A PUBLIC EXPENDITURE MODEL FOR LOCAL GOVERNMENT: A CASE STUDY ON THE USE OF GOVERNMENT SECTORS IN AN INTERINDUSTRY MODEL

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January 1967

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PREFACE

This thesis grew out of a summer intern experience with Arthur D. Little, Inc. in 1964. For the inspiration to continue studying the problems of a mixed economy I am indebted to Francis Hendricks, project director on the Stockton Urban Renewal study. His continual guidance and intellectual stimulation during the project was an invaluable directive to my professional training at the University. Many of the innovative ideas contained in the Stockton interindustry model were the result of his ability to clearly formulate the needs of city planners, and incorporate these needs into the model design.

There are many people to whom I owe thanks for their assistance during the past year. I want to thank the Department of City Planning, Stockton, California and Arthur D. Little, Inc. for the permission to use the inter-industry model, and to explain many of the steps in its design which have been previously unpublished. Herb Epstein, Vance Wilson and Bob Ching of the City Planning Department in Stockton supplied me with original research notes, and Rae Archibald willingly offered answers to many questions about Stockton and its governmental process.

Helpful suggestions on the scope and purpose of my work in its early stages were made by David Bradwell. S. Ananda Rao developed the original interindustry model and clarified some technical problems of "making it work." Ted Dienstfrey assisted with early programming problems, and I owe particular thanks to Howard Cherniack who wrote the final computer program for the model.

I am grateful to John W. Dyckman and the Center for Planning and Development Research for the time that was made available to complete my work and for the assistance in preparing final manuscript . The final report was typed by Shirley Tiangsing.

My advisor, Michael Teitz, has offered endless personal and academic encouragement since I began the Master's program. Because of his efforts I have found myself involved in a more substantive and rewarding approach to city planning. For the patience and encouragement to see this work to its completion, a special thanks to Catherine Ann Dillon.

INTRODUCTION

In recent years, a number of studies on the economics of urban public expenditures have been made that are tackling some of the problems facing city planners.[1] Building on the substantial ground work already laid by the water resources field, these studies have emphasized project analysis or cost/benefit approaches. The project or "new program" framework has purposely concentrated research efforts on the evaluation of additions to existing public budgets, thereby minimizing investigations of the overall budgetary process. This thesis will emphasize a cost/benefit evaluation of all publicly budgeted expenditures in a metropolitan area.

Expenditure policies in the local public sector of the economy may be one of the most effective tools a city planner has in his struggle to eliminate poor housing conditions, inadequate community facilities, inequitably distributed services, and high incidences of crime and juvenile delinquency. Before we can begin to know or to test the effectiveness of expenditure policies, a thorough accounting of the economy is necessary to provide some well-defined links between public and private market activity. To achieve this definition, the trend towards incorporation of government expenditures into regional social accounts needs to be duplicated in the study of metropolitan communities.[2]

A promising technique in inter-market accounting is the use of inter-industry flow tables for recording volumes of activity between sectors of the economy. The interindustry account when used as a model, holds promise of testing the effect on public expenditures of changes in community economic

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[1] H. G. Schaller, (ed.), Public Expenditure Decisions in the Urban Community, (Baltimore: Johns Hopkins Press, 1963); R. Dorfman (ed.), Measuring Benefits of Government Investments, (Washington, D.C.: The Brookings Institution, 1965); and J. Margolis (ed.), The Public Economy of Urban Communities, (Baltimore: Johns Hopkins Press, 1965).

[2] See Werner Hochwald (ed.), Design of Regional Accounts, (Baltimore: Johns Hopkins Press, 1961) and Werner Hirsch, Elements of Regional Accounts, (Baltimore: Johns Hopkins Press, 1964).

activity. The purpose of this thesis will be (1) to describe the procedure used when incorporating local government as a processing (endogenous) sector of the Stockton, California interindustry model, and note the major problems encountered in this process, (2) to make observations on how these problems can be alleviated when future efforts are made to include the local government sector in interindustry models, and (3) to describe a sub-model for testing alternative local government expenditure allocations.

In addition, it will outline the reasoning used and the steps taken in a multi-level government expenditure accounting procedure developed for the Stockton model. I joined the Stockton Community Renewal project at Arthur D. Little, Inc. to develop a complete account of federal, State, special district, and local government expenditures which could be incorporated into the partially completed interindustry flow table. The steps involved in accounting for these expenditures are not included in the presentation of the final model: The Metropolitan Stockton Economy - Analysis and Forecast.

The first section of the study will briefly state the difference between public and private markets; followed by (Section II) an outline of resource allocation procedures available to local government. The Stockton interindustry model is described in Section III and the meaning of the production coefficient for the local government sector discussed. Methods used for allocating government expenditures are presented in Section IV: including a disaggregation of expenditures by function. The effect of alternative expenditure allocations is reported in Section V. An example is used that emphasizes new programs for Stockton's seasonal agricultural employment. A summary of the study and conclusions are brought together in Section VI.

The thoughts and ideas in this thesis have been written with three major assumptions in mind.

First, the description of the public market and the attempt to measure and allocate public expenditure benefits is applicable to an urban community of 500,000 residents or less. Both the available model and the lower order of omplexity accompanying smaller scale urban services necessitate this orientation. Many problems are likely to arise when applying the expenditure criteria to larger metropolitan areas, but appropriate modifications could be made. Also, the intention was to apply this model and its modifications to city government, but its applicability to county government is clear.

Second, and more fundamental, is the assumption that it is possible and desirable to "rationalize" the process of public expenditure decision making; and that city planners have an important role in this process in conjunction to their concern with the proper physical development of urban settlements. The city planners' role in recommending priorities for new community projects poses a need for a measurement framework that will help evaluate decision ramifications. To the degree that city planners will be able to foresee the results of their public expenditure recommendations, decision making will have moved in the direction of a rational process.

Third, city planners have a realm of their own with the consideration of the physical environment of urban communities, but most of the forces which determine the quality of the physical environment remain in unexplored areas of the field. It is my purpose to pursue just one area of exploration -- local public expenditures.

I. A MIXED ECONOMY - THE PUBLIC AND PRIVATE MARKETS

Urban societies place certain economic functions, essential for community life, under the guidance of a public body. In doing so, they create a flow of goods and services that is not completely a part of the private commodity distributive system. A new resource distribution procedure is created which I shall call in this thesis the "public market" or the "public sector."

A study of the public market can emphasize either or both of two theoretical approaches. One approach is a behavioristic view of the income and expenditure budgetary process; a category of sociology for which Richard Musgrave has coined the name "fiscal politics." Another approach would look to procedures for assisting the public market in finding efficient methods of operation. This second approach might be called a normative theory of the public market. Of the two approaches, a normative theory and methodology will receive primary consideration in this paper. The subject area of "fiscal politics" will necessarily be the substantive ground for the development of the expenditure model, but an analysis and evaluation of the budgetary decision making process is not the primary goal of this thesis.[1]

My interest is in the development of techniques for the allocation of public market resources. Unfortunately, efforts to improve economic theory have left the area of public resource allocation largely untouched. In the economics of private enterprise, finding efficient methods of operation suggests that selected variables are being optimized, that is, the best allocation of resources given constraints, is the primary goal. Optimizing the allocation of resources in the public market will not be emphasized in this thesis as much

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[1] A good example of the "fiscal politics" approach is W. H. Brown, Jr. and C. E. Gilbert, Planning Municipal Investment: A Case Study of Philadelphia (Philadelphia: University of Pennsylvania Press, 1961). The normative approach is probably best exemplified by Richard Musgrave's, The Theory of Public Finance: A Study in Public Economy (New York: McGraw Hill, 1959).

as finding a better allocation than now exists. This position is taken because the model framework is not readily adaptable to optimization procedures, and community welfare functions are far from having the tightly defined parameters necessary for precise optimizing methods.

