communities along with the fact that a seemingly greater resistance to tax increases occurs at the local level.⁵⁰ If the empirical coefficient on welfare aid is taken at its face value, and assumed to be absolutely accurate, then the stimulation response would be inferred--i.e., \$1.09 in public expenditure would be forthcoming when \$1.00 in outside aid was received. Of course, this result could not be directly transformed into a statement concerning price elasticities since the data refers to expenditures, and the expenditure figures cannot be readily translated into physical quantities and prices. In addition, the factors affecting elasticities, as discussed by Haskell (see Chapter II) do not seem applicable to the Welfare function.

Even though the statistical analysis implied that stimulation did take place, there are several factors, which if considered, may make a stimulation response less than certain. In the first place, the coefficient is quite close to unity, indicating a potential neutral response. Secondly, the aid coefficient might be biased; and if so, it was shown that this bias would be in an upward fashion.⁵¹ While the extent of this bias cannot be precisely determined, if it does exist, and if the standard deviation associated with the welfare coefficient is also taken into consideration (the standard deviation of the aid coefficient is over one-half as large as the coefficient, but this may be partly due to 12% significance level), the true coefficient easily could be unity or even slightly less than unity. In essence, then, the empirical result does not deviate too greatly from the "a priori" hypothesis of what might be the true and actual expenditure response.

Health Function

Variables Selected. A total of twelve variables were used in the final regression tests on this function. The nine general variables were used along with the two unique variables selected for the Public Welfare function. These unique variables, percentage of families with incomes under \$3,000.00, and percentage of state population which is non-white, were included for the same reasons given for their influence on welfare spending. LIF can also be a "need" factor in the demand for public health programs as is the variable %NW. One other unique variable was considered for use in the health regression. It was:

1. Percentage of State Population Over 65 Years of Age. Several writers have used this variable in their statistical models. David Smith, using data from fiscal year 1965, was unable to show that old age persons had a significant impact on health spending.⁵² However, in the Pogue and Sgontz model which pooled expenditure data over the years from 1958 to 1964, the above variable was found to be significant at the 10% level.⁵³ It is assumed that as the percentage of old people in a state increases an increase should be observed in per capita public health spending. This implies a positive relationship between the variable and functional expenditures on health programs.

Empirical Findings For The Health Function. There were forty states included in this sample.⁵⁴ As with other functions, the states where little or no aid was received by the local governments were excluded as observations.

A number of regression tests were made in order to develop an aid coefficient that could be statistically acceptable for interpreting aid response. In the first test, the step-down eliminated all but A/P. The

aid coefficient was \$1.18 and the R^2 was 52%. It required additional testing with several combinations of independent variables before a group was obtained that were significant (see those in above table), and until enough A/P coefficients were generated that began to approach a stable value. In the tests run, the A/P coefficient ranged from a high of \$1.19 to a low of \$1.05. It was this limited range of coefficients, after repeated testing, which convinced the writer that the final coefficient of 1.049 was truly representative of the actual expenditure response.

TABLE V
STATISTICS PERTAINING TO PER CAPITA LOCAL
GOVERNMENT EXPENDITURE FOR HEALTH

Independent Variable*	Regression Coefficient	Standard Deviation	Standardized Regression Coefficient	Partial Correlation Coefficient
A/P	1.049	.161	.653	.736
Y/P	.001	.0003	.331	.268
65+	-.135	.071	-.188	-.272

*See Appendix for meaning of symbols.

The final R^2 for the Health function was 66 percent, leaving an error term which amounted to 34 percent unexplained variation in local government expenditure. The old age variable has a negative sign which is inconsistent with "a priori" expectations. It was assumed that the elderly would need a greater amount of public health care, and therefore,

those states where the local government jurisdictions had a greater percentage of older citizens would also show higher per capita expenditures for health. Even with the wrong sign, the 65+ variable is much less important than the other two significant variables (as measured by the standardized regression coefficient) in explaining expenditure variation, and it does not seem to distort, to any degree, the aid coefficient. Therefore, it was decided to leave the old age variable in the equation and conduct no further tests.

The final result on this regression, from an empirical standpoint would imply that outside subsidies are stimulative to local spending. The aid coefficient indicates that \$1.05 in per capita expenditures occurs on the Health function in conjunction with \$1.00 in per capita outside aid being received.

