An Externalities Approach to the Analysis of Federal Grants-In-Aid Emphasizing the Effect of Grants on Cooperation Among Local Units of Government.

Charles Franklin Hawkins
Louisiana State University and Agricultural & Mechanical College

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HAWKINS, CHARLES FRANKLIN

AN EXTERNALITIES APPROACH TO THE ANALYSIS OF FEDERAL GRANTS-IN-AID EMPHASIZING THE EFFECT OF GRANTS ON COOPERATION AMONG LOCAL UNITS OF GOVERNMENT

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AN EXTERNALITIES APPROACH TO THE ANALYSIS OF FEDERAL GRANTS-IN-AID EMPHASIZING THE EFFECT OF GRANTS ON COOPERATION AMONG LOCAL UNITS OF GOVERNMENT

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Economics

by

Charles Franklin Hawkins
B.A., Lamar University, 1963
M.A., Louisiana State University, 1965
December, 1980
ACKNOWLEDGEMENTS

The writer is indebted to his committee for helpful suggestions and criticisms of this paper. Special thanks go to the committee chairman, Dr. David B. Johnson, for his review of several drafts and to Drs. Thomas R. Beard and James P. Payne.

Dr. Sterling C. Crim, a member of the Mathematics Department at Lamar University, provided assistance in the proof of geometric relationships in the paper.

Finally, the writer is indebted to his wife, Charla, and to his children for their encouragement and patience.
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ABSTRACT

The genesis of federal grants-in-aid can be traced back to the Northwest Ordinances of 1785 and 1787. From those earlier years to the present, grants have been introduced in response to individual needs that have existed at particular points in time. As a result of the basic reaction nature of grants, only a very negligible consideration has been given to developing the individual grants into an integrated, non-conflicting system. As could be expected, the consequence of this approach to grant development has been an uncoordinated grant program containing overlapping grants in some cases and conflicting ones in others. In fact, the unsystematic approach to grants taken in this country has made it virtually impossible to obtain an accurate count of the number of different grants which exist.

This paper approaches the study of grants from the perspective of enhancing cooperation among governmental units which produce goods with spillout effects. To accomplish this task, a model was developed to demonstrate the effects of reciprocal externalities generated by two communities under several different assumptions. Welfare characteristics were evaluated under conditions of cooperation and non-cooperation to determine whether or not cooperation would likely take
place between the communities. In those cases in which cooperation was likely to occur, grants were found to play a positive role in promoting cooperation.

Finally, individual characteristics of grants were investigated to determine their possible effects on cooperation among governments.
The tripartite federal form of government which exists in the United States was born out of a compromise between antagonists advocating, on the one hand, an all powerful central government and, on the other, state sovereignty. Formal distribution of authority between the national and state levels of government is found in the Constitution of the United States under Article I, Section 8 and the Tenth Amendment. Article I, Section 8 begins: "The Congress will have power to lay and collect taxes, duties, imports, and excises, to pay for the common defense and general welfare of the United States; . . ." and then proceeds to enumerate seventeen other prerogatives of the central government. All residual powers are granted to state governments by the Tenth Amendment which declares: "The powers not delegated to the United States by the Constitution nor prohibited by it to the States are reserved to the states respectively, or to the people." Through this amendment, political autonomy was explicitly established for state governments enabling them to enact laws regulating activities within their boundaries as long as the laws did not infringe on the authority of the national government.
No similar explicit constitutional division of authority separates local governmental responsibilities from those of national or state governments. Rather, in an important exercise of the rights granted to them by the Constitution, state governments have permitted the creation of local governing bodies. These local governments are incorporated under provisions of state constitutions and have only the delegated authority which is provided by the respective states. With this extra constitutional provision for local government, the governmental trilogy of the United States' federal system is complete.

The advantages of a federal system over a unitary one have been enumerated by Arthur W. Macmahon as:

First, federalism is a means, in countries where diversity is pronounced, of accommodating government to the consent of the governed. Second, federalism is a devise for allowing flexibility where the total area is large. Third, a federal system is likely to make experimentation easier. To be sure, central governments in unitary systems engage in much experimentation, but the existence of a federal system heightens the opportunity and encourages the practice. Fourth, federalism widens the opportunity for participation in government.¹

Yet, advantages such as these are in danger of being lost in the United States. Although the Constitution boldly enumerates the powers of the national government and reserves all residual powers to the states, the division of functional responsibilities between the two levels of government and, hence, between the national and local levels has under-

gone continuous change since the ratification of the Constitution in 1789.\textsuperscript{2} This change is not unique to America, however, for as identified by Richard H. Leach, one major characteristic of federalism is that:

Sovereignty, in the classic sense, has not meaning; divided as power is, the element of absoluteness which is essential to the concept of sovereignty is not present. Federalism is concerned with process and by its very nature is a dynamic, not a static, concept.\textsuperscript{3}

When dynamic social, economic, and political variables change, responsibilities among governmental levels also change. As experienced within the American federal system, the realignment of responsibilities and functions has effected an increase in the sphere of influence of the national government at the expense of state and local governments. Commenting on the reasons for this change, the Committee for Economic Development identified the following contributing factors:

1. Interdependence has grown among individuals, local communities, and the various regions of the nation as a result of increasing industrialization and urbanization and a rapid population growth and heightened mobility. Problems that were once regarded largely as local are now of state and national concern.


2. Demands for more and better services have accelerated since World War II, stimulated by a rapid and sustained increase in real national output and personal incomes. Still larger demands can be expected in the future as the population continues to grow and the standard of living continues to improve.

3. The national government has developed a tax system more responsive to economic growth and more easily administered than those of state and local governments, which have traditionally had the responsibility for supplying a large proportion of domestic public services.\(^4\)

Two additional non-economic factors which have played an important role in the tendency toward centralization of power should be mentioned. The first is a social phenomenon involving the demand for equal rights by groups which believe that they have been precluded from full and equal participation in all aspects of society. Turning to the federal government for relief, these groups have been well received and the successes made possible through federal involvement have led other groups, including city and state government, to rely more and more on federal solutions for their problems. The second factor lies in the area of practical politics. Incumbent legislators seeking re-election and aspiring legislators seeking election foster or at least do not discourage the provincial attitudes of their constituents. This lack of resistance at the federal level has encouraged increasing requests for aid by state and local governments.

The Problem

The essence of the fiscal crises facing America's federal form of government was clearly identified by L. L. Ecker-Racz in the following terms:

When the states formed the Union, they retained most functions of domestic government for themselves and for their political subdivisions. They felt secure in retaining these responsibilities, not anticipating that the cost of education, welfare, health, and some of the other services would some day swamp their fiscal system. Neither did they anticipate that economic development and the mobility of people would bridle state and local taxing freedom at the same time that it made the quality of government's performance critical to the people's continued prosperity. In short, they did not foresee that unrestrained decentralization of governmental responsibility would some day jeopardize the very ends of the Union they were in the process of creating.  

Thus, fiscal imbalance between expenditure requirements and revenue sources at the state-local and national levels has caused serious concern over the ability of state and local governments to continue to function in their traditional roles in the federal system.

To demonstrate the dependency of state and local governments on inflexible revenue sources, consider the data contained in Table I. For fiscal year 1976-77, total taxes collected by all governments amounted to $419,778 million. Of this total, income taxes accounted for 60 percent, sales and gross receipts taxes for 20 percent, property taxes for 15 percent, and all other taxes for 5 percent. The striking feature of the table, though, is

---

the high degree of reliance by each level of government on a particular tax source. For the federal government, income taxes accounted for 87 percent of all taxes, local governments gathered 81 percent of their taxes from property levies, and state governments used sales and gross receipts taxes to collect 52 percent of their revenues. Considering the income tax, which is the most income elastic of the taxes, 85 percent was collected by the federal government, 14 percent by state governments, and only 1 percent by local governments. By contrast, for the property tax, which is the least income elastic of the taxes, 96 percent of the revenues were collected by local governments and 4 percent by state governments.

TABLE I

TAXES COLLECTED BY LEVEL OF GOVERNMENT, FISCAL YEAR 1976-77
(millions of dollars)

<table>
<thead>
<tr>
<th>TAX</th>
<th>ALL LEVELS OF GOVERNMENT</th>
<th>FEDERAL GOVERNMENT</th>
<th>STATE GOVERNMENT</th>
<th>LOCAL GOVERNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>250,037</td>
<td>211,617</td>
<td>34,666</td>
<td>3,754</td>
</tr>
<tr>
<td>Sales &amp; Gross Receipts</td>
<td>83,821</td>
<td>23,180</td>
<td>52,362</td>
<td>8,278</td>
</tr>
<tr>
<td>Property</td>
<td>62,527</td>
<td></td>
<td>2,260</td>
<td>60,267</td>
</tr>
<tr>
<td>Other</td>
<td>23,393</td>
<td>6,088</td>
<td>9,897</td>
<td>2,167</td>
</tr>
<tr>
<td>TOTAL</td>
<td>419,778</td>
<td>243,842</td>
<td>101,085</td>
<td>74,852</td>
</tr>
</tbody>
</table>

Considering the other side of the revenue-expenditure problem, Table II presents direct expenditures by levels of government for Fiscal 1976-77. Comparing these data with taxes collected during the same period clearly illustrates the fiscal crises of local governments. For the period, local governments' direct spending amounted to $194,403 million or 28 percent of $682,492 million of direct spending by all levels of government. Concurrently local tax revenues were only $74,852 million for a tax-expenditure difference of $119,551 million. More and more, local governments are being called upon to supply greater quantities of increasingly sophisticated and costly services. The tax base to which they are restricted by state prohibitions, traditions, or practical limitations has not been able to generate revenues fast enough to keep up with the rapidly expanding demand for services. This problem has not been ignored by higher levels of government, but has been the object of several types of intergovernmental aid programs. These programs include: technical assistance, loans, shared revenues, and grants-in-aid.

This thesis is an intergovernmental fiscal relation study of the latter program--grants-in-aid. Its purpose is to analyze a largely neglected aspect of federal grants; namely, the internalization of local government generated externalities through grant induced cooperation among affected local governments. The argument will be developed in this study that a lack of cooperation among local governments has resulted in an inefficient use of available funds, and that greater cooperation could, therefore, ease the existing "fiscal crises" of local governments.
TABLE II

DIRECT EXPENDITURE BY LEVEL OF GOVERNMENT,
FISCAL YEAR 1976-77
(millions of dollars)

<table>
<thead>
<tr>
<th>LEVEL OF GOVERNMENT</th>
<th>DIRECT EXPENDITURES</th>
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<tr>
<td>Federal</td>
<td>359,324</td>
</tr>
<tr>
<td>State</td>
<td>128,765</td>
</tr>
<tr>
<td>Local</td>
<td>194,403</td>
</tr>
<tr>
<td>TOTAL</td>
<td>682,492</td>
</tr>
</tbody>
</table>


The Advisory Commission on Intergovernmental Relations (ACIR) recognized the importance of cooperation in the following:

... the growing stake of the Federal government in the grant system, inherent in the expansion of Federal grant outlays from $3.2 billion in 1955 to $59.8 billion in 1976, has intensified the Federal government's interest in assuring that grant dollars are spent with the maximum efficiency and effectiveness. And, since state and local governments are at the point of service delivery in the expenditure of these funds, this means that the Federal government is acutely concerned over the capacity of those governments to spend and administer effectively. It now is concerned not only with avoiding fraud and incompetence in the use of Federal grant funds, but also in improving the management capacity of state and local grant recipients.6

As a manifestation of Federal concern over cooperation in grant management, the Office of Management and Budget published "Circular A-95" as a statement of its policy guidelines. Commenting on the beneficial results of "Circular A-95," the ACIR stated:

The general thrust of the A-95 response to these problems was, and is, to promote communication and coordination between generalists and specialists at all these governmental levels and to encourage an expanded decision making process. "It substitutes the politics of negotiation for the politics of bypassing," which had been characterized by "vertical functional autocracies" and debilitated general purpose governments.  

Importance of the Study

Since the 1950's federal grants-in-aid to state and local governments have developed into a significant fiscal instrument in the United States. In 1951, for example, aid totaled only $2.2 billion; but by 1977 this figure increased by about thirty-fold to exceed $68 billion. As revealed in Table III, the increase cannot simply be attributed to normal expansion in a growing economy for grants have increased in relative as well as absolute importance. On a percentage basis, GNP grew by 404 percent whereas grants grew by 3009 percent. The greater relative increase in grants caused grants as a percentage of GNP to increase from 0.6 percent in 1951 to 3.7 percent in 1977.

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8Advisory Commission on Intergovernmental Relations, loc. cit.
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<tr>
<th>Year</th>
<th>Grants</th>
<th>GNP</th>
<th>Grants as a % of GNP</th>
<th>Federal Expenditure</th>
<th>Grants as a % of Federal Expenditure</th>
<th>Federal Receipts</th>
<th>Grants as a % of Federal Receipts</th>
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<td>1951</td>
<td>2.2</td>
<td>363.6</td>
<td>.6</td>
<td>45.8</td>
<td>4.8</td>
<td>53.4</td>
<td>4.1</td>
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<tr>
<td>1952</td>
<td>2.4</td>
<td>380.0</td>
<td>.6</td>
<td>68.0</td>
<td>3.5</td>
<td>68.0</td>
<td>3.5</td>
</tr>
<tr>
<td>1953</td>
<td>2.8</td>
<td>411.0</td>
<td>.7</td>
<td>76.8</td>
<td>3.6</td>
<td>71.5</td>
<td>3.9</td>
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<tr>
<td>1954</td>
<td>3.0</td>
<td>363.6</td>
<td>.8</td>
<td>70.9</td>
<td>4.2</td>
<td>69.7</td>
<td>4.3</td>
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<tr>
<td>1955</td>
<td>3.2</td>
<td>380.0</td>
<td>.8</td>
<td>68.5</td>
<td>4.7</td>
<td>65.5</td>
<td>4.9</td>
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<tr>
<td>1956</td>
<td>3.8</td>
<td>411.0</td>
<td>.9</td>
<td>70.5</td>
<td>5.4</td>
<td>74.5</td>
<td>5.1</td>
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<td>1957</td>
<td>4.1</td>
<td>432.7</td>
<td>.9</td>
<td>76.7</td>
<td>5.3</td>
<td>80.0</td>
<td>5.1</td>
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<td>1958</td>
<td>4.9</td>
<td>442.1</td>
<td>1.2</td>
<td>82.6</td>
<td>5.9</td>
<td>79.6</td>
<td>6.2</td>
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<td>1959</td>
<td>6.7</td>
<td>473.3</td>
<td>1.4</td>
<td>92.1</td>
<td>7.3</td>
<td>79.2</td>
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*Estimates

Data revealing a more dramatic growth in the importance of grants are those which provide a comparison with direct federal expenditures and federal receipts. Referring to Table III, in 1951, grants amounted to 4.8 percent of federal expenditures and 4.1 percent of revenues. Even with the monetary value of these two categories increasing from $45.8 billion to $401.9 billion and $53.4 billion to $356.9 billion, respectively, in 1977, grants in the latter year amounted to 17.0 percent of federal expenditures and 19.2 percent of federal receipts. It is significant, then, that by 1977, about $0.20 out of every $1 in federal revenue was being returned to state and local governments to be spent on programs under their control.

The growing importance of these grants to state and local governments is demonstrated in Table IV. Considering first the relationship between grants and state and local taxes, it may be seen that in 1951, grants from the federal government amounted to 8.5 percent of state and local tax revenues. From that time, grants steadily rose as a percentage of taxes, finally reaching 24.0 percent in 1977. Following the same pattern, but reflecting the excess of expenditure requirements over tax revenues, grants as a percentage of state and local direct expenditures amounted to 7.6 percent at the beginning of the period and rose steadily to 21.0 percent by 1977. Finally, even with financial aid from the federal government, the twenty-seven year period covered in the table witnessed a substantial increase in state and local governmental debt. Starting at $27.0 billion in 1951, aggregate debt of sub-national units of government exceeded $100 billion in 1966 and increased further, to $257.5 billion, by 1975.
TABLE IV

STATE-LOCAL REVENUES, EXPENDITURES, DEBT & FEDERAL GRANTS, 1951-1977
(billions of dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Grants</th>
<th>Revenue of State &amp; Local Governments</th>
<th>Grants as a % of Revenue of State &amp; Local Governments</th>
<th>Direct Expenditure of State &amp; Local Governments</th>
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In addition to the general growth trends indicated in the previous tables, two very important conclusions can be drawn relative to grants. The first is that the federal government has developed over a number of years a strong commitment to fund a programs of grants-in-aid at high levels. In reference to 1977, the $68.4 billion allocated to grants represented over one-sixth of federal expenditures and almost one-fifth of federal receipts. As is true in any instance when a choice is made from among alternatives, opportunity costs were incurred. The costs consisted of curtailed or even zero-level funding for programs competing with grants in the federal budgeting process or, perhaps, higher taxes than would have been levied without the grant program. The second conclusion is the growing dependence of lower levels of government on federal grants to help them finance their ever increasing expenditure requirements. Implicitly, the federal government recognizes that a need for the subsidized function exists and chooses to provide aid indirectly rather than by outright assumption of direct responsibility for the function.

Through its system of grants-in-aid, then, the federal government has undertaken heavy financial responsibility for the indirect provision of a wide-range of state and local governmental goods and services. In a program of this magnitude the question of efficiency is vital. Recognizing the existence of over 78,000 local governments and 50 state governments, the potential for mutually cancelling programs looms large. Given the independence of this large number of governmental units, efficiency in the provision of services would be enhanced if the externality
generating governments could be induced to cooperate. It is the func-
tion of this paper, therefore, to consider not only the income transfer
from the national government to state and local governments in the form
of grants-in-aid, but to also consider the benefits of grants which re-
sult through induced cooperative efforts among governments.

Organization of the Study

In the development of this study, Chapter II serves the important
function of providing the reader with a survey of the literature rele-
vant to topics discussed in later chapters. While primary emphasis
will be placed on the review of grant-in-aid literature, coverage will
also be accorded to externality theory.

Chapter III will discuss the independent adjustment process of local
government to reach a position of equilibrium in the provision of public
and private goods. The simple model of independence will then be ex-
panded to include dependence. A geometric reaction model of local gov-
ernments providing goods with spillout effects will be presented to
demonstrate the attainment of cooperative and non-cooperative equilibrium.
The geometric model will be used in a later chapter to evaluate grants-in-
aid under the criterion of their effect on cooperation among units of
local government.

Chapter IV will present a discussion of the history and institutional
characteristics of grants.

A critical analysis of grants will be made in Chapter V.
The primary objective of scientific inquiry is to expand the frontiers of knowledge in the subject area chosen for investigation. Researchers may approach this task by accepting existing dogma and methodology and branching out into new areas of discovery or they may reject existing dogma and methodology and seek to replace it with new cannons. In the main, this study will follow the former approach.

Structurally, the purpose of the present chapter is to present a body of literature containing concepts and analytical techniques that will serve as a background to the major analysis which is to follow. The literature reviewed in this chapter will be drawn from the three distinct, but not mutually exclusive, areas of Externality Theory, Policy Prescriptions for Externalities, and Fiscal Federalism.

Externality Theory

Externalities have long been recognized as important agents in the process of economic decision making. The first formal analysis

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of externalities was conducted by Alfred Marshall in his Principles
of Economics. In this nonrigorous treatment of the topic, Marshall, as part of his discussion on the costs of production, introduced:

... two technical terms.

We may divide the economies arising from an increase in the scale of production of any kind of goods, into two classes—firstly, those dependent on the general development of the industry; and, secondly, those dependent on the resources of the individual houses of business engaged in it, on their organization and the efficiency of their management. We may call the former external economies, and the latter internal economies.

Although Marshall did not make the distinction, further development has associated external economies with an industry's long-run supply curve, giving rise to increasing and decreasing cost industries, while internal economies have been associated with an individual firm's long-run average cost curve, giving rise to economies and diseconomies of scale.

From this early treatment, which was concerned primarily with explaining the phenomena of increasing, decreasing, and constant cost

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3Jacob Viner has commented that, "Marshalls' analysis was excessively simple even on the basis of his own simplifying assumptions, and inadequately precise in formulation ..." Jacob Viner, "Cost Curves and Supply Curves," Readings in Price Theory, ed. George V. Stigler and Kenneth E. Boulding (Chicago: Richard D. Irwin, 1952), p. 169. Reprinted from Zeitschrift für Nationalökonomie, III (1931).

4Marshall, op. cit., p. 266.

industries, an ever expanding body of externality literature began to develop. An early attempt to classify externalities into broad family groups was made by J. E. Meade. Meade's purpose was to distinguish between two externalities which he termed:

. . . "unpaid factors of production" and the second the "creation of atmosphere." The essential difference between these two types of external economy or diseconomy is that in the first case there are still constant returns to scale for society as a whole, though not for the individual industry, whereas in the second case there are still constant returns to scale for each individual industry but not for society as a whole.

While Meade's article provided a rigorous mathematical definition of direct interdependence among producers, it was narrow in scope and did not provide a suitable framework for general externality analysis. In fact, the technological type of externality which Meade's work discussed was of such limited importance that Tibor Scitovsky commented:

The examples of external economies given by Meade are somewhat bucolic in nature, having to do with bees, orchards, and woods. This however is no accident; it is not easy to find examples from industry.


7Ibid. p. 56.


9David B. Johnson has also levied a criticism at Meade's choice of examples depicting technological externalities. His argument demonstrated that bees and apple orchards represented a trivial and incorrect example of externalities. It was shown that Meade's analysis was deficient in that it did not investigate the institutional causes of the divergence between marginal social cost and marginal social
Generalizing his criticism of Meade to include all of the contributors to the existing body of externality literature, Scitovsky wrote:

Definitions of external economies are few and unsatisfactory. It is agreed that they mean services (and disservices) rendered free (without compensation) by one producer to another; but there is no agreement on the nature and form of these services or on the reasons for their being free. . . . The literature contains many examples of external economies; but they are as varied and dissimilar as are discussions of the subject.10

As perceived by Scitovsky, the source of disarray and lack of clarity in externality literature was the failure of writers to recognize that:

. . . there are two entirely different definitions of external economies, one much wider than the other; and that external economies as defined in the theory of industrializations include but go far beyond, the external economies of equilibrium theory.11

He explained that in both usages, externalities were investigated in the context of their effect on the equilibrium positions of perfect competition. In the narrow definition—equilibrium theory—externalities take the form of interdependencies which do not operate through the market mechanism. Because these interdependencies are

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10 Scitovsky, op. cit., p. 143.

11 Ibid.
not "priced," a divergence will exist between private and social benefits/costs and the economy will fail to reach a Pareto optimum. In the broader area of industrialization theory, the nature of investment goods evokes additional impediments to the establishment of a Pareto optimum. Because investment goods are (1) imperfectly divisable, (2) determined in a dynamic framework rather than the static framework of general equilibrium, and (3) subject to different allocation criteria on the national versus the international level, interdependencies which were marketable and, hence, had no effect on Pareto optimality in general equilibrium theory become full-blown externalities in industrialization theory. In classifying externalities found in the literature into these two groups, Scitovsky placed technological externalities into the equilibrium theory group and pecuniary externalities into the industrialization theory group.

This classification scheme, though, as demonstrated in E. J. Mishan's critical analysis, and conceded by Scitovsky, did not prove to be meaningful. For the major innovation of the article, i. e., association of pecuniary economies with industrialization theory, was not new, but "seem[s] to fall readily into already familiar categories," Yet, despite this failure to achieve his


13Ibid., p. 12.
major goal, Scitovsky did make a significant contribution by distinguishing between externalities, per se, and Pareto relevant externalities.

In their seminal paper establishing meaningful operational definitions for externalities, James Buchanan and Craig Stubblebine elaborated on the concept of Pareto relevant externalities by differentiating between marginal and inframarginal externalities and between potentially relevant and potentially irrelevant externalities. To explicate these terms, Buchanan and Stubblebine considered a society consisting of two persons, A and B, who owned adjoining residences. Both A and B had different value functions for their privacy which was expressed in terms of the height of a fence which only B could build. For individual B, it was assumed that utility increases with the height of the fence up to some reasonable limit. Due to his circumstances, however, A had a more complicated pattern. This utility pattern consisted of:

(1) Range 1: As B initially increases the height of the fence, A's utility is increased until the fence reaches a minimum height which satiates A's desire for privacy.

(2) Range 2: A's desire for privacy is fully satiated so that an increase in the height of the fence has no effect on his utility.