Economic theory provides an explanation of how community welfare is maximized under the price-distributive system. When competitive profit-maximizing firms are making the most efficient use of the limited resources available and the consumer is striving to maximize utility under his budgetary constraint, community welfare approaches a maximum, given conditions of perfect competition. It is demonstrable that with a limited amount of resources a perfectly competitive market will provide the highest level of community welfare possible, i.e., the Pareto optimum.[2]

As long as consumers and producers have a price system to guide their decisions, a mechanism is provided for judging when welfare is being maximized, and if a disequilibrium exists, what incremental changes toward equilibrium should be made. The difficulty is that no price system exists in the public market, and the individual is without a measuring device for choosing between different bundles of goods and services.

From the perspective of city planning, Webber has noted the difference between the business firm testing the market through a price structure, and the local governmental decision-makers who are without such a sensitive device. Business management can be expected to produce those items that the market

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[2] The argument for this follows from the assumption that a consumer maximizes utility and a producer maximizes profits while striving for an efficient combination of resources, i.e., $\frac{MPPa}{Pa} = \frac{MPPb}{Pb} = \frac{MPPc}{Pc}$. The consumer attempts to equate his Marginal Rate of Substitution between any two goods with the price ratio between those goods; while the producer is equating his Marginal Rate of Transformation between two products, at a given output, with the ratio of the product prices. Therefore when the equation holds that $MRS_{ab} = \frac{P_a}{P_b} = MRT_{ab}$, community welfare is being maximized.

demands, in such a way that profits are maximized. But, "in the absence of a pricing system attached to the goods and services that governments provide, and in the face of plural values, it is therefore difficult to know what it is that customers prefer, and hence, what combination of services and facilities would benefit them and the community most."[3]

The distribution of resources and products in the public market then depends upon a less precise mechanism for allocation. Technical operating standards, in combination with established political expenditure policy, have been the major market equalization forces. There is apparently a degree of leeway between what a consumer has paid for the product in taxes, and what he expects to receive for that price. And, of course, there is a time lag before an undesired distribution is recorded with the politician and he in turn begins the re-adjustment of the market flow. This "slack" in sensitivity between the producer and consumer is not common in the private market.

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[3] Melvin M. Webber, "The Prospects for Policies Planning" in The Urban Condition, Leonard J. Duhl (Ed.), (New York: Basic Books, Inc., 1963), p. 321.

II. RESOURCE ALLOCATION IN THE PUBLIC MARKET

In managing the public market, local governments have two broad areas of concern, the income side and the expenditure side.

1. Income Side

The classical treatment of public revenues has focused on an adjustment of the incidence of tax burdens on producing and non-producing groups in the community. For the most part, public finance theory has limited itself to this aspect of the public market, and little consideration has been given to the development of revenue theory based upon groups benefiting from expenditures. The reason for the one-sidedness rested in a traditional view of financing public services by an insurance theory of taxation. It was a widely accepted dictum that: "the best plan of public finance is to spend little."

Musgrave and others have been investigating principles of taxation responsive to benefit and equity factors.[1] Their explorations into "horizontal" and "vertical" dimensions of equity, and a responsive adjustment of the incidence of taxation, has moved the theory and practice of public finance (on both the income and expenditure side) fully into the realm of a normative science. The income side is of vital concern in the theory of public finance, but it will not be central to the following discussion.

2. Expenditure Side

The expenditure side of public market resource allocation is receiving increased attention from research economists. Much

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[1] Richard Musgrave, op. cit.

needs to be learned about the effects of alternative expenditure patterns and about the feasibility of designing systems to achieve optimum social welfare levels. It is important to review just what adjustments in allocation are possible, what constraints exist, and what shifts in resources will be most effective in an optimizing situation. The three main points where control might be exerted on the expenditure side of the public market are, Budgetary Allocation, Contractural and Supply Allocation, and Beneficiary Allocation.

(1) Budgetary Allocation - The allocation of public funds between service departments of the governmental unit;

(2) Contractural and Supply Allocation - The distribution of expenditures into the private market; and

(3) Beneficiary Allocation - Expenditures on each public good and service allocated between community user groups and thereby, between areas of the physical community.

A. Budgetary Allocation

Local finance officers channel the total inflow of revenues into various departments of the city government. Some of the funds are already earmarked (especially those coming from higher government levels as subventions), but the remainder are presumably allocated according to broad policy directives of the legislative body and minimal levels of departmental operation deemed necessary. Two significant observations can be made about resource allocation at this level.

First, the proportion of the budget that is spent on normal operating costs for police, fire, public works, recreation and similar core services does not seem to change significantly from year to year. As the budget increases, each department appears to increase in a somewhat constant ratio to the total, setting aside

the lumpiness of capital investments.[2] As a result, there is probably a very small increment of re-allocation possible at this level for any one year. An effective finance officer may, over a period of years, skim the cream off the top of each department and end up with a sizable allocation in a new area. But, in the short run, due to administrative inflexibility, political sensitivity, sunk costs in staff and operations, and recurring equipment and maintenance costs, re-allocation will be minor in magnitude and in impact.

Second, large sums of money that come from federal and state sources are almost invariably earmarked before they reach the finance officer's books. In fact, a specific listing of expenditures is usually required before a grant or loan is issued. For this reason, departmental administrators often feel restricted; the flexibility of alternative expenditure patterns is squeezed out of the two-party agreement at an early stage. This does not exclude the possibility of coordination between the budget office and departmental heads in searching for more funds, but the funds are essentially distributed before they reach the deparmental research allocation level.

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[2] This allocation consistency was revealed while the writer was working on public finance data for the City of Stockton. Statewide, John P. Shelton and others have found the same consistency in allocation except in one area - welfare aid to the needy. See John A. Vieg, et. al., California Local Finance, (Stanford: Stanford University Press, 1960), p. 100, especially Table 4.6. Consistency in budgetary allocation at the national level has been documented by Aaron Wildavsky in his book, The Politics of the Budgetary Process, (Boston: Little, Brown and Co., 1964). Sudden shifts from the "normal distribution" cause public reaction and resistance. He reasons: "because budgets are calculated incrementally from a base representing a widespread notion of fair shares, attention is focused on significant departures from what has gone before." Ibid., p. 101. The notion of contingency planning for budget allocations possibly applies even more so to local governments, and is a constraint that needs full consideration in public expenditure efficiency measures.

The importance of this level is not diminished by the apparent inflexibility. Its role is enhanced by serving as a base from which we can re-allocate the other two types of expenditures. In addition, its allocative function will undoubtedly become more important in the future as the volume of specifically unmarked grants is increased.[3]

B. Contractual and Supply Allocation

Local governments often operate by subcontracting portions of their work load to private firms. The magnitude of this activity is determined by (1) the degree of horizontal integration of service functions, and (2), the periodic expenditure of funds accumulated from bond issues and special assessments. Because of the large sums of money involved in construction projects, contracts can have an important impact on the labor market, service industry, and wholesale supply outlets in the community area. These are direct cash benefits to the community and must be taken into consideration when measuring the influence of public expenditures on community welfare. But, for purposes of this study, the allocation of contractual services will be considered indirect benefits to the community, i.e., as inputs that are necessary for the production of the city's product -- public services. As in the private market, the output of one firm is dependent upon the purchase of many goods and services from other firms.