Empirical Finding Compared To Theoretical Expectation. The predominant aid to the Health function is considered to be of the simple matching variety. Some of this aid comes directly from the federal government and by-passes the state,⁵⁵ while other federal aid is channeled through state agencies and is listed as state aid. The most frequently used basis of distributing health subsidies is in fixed proportion to local expenditures,⁵⁶ and it is for this reason that the grants are considered to be specific matching. As the theoretical discussion suggested, the aid might elicit a stimulation or substitution response depending on demand elasticities and on actual program requirements. However, to the extent public health programs are not financed by outside resources, the local communities must provide for this service from local resources. These resources are often quite limited relative to "local needs." If matching aid does become available, given the scarcity

of local resources, the recipient communities might be more inclined to substitute outside funds for local funds. Or, the local authorities may simply increase the quality or scope of public health programs rather than commit large amounts of additional local resources to this activity.

An empirical coefficient of 1.049, implying stimulation seems to be in direct conflict with the hypothesis that local governments prefer to substitute outside resources for internal resources. If the same scrutiny is applied to the health coefficient as was done in regard to the welfare coefficient, then the possibility does exist that the actual response might be one of neutrality or substitution. Since the health coefficient is within \$.05 of unity, and unity implies neutrality, it can be argued that neutrality nearly occurred (note that the standard deviation is large enough to permit a coefficient of less than one). In addition, any upward bias would tend to put the true parameter within the range that makes the "a priori" hypothesis possible. In the absence of data that allows for the conversion of expenditure levels into price and quantity figures, the writer can only suggest that substitution or neutrality remains a strong possibility--i.e., the coefficient generated statistically does not completely rule out a substitution or a neutrality response.

Public Housing and Urban Renewal Function

Variables Selected. Only nine general variables and one unique variable are used for this regression model. The special variable proposed is:

1. Dilapidated Housing. This variable is expected to influence the demand for public housing and urban renewal programs. Computation

will be on the basis of determining the percentage of the stock of sub-standard housing in a state relative to the total stock of poor housing in the nation. While this variable has not been used explicitly in any of the determinant studies on local governmental expenditures, it is the writer's opinion that the existence of substantial quantities of poor housing in the U.S. encourages many groups concerned about this problem to insist that governmental authorities at all levels act to alleviate the conditions. A recent study, sponsored by General Electric's Center for Advanced Studies analyzed a number of problems connected with public housing and urban renewal activities. The study noted that 6.7 million of the 66 million housing units in the nation are sub-standard dwellings. And, among the six million vacant units, only two million were in standard condition. These estimates suggest a growing shortage of decent housing and this could act as the catalyst to promote activities on the above function.⁵⁷ Because of this circumstance, it is the expectation that a positive association may exist between poor housing and public housing and urban renewal expenditures.

A total of 46 states were included in these regression tests. Four states were eliminated from the sample as no federal funds were reported as being disbursed in these states.⁵⁸

Initially, four regressions were run on this function in an attempt to offset the strong explanatory power of the A/P variable and permit other influences to become significant in the model. With outside aid accounting for 75% of total expenditure variation, the step-down procedure continued to eliminate all other variables. Only A/P was significant, and this target variable coefficient was computed as 1.671 which indicated a strong stimulation response. After eliminating several variables on

the basis of excessive correlation with each other the writer respecified the model and made the dependent variable per capita expenditures from internally raised resources. This effectively removed the one-to-one correspondence which existed between A/P and Ph-Ur/P. Then, five additional tests were performed on the revised model using various combinations of independent variables. The best combination appears in the table below.

TABLE VI
STATISTICS PERTAINING TO PER CAPITA LOCAL GOVERNMENT
EXPENDITURES FOR PUBLIC HOUSING AND URBAN RENEWAL

Independent Variable*	Regression Coefficient	Standard Deviation	Standardized Regression Coefficient	Partial Correlation Coefficient
A/P	.6850	.227	.580	.422
IND	11.2113	8.076	.217	.209
DENSITY	- .0020	.002	- .193	- .161

*See Appendix for meaning of symbols.

The unique variable which is the percentage of dilapidated housing in the state related to the total U.S. stock of dilapidated housing, was never a significant influence in any of the regression runs. An inspection of the zero order correlation coefficient with respect to "own" source spending provided the reason for its insignificance. This statistic was only .208.