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(3) Range 3: As B continues to build the fence higher and higher, A's view of a mountain is obstructed so that each additional increase in height decreases A's utility.

(4) Range 4: The fence is so high that A's view of the mountain is completely obliterated. Therefore, any additional increase in height does not affect A's utility.

In the formal development of the paper, an externality was said to exist when an individual's (A's) utility function depended on his own activities, \((x_1, x_2, \ldots, x_n)\), plus the activity, \(y_1\), of another individual, B. Given that A faces the utility function \(U^A = U^A(x_1, x_2, \ldots, x_n, y_1)\), A's utility is contingent on the externality exerted by B. By allowing small u's to represent partial derivatives of utility functions, a marginal externality is imposed on A by B if \(\mu^A_{y_1} \neq 0\). Moreover, if \(\mu^A_{y_1} > 0\), the marginal externality is an economy, if \(\mu^A_{y_1} < 0\), the marginal externality is a diseconomy.

In contrasting marginal externalities and inframarginal externalities, it can be said if \(\mu^A_{y_1} = 0\), no marginal externality exists. If, at the same time, \(\int_0^{y_1} u^A_{y_1} \, dy \neq 0\) so that B's total activity affects A's utility, an inframarginal externality exists. If \(\int_0^{y_1} u^A_{y_1} > 0\), B exerts an economy on A; if \(\int_0^{y_1} u^A_{y_1} < 0\), B exerts a diseconomy on A.

If an externality (either marginal or inframarginal) exists, it may be potentially relevant or irrelevant depending on whether it "... generates any desire on the part of the externally benefited (damaged) party (A) to modify the behavior of the party empowered to take action (B) through trade, persuasion, compromise, agreement,
convention, collective action, etc."\textsuperscript{15} Furthermore, the externality is Pareto relevant if "... the extent of the activity may be modified in such a way that the externally affected party, A, can be made better off without the acting party, B, being made worse off."\textsuperscript{16}

In relating these terms to the four ranges of A's utility presented above, it is seen that:

(1) A marginal external economy exists in Range 1;
(2) A marginal external diseconomy exists in Range 3;
(3) An inframarginal economy exists in Range 2;
(4) An inframarginal economy or diseconomy may exist in Range 4 depending on the ratio between the utility of privacy and the disutility of an obstructed view;
(5) A potentially relevant marginal external economy exists in Range 1;
(6) A potentially relevant marginal external diseconomy exists in Range 3;
(7) Pareto-relevant and irrelevant externalities are determined by the extent of B's performance. If the net marginal rate of substitution between the activity (fence building) and a numeraire activity for B is not equal to the marginal rate of substitution between the activity and a numeraire activity for A, a Pareto-relevant externality exists. This externality, of course, may be marginal or inframarginal.

\textsuperscript{15}Ibid., pp. 373-374.
\textsuperscript{16}Ibid., p. 374.
Prescriptions for the Effects of Externalities

The recognition that externalities could prevent a Pareto equilibrium from being established led to an investigation into the attending problem of how best to cope with and overcome the effects of externalities. While a consensus as to the best solution to this problem does not exist, the range of conflicting opinion includes only two basic alternatives. On the one hand, it is held that a solution must be determined outside of the externality-affected market and, on the other, that a solution must be determined within the externality-affected market.

One of the earliest participants in the controversy, and the person whose name is most closely associated with the advocacy of an extra-market solution to the externality problem is A. C. Pigou. Relying on the government to provide the required remedy, Pigou stated:

It follows that, under conditions of simple competition, for every industry in which the value of marginal social net product is greater than that of the marginal private net product, there will be certain rates of bounty, the granting of which by the State would modify output in such a way as to make the value of the marginal social net product then more nearly equal to the value of the marginal social net product of resources in general . . . In like manner, for every industry in which the value of the marginal social net product is less than that of the marginal private net product, there will be certain rates of tax, the imposition of which by the State would increase economic welfare . . .

Simply put, Pigou's scheme called for a per unit subsidy equal to the externality-caused difference between marginal benefits and marginal costs to induce a firm to expand its output to the welfare maximizing level. If the externality were negative rather than positive, a per unit tax equal to the difference between marginal benefits and costs would be levied to reduce output to the welfare maximizing level.

Responding to this governmental tax-subsidy plan to achieve a Pareto optimum, R. H. Coase provided an analysis which illuminated a critical analytical oversight; namely, that the problem was not unidirectional but, rather, was reciprocal in nature. Using the production conflict between cattle raising and crop growing on adjacent land as an example, Coase pointed out that if cattle were allowed to roam free they would undoubtedly trample some crops and cause harm to the farmer. But if the government were to step in and force the cattle raiser to pay for the damaged crops, such an action would be harm-


ful to him and cause cattle production to decline. Whether society would be better or worse off would depend on the relative value of crop loss versus cattle loss. In Coase's framework, assuming no decision-making costs, this problem would be solved efficiently through bargaining between the farmer and the rancher.

In the event that decision-making costs exist, Coase recognized that the conclusion of his analysis could change, i.e., that bargaining between the supplier and recipient of externalities may not result in a Pareto optimum allocation of resources and that some other approach would be needed. In this case, three alternatives exist: (1) the externality affected and affecting entities could be organized into a single firm and output decisions would be made administratively rather than through the price system; (2) the government could step in and regulate output; or (3) nothing could be

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done about the problem. Each of these alternatives will, in turn, involve certain costs and it should be recognized that:

... in choosing between social arrangements within the context of which individual decisions are made, we have to bear in mind that a change in the existing system which will lead to an improvement in some decisions may well lead to a worsening of others. Furthermore, we have to take into account the costs involved in operating the various social arrangements (whether it be the working of a market or of a government department), as well as the costs involved in moving to a new system. In devising and choosing between social arrangements we should have regard for the total effect. This, above all, is the change in approach which I am advocating. 23

It is on this ground that Coase criticizes Pigou's contention that, a priori, the governmental sector should be responsible for the externality problem. He states:

It is my belief that economists, and policy-makers generally, have tended to over-estimate the advantages which come from governmental regulation. But this belief, even if justified, does not do more than suggest that government regulation should be curtailed. It does not tell us where the boundary line should be drawn. This, it seems to me, has to come from a detailed investigation of the actual results of handling the problem in different ways. But it would be unfortunate if this investigation were undertaken with the aid of a faulty economic analysis. The aim of this article is to indicate what the economic approach to the problem should be. 24

The attack on a priori acceptance of governmental tax-subsidy solution to the externality problem was continued by Otto Davis and Andrew Whinston in an article in which: "We attempt to establish both

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23 Coase, op. cit., p. 44.
24 Ibid., pp. 18-19.
the conditions under which this classical policy prescription might work and is needed, and those under which it cannot be expected to work."25 Directing their attention specifically to James Meade's restatement of Pigou's prescription, Davis and Whinston's argument can generally be divided into three parts. In the first part, it was demonstrated that when externalities exist, market forces encourage sufficient mergers to take place to establish a "natural unit" for decision making. As in the case of Coase's integrated firm, the natural unit would internalize the externalities and provide for an optimum allocation of resources.

The second part of the argument dealt with the circumstances under which government taxes or subsidies could provide for an optimum allocation of resources. It was demonstrated that when externalities were separable, that is, capable of being expressed as additive functions rather than multiplicative ones, governmental intervention could, on a conceptual basis at least, provide for an optimum resource allocation. The actual implementation of such a program, however, would be extremely difficult. In the first place, the government would have to obtain sufficient data to solve the required simultaneous equations for the determination of specific taxes of subsidies. Secondly, each time the technology of the involved firms changed, the government would have to recalculate taxes and subsidies.

Finally, the argument was advanced that if externalities were not separable, the governmental sector would find it impossible to determine a tax or subsidy which would provide for welfare maximization. In the nonseparable case, externalities affect marginal cost and disallow the welfare maximizing level of production to be unambiguously determined. Firms would adjust output to maximize profit based on their expectations of the externality producing firm's level of production. Since there is no a priori way of determining the precise amount of externalities which would exist, there is no a priori way to determine the welfare maximizing level of output.26 As this related to government intervention, "... even assuming that the governmental policymaker knows the relevant cost functions and desires to maximize welfare, there seems to be no dominant solution to aim at."27 In the nonseparable case, then, any governmental action would not be based on knowledge of the welfare maximizing level of output but on a supposition as to the level. Under these circumstances, it is highly questionable that governmental taxes or subsidies would result in an increase in welfare.

Lest this discussion lead to the faulty conclusion that tax-subsidy proponents capitulated and retired from the controversy, it is necessary to introduce a work which contains representative counter arguments to advocates of effecting a solution to the externality

26Stanislaw Wellisz has argued that it is possible to determine the amount of externalities is his "On External Diseconomies," Economica, XXXI (November, 1964), pp. 345-362.

27Davis and Whinston, op. cit., p. 256.
problem through the market place. The article, authored by Stanislaw Wellisz,\textsuperscript{28} acquiesced to the argument that a government-determined solution would be difficult to devise, but demonstrated that even in Davis and Whinston's case of nonseparable externalities such a solution was possible and that a good solution involved no more inherent difficulties than could be expected in a market-determined solution. In fact, Wellisz contended that the "... conditions under which the modern-old (market) solution is valid leads to the conclusion that far from being a universal panacea, the private bargain solution to external diseconomies applies only to exceptional cases."\textsuperscript{29} Since the bargaining solution is limited in application, it is necessary to understand that "... whether we like it or not, we must try to design a workable Pigovian system of taxes or subsidies, or we must live with the externalities in our non-optimum world."\textsuperscript{30}

Continuing in this vein, James Buchanan\textsuperscript{31} has suggested a taxonomy for externalities which systematized the conditions under which voluntary negotiations and government participation could be expected to move the economy toward an efficient allocation of resources. In Buchanan's classification scheme, the one apparent critical factor was the number of externality-affected individuals. The analysis

\textsuperscript{28}Wellisz, \textit{op. cit.}, p. 354.

\textsuperscript{29}\textit{Ibid.}

\textsuperscript{30}\textit{Ibid.}, p. 361.

\textsuperscript{31}James M. Buchanan, "The Instutional Structure of Externality," \textit{Public Choice}, XIV (Spring, 1973), pp. 69-82.
concluded that regardless of the distribution of property rights between producers and recipients of externalities, if a large number of individuals are benefited (victimized) by the externalities, the free rider problem will work to prevent resources from being efficiently allocated through private bargaining. In this case, an "agent" could negotiate settlements which would be binding on all consumers and efficiency would be obtained. In this process, Buchanan concluded that the agent could not be assumed to be a neutral or impartial participant. Rather, the agent was viewed as an advocate for the consumer and, in the bargaining process, could negotiate for more or less externalities.32

Fiscal Federalism

The major issues associated with fiscal federalism are discussed in companion articles appearing in a conference report of the National Bureau of Economic Research.33 The first article, prepared by Charles Tiebout,34 developed a model for a federalistic structure based on

32 Dewight Lee has provided a discussion which demonstrated that if exclusion is possible, discriminatory pricing can result in consumption efficiency for externalities. See, Dewight R. Lee, "Discrimination and Efficiency in the Pricing of Public Goods," The Journal of Law and Economics, XX (October, 1977), pp. 403-420.


economic efficiency in the production of public goods. Of chief con­
cern to Tiebout were three nonmutually exclusive problems associated
with public goods. These included benefits accruing equally to all
individuals within a region, such as those provided by national de­
fense; benefits which diminish with increases in distance from the
source of production, such as the benefits of fire protection; and
reciprocal and non-reciprocal externalities, such as mosquito spray­
ing by one community which may or may not also be provided by a
neighboring community. Addressing the first two problems together,
Tiebout concluded that the most efficient (least average cost) size
of population for the provisions of public goods will not be uniform
since all public goods do not generate the same pattern of benefits
over given population ranges. As a result, it will be necessary to
have several layers of government, with functional responsibilities
assigned to each in accordance with the cost conditions associated
with the public goods to be supplied. Hence, a federalism would be
an appropriate governmental form to provide an efficient solution to
the first two problems. In a like manner, a federalistic structure
could also be relied upon to provide an efficient solution to the ex­
ternality problem. When one lower level of government generated uncom­
pensated for spillouts to another, Tiebouts contended that "one of the
major functions of a higher level of government, under fiscal federal­
ism, is to arbitrate such spillovers.\(^{35}\) By so doing, public goods pro-

\(^{35}\)Ibid., p. 95.
duction would be carried to the point where the summed marginal benefits equaled marginal cost.

In addition to providing solutions to the supply side of the problems associated with public goods, a federalism was also advocated on the basis of its beneficial effects on demand-related problems. Given the heterogeneity of attitudes and tastes in a society, it would be impossible to design a unique mix of public goods which would provide as much total benefits as the summed benefits from various combinations of public goods which have been tailored to the desires of homogeneous groups of individuals. In a federalism, an ordering of local governments could be arranged to provide a wide variety of public good offerings. Consumer-taxpayers could then choose the local jurisdiction which best satisfied their preference for public goods.

The second article, written by Richard Musgrave, was:

... concerned with quite a different approach, where the role of the central fisc is not limited to consideration of efficiency, but set by the very objectives of political federalism. When independent states join in a federation, they may do so to develop a common


foreign defense, or establish a customs union, or they may wish to pursue certain objectives which require central government interference in the finances of the member state. 38

Keying his comments to the objectives of central interference in the financial matters of subordinate governments, Musgrave identified two reasons for such interference. The first was to bring about equalization among subordinate units of government and, the second was to induce the subordinate units to increase their levels of service.

In the plans which were presented for accomplishing these purposes, it was demonstrated that central interference would have both positive and negative influences. Take, for example, Musgrave's case of equalizing actual per capita dollar outlays on state services in all states. To implement this objective, the central government would have to calculate the average outlay for all states. Those states with tax yields greater than the national average would be assessed an amount equal to their surplus and the money would be given to states with tax revenues less than the national average. The disincentive effects of the plan, however, are obvious. States would be hard-pressed to increase their levels of taxation knowing that a part of any increase would be lost through either a reduction in their subsidy or an increase in their assessment. Therefore, instead of increasing tax efforts, states would attempt to shift their tax burdens by reducing taxes and receiving larger subsidies from the national government. Since all equalization and

minimum service level plans benefit some jurisdictions while imposing costs on others, a Pareto improvement could not result from central interference. For this reason, the final choice in all such plans would depend on the dual considerations of "political philosophy as well as economics."\textsuperscript{39}

To summarize, Tiebout and Musgrave demonstrated that the major issues associated with fiscal federalism are both economic and political in nature. Generally, these issues seem to fall into the following categories: (1) economies and diseconomies of scale; (2) spillouts of a reciprocal and nonreciprocal nature; (3) equalization; and (4) minimum service levels for subnational units of government. Further developments investigating specific ramifications of these general issues led quite naturally into an analysis of the economic implications of a federal governmental structure. In a discussion which attempted to establish criteria for the division of functional responsibilities among governmental units, Mancur Alson, Jr. clearly identified the degree to which this subject had been neglected when he wrote:

\textit{Though economic theory provides a good basis for decisions about which functions ought to be performed through free markets and which by collective or governmental action, it does not tell us what type of government or institution should perform those activities that require collective action. It does not tell us whether a function should be performed by a local, state, or central government, by an ad hoc authority...}\textsuperscript{39}

\textit{Ibid., p. 113.}
or organization, by an international organization or by some other type of institution.\(^{40}\)

Attempting to fill this void, Olson based his analysis on the achievement of "fiscal equivalence" or "a match between those who receive the benefits of a collective good and those who pay for it."\(^{41}\) In more familiar terminology the analysis was similar to that of Tiebout\(^{42}\) in that it was concerned with the establishment of Pareto optimality in the provision of public goods when various types of externalities exist. The major conclusion of the work was that:

\[\ldots\] both the "centralizing" and "decentralizing" ideologies are wrong or at any event entail inefficiency. Only if there are several levels of government and a large number of governments can immense disparities between the boundaries of jurisdictions and the boundaries of collective goods be avoided.\(^{43}\)

Beyond this general conclusion, Olson did not attempt to identify the


\(^{41}\) Ibid., p. 483.


\(^{43}\) Olson, op. cit., p. 483.
public goods which should be provided by each level of government nor did he investigate the reasons for the existing pattern of functional responsibilities.\textsuperscript{44}

Approaching the subject of governmental form on a more abstract level, Manfred Newman questioned whether an ideal structure exists for a political system.\textsuperscript{45} Starting with the acceptance from economic theory that perfect competition would permit the realization of a Pareto optimum and that a pure democracy is the political equivalent to perfect competition,\textsuperscript{46} Newman developed a strong argument advocating federalism as the ideal form of government. His approach was to subdivide public goods into two categories: individual goods and merit goods.\textsuperscript{47} Individual goods are those which are produced in con-

\textsuperscript{44}Selma J. Mushkin and Robert F. Adams have provided an empirical analysis of changes in functional responsibilities among governmental units and reasons for these changes in "Emerging Patterns of Federalism," National Tax Journal, XIX (September, 1966), pp. 225-247. Also, Rex Honey and James Strathman have demonstrated that, for efficiency, small jurisdictions have an advantage in distributing various goods, but large jurisdictions have an advantage in producing complementary goods. See: Rex Honey and James Strathman, "Jurisdictional Consequences of Optimizing Public Goods," The Annals of Regional Science, XII (July, 1978), pp. 32-40.


\textsuperscript{46}For an analysis of the analogy between perfect competition and pure democracy, see: B. S. Frey, "Models of Perfect Competition and Pure Democracy," Kyklos, XXIII (Fourth Quarter, 1970), pp. 736-754.

\textsuperscript{47}Newman uses the term "merit good" in a different sense than its generally accepted usage; namely, a good which provides social as well as private benefits.
formity with individual preferences whereas merit goods are produced in conformity with the preferences of the ruling group. For a social good to be classified as individual, it is necessary that it be approved by the electorate unanimously, but a merit good only needs to be approved by a majority.

In this framework, a Pareto improvement in the provision of public goods could be achieved through a system of governmental units which would permit population groupings sufficiently homogeneous to transform merit goods into individual goods. Thus, goods with wide spread benefits and appeal, such as an orderly system of administering justice, would be provided by the central government. Then as benefits and appeal of public goods diminished, lower levels of government with smaller populations would be established for their provision. In this way, unanimity in the provision of all public goods would exist and a Pareto optimum position would result.48

Considering the lack of homogeneity among the population in a country such as the United States, it appears that satisfying Newman's conditions for an optimum federal governmental structure would require multiple levels of government with numerous units comprising each level. Under these circumstances, it would follow that the relative magnitude of economic activity undertaken at the national level would be substan-

48A federalism thus formed, however, would not provide a solution to all of the problems surrounding public goods. For example, the externality and scalar economies problems, to mention only two, would still remain to cause inefficiencies.
tially less than that of lower levels of government, other things being equal. Further, it appears that over a period of time, increases in demand for products provided by lower levels of government would be greater than for those provided by the national government. Thus, the growth rate of the former should exceed that of the latter. This supposition, however, has not been substantiated by the United States' experience. On the contrary, the rate of growth among governmental units has been more dramatic at the national level than at the state or local levels.

The tendency for economic functions undertaken at the central level to grow at a more rapid rate than those at the state-local level has been the subject of numerous studies. An early theoretical study by Alan T. Peacock and Jack Wiseman\(^49\) demonstrated that increases in governmental activity occur in response to social crises such as depressions or wars. During the period of remedial action, the electorate becomes accustomed to the higher level of activity, so that after the problem has been solved there is not widespread demand for the government to reduce its role. The "crises" expenditures will then flow into other domestic social or economic programs. As a final step, the complexity and extensiveness of problems in a growing economy will necessitate remedial action at higher and higher hierarchial levels of government; hence, the greater will be the growth rate at the higher levels.

Studies specifically investigating the trend toward centralization in the United States have identified many contributing factors. Chief among these are the greater fiscal capabilities of the central government, the ability of the central government to internalize externalities associated with expenditures and taxes, and the ability of the central government to equalize the distribution of wealth among lower levels of government. Also, in a different vein, Kenneth V. Green introduced the possibility of strategic activities causing state and local governments to abdicate to the national government some of the functional responsibilities which they could perform more efficiently. Basing his presentation on the "institutional infrastructure of a federalism, specifically its interstate income distribution and its tax institutions." Green submitted two reasons for the transfer of financing particular goods to the central level. The first would be when a majority experiences lower tax-prices per unit of service at the central level. The second would be when a majority that is paying above average federal taxes, but is unsatisfied with the level of state provision of a good, forms a majority coalition


52Ibid., p. 3.
with a minority that is paying below average federal tax-prices in order to increase the supply of the good.

Grants-In-Aid

One of the most important means of achieving centralization has been through the use of grants-in-aid. These grants, by their very nature, have affected the allocation of resources in the country, and as a result, have been the subject of intense investigation. Among early works dealing with this problem was James M. Buchanan's "Federalism and Fiscal Equity." The thrust of the paper was that in a federalism such as the United States, with resources being unequally distributed among individual states, equals in different geographical areas would be treated unequally by the federal fiscal system. To achieve an equal treatment of equals, Buchanan championed a system of interstate transfers between rich and poor states through the devise of grants-in-aid. In his argument, Buchanan noted that in response to purely economic forces, resources would tend to flow from low marginal product regions with accompanying low compensation to high marginal product areas where compensation was greater. This movement would continue until the marginal productivity for like resources would


For an analogous argument which advocates a transfer to urban areas, see, Kenneth A. Gibson, "A Case for Equity in Federal-Local Relations in Urban Policy Developments," The Annals of the American Academy of Political and Social Science, CDXCI (September, 1978), pp. 135-146.
everywhere be equal. Introduction of a federal "fisc" into this purely economic environment would have unequal impact on different parts of the country and would cause a movement away from the market determined allocation of resources. As explained by Buchanan:

If states are not identical in fiscal capacity, the people in the low capacity (low income) states must be subjected to greater fiscal pressure (higher taxation and/or lower value of public services) than people in high capacity states. If "equals" are thus pressed more in one area than in another, there will be provided an incentive for migration of both human and non-human resources into the areas of least fiscal pressures.55

To remove this fiscal pressure and return to an allocation of resources based on marginal productivity, the article recommended "interarea fiscal transfers" or grants-in-aid.56

Although not specifically responding to Buchanan, A. D. Scott rejected the premise that grants produce a positive effect on resource allocation. He argued that a transfer of amenities to resource-poor areas:

... may be undesirable in the long run for the following reason: the maximum income for the whole country, and so the highest average personal income, are to be achieved only by maxi-
mizing national production. This, in turn, can be achieved only when resources and labor are combined in such a way that the marginal product of similar units of labor is the same in all places.\(^{57}\)

To the extent that grants restrict the movement of resources through subsidy-caused price distortions, the level of national output and income would fail to reach their full potential.

In an acknowledged response to Scott's article, Buchanan\(^{58}\) expanded and refined his earlier analysis which was not intended to be a definitive statement on grants, but only an element in the broader analysis of fiscal equity. In essence, Buchanan's reply was concerned with distinguishing between a collective and a specific grant. Referring to 1950 data, Buchanan discovered that approximately 90 percent of all grant funds were allocated to the four areas of highways, education, social services and unemployment compensation or relief. He undertook a detailed investigation of each of these areas to determine how grants affected resource allocation. Briefly, the investigation concluded that aid to highways was not likely to evoke much effect on the allocation of human resources, but would enhance the allocation of capital resources. The positive impact on capital was thought to occur because a more homogeneous national road transportation system would allow plant location decisions to be based on economic criteria.


rather than road quality differences in various parts of the country. In the area of education, supportive grants were considered to have a positive effect on both labor and capital allocation. To the extent that education levels in poorer regions of the country were raised, workers would be more knowledgable about available opportunities and would be more willing to migrate to take advantage of them. Also, to the extent that a region's labor force becomes better educated, there would be an increase in the potential return for owners of capital; hence, a migration of capital into the poor area would occur. For social services, Buchanan acknowledged Scott's contention to be more applicable, but not without some reservation. To the extent that social services are in the form of health facilities, the results would be similar to the effect of grants for education. If, however, social services were made available to partially productive workers or families of partially productive workers, there would be a negative effect on resource allocation. Finally, grants which subsidize the unemployed would be resource-distorting and Scott's argument would be vindicated. On balance, Buchanan noted:

Equalizing transfers carried out by the central government designed to relieve the fiscal plight of the low-income states, whether in the form of differential tax rates or in that of equalizing grants, cannot be rejected for efficiency reasons. It has been shown that the allocative effects vary from instance to instance, allowing no universally applicable conclusions to be drawn. In specific cases resource effects should perhaps be taken into account, but primarily the transfer
policy should be based on alternative objectives: equity, national interest, and the preservation of minimum standards of the public services.59

As a final factor in the resource allocation controversy, it is necessary to consider the effects of externalities on optimality. In a study based on utility analysis, Albert Breton60 distinguished between externalities resulting from perfect and imperfect utility mappings. By his definition, a perfect mapping exists when "...all the objective benefits of local goods are exhausted within the boundaries of the local jurisdiction..."61 When such a case exists and the non-private good is paid for with benefit taxes rather than general taxes, it is possible to attain a Pareto optimum allocation of resources. But Breton continues:

... if we are presented with an economically optimum constitution and a perfect signaling system for the prices of private goods, the allocation of resources will not be Pareto optimal if non-private goods are paid for by non-benefit taxes, such as a proportional income tax ... . One way of correcting such a situation is through a system of neutral taxes collected from those individuals whose rates are smaller than the marginal utility derived from non-private goods and paid, in the form of neutral grants or subsidies, to those individuals for whom tax rates are larger than the marginal satisfaction from non-private goods.62

59Ibid., p. 217.
61Ibid., p. 180.
62Ibid., p. 181.
Thus, when goods are supplied with intragovernmental externalities and are financed with general taxes, Pareto optimality may be reached through a system of unconditional grants.