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[3] Local governments might have fewer strings attached to subventions if the "noncategorical grants" included in the Heller Tax Plan are accepted. Unfortunately it is likely that states will take a paternalistic attitude and ascertain that local governments allocate the money wisely.

Contractual and Supply allocation includes not only the arrangement of contractural services, but expenditures on supplies and equipment, and wages and salaries. For outlays on these normal operating functions there is probably a limited range of alternative expenditure patterns. Expenditures on wages and salaries has historically been the largest outlay of local government, normally constituting approximately 50% of the operating budget. For this reason, it is difficult to uncover any "decreasing cost" growth functions for non-capital expenditures by local governments.[4] As governmental units grow new expenditures are allocated to the recurrin need for new employees and necessary supplies and equipment. Any flexibility that arises in the allocation of these operating expenditures will have marginal implications for community economic welfare.

But, for large construction contracts, the implications for employment are much greater, and the city must decide whether to integrate its activities or contract new jobs at the risk of benefiting some non-local labor. For this reason, public concern is expressed when construction projects are let to firms outside the local community. Qualifications that local labor be used are often

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[4] Werner Z. Hirsch maintains that 80 to 85 percent of operating expenditures (i.e., police, fire, education, and refuse collection) are subject to constant costs per unit. Werner Z. Hirsch, "Expenditure Implications of Metropolitan Growth and Consolidation," Review of Economics and Statistics, August, 1959, p. 232-241. Wilbur Thompson argues in return that Hirsch has set aside an important part of the problem when he is forced to assume that services of equal quality are rendered regardless of the scale of operations. Wilbur Thompson, A Preface to Urban Economics (Baltimore: Johns Hopkins Press, 1965), p. 258. This volume gives a complete review of the problems surrounding the public service cost function.

included in such contracts.

Contractual and Supply allocation is then definitely part of the market mechanism governments can use to shift the flow of funds within the public sector. Unquestionably, this indirect effect of government operation is essential in tying together the public and private markets of the economy.

But, in the model to be presented, no attempt will be made to reallocate contractual and supply expenditure.

C. Beneficiary Allocation

The third type of expenditure adjustment comes at the departmental level. This is the point where a particular group in the community receives the "product" for the taxes, assessments, and fees it has paid to the government. This allocation involves four dimensions of decision: (1) how does the governmental unit decide when to supply more service benefits? (2) who is to receive the service benefit? (3) where is the beneficiary group geographically located in the community? and (4) what proportion of the total departmental expenditures will be spent on the service for each spatially-located group? Answers to these questions will complete this sketch of the public market.

(1) When to supply more service benefits.

The first dimension underlines the relationship between the private and the public market. As sectors of the private market expand their scales of activity and attain higher levels of total production, they at the same time expand their physical plants, add more parking areas, cause a greater level of traffic on city streets, and stimulate the growth of new homes, personal service establishments, etc. The public market responds by supplying a new

level of community services, for example, new streets, widening old ones, extra police and fire protection, new refuse collection, etc. In this sense the activities of the private market and the building of the city's physical plant determines the need for new community facilities to be supplied by the public market.

On the other hand, the public market can change levels of expenditure in parts of the city that are in need of special attention, and actually supply a greater level of services than has been offered to this sector in the past. Examples of such increases would be renewal and social service programs designed to effect a change in the quality of existing living standards in deteriorating areas of the city. Or expenditure levels might increase in response to a higher service standard that the legislative body has enacted as policy, say, better housing code enforcement.

In the case where a city is supplying the service in response to demand, questions of benefit do not often arise. The public body is doing its duty and providing necessary community services. But, levels of benefit do accompany this supply of new services. The increasing importance of the public service activity which is stimulated in the public market, and does not act strictly as a market response mechanism, has focused interest on the question of program costs and comparable benefits. These have been given closer scrutiny in terms of project analysis. In cases of need for more service, whether it is for the demand of new growth, attacking a specific community problem area, or establishing new standards of quality, beneficiary allocation becomes an essential consideration in terms of the limited resources available to the local public fisc.

(2) Who is to receive the service benefit?

If we assume that individuals are the recipients of the benefits from community service expenditures, the work and play activities individuals are carrying out in the community will serve as a criterion for disaggregating private market activities. In broad terms, people work in economic activities that are "basic" to community growth, like manufacturing; while they also work in "non-basic" retail, wholesale, finance and other service related industries. Each of these economic functions has a definite physical relationship to the city, and can be used as a recognizable spatial unit for public expenditure allocation.[5] There are also work and play activities associated with public facilities where a change in services would influence people's actions by giving them a greater level of benefit. And, finally there is the household, which is the modular economic unit of both the private and public markets. As these coarse categories are resolved into finer detail, the difficulty of delimiting a recognizable unit for public expenditure allocation increases. But, the advantage of having a finer detail is important; it allows a closer recording of incremental benefit changes after expenditure adjustments.

The general sectors of the private market that will be used to indicate benefits accruing from public expenditures are: manufacturing, services, households and public facilities. A more

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[5] The position that some service charges should be placed upon business firms rather than upon individuals is consistent with this view of the market, as many services are rendered to individuals in their capacity of workers, shoppers, and other economic functionaries. This is argued by Lyle C. Fitch, in "Metropolitan Financial Problems," The Annuals of the American Academy of Political and Social Science: Metropolis in Ferment (Philadelphia, Pennsylvania: November 1957), pp. 66-73. Recently republished in Benjamin Chinitz (ed.), City and Suburb: The Economics of Metropolitan Growth, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964), pp. 113-126.

formal breakdown and definition will be given in the next section: A Model of a Mixed Economy.

(3) Location of the beneficiary group.

The disaggregation of economic activities in the private market must be made in such a manner that each sector has a constant spatial dimension. The spatial dimension is needed to recognize a sector when making public expenditure cost-benefit allocations. Here, the city planners' land use maps become a useful guide for visualizing the spatial spread of the receiving groups suggested above. People receive benefits from urban services at a particular location in the community. They may be at a factory, a store, an office or their home. Werner Hirsch has suggested a person-parcel framework for analyzing the relation between benefits and their recipients:

> Urban government services are provided to people and for people. . . Thus, on the output side, urban government services must be linked to people and land, that is, to those who demand services. . . It is important to remember that a person works at a given site (parcel) and there produces either public or private goods. When these outputs are consumed, they become inputs or persons who work, reside, travel, or engage in recreation at this or another site.[6]

We must be able to translate this person-parcel framework into a language that is understandable to those managing resources at the departmental level. It is necessary to design a model for measuring differential impacts of expenditures, such that the physical or area dimension is included.

It is my position that the organization and func-

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[6] Werner Z. Hirsch, "Urban Government Services and Their Financing," in W. Z. Hirsch (ed.), Urban Life and Form (New York: Holt, Rinehart and Winston, Inc., 1963), p. 156f.

tioning of the urban economic community (based upon the above disaggregation) is highly enough structured to allow spatial dimensions a place in a public expenditure model. In fact, it is the physical engineering of zoning that has segregated productive, living, and playing functions into recognizable units of the community, Also, it has been largely the effects of zoning and other more subtle discrimination that has resulted in the segregation of housing and income groups. Paradoxically, housing segregation aids in differentiating allocations and beneficiaries of expenditures.