The IND and DENSITY variables were marginally significant to the equation with the probability of absolute T values of .1725 and .2979 respectively. However, other variables showed less significance. In addition, the DENSITY variable was inversely related to the dependent variable. This is in opposition to the hypothesis that public housing and urban renewal spending would increase as localities experienced a rising concentration of persons residing in the jurisdiction. The wrong sign on DENSITY could be due to the variable being negatively correlated with some unexplained influence in the error term, and with the insertion of DENSITY into the model it is serving as a "proxy" for this unknown factor, thereby taking on the sign of this factor. Other regression runs without the DENSITY variable included did not result in an appreciable change in the A/P coefficient, so the writer decided that the affect of DENSITY was very minimal at best. The A/P variable was highly significant even with aid removed from the dependent variable. The probability of a greater absolute T was less than one percent. The overall R^2 for the final regression was low, being 36 percent; but this is to be expected after removal of aid from total spending.

With the aid coefficient computed as .685 this would be interpreted as \$.69 in spending from "own" sources being associated with each \$1.00 in external subsidy received. If the interpretation is put in terms of total public housing and urban renewal spending, a \$1.69 increase in total expenditures is forthcoming when \$1.00 in outside aid is received by local governments. This empirical result shows a very strong stimulation response has taken place.

Empirical Finding Compared To Theoretical Expectation. As previously indicated, the aid which predominates this function is matching subsidies

of the project type. It was also noted that with this type of aid the local communities were generally spending little or nothing on the function prior to receiving aid. Expenditure data support this contention over the entire period from the time the first major federal public housing legislation was enacted during the Depression, and from the time that urban renewal aid first became available in 1949. As late as 1967, all local governments combined were spending only approximately \$700 million of their own funds in this functional area, while during the same year the federal government was subsidizing the function with nearly the same amount of resources.⁵⁹ In that same year the states were providing virtually no assistance whatsoever. In fact, the Census Bureau listed just a handful of state governments that even participated in public housing and urban renewal activities. They were Connecticut, Hawaii, Massachusetts, New York, Pennsylvania, and Washington.⁶⁰ In essence, it was actually the availability of federal project monies that induced the local governments to embark on public housing and urban renewal programs.⁶¹

In the theoretical model, project matching aid given principally by the federal agencies directly to local governments would result in a strong stimulation response. As shown in Figure 6 in Chapter II, the recipient governments would move from a point of zero (or nearly zero) consumption as depicted by point A in the graph to some output level as determined by the actual specific subsidy amount. The aid coefficient generated statistically definitely corroborated the theoretical conclusion. This aid parameter showed a stimulation response so strong that the accuracy of the empirical result could hardly be questioned. A one dollar per capita receipt of public housing and urban renewal aid is

associated with \$.79 per capita increase in "own" source spending on this function.

Comparisons with Other Expenditure

Response Studies

The regression results of this study are generally not directly comparable with the findings of others who have investigated the stimulation-substitution response. The reasons for this are: most other studies combine state and local government expenditures together and then attempt to estimate the expenditure response on this total amount; most other studies concentrate on the expenditure response to federal aid and ignore state aid; other studies use different time periods and different combinations of independent variables. However, even with these basic problems, there are some similarities and differences that are worthy of discussion.

In regard to studies concentrating on combined state-local expenditures, where federal aid is the external source of funds, the following results were obtained:

<u>Function</u>	<u>Smith Study</u> ⁶²	<u>Osman Study</u> ⁶³	<u>Sacks and Harris Study</u> ⁶⁴
Education	1.0642*	2.71	---
Highways	1.1723*	1.37	1.259
Public Welfare	1.5238*	1.37	1.683
Health and Hospitals	1.0086*	2.09	2.355

*All coefficients were increased by one in order to make all the above coefficients comparable. Smith regressed expenditures from "own" sources on outside aid, and this necessitated the correction.

These coefficients indicate that stimulation is taking place in all functions, whereas the writer's study found unquestioned stimulation only with regard to the Public Housing and Urban Renewal function (not

examined above). On comparable functions, the above studies showed coefficients higher than those found by this writer.⁶⁵ It is possible that more upward bias may occur when combined state-local spending is regressed on federal aid. This could be the case if the federal aid is directed primarily to state activities (which is usually true) while the dependent variable has included a large component of local expenditures. The resulting regression coefficient may tend to be overstated in this situation.