If there exists an imperfect mapping so that "... the benefits of non-private goods spill over the frontiers of the jurisdiction buying the good,"63 a different remedial prescription is called for.

In this case, spill-overs mean that, in addition to the amount of a given good bought by a lower level of government, a higher level of government will have to increase that amount by a given quantity so that an optimal over-all quantum of resources is allocated to that good. ... one of the best methods available to the higher level of government to increase the amount spent on a given non-private good is the conditional grant.64

With the imperfect mapping, the requirement for conditional grants is completely independent of the tax system used to pay for the good. On the other hand, the tax system does play an important role in determining the structure of the total grant program. If taxes are of the benefit type, then only conditional grants are needed. But if a general tax is used to finance the good, "... unconditional grants--in addition to the conditional ones--will be required to equalize the marginal utilities of goods and the tax rate in the budgets of all customers."65

63Ibid.
64Ibid., p. 183.
65Ibid., pp. 183-184.
In an article concerned with grant efficiency, Lester Thurow\textsuperscript{66} presented an analysis which complemented the policy prescriptions of Breton. Stressing the importance of establishing and achieving goals, Thurow maintained that the three inherent goals in a system of grants-in-aid are to maximize the return of a given amount of resources which have been invested, to reach the highest possible indifference curve with a given level of resources, and to redistribute income. To obtain these goals, a combination of conditional grants, unconditional grants and conditional taxes would be required—no one tool could accomplish the task alone. If, however, the goal of grants is to encourage a particular project at the lowest cost, a conditional grant should be used.\textsuperscript{67}

A graphic illustration of the cost-effectiveness of conditional and unconditional grants is presented in Figure 1. The figure utilizes a linear budget constraint, AB, for a community in which two goods, X and Y, are being produced. With the vertical axis measuring quantities of Y and the horizontal axis measuring quantities of X, equilibrium will be established at $X_1, Y_1$, the point of tangency between indifference curve I and the budget constraint. Considering first the effect of a conditional grant, assume that it is desired to increase the consumption of good Y and that a subsidy equal to a


\textsuperscript{67}This conclusion depends on the nature of a community's utility function. See, for example, Samuel Nitzan, "Revenue Sharing in Multi-person Public Choice Models," \textit{Quarterly Journal of Economics}, XCI (November, 1977), pp. 315-326.
Figure 1
Effects of Conditional and Unconditional Grants
given percentage of the community's spending on Y is provided for this purpose. Because X is not subsidized, the maximum quantity that the community can obtain remains fixed at the horizontal intercept of the budget line AB. Increases in the purchase of Y, however, will increase the income subsidy to the community by a constant percentage of spending on Y, and the budget line will rotate through B to intercept the vertical axis above A. The degree of rotation will depend on the percentage subsidy. If the subsidy is sufficient to shift the budget constraint to CB, the community will be able to move a higher level of satisfaction on indifference curve II. The new equilibrium consumption of X and Y will be $X_2$, $Y_2$, and the subsidy will equal to $Y_0 Y_2$.

To contrast the budgetary adjustment associated with conditional grants, assume that a grant equal to $Y_0 Y_2$ is provided without any strings or conditions. In this case, the community could use the entire grant to purchase either X or Y. Since the relative prices of the two goods have not changed, the budget constraints shifts to DE, parallel to AB. With DE cutting through indifference curve II, $X_2$, $Y_2$ does not provide the maximum amount of satisfaction to the community. By moving down DE to its point of tangency with indifference curve III, satisfaction would be increased.

Comparing equilibrium attained under conditional and unconditional grants, two important factors are observed. First, grants given unconditionally will result in a greater level of satisfaction to the recipient than the same dollar amount given conditionally. Second, a given increase in consumption of a particular good can be achieved at a smaller cost with a conditional grant than with an unconditional one.
Theoretical conclusions such as these have been complemented with empirical studies investigating the stimulation—substitution effects of grants. Gramlich and Galper\(^6\) found the following tendencies associated with different types of grants: (1) lump sum transfers create more of a tax reduction and less of an expenditure increase per dollar of grant than open ended or fixed sum matching grants; (2) open ended matching grants stimulate spending almost dollar for dollar with the amount of the grant; and (3) categorical fixed sum grants have an impact somewhere between lump sum transfers and open ended matching grants, but when maintenance of effort is required, the stimulative effect is as great as that associated with the open ended grant.\(^6\)

In a regression-correlation analysis by Sacks and Harris,\(^7\) coefficients for various state-local expenditure categories were calculated. The study used the three traditional variables of per capita income, population density, and percent urbanization in the regression equation. Federal aid was then included as an additional independent variable and resulted in a sizable increase in the explained variation


\(^7\)Martin Feldstein's recent analysis of aided local educational expenditures found that an "add-on" grant, which is equivalent to maintenance of effort, stimulated community educational efforts. See: Martin Feldstein, "The Effects of a Differential Add-on Grant: Title I and Local Education Spending," The Journal of Human Resources, XIII (Fall, 1978), pp. 443-458.

\(^7\)Seymour Sacks and Robert Harris, "The Determinants of State and Local Government Expenditures and Intergovernmental Flows of Funds," National Tax Journal, XVII (March, 1974), pp. 75-85.
for total direct general expenditures, highways, and especially public welfare. For spending on local schools, health services, and "other," the introduction of federal aid did not appreciable affect explained variations.71

Other writers such as Jack Osman,72 Thomas O'Brien73 and Edward Renshaw74 followed a somewhat different approach to constructing regression equations by including not only direct aid to a specific function as an independent variable, but aid to other functions as well. In this way, the analysis could identify not only stimulative effects, but also disrtotive effects of federal aid. Typical of the conclusions reached in these studies was the following by Osman:

One important implication of our analysis is that the federal government is able to increase expenditures on a given function in either of two ways. Direct aid to a function will, in general, increase expenditures for that function and will, our results indicate, stimulate expenditures on

71A recent study by Edward Gramlich has demonstrated that federal aid to state and local governments has been used primarily to increase budget surpluses rather than to expand services. See, Edward M. Gramlich, "State and Local Budgets the Day After It Rained: Why Is the Surplus so High?," Brookings Papers on Economic Activity (Washington, D. C.: The Brookings Institution, 1978), pp. 191-214.


that function. Second, expenditures on some functions will increase through federal aid to other functions. 

Finally, Glenn W. Fisher\textsuperscript{76} among others\textsuperscript{77} questioned the results of regression studies which assumed federal aid to be an independent, causative variable. The point was made that because of the matching provision in most grants, the amount of money spent by state and local governments on aided functions would partially determine the amount of aid received. In Fisher's words:

The nature of this relationship can be illustrated by assuming a federal aid program which provides dollar for dollar matching with no limit and no ceiling. In such a case, the amount of federal aid would always be 50 percent of the state expenditure and the correlation would be perfect (1.0). In this case it would be unrealistic to assume that the amount of federal aid is independent of the amount of expenditure or that federal aid explains the interstate variations in expenditure.\textsuperscript{78}

With federal aid being dependent on state and local government spending, correlation coefficients computed under the assumption of independence must overstate the quantitative impact of federal aid. Yet,

\footnotesize
\textsuperscript{75}Osman, op. cit., p. 371.


\textsuperscript{78}Fisher, op. cit., p. 72.
despite the problems associated with obtaining an exact quantification of the impact of grants on recipient governments, there can be no doubt that some response is present. As identified is a study by H. M. Hardy,79 with the diversity that exists among local governmental units, it is not reasonable to expect each to react to grants in the same way, but some reaction is clearly indicated. Additionally, D. A. L. Ault80 has reported a positive impact on local functional expenditures, with the size of the increase depending on the nature of the function itself. Responses to capital expansion grants, for example, were high, while responses to welfare grants were low.

Referenced articles in the foregoing paragraphs dealt with empirical studies of conditional grants only.81 The narrow focus was dic-


81Interestingly, but not unexpectedly, major additions to the body of grant literature have occurred during periods of increased funding by the federal government. As a result of domestic priorities established in President Kennedy's "New Frontier" and President Johnson's "Great Society," for example, grants-in-aid proliferated from 160 authorizations in 1962 to 379 at the end of 1966. Correspondingly, funding grew from $7.6 billion to $12.7 billion. Stimulated by the greatly expanded emphasis on grants, academic inquiry in the area became more intense and reached a peak, in terms of publications, in the years 1968 and 1969. A combination of a reduced sense of urgency following the concentrated burst of activity and Viet Nam and inflation shifting fiscal emphasis away from grants contributed to an abatement in the number of new contributions to grant literature. Then, in 1972, interest in the study of grants was rekindled with the passage of revenue sharing and a body of literature analyzing the "new" type of grant began to be developed.
tated by the fact that prior to 1972, conditional grants were the only type authorized by Congress. With the passage of the State and Local Fiscal Assistance Act of 1972, however, the pattern of issuing only conditional grants was broken, and Congress provided a virtually unconditional grant to state and local governments which is popularly known as revenue sharing. The first formal outlines of revenue sharing were presented by Walter Heller and Joseph Pechman. Both writers advocated a plan which would earmark a given percentage of federal tax collections to be distributed among state and local governments in accordance with population, weighted by tax effort and per capita income. As finally adopted by Congress, revenue sharing generally followed concepts contained in Heller's and Peckman's proposals.

One of the earliest and most comprehensive analytical works on revenue sharing was published by the Brookings Institution under the


The book addressed itself to the analysis of three aspects of revenue sharing—distributional effects, fiscal effects, and political effects. With the distribution of funds determined by formula, it was found that metropolitan areas received the greatest amount of shared funds, per capita. If, however, revenue sharing was viewed as a percentage of non-school tax revenues, sparsely populated areas received preferential treatment. Also, a comparison of the distribution of funds between rich and poor states revealed that on a per capita basis, low income states were awarded a larger amount of funds than high income states. The fiscal effects of revenue sharing indicated a cautious attitude on the part of state and local governments. Only a very small amount of revenue sharing was used to expand social programs which called for continuing financial commitments. The two primary uses were for tax relief and capital expansion. Finally, in the area of political effects, revenue sharing was found to have increased citizen participation in the governmental budgetary process. This result was effected through the requirement that the use of revenue sharing funds had to be published in local newspapers of general circulation. In many localities, public officials, recognizing that the allocation of funds would receive widespread publicity, actively solicited citizen participation in choosing how revenue sharing monies were to be used.

Focusing on the use to which revenue sharing funds were allocated, Caperto and Cole found that in 1976, about seventy-three percent of revenue sharing dollars were devoted to law, fire, environment, street, and recreation functions. Of these five categories, law and fire protection dominated in the use of funds. It was also determined that the use of funds varied more by region than by size of recipient government. Of some significance, the study reported the following impact on the fiscal affairs of recipient governments: (1) five percent used the funds to reduce taxes, (2) forty-seven percent used the funds to prevent an increase in taxes, (3) thirty-one percent used the funds to reduce the amount of a tax increase and (4) seventeen percent reported that revenue sharing had no impact on local tax levies.

Other studies of revenue sharing have generally been concerned with the three areas staked-out in Monitoring Revenue Sharing. In those dealing with formula analysis, the objective has been to suggest changes so that particular goals, i.e., equalization, equity, tax effort and


87While recognizing these general tendencies, Paul Terrill conducted a study of the uses to which seven communities in Washington Oregon, and California put revenue sharing funds. Stating that the results were atypical and that the communities were chosen for study because of their innovative use of revenue sharing funds, Terrill demonstrated that revenue sharing does have the potential of encouraging innovative programs at the local level in social welfare. See: Paul Terrill, The Social Impact of Revenue Sharing (New York: Praeger Publishers, 1976).
nondistortion, would be easier to achieve. Work done by a research team headed by Barry Jesmer provides a good illustration of the direction of formula studies. Most notably, the study concluded that:

1. The required one-third/two-thirds split of money to state/local governments was unfair and unrealistic because it did not take into consideration individual variations in responsibilities of state and local governments;
2. Defining revenue effort in terms of tax collections encouraged the use of taxes at the expense of nontax sources of revenue;
3. Limitations on the maximum and minimum per capita entitlements were questioned, and it was recommended that the upper limit of 45 percent should be retained to avoid excessive allocations, but that the lower limit of 20 percent should be removed; and
4. Intrastate distribution of funds should be changed to permit a "need" element.

In the second major area of revenue sharing investigation, fiscal efforts, the tendency has been to take use reports which recipient governments have submitted to the Office of Revenue Sharing and from these

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89Barry Jesmer, et. al., loc. cit.
determine the functions that are being supported by shared funds.\textsuperscript{90} Breaking with this approach, the Institute of Public Policy Studies at the University of Michigan developed a fiscal impact model for revenue sharing.\textsuperscript{91} The model employed expenditure data, by function, for periods of 17 to 23 years in five selected cities. Based on historical data, projections for spending in functional categories were made under the assumption that no revenue sharing funds were available. These projections were then compared with the actual expenditure of funds in each category when local revenues had been supplemented by revenue sharing. The fiscal impact of revenue sharing was found to vary according to the fiscal health of the city tested. In cities with a high tax effort, revenue sharing was found to displace local taxes. In cities with operating deficits and little opportunity to increase revenues, revenue sharing was used to reduce the deficits. Finally, in cities with a conservative fiscal philosophy, revenue sharing was used to replenish capital and improve social services. From these findings, the study gives a clear warning against accepting data reported to the Office of Revenue Sharing at their face value.

In addition to the economic-based analyses of revenue sharing, studies have also been concerned with political ramifications. One


article, which considered the effect of precluding all but general purpose local governments from receiving revenue sharing funds, concluded that "general revenue sharing has often worked at cross-purposes with regional planning programs and review processes, as well as with the organizations responsible for their conduct." Rather than being a criticism of an unexpected side-effect of revenue sharing, this finding was a tribute to the successful accomplishment of:

... the major purposes of the State and Local Fiscal Assistance Act (which) were to provide financial relief, restore intergovernmental fiscal balance, and decentralize decision making ... (and not) ... to enhance the operational efficiency of local units, or to support regional planning and coordination.

Thus, there is a bias in revenue sharing against intergovernmental cooperation. If regional cooperation is to be encouraged, future revenue sharing laws should correct that bias.

In another approach to the political effects of revenue sharing, Deil S. Wright's analysis led to the conclusion that revenue sharing's bias against special purpose governments would result in fewer of these organizations in the future. At the same time, however, the 20 percent minimum per capita entitlement to all general purpose governments are eligible for revenue sharing funds.

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93Ibid.


95Only general purpose governments are eligible for revenue sharing funds.
governments would sustain the life of some organizations beyond the period when they would naturally expire. Also, Wright envisioned a change in functional emphasis of state governments through a "secular shift of state government from a capital-intensive to a service-intensive component of the federal system."^6

To conclude the review of revenue sharing literature, two additional works must be mentioned. The first is The Economic and Political Impact of General Revenue Sharing.\footnote{F. Thomas Juster (ed.), The Economic and Political Impact of General Revenue Sharing (Ann Arbor, Michigan: The Institute for Social Research, 1977).} This work was funded through a National Science Foundation/Research Applied to National Needs grant for the purpose of ". . . aid {ing} policy makers in their evaluation of the General Revenue Sharing Program."\footnote{Ibid., p. iii.} Based on data obtained from a survey of state, county, and city recipients of revenue sharing funds, the study provided a comprehensive report on the economic and political impact of revenue sharing. The second work is Revenue Sharing: The Second Round\footnote{Richard P. Nathan and Charles F. Adams, Jr., Revenue Sharing: The Second Round (Washington, D. C.: The Brookings Institution, 1977).} which is the first of two planned Brookings Institution sequels to Monitoring Revenue Sharing. The Second Round looks at the fiscal effects of revenue sharing with emphasis on central cities and investigates political forces which directed the use of revenue sharing funds.
**Optimum Provision of Local Public Goods**

The final issue to be included in the centralization controversy is the problem of optimality in the provision of local public goods. The widely accepted position adheres to the Sameulsonian\(^{100}\) conclusion that an underallocation of resources would occur because summed marginal benefits of a locally provided public good would exceed marginal cost. Charles Tiebout,\(^{101}\) while agreeing with these results in the case of a nationally provided public good, argues that, given certain assumptions (perfect mobility being most important), underallocation will not result in the case of locally provided public goods. Tiebout believes that if there are a sufficient number of communities with individual governments, a consumer will choose to live in the community that best satisfies his preference pattern for public goods. In this way, the individual will reveal his true preference and an optimum allocation of resources will result.\(^{102}\)

Alan Williams has provided an interesting contrast to the consensus position; namely, that without remedial action an underprovision of locally provided public goods would occur. In the thought-provoking article, "The Optimal Provision of Public Goods in a System


\(101^{Tiebout, op. cit., pp. 416-442.}

\(102^{Tiebout recognizes the existence of externalities that accrue within the local community, but overlooks the possibility of inter-community economies or spillovers.}
of Local Government,"103 William's geometric analysis concluded that it is possible for the total production of a public good to exceed the optimum amount. At the same time, however, he admonished, "It is not implied, of course, that this outcome will necessarily be true in all cases, but only that it is a perfectly possible result which does not require any obviously unreasonable assumptions to be made."104

The analysis that leads Williams to his conclusion can be demonstrated by referring to Figure 2. Assume that there are two communities I and II with identical transformation curves, AA'. With each community receiving compensation105 for the spillouts of its public good which benefits the other community, the real income curve SA' shows consumption possibilities for each community.

The lines through a₁ and b₁ and through a₂ and b₂ represent consumption-reaction curves for I and II, respectively. These consumption-reaction curves are the locus of equilibrium combinations of public and private goods consumption by each community for various levels of public good production by the other community. In equilibrium, I produces at


104 Ibid., p. 31.

105 Crucial to Williams' argument are his assumptions concerning the nature of these compensations. The assumptions are that each community (1) receives explicit compensation for its spillout, (2) pays a compensation for each spillin received, and (3) treats compensation receipts as spendable in principle upon either public or private goods. Assumption (3) allows Williams to treat the real income curve, SA' as a production curve.
Figure 2

Alan Williams' Demonstration of the Possibility of an Over-Supply of Public Goods

q_1 and II at q_2 with spillouts of q_1 r_1 and q_2 r_2, respectively. That this is "expectational equilibrium" may be demonstrated by observing the exact interrelationships between I and II which exist at these points. By producing at the point q_1, I is generating spillouts of q_1 r_1 = b_2 r_2. II's consumption-reaction curve dictates that for the level of spillouts generated by I, II should produce at q_2. Performing in this way, II's spillouts equal q_2 r_2 = b_1 r_1. Since each community is, in fact, operating as the other expects it to act, equilibrium must exist.

It must be reiterated that the above equilibrium is only "expectational equilibrium"--it identifies a situation in which each community is acting exactly as the other expected it to act. Suppose that with given tastes, income elasticities, and transformation curves, the preferred position for I is z_1 and for II, z_2. The question must be asked whether it is possible for (q_1 + q_2) to be greater than (z_1 + z_2). If this condition is possible, the reaction model may lead to too much of the public good being provided in aggregate. From Figure II, it can be seen that A_1 > A_2 so that, in this instance, Williams' reaction model demonstrates that it is possible for the total production of a public good to exceed the optimum amount.

The conclusions of Williams' analysis have been criticized in two major areas: (1) the contention that an aggregate oversupply of locally provided public goods is consistent with Pareto optimality and (2) that only rarely will the necessary combinations of price and income elasticities exist to permit an aggregate oversupply of locally provided public goods. The initial criticism, by William C Brainard
and Trenery Dolbear, Jr.,\textsuperscript{106} questioned the legitimacy of William's requirement that social optima be defined within the context of an agreement to a limited pooling of autonomy by the communities. The reason for this objection was that one community would be made worse off by agreeing to pool autonomy and would, therefore, not be likely to do so voluntarily. But if pooling were done under compulsion, the resulting movement to a position of aggregate oversupply of a locally provided public good would violate the principle of Pareto improvement.

Continuing with this theme, Mark A. Pauly contend that Williams' conclusions were reached because of a failure "to specify clearly in what way the 'local public good' being discussed possesses elements of 'publicness'."\textsuperscript{107} Pauly presented four examples of how different spillout assumptions would affect the attainment of optimality. In the case of a good with no interior intracommunity spillouts, the equilibrium provision of a public good would be at an optimum level. In the other three cases, however, when spillouts of one type or another existed, equilibrium failed to meet the Samuelson conditions for optimality, i. e., that summed marginal benefits equal marginal cost. An analysis of what would be required to achieve optimality led to the conclusion that in some cases it is possible for an optimum position to exist at a level of output less than equilibrium. But if this


were true, attainment of optimality would necessitate a redistribution of income and would, therefore, not be a Pareto improvement. It is only when optimality is achieved at higher levels of public good provision that a Pareto improvement is possible. Thus, Pauly vindicated both positions on the question of whether too much or too small an amount of locally provided public goods would be produced in independent equilibrium, but demonstrated that a Pareto improvement could be made only through an expansion in the supply of the public good.

The final contribution to the controversy was provided by Herbert Mohring and Allan Maslove. The purpose of their work was to:

... address the question, How disparate must communities be in their price and income elasticities of demand for the "Williams Effect" to be observed? That is, under what circumstances would uncompensated spillovers of the type of public good Williams considered result in greater output than would eventuate if compensation were paid.

Mohring and Maslove's analysis involved an algebraic model which treated a community's spillouts as "identical with a simple excise tax problem." The procedure consisted of imposing an excise tax equal to a percentage of public good output by a community (thus, the excise tax operated similarly to a loss of spillouts by the community) and transferring the in-kind receipts to another community. In this model, a subsequent elimination of the tax transfer would satisfy William's assumed pooling of autonomy to provide for

109 Ibid., p. 778.
required payments for spillouts. After deriving algebraic relationships from demand and supply functions for the variables to be tested, various rates of taxes, price and income elasticities, and shares of income spent on the public good were substituted to determine under what conditions an oversupply of public goods would occur. It was found that when the public good "... accounts for a modest share of total expenditures, the Williams effect would be observed only if truly striking differences in tastes exist."\textsuperscript{110} Also, when the rate of taxation increased, required elasticities for an oversupply of public goods would increase as well. These results led to the conclusion that: "... although the William's effect involves no violations of received doctrine concerning consumer behavior, the odds against its occurrence are high at least in the context of the model he presented."\textsuperscript{111}

Summary

This chapter has been devoted to a presentation of a broad-based body of literature dealing with resource allocation by units of local government. The discussion began with an analysis of a primary impediment to efficient resource allocation; namely, externalities. The externality problem was treated first from the vantage point of tracing the evolving, increasingly sophisticated definition of the term. Subsequent to establishing the definitional characteristics of external-

\textsuperscript{110}\textit{Ibid.}, p. 783.

\textsuperscript{111}\textit{Ibid.}, pp. 784-785.
ities, arguments were presented relative to the method of remedying the misallocation of resources caused by the existence of externalities. Two differing opinions were presented, one advocated free bargaining between the recipient and the producer of the externality and the other maintained that an outside force—the government—should enter and arbitrate a solution. In the context of this thesis, the arguments can be extended to two local governmental units which are affected by externalities. The externalities hinder efficient resource allocation. To solve the problem, the communities could negotiate between themselves or could turn to an outside force—the national government—for a solution.