Two sectors of the household function to be developed in the model for Stockton are Seasonal Households and Permanent Households. Each of these sectors have definite spatial representation in the city. The Seasonal Household sector represents those households where the head is not employed full time during a year. For the most part these are seasonal agricultural workers who depend upon periods of harvesting, canning and packaging for their main employment. The Stockton Community Renewal Program shows that of those families earning less than $3,000/year, a significant number (over 20% of each census tract) were located in central city census tracts and tracts fringing on the central business district of the city.[7] Other indices of seasonality such as color and overcrowding show an even greater tendency to cluster in centrally located census tracts.

In general, similar clustering can be found with other economic functions: manufacturing, commercial services, civic facilities, etc.

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[7] Arthur D. Little, Inc., Stockton Community Renewal, Policies and Programs, (Stockton, Calif.: City Planning Department, 1965), p. 34.

The use of economic models in metropolitan studies should attempt to build-in this spatial dimension when aggregating economic functions into workable, meaningful sectors. The non-spatial aspect of general market models has been a significant deficiency in the use of these models for city planning purposes. The problems of defining workable spatial units and coterminous economic functions are obviously formidable, but sector definition problems will likely be an inverse function of the size of the metropolitan area under study.

In addition to the advantages of a spatial-sector aggregation for use in general economic analysis and impact analysis for public expenditure allocation, work can be pursued on the use of sector optimizing procedures. As goals for the spatial-sectors or "neighborhoods" are formulated by local pressure groups and city planners, linear programming methods could be applied to ascertain optimum public expenditure allocations for achieving each sector's goal with limited public resources.[8]

(4) What is the level of departmental expenditures for each spatially located group in the model?

Level of expenditure for each spatially located sector, the fourth dimension of Beneficiary Allocation, becomes finally the most important lever in changing personal welfare. At this point we have to make an assumption: an increase in expenditures

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[8] In terms of the interindustry model used in this thesis, an application of linear programming techniques applied to the specification of production coefficients is developed fully by Hollis B. Chenery and Paul G. Clark, Interindustry Economics, (New York: John Wiley and Sons, Inc., 1964), Chapter 4, "Choice in Interindustry Models," pp. 81-137.

on a user group, given a constant number of people and efficient management of resources, will increase their total benefit. Conversely, a decrease in expenditures will decrease total benefit. And, given a limited amount of resources with which to work, taking expenditures from one group and giving them to another will decrease the benefit of the former while increasing that of the latter. Rigid as this definition of individual welfare change seems, it does allow for an increase in total community benefit, given inter-group (sector) productivity relationships in the market, with a constant level of public market resources.

This assumption provides the "utility" or "production" function from which tests of alternative public expenditure distributions can be made. In terms of the interindustry model to be used, a larger coefficient would indicate a movement in the direction of more benefits from community services. The intent of this study will be to determine what level of expenditures (benefits) are now accruing to the community spatial sectors, and what the effects on future expenditures would be of changing the existing cost/benefit pattern.

An image of the output side of the local government portion of the public market has begun to crystallize with this section on resource allocation. Its purpose has been to specify points in the expenditure process of local government where resource allocation takes place. The processes of Contractual and Supply Allocation and Beneficiary Allocation will be worked into the structure of the expenditure model to be presented. The relationship these processes have with the private sectors of the economy will

become clearer at that time. Of the three areas of allocation, Budgetary, Contractual and Supply, and Beneficiary, the third, Beneficiary, will be given emphasis as it is of direct relevance to the problems of city planners.

III. MODEL OF A MIXED ECONOMY

The interindustry accounts model of the Stockton economy provides a structure for testing the impact of alternative local government expenditure allocations. A number of innovations for urban economic analysis evolved during the construction and design of the model. Arthur D. Little, Inc. contracted with the City of Stockton to carry out a community renewal program which included (1) an economic study, (2) a public investment and municipal resource study, and (3) a framework for determining the location and extent of urban renewal action needed.[1] A strong emphasis on governmental policy impact analysis demanded that the economic model incorporate the revenue and expenditure accounts of local, State and Federal government. The accounts of local government were readily available, and to assess the impact of city expenditure patterns on industry production, local government was included as a processing sector of the metropolitan interindustry model.

The 13 sectors endogenous to the Stockton economy shown in the interindustry accounts table (Table 1), include two local government sectors; service and construction; and two household sectors, permanent (year-around) and seasonal (other). Final or autonomous demand consists of Other Government Services and Construction; Semi-Public Services and Construction; and Exports. In a similar fashion, Other Government and Semi-Public Activities are included as primary inputs, in addition to Unallocated Inputs.

Before giving a brief description of each of the sectors in the flow table, a note on the overall design of the model will be helpful

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[1] The two reports submitted to the City of Stockton covering these items were: Arthur D. Little, Inc., The Metropolitan Stockton Economy: Analysis and Forecast, op. cit., and Stockton Community Renewal, Policies and Program, op. cit.