There are two noteworthy studies on education which do concentrate on the state aid aspect of grants, as does this paper.

<u>Function</u>	<u>Bishop Study</u> ⁶⁶	<u>Renshaw Study</u> ⁶⁷
Education	.06 to .80	.163

These statistics indicate substitution is the response. Results here are similar to the regression solutions generated in this research, but again, it is difficult to make direct comparisons because of dissimilarities in the equation specifications. Both of the above studies used per pupil expenditures as the dependent variable and per pupil state aid as the independent variable, whereas the writer's analysis used per capita figures for the entire population. Also, the size of estimating equations are different, and this might affect the results. Eight significant variables appeared in the final regression in this research while the Bishop and Renshaw studies used only three independent variables. In addition, different time periods were used, and this could create difficulty in comparing coefficients.

FOOTNOTES

¹Another method is outlined in Elliott R. Morss, and J. Eric Fredland and Saul H. Hymans, "Fluctuations in State Expenditures: An Econometric Analysis," Southern Economic Journal (April, 1967), p. 498. These authors use a GM-199 program where the variables are included in a step-down manner. The variable which gives the highest R^2 is entered first, then the variables with the highest partial correlations are inserted. All these variables must show regression coefficients significantly different than zero before they are entered.

²See footnote 4 in Chapter I.

³See Thomas F. Pogue and L. G. Sgontz, "The Effect of Grant-In-Aid on State-Local Spending," National Tax Journal (June, 1968), pp. 190-199; Glenn W. Fisher, "Interstate Variation in State and Local Government Expenditure," National Tax Journal, XVII (March, 1964), pp. 55-74; Wallace E. Oates, "The Dual Impact of Federal Aid on State and Local Government Expenditure, A Comment," National Tax Journal, XXI (June, 1968), pp. 220-223; Elliott R. Morss, "Some Thoughts on the Determinants of State and Local Expenditure," National Tax Journal, XIX (March, 1966), pp. 95-103; L. R. Gabler and J. I. Brest, "Interstate Variations in Per Capita Highway Expenditures," National Tax Journal, XX (March, 1967), pp. 78-85.

⁴Pogue, p. 192.

⁵Fisher, p. 74.

⁶Jack Osman, "On the Use of Intergovernmental Aid as an Expenditure Determinant," National Tax Journal, XXI (September, 1968), p. 439.

⁷U.S. Department of Health, Education and Welfare, "Grants-In-Aid and Other Financial Assistance Programs Administered by the U.S. Department of Health, Education and Welfare" (Washington: Government Printing Office, 1961), p. vi.

⁸Morss, p. 98.

⁹Osman, p. 445.

¹⁰Using the symbols from page two and adding E_{t-a}/P = per capita expenditure from own sources, let $E_t/P = a + bA/P$, but since $E_{t-a}/P = E_t/P - A/P$, then subtracting A/P from both sides of the equation it can be shown that $E_{t-a}/P = \alpha + (b-1)A/P$.

- ¹¹Osman, p. 445.
- ¹²Advisory Commission on Intergovernmental Relations, p. 85.
- ¹³Advisory Commission on Intergovernmental Relations, State Aid to Local Government (Washington: October, 1969), p. 40.
- ¹⁴George A. Bishop, "Stimulative Versus Substitutive Effect of State School Aid in New England," National Tax Journal, XVII (June, 1964), p. 134.
- ¹⁵Advisory Commission on Intergovernmental Relations, The Role of Equalization in Federal Grants (Washington: 1964), pp. 148-166, 217, 220-221. This reference shows the matching arrangements on the three functions. The minimum matching rate in 50-50.
- ¹⁶Advisory Commission on Intergovernmental Relations, Fiscal Balance in the American Federal System, I (Washington: October, 1967), p. 93.
- ¹⁷*Ibid*, p. 250.
- ¹⁸U.S. Bureau of Census, 1967 Census of Governments, VI, Topical Studies Number 4, pp. 18-109.
- ¹⁹Advisory Commission on Intergovernmental Relations, The Role of Equalization in Federal Grants, pp. 217, 220-221.
- ²⁰Soloman Fabricant, The Trend of Government Activity in the United States Since 1900 (National Bureau of Economic Research, New York, 1952).
- ²¹See: Fisher, pp. 55-74, and 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.
- ²²Sacks, p. 81.
- ²³Fabricant, p. 129.
- ²⁴See Werner Z. Hirsch, The Economics of State and Local Government (New York: McGraw-Hill Book Company, 1970), pp. 176-184, and Selma Mushkin, Sharing Federal Funds for State and Local Needs, Grants-In-Aid and PPB Systems (New York: Praeger Publishers, 1969), pp. 189-190.
- ²⁵Harvey Brazer, City Expenditures in the United States, Occasional Paper No. 66 (New York: National Bureau for Economic Research, 1959), p. 79.
- ²⁶See Harvey Brazer, p. 19; Soloman Fabricant, pp. 112-139, and Fisher, pp. 349-355.
- ²⁷See the works cited in footnotes 1, 2, and 3 in Chapter I.