The next section of the chapter then addressed the subject of intergovernmental functions and relationships in a federalistic governmental structure. The benefits of a federalism vis-a-vis a unitary form of government were considered and an extensive treatment of grants-in-aid as a tool for intergovernmental cooperation (inducement) was presented. Counter arguments were developed dealing with the effectiveness of grants in improving resource allocation, and the question of whether or not grants fostered substitution or stimulation effects on local government expenditures. As a final consideration, the different effects of conditional and unconditional grants on local governmental behavior were investigated. The purpose of this section was to provide background information which will be heavily drawn upon in later parts of this thesis when analyzing the effects of grants-in-aid on cooperation among units of local government.
Concluding the chapter was an argument by Alan Williams, and responses to the argument, which questioned the contention that locally provided public goods would be supplied in less than optimum quantities. The contribution of William's argument to the development of this thesis was not so much concerned with the conclusions reached, as with the method used to obtain the conclusions. His geometric reaction model provided the stimulus for developing the reaction-cooperation model which is presented in Chapter III. That model, by demonstrating more directly the nature of the reactions adjustment, concurs with Brainard, Dolbear, and Pauly that an oversupply of public goods would imply a non-Pareto change because of a redistribution of income.
CHAPTER III

JOINT PROVISION OF PUBLIC GOODS
IN AN INTERACTION MODEL

This chapter begins the development of an analysis which will culminate in a detailed investigation of federal grants-in-aid to lower levels of government in the United States. The purpose of this chapter is to analyze the concept of optimum supply of public goods as it applies to local governments. The primary difficulty encountered in this area is the existence of intergovernmental spillouts of public goods produced by an individual local government. When such spillouts are generated, it is necessary that they be recognized and included in both the recipient and supplying governments' resource allocating calculus. By acting in isolation and failing to consider the spillouts/spillins of public goods to/from other governments, a community will not allocate resources in a manner consistent with conditions necessary to achieve maximum satisfaction.

For purposes of this discussion, it is assumed that local governments exist which satisfy optimum size criteria for both production and decision making costs. For a discussion of the former, see Leif Johansen, Public Economics (Chicago: Rand McNally and Co., 1968). A good treatment of the latter type of cost is contained in Gordon Tullock, Toward a Mathematics of Politics (Ann Arbor, Michigan: The University of Michigan Press, 1969) and James M. Buchanan and Gordon Tullock, The Calculus of Consent (Ann Arbor, Michigan: The University of Michigan Press, 1965).
A Local Government Interdependency Model

The participants in this analysis include two local governmental units (cities) located opposite each other on the banks of a river. The cities, for convenience called Westbank and Eastbank, are assumed to be identical. Both have identical resource endowments, production functions, and utility functions which provide convex indifference curves to the origin. It is further assumed that the cities produce two goods, food and river deepening, and that the income elasticities for both goods are greater than zero. The good, food, presents no special problems for the analysis because it is a purely private good consumed entirely within the producing city with no spillouts or spill-ins. River deepening, on the other hand, is a purely public good whose benefits are not contained within the city supplying it, but rather spillout in equal quantities to the other city. For example, if the river is dredged one foot deeper, both cities benefit equally no matter who was responsible for the dredging. Other assumptions made to simplify the exposition include: (1) no strategic bargaining by the communities, (2) equal sharing of the costs of public good production when cooperation between the two communities exists, (3) bargaining costs are zero, and (4) political consequences do not enter into the considerations of economic problems.

In this highly simplified economy, each community would attempt to maximize satisfaction for its citizens by producing the combination of food and dredging for which its production possibilities curve is tangent to a social welfare curve. In so doing, an equality between
the marginal rate of transformation and marginal rate of substitution for both communities would be achieved and a Pareto optimum allocation of resources would result.

Such an equilibrium is displayed in Figure 3 which consists of two parts, Part A represents the attainment of equilibrium for Westbank and Part B provides the same information for Eastbank. Production possibilities curves for the two cities have been drawn linearly to indicate a constant marginal rate of transformation (constant marginal cost) between the public good and the private good. Additionally, the two parts have been constructed so that the line segments between the origin and vertical intercept and the origin and horizontal intercept are equal. This convention further emphasizes the theme of equality as stipulated above. In this model of independent adjustment, Westbank will produce $D_w$ units of dredging and $F_w$ units of food, and Eastbank will produce $D_e$ units of dredging and $F_e$ units of food to maximize satisfaction. Because of the equality assumption, $D_w = D_e = F_w = F_e$.

Given the public good, $D$, and the private good, $F$, the familiar marginal conditions associated with the equilibrium described above may be obtained from the following production and utility functions for the two cities:

(1A) $T_w = T_w(D_w, F_w)$  \hspace{1cm} (1B) $T_e = T_e(D_e, F_e)$

(2A) $U_w = U_w(D_w, F_w)$  \hspace{1cm} (2B) $U_e = U_e(D_e, F_e)$

where: $T_w$ = production function for Westbank
$T_e$ = production function for Eastbank
Figure 3
Isolated Equilibrium
In isolated equilibrium, each city will allocate resources in such a manner as to equate the marginal rate of transformation of the two goods with their marginal rate of substitution. Thus,

\[
\begin{align*}
\text{(3A)} & \quad \frac{dT_w}{dD_w} = \frac{dU_w}{dD_w} \quad \text{for Westbank and} \\
& \quad \frac{dF_w}{dF_w} \\
\text{(3B)} & \quad \frac{dT_e}{dD_e} = \frac{dU_e}{dD_e} \quad \text{for Eastbank.}
\end{align*}
\]

Since each city views D and F as pure private goods, neither will have reason to change their production mix from the composition identified by these marginal conditions.

The foregoing highly simplified analysis may now be expanded and made more interesting by relaxing the model's original assumptions. The first assumption to be modified is the improbable stipulation that the two local governments were unable to recognize or benefit from intergovernmental spillouts of the public good, dredging. In a more
practical setting, once a city dredged a river to new depths, the deeper river would be easily indentifiable and equally available to both communities. Under these conditions, the equilibrium positions of Figure 3 represent disequilibrium combinations of dredging and food. Each city would find itself consuming twice the level of dredging that it expected and with the income elasticity of food greater than zero, there would be a reallocation of resources in favor of food production. This reallocation process and the resulting equilibrium may be demonstrated by referring to the effects of Westbank's spillouts on Eastbank's production in Figure 4.

Figure 4 is constructed so that the origin of the diagram for Westbank coincides with the ordinate intercept of Eastbank's production possibilities curve. The vertical attachment of the two diagrams makes it possible to directly measure the effect of Westbank's spillouts to Eastbank. For example, if production is established at isolated equilibrium levels for both communities, Eastbank would be on welfare curve $I_e$ producing and consuming $OD_e^2$ units of dredging and $OF_e^1$ units of food and Westbank would be on welfare curve $I_w$ producing and consuming $OD_w^1$ units of dredging and $OF_w^1$ units of food. Now, because dredging is a pure public good; the production of $OD_w^1$ units by Westbank effects an increase in the ordinate intercept of Eastbank's effective production possibilities curve from $OT_e$ to $OD_w^1$ and increases

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2 In the discussion of Figure 4, it is assumed that neither city engages in strategic behavior to reduce its cost of the public good.
Figure 4

Initial Effect of Westbank's Externalities on Eastbank
the amount of public good available to the latter city at every possible level of private good production by OD₁ units. Hence, Eastbank experiences an increase in its attainable combinations of public and private goods and will be able to reach welfare curve IIₑ. In equilibrium, Eastbank would consume OD₃ₑ units of dredging and OF₂ₑ units of food. To reach these consumption levels, Eastbank would produce OF₂ₑ units of food and OD₄ₑ units of dredging. It would then rely on Westbank to supply the difference in dredging between OD₁ₑ and OD₃ₑ.

This position, however, does not represent full equilibrium for Westbank would be making concurrent adjustments in its production to take advantage of spillins from Eastbank. Hence, there will be a continuous adjustment-readjustment process until Westbank is producing the exact amount of public good that Eastbank expects it to produce and vice versa for Westbank's expectation of Eastbank's public good production.

The process can be explained by referring to Figure 5 in which reaction curves for the two cities are derived. To focus primary attention on the reaction curves themselves, the simplest possible assumptions were made concerning the production and utility functions from which the reactions curves were derived. In addition to the assumed equality between the two cities postulated at the outset of this chapter, which results in Parts I and V of the figure being identical, other assumptions and their effects include:

(1) The construction of linear production possibilities curves for the two cities demonstrates the existence of a constant marginal rate of transformation between public and private goods. Moreover,
Figure 5

Reaction Model
the equal distance between the origin and the horizontal intercepts of the curves indicates that both goods can be produced with equal efficiency by the cities.

(2) The indifference maps for the two cities are symmetrical to a ray drawn at a 45 degree angle on the axes of the lower portions of Parts I and V. This construction indicates that the cities value public and private goods equally and that the income elasticities are equal throughout the income range.

Figure 5 consists of five parts. Parts I and V show equilibrium positions for Westbank and Eastbank, respectively, after provisions have been made for externalities generated by the public good. Parts II and IV are simply helping diagrams which allow coordinates for Westbank's and Eastbank's reaction curves to be located in Part III.

To begin the analysis, assume initially that Westbank produces none of the public good and is, therefore, located at point H in Part I. This point may now be traced to Part IV, where it meets the helping line (at the origin), then through Part III to Part II where it meets the helping line (again at the origin), and finally to Part B where it meets the vertical axis at point D. The result is as expected; since Westbank produces no public goods, Eastbank receives no spillins, and, thus, experiences no change in its production possibilities. Under these conditions, Eastbank is constrained by the transformation curve DF and in equilibrium will produce $D_e^3$ units of dredging and $F_e^1$ units of food. The final thing that remains to be done in this step is to locate Eastbank's reaction to the level of Westbank's production of the
public good in Part III. This is done by tracing $D^3_e$ units of the public good production by Westbank. Since the latter amount is zero, the coordinate is located on the ordinate of Part III at point E. To identify another point, assume in Part I that Westbank is producing $D^3_w$ units of dredging. Tracing this quantity through Parts IV, III, II, and finally into V, the budget constraint BC is established for Eastbank. In equilibrium, Eastbank will consume $F^3_e$ units of food and $D^5_e$ units of dredging. Of the total amount of dredging consumed, Eastbank produced only $D^1_e$ units and received the remainder, $(D^5_e - D^1_e) = D^3_w$, as spillins from Westbank. By tracing Eastbank's production of dredging, $D^1_e$ units, into Part III and establishing a coordinate with $D^3_w$ units of dredging by Westbank, a second point on Eastbank's reaction curve is located. At the risk of redundancy, but to firmly identify the construction technique, one final coordinate will be developed for Eastbank's reaction curve. Suppose that Westbank produces G units of dredging, i.e., uses all of its resources for dredging and none for food. Tracing this amount to the helping line in Part IV results in the establishment of point $E_1$. Going through Part III to the helping line in Part II and then over to Part V permits the location of budget constraint LM for Eastbank. Subject to this constraint, Eastbank will consume $D$ units of dredging and $F$ units of food. The city will produce all of its own food and rely on Westbank to supply all of the dredging. Tracing zero units of dredging from Part V into Part III to establish a coordinate with Westbank's dredging, the point $E_1$ is obtained for Eastbank's reaction curve. By continuing this process
for other quantities of the public good which may be produced by Westbank, a fully defined reaction curve for Eastbank will be obtained.

To determine Westbank's reaction curve, Parts V, III, I, and IV may be used in a manner analogous to the way Parts I, IV, III, II, and V were used to derive Eastbank's curve. For example, if Eastbank is producing $D_e^3$ units of dredging, an increase in Westbank's budget constraint from GH to JK will be effected. In equilibrium, Westbank will consume $F^3_w$ units of food and $D^5_w$ units of dredging. It will, however, produce only $D^1_w$ units of the latter good for itself and rely on Eastbank to supply $(D^5_w - D^1_w) = D^3_e$ units. Tracing $D^1_w$ through Part IV into Part III where it intersects with $D^3_e$, a coordinate for Westbank's reaction curve is established.

For a more complete understanding of the reaction curves, attention is directed to Figure 6 which is a reproduction on a larger scale of the reaction curves derived in Figure 5. The curves $EE_1$ and $WW_1$ are, respectively, the reaction curves for Eastbank and Westbank. Because of the identity assumptions discussed above, $OE = OW$ and $OE_1 = OW_1$. Equilibrium in this diagram is established at point T, the intersection between the two reaction curves, for it is only at this point that Westbank is doing exactly what Eastbank expected it to do when finalizing its production plans, and Eastbank is doing exactly what Westbank expected it to do when finalizing its production plans.

The reaction process which produces equilibrium may be demonstrated by considering the level of public goods produced by each city under totally independent behavior, as represented by point P.
Figure 6

Reaction Equilibrium
and, hence, will respond to the unexpected level of spillins which the other is producing. The second production adjustment taken by the cities will result in Eastbank producing $E_3$ units of the public good and Westbank producing $W_3$ units. Again, however, this combination of the public good does not represent equilibrium and for the same reason that combination $E_2, W_2$ did not. Each city, then, will continue to react to the other's production of the public good and there will be a steady convergence to equilibrium at $T$.

Although the preceding analysis was conducted under the assumption of simultaneous adjustment, this was not a necessary condition for the attainment of equilibrium. The movement toward equilibrium could have been demonstrated equally as well by assuming that one of the cities (either one) recognized and reacted to the quantity of public goods being produced by the other at $P$ and initiated the adjustment. The model would have then moved to equilibrium not through simultaneous adjustments, but through a lead-lag process with each city changing its position from leader to follower to leader at each step. While the movement to equilibrium would have been different, the actual position would have been the same. In general, Table V indicates how public good production will change for each city if it is located in any of the four areas bounded by the reaction curves.

The discussion of reaction curve equilibrium to this point has been conducted under the condition that intersection between the curves will occur in the first quadrant. It is possible, however, under not too extreme assumptions, to have reaction curves intersect
<table>
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<tr>
<th>AREA</th>
<th>EASTBANK</th>
<th>WESTBANK</th>
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<tr>
<td>1</td>
<td>Decrease Production</td>
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<td>2</td>
<td>Increase Production</td>
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<td>Increase Production</td>
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<td>4</td>
<td>Decrease Production</td>
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in other quadrants of a graph. Consider, for example, the results of assuming that the resource base of Eastbank greatly exceeds that of Westbank. Under this assumption, Westbank's production possibilities curve in Part I of Figure 7 lies relatively close to the origin, while the production possibilities curve for Eastbank lies relatively far away from the origin in Part V of the figure.

For convenience in this analysis, assume that Eastbank is in initial equilibrium on welfare function $I_e$ in Part V, producing and consuming $D_e^1$ units of dredging and $F_e^1$ units of food. Tracing Eastbank's spillout of dredging through Part III and into Part I, it is found that the amount of spillins which Westbank receives is greater than the community's capacity to produce dredging for itself. Reacting to the spilling, Westbank would like to move to a position such as $D_w^1$, $F_w^1$ on welfare function, $I_w$. To reach that position, however, Westbank would have to be able to produce $F_w^1$ units of food. Lacking this capability, Westbank will only be able to obtain a level of satisfaction equal to $I_w^2$. This position will be reached by Westbank producing no dredging and $F_w^2$. 

Figure 7

Reaction Equilibrium out of First Quadrant
units of food. Eastbank, receiving no spillins, will remain at the equilibrium position assumed at the beginning of the analysis.

Part III of Figure 7 provides additional insight into the nature of the reaction pressures on the two communities. The reaction curves were constructed in the same way as the reaction curves in Figure 5. The obvious difference between Figures 5 and 7 is the location of the point of intersection between the two reaction curves. In the present case, intersection occurs in the second quadrant rather than the first quadrant of Part III. Eastbank, which is receiving no spillins from Westbank, is operating on its reaction curve at point A. Westbank would like to respond to the level of spillins that it is receiving by producing at point B on its reaction curve. Such a position is not possible, however, because it involves a negative level of public good production and a level of private good production which exceeds Westbank's capabilities to produce. Under these circumstances, Westbank will have a continuing positive reaction force which it is powerless to eliminate because of its relative poverty.

An additional factor which could cause an intersection of reaction curves in the second quadrant is the income elasticity of Westbank for the public good. If Westbank's income elasticity is small, spillins of dredging will cause a substantial reallocation of local resources in favor of food production. It is conceivable that if Westbank received large quantities of spillins, a point could be reached, as in the previous case, such that the community has available more than enough dredging relative to food. Suppose, for example, that Westbank
has received a sufficient quantity of spillins from Eastbank so that it has already devoted all of its resources to the production of food. Additional spillins of dredging would result in Westbank's desire to continue to reallocate local resources toward food production. But because all of its resources are already being used to produce food, a further reallocation of resources would require that Westbank produce a negative amount of dredging; hence, the reaction curve intersection in the second quadrant.

Of the remaining two quadrants, three and four, quadrant four presents no special problems. The same circumstances that existed for Westbank to create an intersection in the second quadrant would have to be present for Eastbank. That is, for an intersection of reaction curves to occur in the fourth quadrant, Eastbank would have to be poor relative to Westbank and/or Eastbank's income elasticity for dredging would have to be small.

An intersection of reaction curves in the third quadrant is more unique and requires an additional explanation. First, in order for an intersection to occur in the third quadrant, the reaction curves of both Eastbank and Westbank must be positively sloped. With the reaction curves having a positive slope, it must be true that spillins which one local government receives from the other will cause the recipient government to expend more of its resources on the public good. The spillin increase in real income of each community results in each producing more public goods and less private goods. But for this to happen, the private good must be inferior in both communities.
Before concluding the analysis of equilibrium, it is necessary to evaluate the results of the reaction model in terms of Pareto efficiency. To conduct the evaluation, a return will be made to the original assumptions associated with Figure 5. For the present purposes, the equilibrium of Figure 5 has been duplicated in Figure 8. In the latter figure, the production and consumption combinations of private and public goods for each of the cities may be traced from the intersection of the two reaction curves in Part III to Parts I and V. For example, with Eastbank producing $D^1_e$ units of the public good, Westbank will be located on real income curve $D^1_w$ and will reach equilibrium at the point of tangency between this curve and indifference curve $I_w$. The equilibrium mix of public and private goods in consumption will equal, respectively, $D^0_w$ and $F_w$ units with Westbank producing $F_w$ units of the private good and $D^1_w$ units of the public good. The difference between $D^1_w$ and $D^0_w, D^1_e$ units, will be the result of spillins from Eastbank. In a similar manner, the equilibrium consumption mix of the two goods for Eastbank is found to be $D^0_e$ units of the public good and $F_e$ units of the private good. Eastbank will produce $F_e$ units of the private good and $D^1_e$ units of the public good itself and rely on spillins from Westbank to provide the difference between $D^0_e$ and $D^1_e$.

As demonstrated in the figure, equilibrium for each city consists of the point of tangency between its real income curve and an indifference curve. Because the real income curve is parallel to the isolated income or production possibilities curve, each city is operating at the combination of public and private goods for which its internal marginal
Figure 8

Reaction Model
rate of transformation is equal to its marginal rate of substitution. In an all-private good world, this equality would result in the maximum level of satisfaction being realized by both communities. Since one of the goods is public, however, efficiency requires that each city adjust production until its marginal rate of transformation of dredging into food is equal to the combined marginal rate of substitution of dredging for food for both communities. Symbolically, \( \text{MRT}_e = \text{MRS}_e + \text{MRS}_w \) for Eastbank and \( \text{MRT}_w = \text{MRS}_w + \text{MRS}_e \) for Westbank if resources are to be allocated optimally. Under these conditions, then, it appears that the model suffers from an internal conflict, i.e., it provides private good optimality with the existence of a public good.

A reinterpretation of the model's geometry, however, will permit a reconciliation of this apparent inconsistency. Referring to Eastbank's equilibrium position, the community it enjoying a level of satisfaction as identified by social welfare curve \( \text{II}_e \), consuming \( D^0_e \) units of dredging and \( F_e \) units of food. Of the \( D^0_e \) units of dredging consumed, Eastbank produces only one-half, or \( D^1_e \) units itself, along with the full \( F_e \) units of food. Based on this combination of the two products, \( D^1_e \) and \( F_e \), Eastbank would only be able to achieve a level of satisfaction as shown by the welfare curve \( \text{I}_e \). Obviously, with welfare curve \( \text{III}_e \), cutting budget constraint \( DF \), Eastbank's actual marginal rate of transformation is equal to its marginal rate of substitution.

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\(^3\)The well-known condition for optimal resource allocation has been questioned when more than one public good is involved and a distortionary tax is used to finance the goods. See, Lawrence J. Law, Eytan Shiskinski, and Joseph E. Stiglitz, "Efficiency in the Optimum Supply of Public Goods," *Econometrica*, XLVI (March, 1978), pp. 269-284.
formation (MRT) is greater than its marginal rate of substitution for its own production. Furthermore, it can be demonstrated that the same relationship exists between Westbank's actual marginal rate of transformation and its marginal rate of substitution for its own production. These results are exactly what is expected for consistency with the requirements for Pareto optimality; namely, that the summed marginal rates of substitution for a public good be equal to the producing entity's marginal rate of transformation. It only remains to take the final step and demonstrate that \( \text{MRT}_w = \text{MRS}_w + \text{MRS}_e \) and \( \text{MRT}_e = \text{MRS}_e + \text{MRS}_w \).

Referring once again to Eastbank's equilibrium position, the shifted budget constraint which resulted from spillins can be viewed as a surrogate for Westbank's budget constraint. With just Westbank's own consumption of the public good, equilibrium did not exist. Now, with Eastbank's consumption added, equilibrium has been established and, hence, Westbank's marginal rate of transformation equals the summation of the marginal rates of substitution for Westbank and Eastbank. Through an analogous argument for Eastbank, the existence of Pareto optimality can be demonstrated so that welfare is maximized for both cities.

The foregoing reaction model which was constrained by independent action on the part of Westbank and Eastbank resulted in an efficient equilibrium within this constraint. If the independent action requirement were relaxed, however, and cooperation in the provision of the public good were permitted, both cities would be able to move to a
superior (greater satisfaction) position. They would discover that the "real" income constraint in the previous discussion was only an illusion resulting from the independent action requirement.

For example, both cities now agree to cooperate fully in public good production by sharing equally the costs of production. In the independent setting, each city's choice between public and private goods was made under the explicit knowledge of the competitive nature of the goods. That is, under the knowledge that more of one type of good could be produced only at the expense of the other good. When the model was opened to permit spillins without the recipient community realizing their source, suddenly benefits were made available for which no opportunity cost had been incurred. The spillins to the recipient community for which no sacrifice had been made, then, were consumption externalities which were considered gifts of nature. Now, with the model extended to permit recognition of the source of the spillins, each community becomes aware of the interrelationships involved in the production and consumption of the public good, and each recognizes that cooperation in production could effectively decrease the opportunity costs in terms of the private good by one-half. Thus, through cooperation, each unit of mutually agreed upon reduction in the production of the private good would make available two units of the public good.

In terms of the geometry of Figure 9, the real income curves would shift to $D_w^J$ for Westbank and $D_e^W$ for Eastbank. These new real income curves intersect the indifference curves of equilibrium in the reaction model and permit an increase in satisfaction for both cities. After these
Figure 9
Effect of Cooperation
adjustments have been accomplished, Westbank will consume $D_w^3$ units of the public good and $F_w^1$ units of the private good. It will supply $D_w^2$ units of the public good itself and rely on spillins from Eastbank to supply the difference. Likewise, Eastbank will consume $D_e^3$ units of the public good and $F_e^1$ units of the private good. It will supply $D_e^2$ units of the public good and rely on spillins from Westbank for the difference.

The critical difference between this analysis and the preceding one is the way that the real income curve shifts in response to cooperative and non-cooperative public good production. In the former case, neither city could see the entire range of potential spillins, but only one point within that range, i.e., the quantity which at any time was being produced. Because the cities were excluded from spillin information, they were surprised by an excess of public goods over the quantity that they themselves had produced. Each city was misled into believing that the existing level of spillins was the only quantity available to it and that the spillins would exist regardless of its production decisions. As a result, each city passively consumed the amount of public good made available by the other, and each reached an equilibrium position with a smaller amount of satisfaction than was possible with cooperation. By permitting cooperation to take place, the veil obscuring the true opportunity cost of public goods was removed and the full range of welfare possibilities was revealed. Under these new conditions, spillins ceased to be passively consumed. Both cities recognized their mutual dependence and the potential gains
which were available through bargaining. With a larger potential quantity of public goods included in the decision making calculus of the cities, a higher level of satisfaction was achieved. In this new preferred position, the reduced opportunity cost of dredging results in each city producing a smaller quantity of food and a larger quantity of dredging than under pure reaction. Thus, the public sector will play a larger role in the economy under cooperation than it would under pure reaction.