Table 1

INTER - INDUSTRY FLOW OF GOODS & SERVICES — STOCKTON URBANIZED AREA — 1962

Input / Output Analysis — In Thousands of Dollars

		CONSUMING SECTORS — ENDOGENOUS TO THE STOCKTON ECONOMY												SECTORS WHICH ARE EXOGENOUS TO THE STOCKTON ECONOMY												
														Other Government Services					Other Government Construction							
	SECTORS	Manufacturing 1	Food Processing 2	Transportation Communications & Public Utilities 3	F.I.R.E., Business & Personal Services 4	Wholesale and Retail Inside CBD 5	Wholesale and Retail Outside CBD 6	Commercial, Industrial Construction 7	Residential Construction 8	Maintenance & Repair Construction 9	Household Labor (year-round) 10	Household Labor (other) 11	Local Government Services Stockton City 12	Local Government Construct. Stockton City 13	Special Districts	County	State	Federal	Other Government Services Total 14	Local Special Districts	County	State	Federal	Other Government Construction Total 15	Semi-Public Services 16	Semi-Public Construction 17	Exports 18	Total Stockton Urbanized Area Output
PRODUCING SECTORS ENDOGENOUS TO THE STOCKTON ECONOMY	1. Manufacturing	1,292	5,968	1,921	368	6,262	2,785	3,280	1,227	196	559	27	612	—	57	298	1,637	2,726	4,718	—	—	—	—	—	432	—	130,676	160,323
	2. Food Processing	2	56	—	—	2,917	2,952	—	—	—	1,455	292	—	—	141	148	177	2,141	2,607	—	—	—	—	—	449	—	113,711	124,441
	3. Transportation, Communications and Public Utilities	11,734	6,849	2,970	770	4,634	4,201	421	275	655	33,235	545	76	—	53	41	225	6,898	7,217	—	—	—	—	—	6,055	—	39,664	119,301
	4. F.I.R.E., Business & Personal Services	2,241	497	2,506	4,508	3,548	2,682	1,733	1,416	354	61,047	3,940	372	—	1,194	1,253	904	1,653	5,004	—	—	—	—	—	1,515	—	35,953	127,316
	5. Wholesale & Retail Inside CBD	3,588	1,987	1,819	2,948	15,862	13,549	2,794	1,916	1,402	63,008	7,422	575	—	1,295	1,536	1,073	820	4,724	—	—	—	—	—	2,577	—	52,132	176,273
	6. Wholesale & Retail Outside CBD	10,191	4,138	9,069	1,668	19,674	40,918	4,983	5,399	4,524	117,662	9,833	1,183	—	3,981	4,388	3,415	1,465	13,249	—	—	—	—	—	3,533	—	264,171	510,195
	7. Commercial, Industrial Construction	1,451	1,998	2,212	163	539	3,359	3,919	535	428	4,454	39	—	2,122	—	—	—	—	—	1,432	822	2,930	908	6,092	—	2,123	23,658	53,092
	8. Residential Construction	64	99	402	345	291	363	378	557	94	5,641	215	—	600	—	—	—	—	—	158	390	382	185	1,115	—	143	5,652	15,959
	9. Maintenance & Repair Construction	50	30	70	290	200	70	440	1,180	760	2,840	430	—	10	—	—	—	—	—	190	400	250	260	1,100	—	630	3,360	11,460
	10. Household Labor (year-round)	30,150	10,941	25,255	54,206	20,656	49,763	16,055	2,930	1,785	—	—	6,000	—	1,191	5,866	5,613	21,500	34,170	—	—	—	—	—	18,228	—	60,003	330,142
	11. Household Labor (other)	1,828	5,611	808	3,096	1,993	4,802	2,025	370	225	3,730	—	—	—	—		37,397		37,397	—	—	—	—	—	—	—	—	61,885
	12. Local Government Services	352	299	540	313	65	749	33	29	15	4,565	937	190	—			238		238	—	—	—	—	—	595	—	209	9,129
	13. Local Government Construction	92	66	164	115	520	325	19	22	10	1,146	231	31	—			52		52	—	—	—	—	—	94	—	—	2,887
SECTORS WHICH ARE EXOGENOUS TO THE STOCKTON ECONOMY	14. Other Government Services	242	115	526	479	142	1,200	94	81	45	22,288	26,720	72	—			369		369	—	—	—	—	—	190	—	57,503	110,066
	15. Other Government Construction	23	8	68	55	13	169	12	12	6	2,307	598	4	—			10		10	—	—	—	—	—	6	—	5,016	8,307
	16. Semi-Public Services	144	119	64	166	54	116	27	8	10	5,292	1,325	12	—			255		255	—	—	—	—	—	49	—	26,093	33,734
	17. Semi-Public Construction	20	16	14	37	12	25	6	2	2	913	255	2	—			56		56	—	—	—	—	—	11	—	1,525	2,896
	18. Unallocated Inputs	96,859	85,674	70,893	57,789	98,891	382,167	16,873	—	949	—	9,076	—	155	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Total Stockton Urbanized Area Input	160,323	124,441	119,301	127,316	176,273	510,195	53,092	15,959	11,460	330,142	61,885	9,129	2,887	—	—	—	—	110,066	—	—	—	—	8,307	33,734	2,896	—	1,857,406

SECTORS 1 - 13 are endogenous to the Stockton economy; i.e., sectors whose sales, employment and income are mutually sensitive to changes in each other's levels of output.
SECTORS 14 - 17 are exogenous to the Stockton economy; i.e., outside sectors which affect the Stockton economy but are not affected by local activity.
SECTOR 18 (row) Unallocated Inputs consist of: (1) development of local capital, i.e., profits, dividends, etc. (2) all goods imported into the Stockton economy (3) any statistical error.

Source: Arthur D. Little, Inc., The Metropolitan Stockton Economy, Analysis and Forecast

in revealing its applicability to a renewal and development programming use.

1. The government sector has been disaggregated into local, other and semi-public, and these in turn disaggregated into operating (service) and capital (construction) sectors. Two of these, local government services and local government construction, are included in the processing (or endogenous) portion of the model for predictive and testing purposes.

2. The Household sector is disaggregated into permanent (year-around) and seasonal (other), and included as a processing sector.[2]

3. The Manufacturing sector is highly aggregated. Food Processing is a sector having a primary function in the economy, and is given representation. All others are combined into a composite: "Manufacturing."

4. A spatial dimension has been included in sector definitions by (a) grouping activities that would have tendencies (either institutional zoning, or for economics of agglomeration) to locate in proximity to one another, e.g., F.I.R.E., Business and Personal Services, and (b) by separating wholesale and retail activities inside the Central Business District (C.B.D.) from wholesale and retail activities outside the C.B.D. Setting aside the difficulties in accounting, spatial

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[2] Other examples of I/O models for metropolitan areas that use households as an endogenous sector are Werner Z. Hirsch's St. Louis model presented in "Interindustry Relations of a Metropolitan Area," The Review of Economics and Statistics, XLI (November 1959), pp. 360-369; and Ananda S. Rao and David J. Allee, An Application of Interindustry Analysis to San Benito County, California, Giannini Foundation of Agricultural Economics (Berkeley: Giannini Foundation Report No. 278, University of California, 1964).

emphasis in interindustry models can be useful for impact analysis in declining areas of urban regions.

5. Construction activity has been disaggregated into three sectors useful for development and renewal purposes. These are Commercial and Industrial Construction, Residential Construction, and Maintenance and Repair Construction.

6. With the inclusion of local government as a processing sector, Leontief's technologically determined coefficients of production must be given a broader interpretation. The coefficients of production for government represent institutionally stable relationships between inputs and output of the economic sectors. In the broadest sense, any factors of production that have a constant structure of demand can be incorporated into an interindustry model. (See section below on meaning of the Production Coefficients for Government.)

1. Description of the Sectors

Sector 1 - Manufacturing

Original survey questions disaggregated the manufacturing sector. Because of the need for a renewal programming model, and the relative under-representation of specific manufacturing activities in the economy, the manufacturing sector is composed of the following aggregated sub-sectors:

(1) Furniture, lumber and wood manufacturing

(2) Electrical and non-electrical machinery

(3) Printing and Publishing and Allied products

(4) Metal Cans and Primary and fabricated metals

(5) Transportation equipment manufacturers

(6) Other durable goods industries

(7) Non-durable goods industries

Sector 2 - Food Processing

Food Processing is given separate representation, because Stockton is a port terminal in the Central Valley, and serves as a processor and distributor of agricultural products. Canneries and frozen food plants are significant industries in the metropolitan area.

Sector 3 - Transportation, Communication, and Public Utilities

Examples of this SIC category in the Stockton economy are: Pacific Telephone and Telegraph Company, Pacific Gas and Electric Company, California Water Service Company, and numerous private trucking firms.

Sector 4 - Finance, Insurance and Real Estate, and Personal and Business Services

This sector is an aggregation of the individual two digit SIC categories.

Sector 5 - Wholesale and Retail Firms Located Inside the Central Business District

Sector 6 - Wholesale and Retail Firms Located Outside the Central Business District

These sectors have functional and geographical criteria. The functional need was both wholesale and retail activities, while the geographical criterion was the older, central city retail and

wholesale activities, separated from the more recently developed suburban shopping centers.

The geographical criterion in both sectors was the location of the business premises and not the market area. Limits of the Study Area were approximately the Stockton Urbanized Area as defined in the 1960 U. S. Census of Population.