²⁸Brazer, p. 21.

²⁹Jerry Miner, Social and Economic Factors in Spending for Public Education (Syracuse: Syracuse University Press, 1963), pp. 78-79.

³⁰See Jerry Miner, George Bishop, and Seymour Sacks and William F. Helmuth, Financing Government in a Metropolitan Area (New York: Glencoe, 1961).

³¹U.S. Department of Commerce, "Taxable Property Values," 1967 Census of Governments (Washington: September, 1968), pp. 42-47.

³²Austin Ranney, "Parties in State Politics," in Politics in the American States, edited by Herbert Jacob and Kenneth N. Vines (Boston: 1965), pp. 64-65.

³³See Osman, p. 368, Sacks and Harris, p. 79, and Ira Sharkansky, "Some More Thoughts About the Determinants of Government Expenditures," National Tax Journal, XX (June, 1967), p. 172.

³⁴Only public education expenditure on primary and secondary schools is used as the state controls and contributes directly toward higher education spending.

³⁵See the works of Werner Z. Hirsch, "The Supply of Urban Services," in Issues in Urban Economics, edited by Harvey S. Perloff and Lowden Wingo, Jr. (New York: Resources for the Future, Inc., 1968), pp. 477-525; Miner, Bishop, Edward Renshaw, "A Note on the Expenditure Effect of State Aid to Education," Journal of Political Economy, April, 1960), pp. 170-174.

³⁶Jerry Miner, "Social and Economic Factors in Spending for Public Education," The Economics and Politics of Public Education #11 (Syracuse, 1963), p. 80.

³⁷Miner, pp. 79-80.

³⁸H. Thomas James, James A. Kelly, and Walter I. Garms, "Determinants of Education Expenditures in Large Cities of the United States," U.S. Department of Health, Education and Welfare, Office of Education, Cooperative Research Project #2389 with the School of Education, Stanford University, 1966, pp. 113-114.

³⁹Morris Beck, "The Role of State Aid in Local Government Finance," in Tax Institute of American, Federal State-Local Fiscal Relationships, Princeton, 1968, p. 383.

⁴⁰Advisory Commission on Intergovernmental Relations, State Aid to Local Governments (Washington, October, 1969), p. 85.

⁴¹See Phillip H. Burch, Jr., Highway Revenue and Expenditure Policy in the United States (New Brunswick: Rutgers University Press, 1962), Chapters II and IV; Gabler and Brest, pp. 78-85; Sharkansky, p. 28.

⁴²Burch, p. 27.

⁴³Ibid, p. 27.

⁴⁴U. S. Census Bureau, 1967 Census of Governments, IV, No. 2, State Payments to Local Governments (Washington: U.S. Government Printing Office, 1969), p. 100.

⁴⁵See the works of Glenn Fisher and Thomas Pogue and L. G. Sgontz.

⁴⁶Fisher, p. 61.

⁴⁷Renshaw, pp. 170-174.

⁴⁸The categorical programs are: Old Age Assistance, Aid to Families with Dependent Children, Aid to the Blind, Aid to the Permanently and Totally Disabled, and Medicaid.

⁴⁹Advisory Commission on Intergovernmental Relations, pp. 70-71.

⁵⁰See theory discussion on Simple Matching Aid in Chapter II, and also the George F. Break study put out by the Bookings Institution cited in footnote 26 in Chapter II.

⁵¹Pogue and Sgontz, pp. 190-199.

⁵²David L. Smith, "The Reponse of State and Local Government to Federal Grants," National Tax Journal, XXI (September, 1968), pp. 349-357.