Importantly, the conclusion that cooperation in the identity model results in an expansion of welfare does not depend on the assumption of symmetry of welfare curves on a ray of 45 degrees from the origin. To demonstrate the validity of this statement, assume the existence of welfare curves symmetrical on respective rays of 22.5 and 67.5 degrees from the origin. With the exception of these changes and the resulting effects on reaction curves in Part III, Figures 10 and 11 have been constructed similarly to Figure 9. In Figure 10, reaction equilibrium is established at $D_w^0, F_w$ for Westbank and $D_e^0, F_e$ for Eastbank. Because of the greater preference for private goods, only small amounts of public goods are desired and produced, so the reactions curves in Part III lie relatively close to the origin throughout their entire range. Now allowing cooperation to take place shifts the respective budget constraints of Westbank and Eastbank from $D_e^0G$ and $D_w^1H$ to $D_eJ$ and $D_wF$.

\footnote{For a different geometrical approach to gains through bargaining, see: James M. Buchanan, The Demand and Supply of Public Goods (Chicago: Rand McNally and Company, 1968), Chapter Two.}
Figure 10
Effect of Preference for Private Good being Greater than that for Public Good
Figure 11

Effect of Preference for Public Good being Greater than that for Private Good
Each of the new budget constraints intersect the reaction equilibrium indifference curves for the communities and thereby reveal the existence of greater satisfaction levels under cooperation than under pure reaction.

This result is brought out more clearly in Figure 12 which is an enlargement of Part I in Figure 10. With the budget constraint $D_e^1$ representing Westbank's real income curve in reaction equilibrium, that city will be obtaining a level of satisfaction equal to $II_w$ (the welfare curve tangent to the budget constraint $D_e^1G$). With full cooperation and equal sharing of the costs of public good production, the budget constraints shifts to $D_e^2J$, which passes through $II_w$. Equilibrium now exists on welfare curve $III_w$. Because this curve lies further from the origin than $II_w$, it must represent a greater level of satisfaction.

Following an analogous line of reasoning in Figure 10, except that a strong preference for public goods results in the establishment of reaction curves lying further from the origin than they did in that figure, reaction equilibrium is established at $D_w^0$, $F_w$ for Westbank and $D_e^0$, $F_e$ for Eastbank in Figure 11. Opening the model to cooperation results in budget line shifts of $D_e^1F$ to $D_eJ$ for Westbank and $D_w^1H$ to $D(M$ for Eastbank. As in the two previous cases, the shifted budget constraints intersect respective reaction equilibrium indifference curves of the two cities. Thus, once again, higher levels are possible through cooperation than through reaction.

One final point that should be considered is efficiency in the cooperation model. Using Westbank as the example again, the geometry of
Figure 12
Enlargement of Part I, Figure 10
Figure 9 indicates that real income curve $D_{eJ}$ has twice the slope of $G_{J}$. In cooperative equilibrium, Westbank consumes on indifference curve $II_{w}$, tangent to $D_{eJ}$, and produces on the production possibilities curve $G_{J}$. Hence, in the equilibrium position, the MRT of public for private goods for Westbank is equal to one-half of its MRS. But, recalling that Westbank's equilibrium position was attained under full recognition that at any level of private good production its contribution to incremental changes in the production of the public good would be equal to one-half the required rate, it may be concluded that $MRT_{w}$ equals $MRS_{w}$ for the supply of public goods produced internally. The difference between Westbank's total willingness to substitute public for private goods and its willingness to substitute internally produced public goods for private goods will be equal to the negotiated spillins from Eastbank. Recognizing that Eastbank is fully aware of the production capabilities of Westbank and that dredging is a pure public good, it must be true that Eastbank has adjusted its consumption mix of public and private goods to take maximum advantage of the spillins and that the spillins are worth the same to Eastbank, i. e., are produced at the same cost of private goods or MRT, as they are to Westbank. Therefore, $MRT_{w}$ equals $MRS_{w}$ for internally produced dredging plus $MRS_{e}$ for dredging spillins from Westbank. By similar reasoning, it may also be concluded that $MRT_{e}$ equals $MRS_{e}$ for internally produced dredging plus $MRS_{w}$ for dredging spillins from Eastbank.
Effect of Unequal Resource Endowment

A further complication is added to the original identity model when it is recognized that the communities may not have equal resource bases. In Figure 13, the identity assumption has been relaxed by assigning a resource base to Eastbank equal to three-fourths of that for Westbank. The major geometric changes which result are a one-fourth reduction in the horizontal and vertical intercepts of Eastbank's transformation curve in the lower portion of Part V and a one-fourth reduction in the vertical axis of Part III. Under these conditions, reaction equilibrium will be established with Westbank on real income curve $D_w^1$ and indifference curve $I_w$ and Eastbank on real income curve $D_e^1$ and indifference curve $I_e$. In their respective equilibrium positions, Westbank will produce $D_w^1$ units of dredging and $F_w^1$ units of food and Eastbank will produce $D_e^1$ units of dredging and $F_e^1$ units of food.

Under present conditions, the total public sector will be smaller than in the original identity model. In terms of geometry, the proof if this assertion is straightforward. Since Westbank has experienced no change in its utility function for private and public goods or in its transformation curve, no change will occur in its reaction curve from Figure 9 to Figure 13. Because Westbank's income elasticity for public goods is greater than zero, the community's reaction curve has a slope whose absolute value is greater than one. Any movement along the reaction curve, therefore, will result in a greater vertical than horizontal change. With Eastbank's resource base declining, its reaction curve at a lower vertical position. Thus, Westbank's production
Figure 13
Unequal Resources
of public goods will increase from the original identity model, but Eastbank's production will fall by a greater amount, to reduce the total size of the public sector. In economic terms, Eastbank finds that its smaller resource base has put it in a preferred spill-in position, while just the opposite is true for Westbank. The combination of a smaller resource base and a greater spill-in level, relative to that base, caused Eastbank to reduce its production of public goods. Westbank, faced with a smaller spill-in of public goods was forced to increase its production, but by a smaller amount than Eastbank's decrease. It should be noted that this result is the consequences of the model's parameters and should not be considered an automatic or necessary conclusion. If the income elasticity of either, or both, of the two cities for the public good were permitted to increase sufficiently, the present model could result in equilibrium at a greater level of public good production. But if, as assumed in Figure 13, preferences of the two cities for the two goods are identical and the income elasticity for dredging and food are equal, there will be a reduction in the total amount of dredging produced.

More significant than the effect on public good production in the reaction model, though, are the results of the cooperative efforts of Westbank and Eastbank in the production of dredging. Such cooperation will shift Westbank's real income curve from $D^G_W$ to $D^J_W$ and Eastbank's from $D^H_e$ to $D^F_e$. As a result, Westbank will experience an increase in welfare by moving to indifference curve $II^w_W$ and consuming $D^3_w$ units of dredging and $F^w_w$ units of food. Eastbank, on the other hand, will suf-
fer a loss in satisfaction by moving to indifference curve $I_e$ and consuming $D^3_e$ units of dredging and $F^1_e$ units of food.

These results were not completely unexpected and are readily explainable. Because Westbank possessed a greater resource base than Eastbank, the spillouts which it generated were greater than the spillins which it received. Viewing spillins in a *quid pro quo* framework, Westbank was in a position as a net donor of spillins and Eastbank a net recipient. As long as the communities were unaware of each other, bargaining between the two to share the cost of the net spillins provided by Westbank could not be accomplished, and Eastbank could continue to receive the surplus spillins free of charge. Under conditions of equal bargaining skills and full cooperation without strategic bargaining behavior, Eastbank was induced to product greater quantities of the public good to "pay" Westbank for the net spillins which it received. To do this, resources were reallocated from private to public good production with a resulting loss of utility by Eastbank. It is interesting to note that under equal income elasticities for food and dredging, cooperation resulted in an increase in private good production and decrease in public good production by Westbank. If the income elasticity for food had not been equal to that for dredging, it would have been possible for Westbank's production of food and/or dredging to increase, decrease, or remain the same.

The conclusions reached above are particularly apropos to central city problems. Considering the relationship between central cities and suburbs, the central city has traditionally been placed in a posture of providing an expanding supply of public goods and is generally consid-
ered to be a net donor of spillins to suburbs. Under these conditions, it is important to recognize that the spillins provided by the central city yield not only direct consumption benefits to recipient communities, but important indirect consumption benefits as well. For example, to the extent that a suburb does not fully compensate a central city for spillins received, it not only obtains a free supply of a particular commodity, but it is also placed at a competitive advantage in attracting industry. The uncompensated spillins permit the suburban area to maintain an artificially low tax effort for its existing level of consumption and in so doing provides a location for tax avoidance by industry. But not only do uncompensated spilling permit advantageous consumption/tax ratios for particular goods, they can also reduce the overall level of "normal" suburban governmental spending. In the case of low cost housing for the poor or elderly, for example, an excess of spillins, i.e., central city provisions of housing units which cause a migration of the poor and aged to central cities, would relieve the suburbs of the responsibility of providing collateral services to these two groups. Given consideration such as these, it would appear that suburbs would resist efforts toward full-sharing cooperation in the provision of goods with reciprocal spillout effects.

Another spin-off of the foregoing analysis deals with governmental fragmentation and special districts. Typically, the special district is viewed in an unfavorable light because of the difficulty in achieving cooperation, coordination, and control. To the extent that the special district corresponds to the low resource community, there is nothing in the previous analysis that would mitigate those
criticisms. But if the special district is well funded, it is conceivable that the resource base for the particular purpose for which the district was formed might be greater than the effective resource base of a general purpose government which was also supplying the good. In this case, the special district would be in the position of net donor and the free rider would be the general purpose government. The breakdown in efforts toward cooperation would then come from the general government rather than the special district. One example of this might be a wealthy school district which provided quality recreational facilities for its patrons. If the general government does not allocate sufficient funds to recreational facilities, residents living outside of the special district may cause an overcrowding of the school facilities. In this case, it would be to the advantage of the special district to enter into contracts of cooperation with the general purpose government and to the advantage of the general government to resist such cooperation.

Effect of Unequal Preferences for the Public Good

A second interesting variation of the original model is obtained when the assumption of equal income elasticities between public and private goods for both communities is relaxed. In terms of Figure 14, the geometric effect of relaxing this assumption is shown as a change in the indifference ray configuration of Eastbank. Rather than consisting of symmetrical indifference curves centered on a ray eminating from the origin at a 45° angle, the map now includes symmetrical indifference curves centered on a ray drawn from the origin with a flatter, 40° slope. The economic condition indicated by this geometry is that
Figure 14: Unequal Preferences for Private and Public Goods
Eastbank now has a stronger preference for the private good than the public good at greater levels of income, i.e., the income elasticity for food is greater than the income elasticity for dredging. Under these circumstances, reaction equilibrium is established on real income curve $D^1_G$ and indifference curve $I_w$ for Westbank and real income curve $D^1_H$ and indifference curve $I_e$ for Eastbank. Because of its stronger preference for the public good, Westbank produces a larger quantity than Eastbank, i.e., $D^1_w$ versus $D^1_e$, and provides greater spillouts. Eastbank, in turn, relies on spillins to satisfy most of its desires for the public good and concentrates its production efforts on the private good. Hence, in this model as in the previous one, Westbank is a net donor and Eastbank a net recipient of spillins.

Opening the model to full cooperation, uninhibited by strategic activities or unequal bargaining abilities, causes the real income curves of Westbank and Eastbank to shift to $D^e_J$ and $D^w_F$, respectively. With equal sharing of the costs of production, Westbank's equilibrium will be established at a level of satisfaction represented by indifference curve $II_w$. In production, Westbank's output will equal $F^1_w$ units of food and $D^2_w$ units of dredging—a reallocation of resources in favor of food production as compared to reaction equilibrium. Eastbank, in turn, will be located on indifference curve $II_e$ and will produce $F^1_e$ units of food and $D^2_e$ units of dredging. In contrast to Westbank's change in production, Eastbank will have reallocated resources away from food and toward dredging. As a result of the production changes, Westbank experiences an increase in satisfaction and Eastbank a reduction.
Conclusions

The foregoing models demonstrated that only in a world in which everything was equal could cooperation between two governmental units, both producing spillins to the other, be expected to result in a Pareto improvement from reaction equilibrium. The reason for this, as pointed out in the models dealing with various types of inequalities between the two governmental units, is because of the free rider principle which arises when the equality assumption is relaxed. When there was an absence of perfect equality, cooperation resulted in an increase in welfare of one city only at the expense of the other. In two cases which are typical of actual economic conditions—unequal resources bases and unequal preferences—it was demonstrated that governments with smaller resources bases and a greater preference for private goods will be net recipients of spillins in reaction equilibrium. Under these circumstances, there will not be a smooth, automatic transition from reaction equilibrium to cooperation equilibrium. But because the wealthier community or one with a stronger preference for public goods than the other recognizes the potential gains from trade, bargaining will take place. If there are no political consideration such as jurisdictional jealousies, the bargaining process will fully exhaust all potential gains. If political jealousies do exist, bargaining may not take place or may only be limited so that there is not a full exhaustion of potential gains. As an alternative to the bargaining requirement, arguments will be presented later to demonstrate that a higher level of government could enter with a system of grants to pay the donor government for uncompensated spillins and/or the recipient government to
expand its production of spillouts to reach the maximum level of welfare which is possible.
The purpose of the present chapter is to provide the reader with a broad understanding of federal grants in the United States. To accomplish this goal, attention will be given to three topics—philosophy of grants, historical development of grants, and major characteristics of grants. Prior to beginning this topical discussion, however, a brief comment must be made concerning the national government. Drawing directly from conditions in the United States, the national governing body consists of duly elected representatives from districts which may include more than one governmental unit. The representatives are elected for a specified term and must stand for re-election at the end of the term if they wish to continue in office. The legislative latitude of each representative is formally limited by a written constitution and, within these confines, informally by the will of his constituents.

One of the provisions in the United States' constitution is that congress has the responsibility of promoting the general welfare of the country. Because the country is not homogeneous in the geographic distribution of resources, degree of development, or per capita income, there exists a wide range of per capita public good consumption for
those public goods provided by local governments. Moreover, some communities supply the goods in quantities less than the amount deemed to be optimal by the national government. One way that the national government can resolve this problem and satisfy the constitutional mandate of promoting the general welfare is by instituting a system of grants-in-aid to be made available to local governments.

Philosophy of Grants

Basically, the United States' grants-in-aid program employs two approaches to increase welfare.\(^1\) One approach is to increase a community's satisfaction from the consumption of a specific good and the other is to increase the general utility level of the recipient government. Correspondingly, the former may be said to represent specific welfare and the latter general welfare. Two important aspects of this taxonomy should be noted. First, the specific and general welfare functions to be developed in this paper pertain to representatives of the national government rather than to citizens of local governmental units. Considering that representatives are elected for specific terms and must periodically stand for re-election, it is necessary for the incumbents to discharge their responsibilities in a way that is favored by a majority of their constituents if they wish to continue in office. Therefore, if representatives, through a program of grants-in-aid, can assist local governments in providing larger quantities of public goods,

\(^1\)Terminology in this section was adopted from: Thomas R. Ireland and David B. Johnson, The Economics of Charity (Blacksburg, Virginia: Center for the Study of Public Choice, 1970).
consumption benefits which accrue to citizens of the aided governments will increase political support for incumbents. It is the satisfaction of this political support which is measured by the welfare functions mentioned above.

The second aspect of the taxonomy is concerned with efficient techniques of achieving desired goals. For example, suppose that a community suffers from a relatively small resource base and is unable or unwilling to provide a level of public goods deemed minimal by the national government. The satisfaction concept apropos to this situation is that of general welfare and the type of grant which should be used to achieve the desired result most efficiently is different from the type used to achieve a specific welfare goal most efficiently. As will be demonstrated below, the former welfare goal should be pursued through an unconditional grant while the latter through a conditional one.

Specific Welfare

The specific welfare function of the representatives of the national government may formally be presented as follows:

\[ U^S = f(Y, X^C) \]

where: \( Y \) is a pure public good which is national in character, e.g., national defense and

\( X^C \) is the consumption of specific goods in local communities.

Design of grant program to subsidize specific goods. One effect of the national government's specific welfare function is the establishment of minimum standards for the quantity of public goods supplied by local governments. Since the problem is one of increasing the supply
of particular goods favored by the national government, efficiency calls for a grant system which will subsidize the local consumption of these specific goods. If aid were given to local governments on an unconditional basis, the national government would have no assurances that the money would be used for its intended purpose, and the result would be an inefficient method of goal achievement. On the other hand, if aid were given only under the condition that it be used for a stated purpose, the goal of a minimum level of output could be achieved at a cheaper dollar cost than it would be with no conditions attached. In the terminology of grants-in-aid, then, specific welfare would seem to be more efficiently implemented through conditional rather than unconditional grants. Whether this is actually the result will depend on a number of factors, the chief of which are: the nature of the imposed conditions, the degree of financial support available, the income elasticity for supported goods, and the actual level of consumption of that good relative to the planned amount.

Consider, for example, Figure 15 which measures the quantity of a nationally favored specific good, N, on the vertical axis and the quantity of a composite good, K, on the horizontal axis. A local government's budget constraint is shown initially as the line AB. With this budget constraint, equilibrium for the local government is established at $N_2$ units of the favored good and $K_1$ of the composite good. If the federal government establishes $N_4$ units of N as the minimum quantity which should be made available to the citizens of the local government, a grant program designed to achieve this minimum standard could take one of the following forms: First, aid could be given in
Figure 15
Comparison of Conditional and Unconditional Grants
the form of a subsidy equal to $\frac{AC}{OC}$ percent of the cost of N. Such an offer would effectively shift the local budget constraint from AB to CB and would result in an equilibrium combination of $N_4$ units of N and $K_2$ units of K being supplied. With the dollar amount of aid being contingent on the level of support by the local governments, a grant such as this is classified as conditional.

A second possibility would be to provide the same amount of dollar aid to the local government with no strings attached. In this case, the budget constraint would shift to DE and the local government would supply $N_3$ units of N, a smaller quantity than the minimum national standard. To encourage the local government to provide $N_4$ units of N with such an unconditional grant, the national government will be required to spend more money than was necessary in the case of a conditional grant. The logic of this result may be explained through the relative and absolute effects of different types of grants-in-aid on expenditure patterns of local governments. In the case of unconditional grants, local governments will experience an increase in their capacity to provide more of all goods. Since the grant has not make one good any more or less desirable than another good, the preference pattern of communities will not be distorted by the grant. In the case of the conditional grant, on the other hand, relative prices between the subsidized good and all other goods will change, making the subsidized good a relatively better buy, and preferences will be distorted in its favor. Hence, the greater will be the supply of the nationally favored good if aid is given conditionally rather than unconditionally.
Another qualifying factor to the initial analysis concerns the type of conditions associated with grants. If the local government which receives the grant is required to provide the same amount of internal support for the good that existed before grants were given, a grant program sufficient to increase N from $N_2$ to $N_4$ units would result in a budget constraint of $HJLB$. Such a program would provide the desired result at the least money cost, but at the greatest distortion of the community's preference pattern.

A final limiting factor is the income elasticity for the composite good. If, within the range of favored-good and composite-good which is being provided prior to the introduction of grants, the income elasticity for the composite good is zero, an unconditional grant producing budget line $HJK$ will have the same effect on the equilibrium quantity of the public good as the conditional grant of the preceding paragraph. The policy implications of these limitations with respect to achieving political support will be brought out in greater detail in a later chapter.

**General Welfare**

The general welfare function of the national government may be stipulated as:

$$U^g = f(Y, U^c)$$

Where: $Y$ is a pure public good which is national in character and $U^c$ represents the general economic conditions of a local government.

The functional relationships between the independent and dependent var-
iables are analogous to those which existed for the specific welfare functions; namely, increases in Y and U will increase the satisfaction of the national government. As was inferred in the previous discussion of specific welfare, the type of grant-in-aid program which will efficaciously implement the general welfare goals of the national government will be different from those associated with specific welfare goals. Under general welfare goals, an unrestricted grant will be called for rather than a conditional one.

Historical Development of the Grant Program

The historical development of federal grants-in-aid in the United States can best be explained within the context of an evolving relationship among governmental partners in a federal system of government. Although a federalism technically "... divides authority between self-governing parts in the central whole...." cooperation, as implied by the term "partners," is more appropriate to the American experience. As explained by Daniel Elazar:


3 Elazar has used a marble cake-layer cake analogy to distinguish between the workings of a federalism in practice and theory. He contends that governmental functions are not distinctly separated as are the different flavors in a layer cake, but that they overlap and are intertwined as in a marble cake. See, for example, Daniel J. Elazar, "The Shaping of Intergovernmental Relations in the Twentieth Century," The Annals, CCCLIX (May, 1965), pp. 10-22, and ________, American Federalism: A View from the States, (New York: Thomas Y. Crowell Company, 1966), pp. 339. Examples of the more traditional views of federalism include Arthur N. Holcombe, Our More Perfect Union, (Cambridge, Mass.: Harvard University Press, 1950) and Edward S. Corwin, The Twilight of the Supreme Court, (New Haven, Conn.: Yale University Press, 1934).
The idea of the federal union as a partnership is a key aspect of federalism. This idea of partnership has been extended far beyond the simple sense of a relationship between the federal and state governments to become the guiding principle in most of the political relationships that tie institutions, groups, interests, and individuals together in the American political order, animating public-private relations as well as intergovernmental ones. The term itself has come into common usage. We all recognize the frequent references made to the "partnerships" between "government and business"; between "labor and management"; as well as to those between governments.

Partnership implies the distribution of real power among several centers which must negotiate cooperative arrangements with one another to achieve common goals.4

By viewing the federation as a partnership, problems which more than one level of government consider as their responsibility should be resolved through joint action. In many instances where problems have been considered to be under the administrative jurisdiction of sub-national levels of government, the grant has proven itself to be an efficient and flexible tool to promote goal achievement through cooperative action. The discussion which follows will trace the historical development of grants as they were modified to meet changing intergovernmental problems.

Land Grants: The Beginning

The genesis of America's system of grants-in-aid can be found in the great land grant programs of the Nineteenth Century which gave primary support to education and internal improvements. These early

4Elazar, American Federalism, op. cit., pp. 2-3.
grants established the foundation and contained many precursors of the provisions written into present-day grants. The formal commitment of the federal government to a system of grants was first established in the Northwest Ordinances of 1785 and 1787. Terms of the Ordinances pledged federal aid to the states which were to be carved out of the Northwest Territory for the support of public education. The first actual grant under this authorization was made in 1802 when Ohio was admitted into the Union as the seventeenth state. In the enabling legislation granting statehood to Ohio, Congress gave each township one section of land which was to be sold for not less than $1.25 per acre. All revenues obtained from the sale of the land were to be used for public education. In later legislation, instead of granting one section of land in each township to the governing body of the township, Congress gave the land to the State and allowed it to choose the location of the allotted land. In 1816, fourteen years after the initial grants, Congress, at the insistence of States not qualifying for grants under the Northwest Ordinances, expanded educational support to all

5Ibid., pp. 131-132.

Although the expressed purpose of the land grants was to support public education, the substantive purpose was to provide an incentive for rapid settlement of the Northwest. In order to make this area attractive to settlers, the federal government secured pledges from the territories to temporarily exempt public lands from taxation after being purchased by private individuals. To compensate the territories for lost tax revenues, Congress gave them one section of land in each township. This early example of intergovernmental cooperation clearly reveals the national government's attitude toward intergovernmental relations in federalism—that of providing an incentive for lower levels of government to act in such a way as to promote the general welfare of the whole country.
states with public land by enacting legislation to return 5 percent of the revenues collected from the sale of these lands to the respective states.

Perhaps the single most important piece of legislation providing aid to education was the Merrill Act of 1862. The basic form of this Act was passed by both houses of Congress in 1859, but was the victim of a veto by President Buchanan. With the change in administration resulting from the presidential election of 1860, Senator Morrill reintroduced his bill. Subsequent to its acceptance by Congress the bill was signed into law by President Lincoln. The terms of the Morrill Act provided each state with 30,000 acres of land for each of its representatives and senators. The land was to be used to maintain colleges where agriculture and mechanical arts would be taught. Those states not having public land received land script equal to their distributive shares.