Sector 7 - Commercial, Industrial and Public Construction

Some of the firms in this sector were simultaneously involved in residential construction, and maintenance and repair work. The result is that the three construction sectors are not mutually exclusive. The report states "However, it was essential that some detailed measure of Residential, and Maintenance and Repair Construction be available for assessing the separate impacts these different forms of construction would have on the community. An imperfect estimate was felt to be more important than no breakdown at all."[3]

The survey questionnaire was designed to determine what portion of their wages were paid locally and the portion paid to non-local employees.

Sector 8 - Construction - Residential

Construction firms engaged primarily in building new housing.

Section 9 - Construction - Maintenance and Repair

Contracting firms for repairs on all structures are included,

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[3] Arthur D. Little, Inc., The Metropolitan Stockton Economy: Analysis and Forecast, op. cit., p. 26.

plus, plumbing, heating, electrical and similar sub-contracting firms. Also, construction firms not elsewhere classified.

Sector 10 - Households - Permanent

To qualify, the principal wage earner had to be employed at least 48 weeks per year.

Sector 11 - Households - Seasonal

Principal wage earners working less than 48 weeks per year were included in the sector, plus households that depend on non-wage sources of income, i.e., veteran's assistance, social security payments, social welfare payments, aid to the blind and disabled, etc. The seasonal household entry for the column, Other Government Services, is partially made up of social welfare and aid payments, but also includes wage payments for seasonal labor by the State of California in the Stockton Urbanized Area. Local government and semi-public agencies were not assumed to hire seasonal workers.

Sector 12 - Local Government Services

Includes expenditures by the City of Stockton only:

- General Government
- Police
- Fire
- Building Safety and Inspection
- Transportation and Traffic Administration
- Public Works
  - Administration
  - Maintenance and Repair
    - Streets
    - Sewers
    - Water
    - Waste Collection
- Health
- Libraries
- Parks and Recreation

Sector 13 - Local Government Construction

City of Stockton expenditures on major community capital improvements:

Streets
Utilities
Major Park Improvements
Buildings
Debt Service

Sector 14 - Other Government Services

Sector 15 - Other Government Construction

Consist of:

Local School Districts
Metropolitan Special Districts
San Joaquin County
State of California
U. S. Federal Government

The operating and capital budgets of local offices for these governmental units were totalled and represent the total output of Other Government Services and Construction respectively. To solve the problems of large service areas for local offices of these governmental units, local benefits were assumed to accrue in proportion to the size of the S.U.A. population as a ratio to total service area population. The proportion was then applied to the expenditure level of the local office.

Sector 16 - Semi-Public Services

Sector 17 - Semi-Public Construction

Includes the expenditures of the:

Port of Stockton
Stockton Airport
University of the Pacific
Stockton State Hospital
San Joaquin General Hospital,
and other Community hospitals

Sector 18 - Unallocated Inputs and Exports

Unallocated inputs include an aggregation of (1) inputs to capital investment, including profits, dividends, etc., (2) all goods and services imported into the Stockton economy, and (3) reconciliation error that arose when developing a consistent set of double-entry figures for sector input and output.

Exports were defined by the Study Area, approximately the Stockton Urbanized Area as defined in the 1960 U. S. Census of Population. Figure includes both goods and services sold to producers and consumers outside of the Study Area, and income that was spent on non-local goods and services.

2. Equations of the System

To make the account system operational for testing of local government expenditure levels, some definitional equalities of the interindustry table will be specified.

Let X_i be the gross or total output in dollars, of sector i ($i = 1,.....,13$), where the subscript i refers to the 13 processing (endogenous) sectors. The amount of output i sold to sector j which is used as input in producing X_j, will be denoted: X_{ij}. If the final demand for output of industry i is Y_i,

where:

$Y_{i,14}$ = output of i sold to "other government services"

$Y_{i,15}$ = output of i sold to "other government construction"

$Y_{i,16-17}$ = output of i sold to "semi-public services and construction"

and

Y_{iexp} = output of i exported, so that

$$Y_i = Y_{i,14} + Y_{i,15} + Y_{i,16-17} + Y_{iexp} \quad , (i=1,.....,13) \tag{3.1}$$

then, the level of <u>production</u> for industry i, or its total output, can be expressed as:

$$X_i = \sum_{j=1}^{13} X_{ij} + Y_i \ (i=1,.....,13), \tag{3.2}$$

or

$$X_i = \sum_{j=1}^{13} X_{ij} + Y_{i,14} + Y_{i,15} + Y_{i,16-17} + Y_{iexp} \ (i=1,...,13) \tag{3.3}$$

Considering any j industry as a consumer of goods and services, the total output $X_j = \sum_{i=1}^{13} X_{ij} + V_j \ (j=1,.....,13)$ (3.4)

where:

$$V_j = V_{j,14} + V_{j,15} + V_{j,16-17} + V_{jual} \tag{3.5}$$

when,

$V_{j,14}$ = input value of "other government services" used in producing X_j of industry j,

$V_{j,15}$ = input value of "other government construction" used in producing X_j of industry j,

$V_{j,16\text{-}17}$ = input value of "semi-public services and construction" used in producing X_j of industry j,

and

V_{jual} = input value of unallocated inputs used in producing X_j of industry j.

then equation (1.4) becomes:

$$X_j = \sum_{i=1}^{13} Xij + V_{j,14} + V_{j,15} + V_{j,16\text{-}17} + V_{jual} \quad (j=1,\ldots 13) \quad (3.6)$$

Equation (3.3) represents a row of the interindustry flow table, and equation (3.6) represents a column.

3. Structure of the Model and the Allocation Procedures of Local Government.

The input/output account of each industry in the economy offers a framework for analyzing two of the allocation procedures of local government set out above. We assumed that the level of budgetary allocation does not provide adequate flexibility for major shifting of expenditures, but in any case a policy change at this level would be reflected at the levels of Contract and Supply Allocation. In terms of economic and productive impact on the economy, the last two allocation procedures take on the most significance.

Using the equalities defined for the general system in equations (3.3) and (3.5); the column equation for local government represents an account of Contract and Supply Allocation and the row equation represents an account of Contract and Supply Allocation.[4]

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[4] A general statement of government income and expenditure accounts for all levels of government, within the framework of an interindustry model can be found in the "Introduction to the American Edition,"

Specifically, the two sectors, Local Government Services and Local Government Construction have the following equations:[5]

Contract and Supply Allocation (Column)

$$(L.G.S.)\ X_{12} = X_{1,12} + X_{2,12} + X_{3,12} + X_{4,12} + \ldots + X_{13,12} + V_{12} \quad (3.7)$$

$$(L.G.C.)\ X_{13} = X_{1,13} + X_{2,13} + X_{3,13} + \ldots\ldots\ldots + X_{13,13} + V_{13} \quad (3.8)$$

Beneficiary Allocation (Row)

$$(L.G.S.)\ X_{12} = X_{12,1} + X_{12,2} + X_{12,3} + \ldots\ldots X_{12,12} + Y_{12} \quad (3.9)$$

$$(L.G.C.)\ X_{13} = X_{12,1} + X_{12,2} + X_{12,3} + \ldots\ldots X_{12,12} + Y_{13} \quad (3.10)$$

The output of any industry i, then, is a function of sales to local private sectors, sales to households, goods and services supplied to local government, and sales to final demand.