⁵³Pogue and Sgontz, pp. 190-199.

⁵⁴The excluded states are Alaska, Arkansas, Delaware, Hawaii, Indiana, Massachusetts, Missouri, Oklahoma, South Dakota, and Vermont.

⁵⁵Advisory Commission on Intergovernmental Relations, The Role of Equalization in Federal Grants (Washington, January, 1964), p. 26. This is an estimate of direct assistance for the year 1962.

⁵⁶Advisory Commission on Intergovernmental Relations, State Aid to Local Governments, p. 75.

⁵⁷Kaiser Committee, "The Nation's Housing Problem," in Readings in Urban Economics, edited by Matthew Edel and Jerome Rothenberg (New York: The Macmillan Co., 1972), p. 179.

⁵⁸U.S. Bureau of Census, "Compendium of Government Finances," 1967 Census of Governments, IV, No. 5 (Washington, 1969), p. 50. The states where no federal funds were received were Alaska, South Dakota, Utah, and Wyoming.

⁵⁹Advisory Commission on Intergovernmental Relations, The Role of Equalization in Federal Grants, p. 217, 220-221. In this same connection see Table I in Chapter I.

⁶⁰Advisory Commission on Intergovernmental Relations, State Aid to Local Government, p. 98.

⁶¹Ibid, p. 97.

⁶²David L. Smith, "The Response of State and Local Governments to Federal Grants," National Tax Journal, XXI (September, 1968), pp. 349-357.

⁶³Jack W. Osman, "The Dual Impact of Federal Aid on State and Local Government Expenditures," National Tax Journal, XIX (December, 1966), pp. 362-372.

⁶⁴Seymour Sacks, pp. 75-85.

⁶⁵One exception is noted. Smith's coefficient of 1.0086 for Health and Hospitals is less than the coefficient of 1.05 which was found in this study. It should be pointed out that only Health expenditures were considered in this work while Smith included hospital spending.

⁶⁶George A. Bishop, "Stimulative versus Substitutive Effects of State School Aid in New England," National Tax Journal, XVII (June, 1964), pp. 133-143.

⁶⁷Edward F. Renshaw, "A Note on the Expenditure Effect of State Aid to Education," Journal of Political Economy (April, 1960), pp. 170-174.

CHAPTER IV

CONCLUSION

The question whether external aid from state and federal sources to local governments results in a stimulation or substitution expenditure response was approached from an abstract theoretical standpoint which was then subjected to empirical testing. In the examination of this question it was assumed that local governments would be influenced by outside aid, and the statistical regressions on the five major local government functional spending activities did confirm that this was the case. The partial correlation coefficient furnished a guide to which factors were most prominent in determining local expenditure levels. By the use of this statistic it was found that per capita state-federal aid actually ranked first in importance with three of the five functions: Highways, Health, and Public Housing and Urban Renewal. Per Capita state-federal aid occupied a second place ranking with Public Welfare and a fourth place ranking with the Education function.

While this research had no control group or prior standard with which to compare the empirical results, the primary basis for comparison was the extent to which the statistical inferences as to expenditure response were compatible with the response inferences developed in abstract theory. The following were the response possibilities which were developed by the theoretical and empirical models:

<u>Function</u>	<u>Dominant Aid Type</u>	<u>Theory Response*</u>	<u>Empirical Response</u>
Education	Foundation Aid (Matching)	Substitution to Stimulation	Substitution
Highways	Specific Non- Matching	Substitution	Substitution
Public Welfare	Simple Matching	Substitution to Stimulation	Slight Stimulation
Health	Simple Matching	Substitution to Stimulation	Slight Stimulation
Public Housing and Urban Renewal	Project Aid (Matching)	Stimulation	Strong Stimulation

*The theoretical response shows the range of responses; so a neutral response may be possible with some functions.

As can be seen from the foregoing tabular summary, three functions-- Education, Public Welfare, and Health--permit a broad range of potential theoretical expenditure responses. Yet, the statistical coefficients indicated that local governments were substituting outside funds for local resources, or were simply adding the external funds as a supplement to existing expenditure levels (see Chapter III under Public Welfare and Health for a full discussion of potential substitution or neutral impact of grants).