It is interesting to note that in all of the years that have passed since the provisions of this Act were first implemented, only two important pieces of legislation have been passed dealing with land-grant colleges. The first of these was the second Morrill Act of 1890. The purpose of the Act was to provide more adequate funding for the land-grant colleges and at the same time provide for more efficient management of grant funds. Specifically, the Act appropriated the proceeds of 500,000 acres of land to each state and territory, up to

a total of $625,000 per year. The money itself, however, was not to be given to the colleges, but was to be used to purchase 5 percent United States' bonds to provide a permanent endowments. Annual interest earned on the endowments was to be given to the colleges. By establishing the permanent endowment, squandering of funds was eliminated. The second Act, Bankhead-Jones, was passed in 1935. In addition to increasing annual support to land-grant colleges by $960,000 annually, the Act also extended support into the areas of agricultural research by providing for the dissemination of information through the Agricultural Extension Service.

As the federal program of aid to education was developing, a parallel program was begun to promote a more rapid rate of internal improvements. Directed primarily to the areas of overland road, canal, and railroad construction, legislation which inaugurated a system of land grants to states to promote these internal improvements was passed in 1823. Designed to aid Ohio in building a road to the border of the Michigan Territory, the 1823 Act contained many features commonly found in subsequent internal improvement grants. In addition to providing for a basic 120-foot wide right-of-way for the road itself, Congress also gave Ohio strips of land one mile wide on both

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9Graves, op. cit., p. 492.
sides of the right-of-way to be sold to defray construction costs. Under the terms of the grant, Ohio was required to sell its land for not less than $1.25 per acre and to complete the road within a four-year period. While overland roads continued to be the chief transportation concern of the nation, Congress continued to provide primary aid to this function. As interest turned first to canals and later to railroads, however, Congress shifted its grant priorities into these areas.

If Professor W. Brooke Graves view is correct—that other than slavery the three major problems of America in the 1800's were disposition of the public domain, internal improvements, and education—land grants proved to be an effective tool in providing solutions to America's problems. The grants, for example, made it possible for states created out of the Northwest Territory to exempt homestead land from taxation and thereby encouraged rapid settlement of the new states. The grants also provided support for primary and secondary schools, and, through the Morrill Acts, aided higher education. Finally, by subsidizing road, river, canal, and railroad construction, the grants increased the rate of internal improvements and made settlement of the West a less arduous task.

10In later grants, land along the right-of-way was given in a checkerboard pattern on either side of the right-of-way rather than in continuous strips to permit the federal government to retain some of the more valuable land adjacent to the right-of-way.

11Graves, op. cit., p. 491.
Money Grants: Extensions of Aided Functions and Controls:

Although land grants were the usual form of federal aid until the 1900's a precedent for monetary aid can be traced back to the year 1790. It was in that year that the federal government assumed responsibility for debts incurred by the states to finance the Revolutionary War. This action was taken because the federal government recognized that its foreign credit standing was inextricably intertwined with the credit of the individual states. If any state defaulted on its debt, a shadow of uncertainty would be cast on the financial viability of the entire new nation. To avoid this possibility, the states' debt obligations were assumed by the federal government.

A second example of pre-1900 monetary aid occurred in 1803 when Ohio was admitted into the Union. The assistance, given in the form of shared revenue rather than a grant-in-aid, required the federal government to set aside one-tenth of all revenues received from the sale of public land within the state to be used to finance a road linking the populated East to Ohio and the Mississippi River.

A final example of early cash aid which should be mentioned was the distribution of a federal budget surplus to the states in 1837.

\[12\] Ibid., p. 484
\[13\] Ibid.
By that date, the federal government had retired its war debt and found itself with a surplus for the first time in history. After considering several options for disposing of the surplus, Congress decided to distribute it to the states. To avoid possible constitutional conflicts, the funds were given in the form of loans with the mutual understanding that the loans would not have to be repaid.

With these and other instances of financial aid scattered throughout the period of time when land grants were the dominant form of federal aid to states, any starting point which is chosen to begin the discussion of money grant development must be somewhat arbitrary. Recognizing this element of arbitrariness, the Morrill Act of 1890 has been chosen as the legislation which effected a transition from land to money grants-in-aid. This Act is tied in philosophy, purpose, and author to one of the most important pieces of land grant legislation, the Morrill Act of 1862. Passed to provide more adequate support than the land grant colleges were then receiving, the second Morrill Act of 1890 specified that aid was to be given in the form of financial assistance; namely, interest income from bonds purchased with the proceeds from the sale of dedicated land. As a condition for receiving grants, states were required to submit an annual report detailing how their funds were spent. If the funds were not spent for specified functions, Congress authorized the Treasury to withhold grants from non-complying states.15

In looking at the historical development of grant controls, it is important to recognize that the annual report requirement predated the Morrill Act of 1890. This provision was first introduced in the Morrill Act of 1862 and continued in the Hatch Act of 1887. Alternatively known as the Agricultural Experimental Station Act, the Hatch Act provided grants of $15,000 per year to states for the establishment and maintenance of agricultural experimental stations. Although each state was required by this legislation to submit an annual report on its expenditures, no provision was made to verify the validity of state reports. This omission persevered in all grant legislation for the next eight years. Finally, in 1895, an amendment to the Hatch Act established the principle of a federal audit, and this principle has been continued in succeeding grant legislation.\(^{16}\)

The final control provisions which are included in present grants were introduced in the Weeks Act of 1911 and the Smith-Lever Act of 1914. The former Act, intended as an aid to help prevent forest fires, provided funds for the purchase of watershed lands along navigable streams in the Appalachian and White mountains. Before funds were dispersed to the states, however, approval for the purchase of watershed land had to be obtained from the Interior Department. This provision of prior federal approval of state projects permitted closer control of grant funds and assurance that grants would be spent for

the purpose that Congress intended when enacting the legislation.\textsuperscript{17}

Three years later, the Smith-Lever Act completed administrative controls by establishing the concept of apportionment formulas and requiring states to match federal grants dollar for dollar. Under the terms of this Act, each state was to receive a minimum grant of $10,000 to finance programs giving instructions and practical demonstrations in agriculture and home economics. In addition to the base grant of $10,000, each state was eligible to participate in a fund of $600,000 which was to be distributed on the basis of a state's rural population as a percentage of the rural population of the U. S. To receive their share of the variable fund, however, states were required to match federal funds with state funds.\textsuperscript{18}

By 1914, then, many of the control devises that exist in today's grants were to be found in existing legislation. A review of the Acts serving as vehicles for developing control provisions--Morrill, Hatch, Weeks, Smith-Lever--indicates that the early monetary grants emphasized the deepening or providing more intensive support to existing programs rather than widening or extending support to other areas. In 1916, an exception to this trend was instituted with the passage of the Federal Highway Act. The major purpose of the Highway Act was "to get farmers out of the mud" by entering into agreements with state highway departments to construct hard surfaced rural post roads. In an important extension to the principle of prior federal approval of

\textsuperscript{17}Ibid., pp. 245-247.

\textsuperscript{18}Graves, op. cit., pp. 449-501.
state plans, Congress demanded that a department of highways in each state be responsible for administering the program. As a result of this requirement, ten states which had no functioning highway departments were forced to create them or forfeit their share of funds.\(^{19}\)

The final major extension of aid prior to the World War I was in the area of vocational education. Under the auspices of the Smith-Hughes Vocational Education Act of 1918, Congress committed itself to support:

\[\ldots\] vocational education in schools of less than college grade \[\ldots\] for the education of boys and girls who did not intend to go to college and of adult workers who needed instruction not provided by agriculture and industry.\(^{20}\)

Aid was provided to pay salaries of vocational agricultural teachers and vocational trades teachers and to support teacher training. Aid to each state was determined by the population of each state relative to the population of the United States, with the stipulation that at least $10,000 would be given to each state in each of three specified categories regardless of population.

Following World War I to the Great Depression, only two new significant programs were inaugurated, both in the area of community health. The first of these programs, the Chamberlain-Kahn Venereal Disease Control Act of 1918, was sparked by the increase in venereal disease which occurred during the war. The Chamberlain-Kahn Act provided $1 million a year for two years to be distributed to states on

\(^{19}\)Maxwell, op. cit., pp. 185-186.

\(^{20}\)Ibid., p. 82.
the basis of population disease control programs. At the end of the two-year period, Congress demonstrated little enthusiasm for the program and initially curtailed appropriations, then stopped them completely.\textsuperscript{21}

Although funded more liberally than Chamberlain-Kahn at its inception, the second venture in public health suffered the same ultimate demise. Passed in 1921, the Shepherd-Towner Act supported maternal and child health care. Grants were initially appropriated in the amount of $1,240,000 a year for five years. Each state was to receive a $10,000 basic grant with the remainder of the allocation distributed to states in accordance to population. Because of political pressures brought by "states righters," grants expired in 1929.\textsuperscript{22}

In the years between 1921 and 1933, the federal government seemed content with the existing categories of grants for no new programs were developed during this period. With the advent of the Great Depression, however, a wide range of new welfare and economic security programs were enacted. Although many of these programs provided only emergency relief and expired in the late thirties and early forties, seventeen of the basic welfare grant categories that exist today were authorized between 1933 and 1944. Perhaps the most important of these was the Social Security Act of 1935. Encompassing the three major program areas of unemployment insurance, public assistance, and maternal and child welfare

\textsuperscript{21}\textit{Ibid.}, p. 203.

\textsuperscript{22}\textit{Ibid.}
care, this Act provided the basic ingredients for the United States' program of public assistance.

From the end of the second World War to 1972, major new grants were provided for urban development, environmental protection, and rehabilitation of depressed areas. Addressing the problem of urban improvements, Congress initiated grants for slum clearance and low income housing in 1945. It was not until four years later, however, that a sufficient support could be obtained to pass the Housing Act of 1949. Through this Act, local governments were given financial support for slum eradication and for construction of low income housing units.23

In the area of environmental protection, two path-breaking Acts should be mentioned. The first was passed in 1948 as the Water Pollution Control Act. This Act authorized $3 million per year for a five-year period to help states finance the cleaning of streams which were polluted by city sewage or industrial waste.24 The second piece of legislation was the Air Pollution Control Act of 1955. Designed to attack air pollution through research and demonstration projects, the Act called for an initial appropriation of $8.5 million annually for three years. Grants were to be made available to the states, to the District of Columbia, to local governments, or to private or pub-

23Ibid., pp. 203-204.

24Ibid., p. 547.
lic institutions to support research, training, and demonstration projects to combat air pollution.\textsuperscript{25}

The final major new grant area during this period, rehabilitation of depressed areas was funded through the Area Redevelopment Act of 1961. Earlier versions of this Act were passed by Congress in 1958 and 1960, but were victims of veto by President Eisenhower. Upon the assumption of the presidency by John F. Kennedy, Senator Paul Douglas introduced and obtained passage of his bill for the third time. The bill was favorably received by President Kennedy and was signed into law. The Act initially allocated $50 million to be used by the states to develop rail, bus, subway, or other transit equipment and facilities.\textsuperscript{26} In later years, this grant served as the prototype for more ambitious undertakings, such as the extensive Appalachian redevelopment program.

The final major extension of the grant concept occurred in 1972 with the passage of legislation establishing a system of revenue sharing. For the first time in the long history of grants-in-aid, Congress heeded the advocates of unconditional grants and passed the State and Local Fiscal Assistance Act of 1972. Nominally, the Act did not create an unconditional grant. Rather, local governments were restricted in their use of funds to certain "priority expenditures." Quoting from the Act:

For purposes of this title, the term "priority expenditures" means only-

\textsuperscript{25}Ibid., p. 551.

\textsuperscript{26}Ibid., p. 673.
(1) ordinary and necessary maintenance and operating expenses for—
   (a) public safety (including law enforcement, fire protection, and building code enforcement),
   (b) environmental protection (including sewage disposal, sanitation, and pollution abatement),
   (c) public transportation (including transit systems and streets and roads),
   (d) health
   (e) recreation
   (f) libraries
   (g) social services for the poor or aged, and
   (h) financial administration; and

(2) ordinary and necessary capital expenditures authorized by law. 27

The above enumerated expenditure categories are so broad, however, that the Act puts very little effective restrictions on the use of revenue sharing funds. Commenting on the broad spending authority of local governments, William Willner and John P. Nichols have written:

The priority areas are very broad, and it would seem that only the operation of schools is excluded. However, even schools can be partially financed through construction of capital facilities with revenue sharing funds. 28

Thus, substantively, revenue sharing may be considered an unconditional grant with one exception—state and local governments are specifically prohibited from using revenue sharing funds to satisfy the matching requirements of conditional grants.


Unlike the Heller and Pechman plans which called for a given percentage of federal taxes to be made available for revenue sharing, the Act passed by Congress funded the program at a given dollar amount ($5.3 billion in 1972 and increasing thereafter to $6.35 billion in 1976). The total amount of monies were to be distributed among states in accordance with a three or five factor formula, which ever was most beneficial to the state. Upon receipt of revenue sharing funds, states were mandated to allocate two-thirds of their total allocations to general purpose local governments. The method of distribution was once again specified by formula with limits on the minimum and maximum amounts that could be received by local governments.

One additional new feature of revenue sharing is that recipient governments are required to publish in a newspaper of general circulation an accounting of how revenue sharing funds were spent. The resulting high visibility of the use of these funds led many governmental units to solicit recommendations from interested parties as to how the funds should be used. In this way, extensive community participating in governmental affairs was achieved.

Following a detailed debate over whether or not revenue sharing should be continued beyond its legislatively determined expiration in

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31The specifics of these formulas will be presented in the next section of this chapter.
1976, Congress passed the State and Local Fiscal Assistance Act Amendments of 1976 and breathed new life into revenue sharing. In addition to extending the program for three and three-quarter additional years, the amended Act made some important changes in the provisions of the earlier Act. First, additional prohibitions against discrimination were added. Originally, only discrimination based on race, color, national origin, and sex was explicitly forbidden. To this list was added age, handicapped, and religion. Second, all strings were removed from the use of sharing funds. Third, revenue sharing funds could be used to meet the matching provisions of conditional grants. Fourth, public participation in determining the allocation of sharing funds was required. Finally, recipients were required to report to the Secretary of the Treasury how revenue sharing funds were spent. Thus, through the second and third changes, revenue sharing was transformed into a truly unconditional grant.

Before ending this section on the development of grants-in-aid, it is necessary to mention a companion program to general revenue sharing; namely, special revenue sharing. As it was originally described by President Nixon, special revenue sharing was intended to consolidate the variety to existing conditional grants providing

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funding in the six major areas of urban development, rural development, education, manpower, transportation, and law enforcement. Under this program, funds would be allocated to states without matching provisions to be used for priority items within each of the major areas. The purpose of the program was to provide more flexibility to state and local governments and to relieve the uncoordinated proliferation of conditional grants. Although special revenue sharing was first proposed in 1971, Congress did not enact the first enabling legislation until 1973, with the passage of the Comprehensive Employment and Training Act. Since 1973, four other pieces of legislation have been passed providing for special revenue sharing. These include the Housing and Community Development Act and amendments to the Social Security Act of 1935, both passed in 1974, and the Partnership for Health and the Safe Street Act, passed in 1976.34

A General Description of the Grant Program

Four topics will be discussed in this section. The first three concern conditional grants and include: (1) Types of Grants; (2) Matching Requirements; and (3) Levels of Funding. The last topic is concerned with formula allocation associated with revenue sharing.

Types of Grants

The individual grants which comprise the United States' system of conditional grants-in-aid may be classified as either project grants

or formula grants. In the former category, the potential recipient government must assume the initiative and apply for aid, which is then issued on a competitive basis. By contrast, once formula grants have been authorized and funded, each lower governmental unit will receive its share of the grant as specified in a statutory allocation formula. The provisions written into the formulas for individual grants are tailored to deal with particular problems and are, therefore, widely divergent. It is possible, however, to establish a very broad classification system for allocation provisions. This classification system consists of the following two divisions.

1. Population of lower government, weighted with respect to need and fiscal capacity.

2. Fixed percentage of cost, plus bonus to induce higher standards.

Weighted population as the prime allocating base. Grant programs which are included in this category employ formulas based on the ratio of the lower governmental unit’s population and income to national population and income. The population figure used is not necessarily that for total population. Indeed, most grants define a "target" population which is used as the basis for allocating funds to lower levels of government. For example, if it is desired to aid the aged, a formula based on the percentage of aged population might be used because this is the group for which aid is intended.

The following example demonstrates how weighted population is employed in calculating grants.
EXAMPLE 135

Hospital and Medical Facilities Construction

In this program, funds are allocated to states on the basis of
the ratio of a state's population weighted by the square of its allot-
ment percentage to the summed similarly weighted population for all
states. The allotment percentage, in turn, is defined as 100 percent
minus the product of 50 percent times the ratio of a state's per capita
income to the national per capita income, subject to the constraint
that the allocation percentage be between 33% and 75 percent. In math-
ematical notation:

$$G_i = \frac{P_i A_i^2}{\sum_{i=1}^{n} P_i A_i^2} \quad \text{and} \quad A_i = 1.00 - 0.50 \frac{Y_i}{Y_t}$$

Where:  
$G_i$ = percent of grant funds for the $i$th state,

$P_i$ = population of the $i$th state,

$A_i$ = allocation percentage of the $i$th state,

$n$ = number of states = 50,

$Y_i$ = per capita income of the $i$th state,

$Y_t$ = national per capita income.

By multiplying the value obtained for $G_i$ by the amount of appropriated
funds, it is possible to determine the amount of money to be received
by each state. In this formula, the greater a state's population and
smaller its income, the greater will be its financial aid.

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Need and Fiscal Capacity as Prime Allocating Base. The allocating base of this class of formulas consists primarily of population, target or total, and per capita income. In this respect, the formulas are similar to the ones discussed in the preceding section. The dissimilarity of the groups and, hence, the need for two separate classifications lies in the direct determination of the allotment percentage in the earlier group and the indirect or two-staged determination of the allocation percentage of the present group. Because of the need concept, the present class of formulas must first calculate a ratio for each state. But before a state's share of a grant can be determined, it is necessary to make an additional calculation which measures the relative value of the state's ratio to the ratio of all other states.

The following example is representative of formula in this classification.

EXAMPLE 2\(^{36}\)

**Alcohol Formula Grants**

One-third of a state's allocation is based on need as measured by its population relative to the population of the United States and two-thirds are based on fiscal capacity as measured by relative per capita income. In mathematical notation:

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\[ G = \frac{1}{3} \sum_{i=1}^{n} \frac{p_i}{\bar{p}} + \frac{2}{3} \left( \frac{\sum_{i=1}^{n} y_i}{\bar{y}} \right) \]

Where:  
- \( G_i \) = Grant ratio for the \( i \)th state,  
- \( p_i \) = Population in the \( i \)th state,  
- \( y_i \) = Per Capita income in the \( i \)th state,  
- \( n = 50 \).

Fixed percentage of cost, plus bonus to induce higher standards.

The allocating base for formulas in this class consist of two parts. First, the national government pays to each state a fixed percentage of the cost of providing what it considers to be a minimum standard for a particular service. Second, those states providing more than just a minimum level of support or those that provide additional types of eligible benefits receive further federal aid. Example 3 is representative of this final class of formulas.

**EXAMPLE 3**

**Maintenance Assistance**

The basic grant is equal to five-sixths of the first $18 of assistance given by states to aid families with dependent children. Assistance provided by states which exceed $18, up to $75, is eligible for a fifty percent subsidy from the federal government. In addition, the federal government will provide fifty percent, up to a maximum of $500, of aid given to families for home repairs. The formula may be written:

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\[ ^{37} \text{Ibid., p. 315.} \]
\[ G_i = \sum_{j=1}^{n} p_j \left( \frac{5}{6} \times 18 + \frac{1}{2} (X - 18) \right) + \sum_{j=1}^{l} H_j \times \frac{1}{2} Z_j \]

Where:

- \( G_j \) = Amount of grant received by the \( i \)th state,
- \( P_j \) = Eligible recipient of aid in the \( i \)th state,
- \( X \) = Amount of state assistance, maximum of $75,
- \( Z \) = Amount of state assistance for home repair, maximum of $1,000,
- \( n \) = Number of persons receiving assistance,
- \( l \) = Number of homes receiving assistance,
- \( H \) = Eligible homes to receive aid in the \( i \)th state.

The choice of allocating formulas for conditional grants may greatly influence the efficiency of goal achievement by the federal government, especially if the choice is between the third class of formulas and either of the first two classes. Because conditional grants are intended to increase the supply of particular goods, it is important that local recipient governments not simply substitute national funding for local funding, but that they use the grant to expand service levels. Such an expansion is more likely to occur if grant legislation requires the matching of national funds with local funds. But caution must be exercised in the use of such requirements because of the greater distortion on local governments. It

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38 An exception to this general tendency might exist in the case of a particular local government supporting a nationally favored function at levels higher than provided for in grant legislation. The "windfall" grant monies might simply be used to release local funds from the favored activity and re-allocated to some other function.
must be recognized that the more rigorous conditions reduce the income effect of a given level of aid and increase the substitution effect. Local governments will then be confronted with the choice of trading greater amounts of political autonomy for federal aid than would have been true under less rigorous conditions. This can be expected to result in less political support for the grant program.

Matching Requirements

State matching of federal grants-in-aid is a common feature of conditional grants. The preceding section of this paper alluded to this feature by demonstrating how certain matching requirements are incorporated into grant formulas. Indeed, the requirement that recipient governmental units match federal contributions is a common feature of grants regardless of whether they are of the formula or project type.

Initially, all grants contained the requirement that state and local governments obtaining aid would be required to match federal funds dollar for dollar. Since 1935, however, there has been an increase in the variety of matching requirements. In that year, a total of twelve new grant-in-aid programs were initiated. Of this total, one required thirty-three to sixty-seven percent matching by recipient governments, four required fifty percent matching, three required seventeen to fifty percent matching, two had a seventy-five percent requirement, one required no matching, and one contained an undefined matching provision. As new grants were enacted, the variation in matching requirements was continuously expanded. As Table 5
**TABLE 5**

MATCHING RATIOS, EXISTING PROGRAMS OF GRANTS-IN-AID TO STATE OR LOCAL GOVERNMENTAL UNITS AS OF CALENDAR YEARS OF ORIGIN

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shows, by 1978 the matching provisions of grants had become so pro-
liferated that state and local governments were confronted with match-
ing ratios requiring from zero to eighty percent participation.

At the risk of being redundant, it is necessary to point out two
important aspects of variable matching ratios. The first is that they
are used to implement formula allocation provisions. Assume, for ex-
ample, that a grant program providing aid for dependent children has
been enacted. The provision of the allocating formula is devised to
distribute aid inversely to a state's per capita income so that lower
income states would be allotted more funds than high income states.
Now, if matching provisions require states to match federal grants
dollar-for-dollar, the poorer states for whom most aid was intended
might be unable to meet the matching requirements and may have to for-
feit a portion of their earmarked funds. To avoid this dilemma, vari-
able matching may be written into the grant to allow the "poorer"
states to participate at smaller rates that those which apply to the
"richer" states.

The second aspect of matching ratios is that they are used as
incentives for state and local governments to meet a desirable, but
not mandatory, level of participation. An actual example of this is
found in the Federal Water Pollution Control Act. Under the provi-
sions of this act, a municipality may obtain a grant for up to thirty
percent of the total cost of sewage treatment plant. If the state
in which the municipality is located contributes at least thirty per-
cent of the cost of the project, the federal share may be increased
to forty percent of the cost of the project. Another possibility is that if the project conforms with enforceable water quality standards, and if the state contributes at least twenty-five percent, federal contributions may be expanded to fifty percent of the project's cost. Moreover, if the project conforms with a comprehensive metropolitan plan, federal participation may be increased by ten percent.

**Level of Funding**

Table 6 presents historical financial data showing the federal government's support of state and local governments through grants-in-aid. The data are displayed to identify not only aggregate aid figures, but also the distribution of aid among supported functions.

In reference to the last column in Table 6, which contains the total amount of grant support, it is seen that in 1902, federal grants to state and local governments amounted to only $3.0 million. Although increasing by a substantial percentage amount between 1912 to 1920, and 1920 to 1925, dollar increases were less impressive. Reflecting the dire economic conditions of the depression of the 1930's, aid in 1934 increased by 855 percent over the previous year. In the mid-1950's highways and urban renewal projects resulted in major increases in federal aid which continued through the end of that decade. Finally, the "New Frontier" and "Great Society" programs of the 1960's led to a further expansion culminating in an estimated expenditure in 1980 of $74,755 million.