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p. XXXV, of Roland Artle, The Structure of the Stockholm Economy, Toward a Framework for Projecting Metropolitan Community Development, (Ithaca, N.Y.: Cornell University Press, 1965). It is expected that a full set of accounts on government revenues and expenditures would be maintained in addition to the use which can be made of an inter-industry account. Burkhead notes that: "adequate information on the public finances of the region cannot be easily contained in an input-output matrix. The best hope would appear to lie in the development of a family of subsidiary statements linked with and fully integrated with comprehensive regional accounts but capable of standing on their own feet and useful for purposes quite different from those to which the integrated accounts may be put." Jesse Burkhead, "Public Finance as an Integral Part of Regional Accounts," in Hirsch, (ed.), Elements of Regional Accounts, (Baltimore: Johns Hopkins Press, 1964), pp. 51-76.

[5] While working on a modification of the basic model for a repercussions analysis, David Bradwell defined the effects of government expenditures along the column as induced benefits, and those along the row as stemming benefits. While the terminology is different, the understanding of what allocation is intended is the same. David Bradwell, Repercussions Analysis - Stockton CRP, unpublished memo to F. H. Hendricks and Stockton CRP Team, Arthur D. Little, Inc., September 8, 1964.

$$X_i = \sum_{j=1}^{9} X_{ij} + x_{ij} + x_{ij} + Y_i \quad (i = 1,\ldots,13) \qquad (3.11)$$

local private sectors (inputs to further production)	j=10,11 households	j=12,13 local government	Final Demand

The amount of local and non-local input used in producing the goods and services of industry j include local intermediary private inputs, local labor (households), local government services, and total primary exogenous inputs.

$$X_j = \sum_{i=1}^{9} x_{ij} + x_{ij} + x_{ij} + V_j \qquad (3.12)$$

local inter-industry Private Inputs	i=10,11 House-hold Labor	i=12,13 local govern-ment	Autonomous and Unallo-cated inputs

Re-allocation of local public expenditures takes place in equations (3.7 - 3.10), and procedures for re-allocation will be discussed in Section V below. The impact of this re-allocation on the economy as an expression of inputs and sales in the interindustry table, is represented in a general form in equations (3.11) and (3.12).

4. Production Coefficients

Economic theory defines an interindustry coefficient of production as the amount of output of industry i directly required to produce a unit of output of industry j. Including both households and local government, constant quantities of production needed for a unit of output in the Stockton model can be defined by the expression:

$$a_{ij} = \frac{X_{ij}}{X_j} \qquad (3.13)$$

where:

a_{ij} = coefficient of production for industry i, required to produce a unit of output in industry j,

and

X_{ij} = represents the flow of goods and services from industry i to industry j that has been used in producing X_j.

X_j = total level of production in industry j.

For the Stockton economy, the coefficients of production can be expressed in matrix form as follows:

$$A = \begin{bmatrix} a_{1,1} & a_{1,2} & a_{1,3} \cdots\cdots\cdots, & a_{1,13} \\ a_{2,1} & a_{2,2} & \cdots\cdots\cdots\cdots, & a_{2,13} \\ a_{3,1} & \cdot & & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ \cdot & & a_{ij} & \cdot \\ \cdot & & & \cdot \\ \cdot & & & \cdot \\ a_{13,1} & a_{13,2} & \cdots\cdots\cdots, & a_{13,13} \end{bmatrix} \qquad (3.14)$$

where $a_{12,j}$ and $a_{13,j}$ (j=1,.....,13) are the local government production coefficients.

Table 2 shows these production coefficients for the model's 13 endogenous sectors, plus inputs of exogenous goods and services.

Table 2

DIRECT PURCHASES PER DOLLAR OF OUTPUT

SECTORS	Manufacturing 1	Food Processing 2	Transportation Communications & Public Utilities 3	F. I. R. E., Business & Personal Services 4	Wholesale and Retail Inside CBD 5	Wholesale and Retail Outside CBD 6	Commercial, Industrial Construction 7	Residential Construction 8	Maintenance & Repair Construction 9	Household Labor (year-round) 10	Household Labor (other) 11	Local Government Services Stockton City 12	Local Government Construct. Stockton City 13
1. Manufacturing	.008059	.047958	.016102	.002890	.035524	.005459	.061779	.076885	.017103	.001693	.000436	.067032	—
2. Food Processing	.000012	.000450	—	—	.016548	.005786	—	—	—	.004407	.004718	—	—
3. Transportation, Communications & Public Utilities	.073190	.055038	.024895	.006048	.026289	.008234	.007930	.017232	.057155	.100669	.008807	.008324	—
4. F.I.R.E., Business & Personal Services	.013978	.003994	.021006	.035408	.020128	.005257	.032641	.088727	.030890	.184911	.063666	.040745	—
5. Wholesale & Retail Inside CBD	.022380	.015726	.015247	.023155	.089985	.026557	.052626	.120058	.122339	.190851	.119932	.062979	—
6. Wholesale & Retail Outside CBD	.063565	.033253	.076018	.013101	.111611	.080201	.093856	.338304	.394764	.356398	.158891	.129573	—
7. Commercial, Industrial Construction	.009050	.016056	.018541	.001280	.003058	.006584	.073815	.033523	.037347	.013491	.000630	—	.735019
8. Residential Construction	.000399	.000796	.003370	.002710	.001651	.000711	.007120	.034902	.008202	.017088	.003474	—	.207828
9. Maintenance & Repair Construction	.000312	.000241	.000587	.002278	.001135	.000137	.008287	.073939	.066318	.008602	.006948	—	.003464
10. Household Labor (year-round)	.188058	.087921	.211691	.425760	.117182	.097537	.302399	.183595	.155759	—	—	.657174	—
11. Household Labor (other)	.011402	.045090	.006773	.024317	.011306	.009412	.038141	.023184	.019634	.011298	—	—	—
12. Local Government Services	.002196	.002403	.004526	.002458	.000369	.001468	.000622	.001817	.001309	.013828	.015141	.020811	—
13. Local Government Construction	.000574	.000530	.001375	.000903	.002950	.000637	.000358	.001379	.000873	.003472	.003733	.003395	—
14. Other Government Services	.001509	.000924	.004409	.003762	.000806	.002352	.001771	.005076	.003927	.067510	.431769	.007886	—
15. Other Government Construction	.000143	.000064	.000570	.000432	.000074	.000331	.000226	.000752	.000524	.006988	.009663	.000438	—
16. Semi-Public Services	.000898	.000956	.000536	.001304	.000306	.000227	.000509	.000502	.000873	.016029	.021411	.001314	—
17. Semi-Public Construction	.000125	.000129	.000118	.000292	.000068	.000049	.000113	.000125	.000175	.002765	.004120	.000329	—
18. Unallocated Inputs	.604150	.688471	.594231	.453902	.561010	.749061	.317807	—	.082808	—	.146661	—	.053689
TOTAL	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

Source: Arthur D. Little, Inc., The Metropolitan Stockton Economy, Analysis and Forecast

The general equation for the account system, in matrix terms, becomes:

$$X = AX + Y \tag{3.15}$$

where:

$X = (X_1, X_2, X_3, \ldots\ldots, X_{13})$, or a column vector of total outputs for the i^{th} sector,

A = coefficient of production matrix for interindustry demand, defined above in (2.4),

AX = local interindustry demand for total output of industry i, (i = 1,2,.....,13) and,

$Y = (Y_1, Y_2, Y_3, \ldots\ldots, Y_{13})$, or a column vector of final demands for the i^{th} sector.