It is usually assumed that the primary objective of state and federal aid is to act as an incentive for local governments to expand the service levels from locally raised revenues.¹ This understanding is based on viewing aid from the grantor standpoint. However, consideration must be given to the fact that recipient governments face severe financial limitations brought on by the following conditions: extensive tax competition is carried on by local jurisdictions in an effort to attract new industries and wealthy residents; there is an excessive fragmentation of local areas into separate governmental entities which often reduces overall fiscal capacity; localities rely more heavily on tax sources that are relatively less income elastic for financing public services, and this

necessitates continuing tax rate increases to meet expanding needs; there is generally greater resistance by citizen-voters at the local level to tax rate hikes.² The above conditions could easily create a preference on the part of local decision making authorities to substitute external funds for local funds or a preference to expand the quality and scope of existing local services by only raising expenditures by the amount equal to available outside grants. If, as the writer had assumed earlier in this study, that a substitutive (or neutral) preference pattern actually exists, then the substitution response (or neutral response) could be a more likely possibility.

This study was not definitive in the sense that it fully and unambiguously answered the question of which expenditure response would actually occur in all the functional activities examined. In two functions, Highways (the only function where non-matching funds are available) and in Public Housing and Urban Renewal, the theoretical and empirical response was identical. In the remaining three functions-- Education, Public Welfare, and Health--the fiscal realities could force local governments to ignore the stimulating objectives of grantor agencies and shape the demand curve for aided goods in a more inelastic fashion. This conclusion was further reinforced by the fact that this research did generate aid coefficients substantially less stimulative or more substitutive than those associated with other studies.³

FOOTNOTES

¹See Morris Beck, "The Role of State Aid in Local Government Finance," in Tax Institute of American, Federal, State-Local Fiscal Relationships, Princeton (1968), p. 382, and Mark A. Haskell, "Federal Grants and Budgetary Distortion," The Quarterly Review of Economics and Business, II (May, 1962), p. 87.

²See L. L. Ecker-Racz, The Politics and Economics of State-Local Finance, Englewood Cliffs, New Jersey: Prentice-Hall, Inc. (1970), pp. 7, 13, 19, and James A. Wilde, "Expenditure Effects of Grants-In-Aid Programs," National Tax Journal, XXI (September, 1968), p. 346.

³See the Chapter III section of Comparisons with Other Stimulation-Substitution Studies.

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APPENDIX

DEFINITIONS OF VARIABLES WITH
ACCOMPANYING SYMBOLS

<u>Variable</u>	<u>Unit of Measure</u>	<u>Symbol</u>
<u>Dependent Variable</u>		
Local Per Capita Expenditure for Education	\$	Ed/P
Local Per Capita Expenditure for Highways	\$	Hi/P
Local Per Capita Expenditure for Public Welfare	\$	PW/P
Local Per Capita Expenditure for Health	\$	He/P
Local Per Capita Expenditure for Public Housing and Urban Renewal	\$	Ph-Ur/P
<u>Independent Variable (general)</u>		
Per Capita Personal Income	\$	Y/P
Median Years of Schooling Completed	years	S. COMP
Population Per Square Mile	sq. mile	DENSITY
Percentage of Labor Force in Manufacturing Empl.	%	IND
Percentage of Population in Cities Over 2,500 Pop.	%	URB
Per Capita Federal-State Aid	\$	A/P
Per Capita Market Value of Real Property	\$	MVP
Index of Political Party Competition	decmil	TP COMPT
Percentage of Func. Expenditure Financed by Outside Aid (with functional subscript)	%	% AID
<u>Independent Variable (unique)</u>		
Percentage of Population of School Age, 5-18 years (Education function)	%	S. AGE
Percentage of Population in Non-Public Schools (Education function)	%	% NPS
Population of State Non-White (Education, Public Welfare, and Health functions)	%	% NW
Urban Freeway Mileage in State (Highway function)	miles	FREEWAY
Average Snowfall in State (Highway function)	inches	SNOW
Road Usage by Motor Vehicles (Highway function)	miles	MILEAGE

Variable

<u>Independent Variable (unique) (Continued)</u>	<u>Unit of Measure</u>	<u>Symbol</u>
Percentage of Families with Incomes Less than \$3,000 (Public Welfare and Health functions)	%	LIF
Percentage of Population Over Age 65 (Health function)	%	65+
Dilapidated Housing (Public Housing and Urban Renewal function)	\$	% DIL

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