In addition to the important trend in total expenditures on grants-in-aid by the federal government, Table 6 reveals a second
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Federal aid highway program financed for these years out of emergency relief funds. $5-$7 million for services to Indians embracing both education and welfare functions. Less than .05%. Estimates.


interesting facet of grants-in-aid—that of changing functional emphasis. As exhibited in the table, veterans' services and benefits, education and agriculture were the functions favored by the federal government in its initial grants. By 1920, however, aid was redirected to the area of commerce, housing, and transportation, with these functions receiving 60.5 percent of all grant funds. The advent of the Great Depression initiated a second major change in functional emphasis of grants. This time the favored areas were health, welfare, and labor. As a percentage of total grants, support for these functions reached its peak in 1935. In that year, 98.8 cents out of every federal grant dollar was allocated to support those three functions. The period from 1935 to the present has witnessed a continued decline in the percentage of funds allocated to health, welfare, and labor and a concurrent increase in the percentage of funds allocated to commerce, housing, and transportation. Also, in the decade of the 1970's, there was a growing emphasis on the support of educational services.

While the data in Table 6 reveals interesting financial facts about the dollar value of grants-in-aid, it does not indicate that extent to which lower levels of government have grown to depend on this source of revenue. Such information is contained in Table 7, which displays federal grants as a percent of total state and local revenues for selected years. As indicated in the table, federal grants contributed only very modestly to state and local revenue until the Great Depression. Since that time, federal grants as a
### TABLE 7

**FEDERAL GRANTS AS A PERCENT OF TOTAL STATE AND LOCAL REVENUE, 1902-1980**

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<th>Year</th>
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*Estimates


percentage of state and local revenue have exhibited only a very gradual increase, finally exceeding fifteen percent by 1967. The estimated contribution to state and local revenues in 1980 is 24 percent.

**Allocation of Revenue Sharing Funds**

The allocation of revenue sharing funds to the various state and local governments is effected through a three-staged allocating formula. In the first stage, funds are allocated among state governments. The second stage requires allocations to be made among county/parish governments. Finally, in the third stage, funds are allocated to general purpose governments within each county/parish. But the numbers generated by the respective formulas are not inviolate. Minimum and maximum limits are established for the amount of funds a local governmental unit can receive and there are special provisions when townships, Indian tribes, or Alaskan native villages exist within a county.

In determining the distribution of revenue sharing funds among states, a three factor formula or a five factor formula may be used, depending on which is most advantageous to the state. The three factor formula considers the variables: population, tax effort, and relative income. These variables are combined as follows:

\[ X_i = \frac{P_i \times T_i \times Y_i}{\sum_{i=1}^{n} (P_i \times T_i \times Y_i)} \times A \]

where:

- \( X_i \) = share of funds going to the \( i \)th state,
- \( A \) = total appropriated for revenue sharing,
- \( P_i \) = population in the \( i \)th state,
\[ T_i = \text{tax effort in the } i^{\text{th}} \text{ state as determined by net state and local taxes collected divided by state's total personal income}, \]

\[ Y_i = \text{relative income of the } i^{\text{th}} \text{ state as determined by per capita income in the United States divided by per capita}, \]

\[ n = 51 \text{ (fifty states plus Washington, D. C.).} \]

The five factor formula is slightly more complicated in that it is divided into two parts as follows: A portion of revenue sharing funds is allocated on the basis of total population, urbanized population, and population weighted for per capita income. The remaining funds are allocated on the basis of state income taxes and general tax effort. More precisely, the five factor formula requires the following calculations:

\[
S_i = \frac{1}{3}A \sum_{i=1}^{n} \frac{P_i}{P_i} + \frac{1}{3}A \sum_{i=1}^{n} \frac{U_i}{U_i} + \frac{1}{3}A \sum_{i=1}^{n} \frac{Y_i}{Y_i} + \frac{1}{2}A^1 \sum_{i=1}^{n} \frac{T_i}{T_i} + \frac{1}{2}A^1 \sum_{i=1}^{n} \frac{E_i}{E_i}
\]

where: \( S_i \) = dollar amount of revenue sharing of the \( i^{\text{th}} \) state,

\( A \) = amount of revenue sharing funds allocated on the bases of population, urbanized population, and population weighted for per capita income,

\( A^1 \) = amount of revenue sharing funds allocated on the basis of state income tax and tax effort,

\( P_i \) = population of the \( i^{\text{th}} \) state,

\( U_i \) = urban population of the \( i^{\text{th}} \) state,

\( Y_i \) = population weighted by per capita income as defined by state population x national per capita income divided by state per capita income,
\( T \) = state income tax,
\( E \) = general tax effort as determined by net taxes collected divided by personal income,
\( n \) = 51 (fifty states plus Washington, D. C.)

After data for each state are substituted into both formulas, the greater of the two amounts is assigned as the state's share of funds. If the total assignment to states is greater than appropriated amounts, each state's share is reduced proportionately; if total state assignment is less than appropriated amounts, each state's share is increased proportionately.

After a state's share has been determined, two-thirds of the total must be allocated to local units of government according to the following specifications:

**County Areas.**

\[
C_i = \frac{P_i \times T_i \times Y_i}{\sum_{i=1}^{n} (P_i \times T_i \times Y_i)} \times S
\]

where:
- \( C_i \) = county area allocation out of two-thirds of total state allocation in \( i^{th} \) county area,
- \( P_i \) = population of the \( i^{th} \) county area,
- \( T_i \) = tax effort of the \( i^{th} \) county area as determined by net county area taxes collected divided by state tax collection,
- \( Y_i \) = relative income of the county area,
- \( S \) = two-thirds of state appropriation,
- \( n \) = total general purpose local governmental units.

**County Governments.**

\[
G_i = C_i \times \frac{AT_i}{AT}
\]
where: \( G_i \) = county governments' share of a county area allocation,

\( C_i \) = the county area allocation,

\( \text{AT}_i \) = adjusted taxes of the county government,

\( \text{AT} \) = adjusted taxes of all local governments in the county area

Other Local Governments.

\[ L_i = C_i - G_i \times \frac{\sum_{i=1}^{n} (P_i \times T_i \times Y_i)}{\sum_{i=1}^{n} (P_i \times T_i \times Y_i)} \]

where: \( L_i \) = share of the \( i^{th} \) governmental unit from county area allocation,

\( C_i \) = allocation to the county area,

\( G_i \) = county governments share of county area allocation,

\( P_i \) = population of the \( i^{th} \) local governmental unit,

\( T_i \) = tax effort of the \( i^{th} \) local government as determined by net taxes collected divided by net county areas taxes collected,

\( Y_i \) = relative income of the \( i^{th} \) governmental unit,

\( n \) = number of general purpose local governmental units.

The funds allocated to local governments via the above formula are subject to the following restrictions:

1. Per capita allocations to local governmental units within a state must be at least 20 percent, but not more than 145 percent of two-thirds of the state's allotment, divided by the state's population.

2. No local government may receive revenue sharing funds in excess of 50 percent of the government's adjusted taxes plus intergovernmental transfers of funds to the government.
(3) If the formula entitlement of a local government other than a county government is less than $200, the entitlement is given to the county government in which the unit is located.

Summary

Rather than being the product of a well designed, coordinated planning process, the United States' system of grants-in-aid has evolved in response to individual problems which have surfaced at various times throughout the history of the country. Prior to the State and Local Fiscal Assistance Act of 1972, grants were conditional in nature and were issued as either project grants or formula grants. The difference between the two is that project grants are issued on a competitive basis whereas formula grants are issued to all qualified jurisdictions.

One key feature of conditional grants is that state and local recipient governments are usually required to match federal expenditures. Initially, the typical match was fifty percent of a project's total cost. To provide more flexibility, matching requirements have become more variable and, under certain grants, are negotiable between the federal government and state-local governments.

Finally, funding for grants has increased in both absolute and relative terms. Between 1902 and 1980, the dollar value of grants has increased from $3 million to an estimated $74,755 million. During the same period, grants have increased from one percent to an estimated twenty-four percent of state and local revenue.
Previous chapters of this paper have investigated problems associated with the efficient production of local public goods when reciprocal externalities existed and with the development and major characteristics of grants in the United States. In the chapter dealing with the historical development of grants, it was demonstrated that new grants were initiated in response to specific problem areas which were brought to the attention of Congress. It is interesting that in the evolution of the grant system the functional purpose of aided activities changed over time from general purpose, i.e., land grants to support public education, to specific purpose, i.e., venereal disease, and now appears to be swinging back to general purpose via revenue sharing. Perhaps the most intense period of new categorical grant authorizations was in the mid 1960's under the umbrella of President Johnson's Great Society. In 1965 alone, Congress passed 109 new categorical grants. Unfortunately, during this period legislation was passed on its own individual merit.

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without concern over duplication, coordination, or conflicts. As stated by James Sundquist:

When the federal structure was transformed in the 1960's, it was not recast according to anybody's master plan. Nobody had one. Indeed, in the enactment of new programs of federal assistance, scant attention was paid to the pattern of federal-state-local relations that was emerging. At every level--in the executive department, in the White House, in the Congress--the concentration was upon the substance of the legislation; the administrative language was inserted almost incidentally. "We have no organizational philosophy, only a program philosophy," one high federal official put it. In the absence of a common doctrine, the structure of federalism embodied in a particular bill reflected the ideas of whatever particular group of legislative draftsmen worked on that particular measure and what laws they used as precedents. The rapid proliferation of grants without provisions for coordination began to change in the late 1960's. More and more frequently, part of the administrative procedure in securing grants required that potential recipients coordinate their efforts through a regional agency. As a result, conflicting programs could be eliminated and complementary programs could be encouraged to make the overall fiscal process more efficient. In the remainder of this chapter, grants-in-aid will be analyzed with respect to their effects on cooperation among local governments.

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3 Ibid., p. 13.

4 It should be emphasized that using grants to encourage cooperation is still in the development and experimentation stage. See, Robert D. Thomas, "Implementing Federal Programs at the Local Level," Political Science Quarterly, XCIV (Fall, 1979), pp. 419-435.
Grant Goals

The first objective of this chapter is to identify the goals of America's federal grant system. Reading the enabling legislation for grants-in-aid clearly indicates that Congress instituted and continues to use grants as a tool to increase the supply of goods which are provided by lower governmental units. It would be a serious error, though, to assume that this is the sole objective of grants. Rather, the objective of increasing federally favored services is constrained by a fundamental consideration which is based on the philosophical framework of the United States' system of government. Basically, this philosophy adheres to the premise that whenever possible decision making should be decentralized rather than centralized, and it is institutionalized as a federal system of government. Accordingly, even though the federal government may have a specific utility function for locally provided services, plans to achieve greater levels of satisfaction should be executed through a program which strengthens the federal system. Commenting on the use of national grants to promote viable local governments in a federal system, the Commission on

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5It is interesting to note that a recent study has found that individual congressmen do not have provincial voting records on grants. National issues are considered on merit rather than on the basis of narrowly focused local attitudes. See, Denetrios Caraley, "Congressional Politics and Urban Aid: A 1978 Postscript," Political Science Quarterly, XCIII (Fall, 1978) pp. 411-419.

6Many grant programs are administered by executive agencies and departments which follow such rigid procedural rules that real decentralization does not occur. See, Richard P. Nathan and Paul R. Dommel, "Federal-Local Relations under Block Grants," Political Science Quarterly, XCIII (Fall, 1978) pp. 421-442.
Intergovernmental Relations wrote:

    The common characteristic of all forms of grants is that the central government provides aid without supplanting smaller units as the governments which bring the aided services to the public.7

Further emphasis of this point was provided by L. H. Fountain, Congressional Representative from North Carolina, when he testified before the House Subcommittee on Governmental operations. His testimony, given in support of a bill whose purpose was "... to insure that (1) the effectiveness of grants-in-aid as instruments of Federal-State-Local cooperation is improved and enhanced ..."9 stated:

    ... enactment of the Bill would make a positive contribution to the States and localities in terms of their efficient utilization of Federal funds and would effect greater Federal interest in strengthened government--at the State and local levels.

    Mr. Chairman, cooperative federalism, our Federal system of checks and balances at all levels, in fact our very constitutional system itself, if it is to survive the perilous days ahead, demands not just greater interest in, but more aggressive action toward, stronger and more effective government at the local and State levels.10

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8Emphasis mine.


10Ibid., p. 188.
The concept of strengthening the role of state and local governments in America's federalism, while at the same time reducing federal influence, was a major argument used by President Nixon in his message to Congress advocating the passage of his recommended revenue sharing program. In that message, President Nixon commented:

The growing fiscal crises in our States and communities is the result in large measure of a fiscal mismatch; needs grow faster at one level while revenues grow faster at another. This fiscal mismatch is accompanied, in turn, by an "efficiency mismatch"; taxes are collected most efficiently by the highly centralized Federal tax system while public funds are often spent most efficiently when decisions are made by State and local authorities.

What is needed, then, is a program under which we can enjoy the best of both worlds, a program which will apply fast growing Federal revenues to fast growing State and local requirements, a program that will combine the efficiencies of a centralized tax system with the efficiencies of decentralized expenditure. What is needed, in short, is a program for sharing Federal tax revenues with State and local governments.

At this juncture, it is important to recognize that a fundamental change occurred in the national government's concept of cooperation. Prior to revenue sharing, grants were designed to promote specific goods favored by the federal government but supplied by local governments. As grants evolved, the concept of cooperation grew from that of

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11 An ex post verification of this contention can be found in: Bert Mason and Varden Fuller, "Small Communities and the New Federalism: Some Observations from General Revenue Sharing," Publius, VIII (Fall, 1978), pp. 113-128.

simply supplying funds to independently acting local governments, subject to matching and use conditions, to that of promoting dialogue and joint decision making among local units in an impacted area. Then, all at once, a major new grant program—revenue sharing—broke the concept of overtly encouraging cooperation among local governments. Monies under the new program were issued to local governments as a matter of right, under the auspices of an impartial formula. Under the new program, recipient governments could independently determine how their funds would be spent and the cause of cooperation was dealt a severe set back.\textsuperscript{13}

Effect of Close Ended Grants

As was explained in Chapter IV, federal grants may be funded without dollar limit (open ended) or with dollar limit (close ended). If the purpose of grants is to increase general welfare, either funding method could be used with equal efficiency. The only difference would be the extent to which general welfare was promoted. If, however, the purpose of federal grants is to increase specific welfare, close ended funding may eliminate the advantages of conditional grants over unconditional ones for that purpose. That is, the close endedness of a conditional grant may cause the effects of this grant to be identical to

the effects of an unconditional grant. But, in this case, the induce-
ment to cooperate will be greater than would be true if an unconditional
grant were provided.

To demonstrate this, assume as in Figure 16 that the government
wants to increase the supply of a public good which is measured on the
vertical axis. If a program of open ended conditional grants is insti-
tuted, the budget constraint will shift from AD to a position such as
CD and an increase in public goods from $Y_1$ to $Y_2$ will be effected. In
contrast, if a close ended grant is given, the budget constraint may
shift to a position such as BED and the effect of the grant would be
identical to that of an unconditional grant in the amount of the imposed
dollar limitation. The line BED was formed under the assumption that
the federal government would provide a subsidy of a given proportion
of the public good's cost, up to a level of $Y_4$. Beyond $Y_4$, no addi-
tional subsidy would be given. Therefore, the budget constraint which
includes the federal government subsidy would run parallel to the bud-
get constraint without the federal government subsidy. If this point
is recognized in grant administration, the federal government could be
able to achieve the welfare increases associated with unconditional
grants, while instituting cooperation requirements to obtain the grants.
As a practical matter, however, it is likely that the dollar limitations
on grants would have to be so small that the basic intent of increasing
the quantity of the subsidized good would be compromised.
Figure 16

Federal Grants with Dollar Limitations
Bargaining and Grants

Analyses presented in Chapter III demonstrated that except for the case in which local governments were identical, a move from reaction equilibrium to equal cost-sharing cooperation equilibrium would result in gains of welfare for one government and losses in welfare for the other. Thus, there would exist a bargaining range within which negotiations between the communities could occur to exhaust potential gains from trade. The bargaining process, however, would be more restricted and costly between governmental units than it would be between individuals, and if there were an increase in the number of governments participating in the bargaining process, restrictions and costs would increase accordingly. The reason for this is that intergovernmental bargaining includes political as well as economic elements. On an individual level, bargainers attempt to gain for themselves the greatest amount of economic benefits in the form of consumable goods and services. Governments and politicians, though, are not only concerned with consumable goods and services, but with spheres of jurisdiction also. Hence, a governmental unit will be less willing than an individual to strike a bargaining agreement which economically might call for a transfer of the actual provision of a service function to some other economic unit.

In addition to governments wanting to protect their sphere of influence, the action of pressure groups may also work to hinder cooperation. Vested interest citizen groups and municipal employee associations have considerable impact on the establishment of budget priorities. Where efficiency through cooperation conflicts with the desires of interest groups, choices must be made. Unless advocates for efficiency can demonstrate wider support for their position than other pressure groups can for theirs, the cause of efficiency will suffer. Commenting on the impact of pressure groups in determining the budgets of state and local government, James O'Connor has written:

The dominate private interests (particularly the leading industries) predetermine the volume of state spending and the major budgetary priorities. There is little planning at the state and local levels, and the role of financial expertise and integrated decision making (so important at the federal level) is minimal.

Among other deterrents to cooperation between governments, it has been found that governmental units, like individuals, in many instances tend to gravitate toward an association with similarly situated governments. Commenting on the results of a study dealing with this problem, John C. Bollens and Henry J. Schmandt wrote:

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15An excellent example may be found in the experiences of public hearings held for the purpose of citizen participation in allocating revenue sharing funds. Despite citizen review, city managers were found to be able to strongly influence the expenditure of shared funds. See, Timothy A. Almy, "City Managers, Public Avoidance, and Revenue Sharing," Public Administration Review, XXXVII (January/February, 1977), pp. 19-27.

School cooperation tends to develop between governments of similar social rank and financial resources. Sewage agreements also occur more frequently between units of comparable social status and, where a range of choice exists, this factor appears more important than the taxable resources of the respective municipalities.\(^{17}\)

With decisions being based on social compatibility rather than economic rationality, independent cooperation cannot be relied upon to provide an economically efficient solution to problems requiring joint efforts.\(^{18}\)

Perhaps the broadest inditement of independent action among political units as an agent to provide economic efficiency was provided by L. C. Ecker-Racz in the following:

> Public officials are committed to their respective missions. Their loyalties are to their own jobs. They do their best to merit the approval of their superiors. Those exposed to public view crave the approval of their constituents. But constituencies tend to rate their political representatives in terms of narrow personal interests; and the interests of one constituency, one community, or one state, as popularly interpreted, may conflict with interests of other communities or states, or with those of the nation.\(^{19}\)

Commenting further, Bryan T. Downes has suggested:

> Each local government has its own jurisdiction, functions or services to provide. All have been established under


\(^{18}\)The tendency for cooperation to take place among similar entities was emphasized with respect to fiscal histories in: Robert E. Firestine, Bernard L. Weinstein, and Shilly M. Hayden, "Intergovernmental Fiscal Cooperation in Growing Metropolitan Economies," The Annals of Regional Science, XII (November, 1978), pp. 12-20.

the constitutional or statutory provisions of a particular state. Typically, they pursue their own self-interests, provide services to their constituents, and sometimes compete with neighboring localities for taxable wealth. Most, however, disregard their neighbors and problems that spill over governmental boundaries. The tendency is to view local problems as unique with relation to those in adjacent communities. Hence, coordinated and cooperative problem solving by local governments seldom occur.20

Under these conditions, federal grants could be used to overcome the effects of recalcitrance by local governments to bargain among themselves. Consider, for example, the case of unequal incomes in two communities producing reciprocal spillouts. As depicted in Figure 17, Westbank the wealthier community, would be able to obtain a level of satisfaction as identified by welfare function $I_W$ in reaction equilibrium. If Westbank and Eastbank were to cooperate in producing the public good and were to agree to an equal sharing of costs, Westbank's satisfaction would increase to $II_W$. From Eastbank's point of view, a change from reaction equilibrium to equal cost sharing cooperation would result in a reduction of satisfaction from $I_e$ to $II_e$. Clearly, cooperation under these circumstances would not occur automatically, but only after cost sharing negotiations between communities have

Communities with Unequal Resource Bases
taken place. If the cities refuse to negotiate because of political considerations, grant programs could be designed to cause the communities to act in such a way as to exhaust the potential gains from trade. To achieve this result, however, grant provisions would necessarily grow in complexity.

Under the conditions of Figure 17, the federal government could offer a conditional grant to Westbank equalling \( \frac{D_w^4 D_w^3}{D_w^1 D_w^4} \) percent of its expenditures of dredging. Westbank would then be able to move to welfare function II. Its total consumption would equal \( D_w^3 \) units of dredging and \( F_w \) units of food. Of the total amount of dredging consumed, \( D_w^1 \) would be produced by Westbank from its own income and \( D_w^4 \) would result from the grant. But Eastbank would obtain greater spill ins from the increased quantity of dredging and would not want to continue producing at its current level. With spill ins from Eastbank falling below \( D_w^1 D_w^4 \), Westbank would not be able to remain on II, unless it received additional aid or unless Eastbank received aid to induce it to produce \( D_w^1 D_w^4 \) units of dredging, or some combination of the two.

A second possible approach to the problem would result in the federal government obtaining an agreement between the two communities to cooperate fully with an equal sharing of costs. Then, to compensate Eastbank for its welfare loss, an unconditional grant could be given to permit a return to the pre-cooperation level of satisfaction. In either case, one factor which should be recognized is that federal participation through grants will generally result in a greater level of public good production than would exist under pure cooperation between the local governments. Possible exceptions to this general rule include the case in which income elasticity for the private good is zero, or the case in which receipt of federal funds was conditioned with an absolute requirement that local governments maintain their pre-grant level of spending on the public good out of their own revenues.

Provisions for Cooperation in Grant Legislation

An evaluation of America's system of grants-in-aid in terms of their effect on cooperation among local units of government is mixed. Certain attributes can be pointed to which have aided cooperation while other attributes have been neutral or even adverse to cooperation. Re-iterating an earlier discussion, it is important to note that early in the evolutionary process of grant development little consideration was given to any form of cooperation except for that which existed between donor and recipient governments. When a problem arose that had sufficient support to receive federal funding, monies were provided to attack
the problem directly and in isolation of any other problem or program.\textsuperscript{22}

As a result of dealing with problems on a piecemeal basis, there developed an overlapping and conflicting grant system. Emphasizing the lack of coordination in early grants, James L. Sundquist has stated:

> The federally initiated community mechanisms differed not just in name, structure, and function but also in elements of the communities' social, economic, and political structures upon which they were based. Each reflected the particular clientele of its parent agency, as well as that agency's administrative traditions and customary channels of communication. Thus, HUD relied on elected officials, particularly urban mayors, and built its mechanisms around local governments—but even so, in the case of model cities, required creation of the city demonstration agencies. The Office of Economic Opportunity, skeptical of the treatment that its clientele, the poor, would receive at the hands of local government, created in its community action agencies a new kind of institution whose control was to be shared by public officials, representatives of private organizations and the poor themselves.\textsuperscript{23}

Thus, monies were channeled into communities and different groups were given the authority to make expenditure decisions. The diverse groups, following their own special interests, could not be expected to establish a coordinated pattern of expenditures within a single community or among several communities. It was not until 1964, when the Advisory Commission on Intergovernmental Relations prepared a study detailing the lack of cooperation and coordination among individual grants, that

\textsuperscript{22}Even in this case, it has been demonstrated that unless goals are shared by recipient governments and the federal government, there are serious questions as to whether or not the recipient government's activities will change substantially. See, Helen Ingram, "Policy Implementation Through Bargaining: The Case of Federal Grants-In-Aid," Public Policy, XXV (Fall, 1977), pp. 499-526.

any substantive remedial action was undertaken. Following the publication of the Commission's study, hearings in both Houses of Congress culminated in the passage of the Intergovernmental Cooperation Act of 1968. One of the major provisions of the Act was:

To the maximum extent possible, consistent with national objectives, all Federal aid for development purposes shall be consistent with and further the objectives of State, regional, and local comprehensive planning. Consideration shall be given to all developmental aspects of our total national community, including but not limited to housing, transportation, economic development, natural and human resources development, community facilities, and the general improvement of living environments.

Subsequently, all grant applications were processed through reviewing agencies to certify that requirements of the Act were being complied with. Where conflicts among units of government developed, it became necessary for the conflict to be resolved before an application would be approved by the reviewing agency.

This major effort toward cooperation, however, has not been continued uniformly. A severe break occurred in 1972 with the passage of revenue sharing. Recipients of sharing funds were not required to submit coordinated plans for projected use. Indeed, no use plans were required to be submitted at all. Governments were slated to receive a portion of these funds as a right, with allocation depending on the results of substituting respective data into a fixed formula. In this

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way, governments were given a green light to go their own way and make expenditures decisions independent of any other governmental unit.

**Maintenance of Effort**

Maintenance of local efforts in support of functions subsidized by the Federal government is closely related to matching requirements of grants-in-aid. In the present context, it is the source of matching funds that is important. Possible sources include increased tax revenues, the shift of funds from functions not funded by grants, the shift of funds from programs which in the past have been partially funded through grants, or the re-allocation of funds from one component of a functional expenditure not eligible for grant funds to a component which is eligible for support. Presently, there is not effective control over the level of local support for programs subsidized through grants. This lack of control may cause local governments to be unwilling to tie themselves to cooperative agreements with other governments in order to retain their flexibility in shifting funds from one program to another to gain additional grants.

One approach that might be taken to provide for maintenance of effort by local governments is the use of an incremental conditional grant. The workings of this type of grant may be demonstrated in reference to Figure 18. In this figure, equilibrium is established at the point of tangency between the budget constraint AB and the welfare curve $W_1$. If the national government wishes to increase the level of the public good $S$, it could design a grant program which would subsidize only quantities of $S$ greater than $S_1$ units. Such a grant
Figure 18
Incremental Conditional Grants
would shift the community's budget constraint to ACD and effect an increase in S to S<sub>2</sub> units. In this way, the desired effects of a conditional grant would be obtained at the least cost to the federal government.

The desire of the federal government to encourage local governments to support funded programs out of local funds was demonstrated in the State and local Fiscal Assistance Act of 1972. The Act prohibited revenue sharing funds to be used to satisfy matching requirements for conditional grants. However, standards for judging whether or not a local government used revenue sharing funds for such a purpose were so nebulous as to be ineffective. The Act said, for example, that:

No state government or units of local government shall be determined to have used funds in violation of subsection (a) with respect to any funds received for any entitlement period to the extent that the net revenues received by it from its own sources during such period exceed the net revenues receiving by it from its own sources during the one-year period beginning July 1, 1971 (or one-half of such net revenues, in the case of an entitlement period of 6 months). <sup>26</sup>

Therefore, the only proof that a local government needed to demonstrate that it did not use sharing funds to meet matching requirements for other grants was an increase in its tax collection. Under amendments passed in 1976, even this minor restriction was removed from purposes for which revenue sharing funds would be used.

<sup>26</sup>U. S. Congress, An Act to Provide Fiscal Assistance to State and Local Governments, Public Law 92-512, 92<sup>nd</sup> Congress, 1972, p. 2.
Formula Effects

As identified in the previous chapter, provisions in the allocating formulas used to distribute grant funds do not contain a "cooperation" variable. Rather, the formulas are designed to recognize need and fiscal effort of recipient governments. Two important factors which account for the choice of variables are primary intent of grants and practicality. Historically, after the federal government has identified an area which it deems worthy of national attention, emphasis is placed on getting funds to the proper governmental unit to begin remedial action. Along with this emphasis, but only of secondary importance, are provisions to attain other goals such as nondiscrimination in spending federal funds, minimum wages, and cooperation among governmental units.27 Because the primary consideration is to increase local spending, it is understandable that variables chosen as allocating criteria would be associated with need and fiscal effort. Also, on a more practical bases, need and fiscal effort are more easily quantified than a concept such as cooperation. Thus, to avoid the pitfalls of attempting to define quantitative variables to measure qualitative phenomena, non-formula conditions are written into enabling grant legislation.

One formula that requires special attention is the formula for revenue sharing that allocates funds to local governments within a

27This is not to say that in the hierarchy of the federal government's goal these latter objectives are lower priority items, but only that in the specific context of grant programs the primary effort is to place money in the hands of local governments to help solve particular problems.
state. Distinguishing between county governments and other local governments, one allocating variable is adjusted tax revenues. Under a decision known as the Memphis Rule, it was determined that in those states which provided for city taxes, e.g., sales tax, to be collected at the county government level, sharing funds would be distributed as if the city collected taxes for itself. This decision meant that cities which entered into cooperative agreements with a governmental entity that was more efficient at collecting taxes would not suffer a loss of revenue sharing funds. Although not positively encouraging cooperation, the Memphis Rule meant that cooperative efforts would not be penalized.

Effects on Government Structure

From the provisions written into enabling grant legislation regarding recipients of aid, it would appear that Congress was, for a time, oblivious to the possible adverse consequences of grants on governmental structure. Until the early 1960's, emphasis was placed on funding specific functional expenditures through responsible organizations, public or private, which submitted proposals justifying national support. Although most grants required that a systematic plan be included in the application for aid, "... it was most often special purpose planning for the specific type of program being assisted rather than comprehensive planning.28 Yet, it is precisely the latter type of planning

---

which is necessary to avoid an inefficient hodgepodge of overlapping and conflicting programs and to promote an efficient delivery system to provide the services which grants support. In order to develop such a system, eligibility requirements for the receipt of grants can play an important role. It is in this area that revenue sharing has a more positive impact on cooperation than conditional grants have. Under revenue sharing legislation, funds are allocated only to general governmental units. This is not true of conditional grants which include general purpose governments, special purpose governments, and profit and non-profit institutions as eligible recipients. By offering grants to this wide range of organizations, the federal government has reduced the incentive to solve problems jointly at the local level and has made it easier for local governments to act independently. The non-restrictiveness of conditional grants and, in fact, the apparent advocacy of special purpose governments was criticized by the Advisory Commission on Intergovernmental Relations when it reported that:

A relatively new type of Federal aid recipient has arisen in recent years--the special purpose units of government with independent or semi-independent status. These new units, actually induced and sometimes even required by about a quarter of all Federal programs, include public housing and urban renewal authorities, State and local planning agencies, local area redevelopment organizations, industrial development authorities, State and county rural area development committees, irrigation districts, water users associations, soil conservation districts, State and county agricultural stabilization and conservation committees, and State and local Farmer's Home Administration committees.
Despite the fact that most Federal aid is available to both general purpose and special purpose units of local government, several programs show a strong tendency to bypass general purpose units. As a result of encouraging special, single function governmental units, conditional grants tend to reduce the amount of cooperation among governments unless cooperative agreements are made an explicit condition for obtaining grants.

The foregoing, however, does not imply that unconditional grants are without negative influences on government structure and cooperative efforts. As was discussed in the previous chapter, revenue sharing has provided funds to some general purpose governments which have permitted them to remain active beyond the time when normal fiscal conditions would have forced dissolution or consolidation. Thus, by providing funds to support the continued operation of these governments, revenue sharing has been instrumental in promoting a governmental structure with more units of local government than would be true without revenue sharing. At the same time, revenue sharing has also been responsible for discouraging negotiations leading to cooperation by the same governmental units. As a result, both conditional and unconditional grants exert adverse influences on cooperation. However, although federal grants may be criticized on the basis of promoting special units of government (in the case of conditional grants) and permitting general units of government to continue to exist as independent units rather than to

consolidate (in the case of revenue sharing), the elimination of these units may not necessarily result in an increase in efficiency or a decrease in cost. Richard Gustely, for example, has found that when governments are consolidated, wages and programs are upgraded to the highest level. Thus, rather than reduce cost, consolidation may have just the opposite result.

Another factor that should be considered in this discussion dealing with governmental structure is the effect of grants-in-aid on the relationship between governmental size and the type of tax levied to provide revenues. Due in part to their relatively small geographic boundaries, sub-national units of government have been restrained in the use of income taxes and, instead, rely on sales and property taxes as their chief sources of revenue. The problems encountered in levying income taxes at the state and local levels are primarily those of base definition and base migration. With respect to the former problem, it is necessary to specify whether the tax is to be levied on incomes of residents of the jurisdiction imposing the tax or on individuals working in the jurisdiction, regardless of where they live. The determination of this issue will affect the latter problem--base migration--by making the jurisdiction a more or less favorable location for residences and businesses.

With the institution of a program of federal grants-in-aid, geographic limitations to the use of income taxes to finance state and

local expenditures can be evaded. The federal government, which is not substantially affected by the limitations, depends on a tax structure dominated by income taxes for its revenue. Grants-in-aid, which are made available from the federal tax system, will result in local expenditures being financed through a tax mix placing greater emphasis on the income tax than would have been possible without the federal grants. In so doing, grants help to overcome limitations on taxes which are caused by the small geographic size of governmental units.31

Matching Requirements

Matching requirements appear to have a great potential as a device for achieving cooperation among units of local government. As has been pointed out in Chapter IV, matching provisions with wide latitude are already included in conditional grant authorizations. Early grants typically required fifty percent matching on the part of recipient governments. The purpose of matching was to assure a degree of financial commitment, and thereby proprietary interest, in the function being supported. Later, it was recognized that the fifty percent matching provision was too great for some otherwise eligible governments, and variable matching became more and more common in new revised legislation.32


32Advisory Commission on Intergovernmental Relations, The Role of Equilization, pp. 5-6.
While variable matching in the past has been used almost exclusively as a means of easing matching requirements for poor communities, this particular usage does not have to continue to prevail in the future. The matching percentage for a local government could easily be tied to a proof of cooperation among affected local governments. Also, cooperation does not have to be tied just to the program for which grants have been requested. A graduated downward matching percentage could be designed for those communities willing to enter into more comprehensive bargaining agreements on spending requirements for related projects or even for integrating revenue systems to obtain tax revenues more efficiently.

To use variable matching requirements efficiently in achieving a greater degree of cooperation among lower levels of governments, it is necessary that differences among recipient governments be recognized and taken advantage of. Suppose, for example, that two local levels of government are producing a good with spill-out benefits under conditions of non-cooperation. If the two entities are alike in all respects except that one has a greater preference for the good with spill-out benefits, it can be demonstrated that the city with the greatest preference for the good will be more responsive to grant stimulation than the city with the smaller preference for the good. Therefore, to accomplish an equal increase in public good production by both communities, a greater subsidy (smaller matching ratio) will have to be offered to the city with the smaller preference,
To demonstrate this, Figure 19 has been drawn so that the budget constraints for two communities are equal, but the indifference map for the community on the left indicates a greater preference for public good than the indifference map for the community on the right. With public goods being measured horizontally, each community will be in equilibrium at the respective points of tangency between their budget constraints and their indifference curves. Now, let the federal government provide a thirty-three and one-third percent grant to subsidize production of the public good. Budget constraints for the two community will shift from AB and A'B to CB and C'B for the communities identified by the left and right parts of Figure 19, respectively. A new equilibrium position will be established for each community which will involve a greater production/consumption of both goods. What is relevant for this discussion, however, is that the community on the left will experience a greater increase in public good production than the community on the right because of its greater preference for public goods. It is clear, then, that if the federal government wishes to induce a given community to increase its production of a public good, it will have to pay a larger proportion of the good's total cost, the smaller the community's preference for the good.

A second interesting case associated with variable matching occurs when communities are equal, except in their efficiencies to produce public goods. Under these conditions it would appear to be reasonable to expect that the community with the greatest efficiency in producing the public good would be most responsive to governmental subsidies. Such
Figure 19
Unequal Preference for Public Goods
an expectation, however, is not valid uniformly, but only when preference functions for private and public goods meet certain conditions. To demonstrate this point, Figure 20 has been drawn with budget constraints AB and CB for two communities. For both constraints, the maximum output potential for private goods is the same. At any level of private good production less than OB, budget constraint CB will permit twice as much public goods to be produced as budget constraint AB. Suppose that the communities have identical preference maps for private and public goods and that the maps result in a contract locus with budget constraints indicated by the ray, OD. If the government now subsidizes the production of the public good with a fifty percent grant, budget constraints shift from AB and CB to A'B and C'B, respectively. Depending on the relationship between the slope of OD and the budget constraints AB, A'B, CB, and C'B, the increase in public good production by the community with the greatest efficiency in producing the good may be greater than, equal to, or less than the increase in public good production by the community that is less efficient in producing the good. 33 If variable matching is to be used to obtain the greatest re-

33Given the reference points in the following diagram, when the slope of OD equals M, the communities will respond to a government subsidy by increasing their output of the public good by the same amount. When the slope of OD is greater than M, the community with the greatest efficiency in producing the public good will increase its output by the greatest amount. When the slope of OD is less than M, the community with the greatest efficiency is producing the
Figure 20
Unequal Abilities to Produce a Public Good
sponse to a federal grant, it will be necessary to determine the relationships that exist between the contract locus and budget constraints of the recipient communities.

Of course, with a program such as revenue sharing, the use of matching requirements as an inducement to cooperation is meaningless. Funds provided by revenue sharing were intended to be used to increase decision making at the local level, and recipient governments were not supposed to be constrained by federal spending biases.

Conclusions

An extensive body of literature exists which documents the adverse effects that externalities have on attaining a Pareto optimal allocation of resources. When externalities exist, affected parties may enter into negotiations to internalize the externalities and thus

\[ m = \frac{-[B(C'A'\beta^2 - 2A'C)] \pm \sqrt{[B(C'A'\beta^2 - 2A'C)]^2 - 4B^2(A' - A'\beta - C + C')C(A\beta + A'\beta + A'\beta + A'\beta')}}{2B^2(A - A' - C + C')}. \]

For a proof of this condition, see Appendix A.
achieve Pareto optimality. As was demonstrated in a previous chapter of this paper, local governmental units generating reciprocal spillouts can be shown to reach an equilibrium position based on reactions to spillins from other units. In the case of identical communities, agreements to cooperate in the provision of goods with spillouts under equal cost sharing will increase levels of satisfaction of each community involved. In the case of unequal communities, cooperative agreements with equal cost sharing will result in a loss of satisfaction for one community and a gain in satisfaction for another. As a matter of practicality, communities are not identical and for negotiations to take place to exhaust unrealized gains, difficult bargaining among communities can be expected. Add to this the political factors that enter when dealing with autonomous governmental units and the successful completion of negotiations is even more unlikely. Practical political consideration such as pressure group action and maintaining spheres of jurisdiction may be more influential in decision making than efficiency through cooperation. Under these conditions, the federal government, through its program of grants-in-aid could encourage local governments to act in such a way as to effectively obtain those unrealized gains. For grants-in-aid to achieve this result, substantial procedural changes would need to be made in criteria for allocating grant funds. Especially useful in this regard would be the universal requirement that comprehensive plans for the use of funds be made a part of grant applications. This would force local governments to recognize and consider existing interrelationships. Another
potentially powerful instrument for achieving cooperation is the existing variable matching provision in grant legislation. Those local governments which enter into cooperative agreements could be compensated by a reduced percentage matching requirement for receiving grant funds. In addition to these active steps to promote cooperation, grant legislation could also be changed so as to be more permissive in achieving cooperation. In this respect, one of the chief changes that could be make is the removal from eligibility any local governmental unit other than general purpose governments. This change would require special purpose governments to coordinate plans with general purpose governments to avoid inefficient overlapping and conflicting programs.

Finally, it is necessary to consider general revenue sharing in light of its effect on cooperation. While this type of aid is very effective in placing discretionary funds in the hands of local governments, it does not positively enhance cooperation. By providing local governments with revenue, without effective conditions, general revenue sharing has encouraged independent rather than cooperative action on the part of recipient governments. From the perspective of this paper, special revenue sharing would appear to be a more efficient means of transferring funds to local governments. While recognizing that special revenue sharing would be less effective in promoting President Nixon's "New Federalism", or decentralized decision making, it would permit more coordination and less conflict in public sector expenditures.
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The purpose of this appendix is to present a proof of the necessary relationships among lines $L_1$, $L_2$, $L_3$, $L_4$, and $L_5$ in Figure 21, which will result in $D_{12}$ being equal to $D_{34}$. When $D_{12}$ equals $D_{34}$, the ninety degree triangles formed in the figure will be isosceles and the vertical segments of each will be equal. In the context of the body of this paper, this means that grants-in-aid will result in equal increases by two communities in the provision of a public good.
The formal proof requires that formulae for lines \( L_1, L_2, L_3, L_4, \) and \( L_5 \) be calculated by the use of the two point formula. For \( L_1 \), the calculations are as follows:

\[
\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}
\]

\[
\frac{y-y_1}{x} = \frac{0-y_1}{x_2-0}
\]

\[
\frac{y-y_1}{x} = \frac{-y_1}{x_2}
\]

\[
y-y_1 = -\frac{x_1 y}{x_2}
\]

\[
y = y_1 - \frac{y_1}{x_2} x
\]

By similar calculations, the formulae for \( L_2, L_3, \) and \( L_4 \) are:

\( L_2 \):

\[
y = y_2 - \frac{y_2}{x_2} x
\]

\( L_3 \):

\[
y = y_3 - \frac{y_3}{x_2} x
\]

\( L_4 \):

\[
y = y_4 - \frac{y_4}{x_2} x
\]
For $L_5$, the formula is:

$$y = mx$$

It is now necessary to find the coordinates for the point of intersection between $L_5$ and $L_1$, $L_2$, $L_3$, and $L_4$. This is done by setting $L_5$ equal to each of the other lines. For the intersection between $L_5$ and $L_1$, the following procedure may be used:

$$y_1 - \frac{y_1}{x_2} X = mx$$

$$y_1 = mx + \frac{y_1}{x_2} X$$

$$y_1 = X(m + \frac{y_1}{x_2})$$

$$X = \frac{y_1}{m + \frac{y_1}{x_2}}$$

$$X = \frac{y_1}{mx_2 + y_1}$$

$$X = \frac{y_1x_2}{mx_2y_1}$$

Now, substitute the value of $X$ into:

$$y = y_1 - \frac{y_1}{x_2} X$$
\[y = y_1 - \frac{y_1}{m x + y_1}\]

\[y = y_1 - \frac{y_1^2}{m x + y_1}\]

\[y = \frac{y_1 (m x + y_1) - y_1^2}{m x + y_1}\]

\[y = \frac{m x y_1}{m x + y_1}\]

In a similar manner, the intersection between \(L_5\) and \(L_2, L_3,\) and \(L_4\) may be calculated as:

\[D_2 : \quad X = \frac{x_2 y_2}{m x + y_2} \quad \quad Y = \frac{m x_2 y_2}{m x + y_2}\]

\[D_3 : \quad X = \frac{x_3 y_3}{m x + y_3} \quad \quad Y = \frac{m x_3 y_3}{m x + y_3}\]
Now that the intersecting coordinates have been found, the distance, $D_1D_2$, may be found by using the Pythagorean Theorem:

$$D_1D_2 = \sqrt{\left(\frac{x_2y_1}{m_{x_2+y_1}} - \frac{x_2y_2}{m_{x_2+y_2}}\right)^2 + \left(\frac{m_{x_2}y_1}{m_{x_2+y_1}} - \frac{m_{x_2}y_2}{m_{x_2+y_2}}\right)^2}$$

$$= \sqrt{\left(\frac{(x_2y_1)(m_{x_2+y_2}) - (m_{x_2+y_1})x_2y_1}{(m_{x_2+y_1})(m_{x_2+y_2})}\right)^2 + \left(\frac{(m_{x_2}y_1)(m_{x_2+y_2}) - (m_{x_2+y_1})m_{x_2}y_2}{(m_{x_2+y_1})(m_{x_2+y_2})}\right)^2}$$

$$= \sqrt{\left(\frac{x_2(m_{x_2}y_1 + y_2 m_{x_2} - m_{x_2}y_2)}{(m_{x_2+y_1})(m_{x_2+y_2})}\right)^2 + \left(\frac{m_{x_2}(m_{x_2}y_1 + y_2 - m_{x_2}y_2)}{(m_{x_2+y_1})(m_{x_2+y_2})}\right)^2}$$

$$= \sqrt{\left(\frac{x_2(m_{x_2}y_1 - m_{x_2}y_2)}{(m_{x_2+y_1})(m_{x_2+y_2})}\right)^2 + \left(\frac{m_{x_2}(m_{x_2}y_1 - m_{x_2}y_2)}{(m_{x_2+y_1})(m_{x_2+y_2})}\right)^2}$$
$$\overline{D_1D_2} = \frac{\sqrt{[x_0(mx_2y_1) - mx_2y_2]^2 + [mx_0(mx_2y_1 - mx_2y_2)]^2}}{(mx_2+y_1)(mx_2+y_2)}$$

$$= \frac{\sqrt{[mx_2(x_0y_1 - y_2)]^2 + [mx_2(mx_0y_1 - mx_2y_2)]^2}}{(mx_2+y_1)(mx_2+y_2)}$$

$$= \frac{\sqrt{(mx_2)^2 [x_0(y_1 - y_2)]^2 + (mx_2)^2 [mx_0y_1 - mx_2y_2]^2}}{(mx_2+y_1)(mx_2+y_2)}$$

$$= \frac{mx_2 \sqrt{x_0^2(y_1-y_2)^2 + mx_0^2(y_1-y_2)^2}}{(mx_2+y_1)(mx_2+y_2)}$$
Through a similar process, the distance, $D_3D_4$, may be calculated as:

$$\overline{D_3D_4} = \frac{m x_2 \sqrt{(y_3-y_4)^2 - x_2^2}}{(m x_2 + y_3)(m x_2 + y_4)}$$

Now, setting $D_1D_2$ equal to $D_3D_4$, the required isosceles triangles will be established and the conditions necessary for equal vertical distances will be obtained. This may be done as follows:
\[ \frac{m x_2^2 (y_1 - y_2) \sqrt{x_m}}{(m x_2 + y_1)(m x_2 + y_2)} = \frac{m x_2^2 (y_3 - y_4) \sqrt{x_m}}{(m x_2 + y_3)(m x_2 + y_4)} \]
\[ \frac{(y_1 - y_2)}{(m x_2 + y_1)(m x_2 + y_2)} = \frac{(y_3 - y_4)}{(m x_2 + y_3)(m x_2 + y_4)} \]
\[ (y_1 - y_2)(m x_2 + y_1)(m x_2 + y_2) = (y_3 - y_4)(m x_2 + y_3)(m x_2 + y_4) \]
\[ (y_1 - y_2)(m x_2 + m x_1, y_4 + m x_1, y_3 + y_4 y_4) = (y_3 - y_4)(m x_2 + m x_2 y_2 + m x_2 y_1 + y_1 y_2) \]
\[ (y_1 - y_2)[m x_2^2 + m x_2 (y_3 + y_4) + y_3 y_4] = (y_3 - y_4)[m x_2^2 + m x_2 (y_1 + y_2) + y_1 y_2] \]

\[ m x_2^2 y_1 - m x_2^2 y_2 + m x_1 (y_3 + y_4) y_1 - m x_1 (y_3 + y_4) y_2 + y_1 y_3 y_4 - y_2 y_3 y_4 = m x_2^2 y_3 + m x_2 (y_1 + y_2) - m x_2^2 y_4 \]
\[ - m x_1 (y_1 + y_2) y_4 + y_1 y_3 y_4 - y_2 y_3 y_4 \]
\[
\begin{align*}
0 &= m^2 y_x^2 (3y - 2y - g + y) + m y x (y + m^2) + m y x (y + m x) y_x y - y x^2 + y^2 y_x^2 + y x^2 + y^2 y_x^2
\end{align*}
\]
Solve for \( m \), using the quadratic formula:

\[
m = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

\[
m = \frac{-[X_2(2y_1 y_4 - 2y_2 y_3)] \pm \sqrt{[X_2(2y_1 y_4 - 2y_2 y_3)]^2 - 4X_2(2y_j - 2y_k y_4)(2y_1 y_4 - 2y_2 y_3 + 2y_3 y_4)}}{2 X_2(2y_j - 2y_k y_4)}
\]
VITA

Charles Franklin Hawkins was born December 17, 1938 at Houma, Louisiana. While quite young, he moved to Beaumont, Texas and there completed his elementary education. In June, 1957, he was graduated from Culver Military Academy. After attending Georgia Institute of Technology, he graduated with a Bachelor of Arts degree from Lamar University in Beaumont, Texas.

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Candidate: Charles Franklin Hawkins

Major Field: Economics

Title of Thesis: An Externalities Approach to the Analysis of Federal Grants-in-Aid Emphasizing the Effect of Grants on Cooperation Among Local Units of Government

Approved:

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Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

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Date of Examination:

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