When the assumption of constant production coefficients is made (3.14), the accounts system becomes a model of the mixed economy. Manipulation of general equation (3.15) expresses the total output of the mixed economy as a function of constant interindustry demand and final demand.

$$X - AX = Y \tag{3.16}$$

$$IX - AX = Y \tag{3.17}$$

where:

I = an identity matrix 13 x 13.

$$(I - A) X = Y \tag{3.18}$$

$$X = (I - A)^{-1} Y \tag{3.19}$$

The (I - A) inverse matrix for the general account system presented in Table 1, is shown in Table 3.

Table 3

DIRECT AND INDIRECT PURCHASES PER DOLLAR OF OUPUT

(Output Multiplier)

SECTORS	Manufacturing 1	Food Processing 2	Transportation Communications & Public Utilities 3	F. I. R. E., Business & Personal Services 4	Wholesale and Retail Inside CBD 5	Wholesale and Retail Outside CBD 6	Commercial, Industrial Construction 7	Residential Construction 8	Maintenance & Repair Construction 9	Household Labor (year-round) 10	Household Labor (other) 11	Local Government Services Stockton City 12	Local Government Construct. Stockton City 13
1. Manufacturing	1.018391	.056121	.027158	.017230	.047757	.011910	.083023	.104935	.041262	.026232	.012089	.093204	.082975
2. Food Processing	.004436	1.003442	.004677	.007316	.021833	.008753	.007950	.010924	.010187	.014235	.009590	.012792	.008149
3. Transportation, Communications & Public Utilities	.113457	.082993	1.068124	.077633	.063003	.030307	.078739	.095631	.121251	.151421	.030647	.130036	.078169
4. F.I.R.E., Business & Personal Services	.081079	.047161	.093909	1.161143	.074431	.041235	.148999	.206944	.127340	.265035	.096441	.243315	.152967
5. Wholesale & Retail Inside CBD	.104293	.071395	.104119	.172894	1.164208	.073357	.200047	.287369	.263724	.308068	.171972	.307282	.207675
6. Wholesale & Retail Outside CBD	.220926	.138862	.245581	.291977	.250705	1.169001	.371198	.672749	.679776	.579011	.255094	.590212	.415009
7. Commercial, Industrial Construction	.021059	.025224	.031979	.018855	.015361	.013397	1.097276	.061454	.061833	.034339	.010446	.031146	.819505
8. Residential Construction	.007460	.005341	.011225	.015624	.007908	.004556	.019438	1.048761	.019162	.026723	.007770	.021108	.232315
9. Maintenance & Repair Construction	.004466	.003181	.005414	.010235	.004734	.002446	.017089	.089291	1.077770	.015660	.009794	.012036	.034851
10. Household Labor (year-round)	.297890	.171776	.327318	.581971	.226952	.157870	.500897	.461093	.382201	1.275231	.113725	.940352	.465321
11. Household Labor (other)	.022239	.052797	.018811	.041848	.022714	.016018	.059513	.050570	.042509	.033988	1.009523	.030003	.054400
12. Local Government Services Stockton City	.007977	.006597	.010614	.012753	.005040	.004569	.010325	.011738	.009686	.021069	.018131	1.037524	.010062
13. Local Government Construction Stockton City	.002430	.001854	.003309	.004122	.004697	.001688	.003552	.005036	.004029	.006436	.005059	.008691	1.003671
Output Multipliers (sum of each column)	1.906103	1.666744	1.952239	2.413601	1.909343	1.535107	2.598046	3.106495	2.840820	2.757448	1.750281	(3.457701)	(3.565069)

Source: Arthur D. Little,Inc., The Metropolitan Stockton Economy, Analysis and Forecast

5. Meaning of the Production Coefficient for the Local Government Sector.

Leontief interpreted the input parameters (a_{ij}) as fixed coefficients of production which are technologically determined. With the inclusion of local government in the processing portion of the Stockton model, a stable relationship, but not technological, between the output of an industry and inputs of public services is assumed. The development of regional input-output models has ignored the problems of non-industrial sectors which may demonstrate constant demand structures in terms of regional income and total product. There is an increasing use of interindustry models for metropolitan area economic studies.[6] Attempts to measure comparative economic welfare impacts from new public programs will force investigation of the problems which arise when using non-technological government coefficients.[7]

Three criticisms can be aimed at the use of constant local government coefficients. First, the political decision making process involved in allocating public services, both at the contract and beneficiary stage, does not lend itself to a structure of constant

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[6] In addition to the Artle, Hirsch, and Rao works cited so far, a number of other metropolitan area interindustry studies have been carried out. Examples are: Berman, B. R., B. Chinitz, and E. M. Hooever, Projection of a Metropolis, (Cambridge, Mass.: Harvard University Press, 1960); Bureau of Business and Economic Research, Michigan State University, Economic and Population Base Study of the Lansing Tri-County Area, (East Lansing, Mich.: Bureau of Business and Economic Research, Michigan State University, 1960); Harold T. Smith, The Kalamazoo County Economy, (Kalamazoo, Mich.: The W. E. Upjohn Institute for Employment Research, 1960); and Pittsburgh Regional Planning Association, Region With a Future: Economic Study of the Pittsburgh Region - Volume Three, (Pittsburgh, Pa.: University of Pittsburgh Press, 1963).

[7] For a discussion of these problems, see: H. Perloff and C. Leven, "Toward an Integrated System of Regional Accounts: Stocks, Flows, and the Analysis of the Public Sector," in W. Z. Hirsch (ed.),

input factors. Second, even if operating and capital expenditures are separated, there is an uneven output of government services caused by administrative delays, inadequate revenue sources, and other inefficiencies. Third, total sales and total employment commonly used in interindustry accounts are not good independent variables to explain the need for new levels of public services.

An answer to these criticisms lies in the procedure for entering the activities of government into the local accounts table. A general rule would be: that portion of the public budget where a consistency in expenditure level is found - and the level is significantly correlated with indices of general economic activity - should be included as a processing sector of the general model. Other types of expenditure exhibiting an irregular allocation pattern could be entered as a component of final demand. A suggestion for this type of budgetary disaggregation has been offered by Jesse Burkhead:

> ....Government expenditures in the region could be divided between autonomous and derived.
>
> The distinction is this: some government activities within a region are a function of the economic-activity levels of households and business firms. Let this portion of government expenditures be classified as derived. There is another portion of government activity in the region that is autonomous. That is, independent of the activity levels of households and business firms. In an input-output framework, making this distinction amounts to shifting a part of government activity into the processing sector with an equivalent reduction of that portion of government that is treated as final demand. This implies the existence of production coefficients for the portion of government activity in the processing sector.
>
> For example, a very large part of the local-government services associated with middle-income residential development may be classified as derived. A suburban residential development with households of specified characteristics with respect to income, age, occupation, and ethnic status will be accompanied by a volume of governmental activity that probably

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Elements of Regional Accounts, (Baltimore: Johns Hopkins Press, 1964), pp. 175-214.

> varies within rather narrow limits. Such residential developments give rise to a governmental package of public education, streets and roads, police and fire protection, water supply, and sewage disposal. Decision patterns within municipalities and other local-governmental units respond in a highly predictable fashion to provide this package.[8]

Even with this derived/autonomous disaggregation, the third criticism of a constant government coefficient deserves special consideration; What of the explanatory value of total sales and employment in the combined market framework?

Of the few statistical studies on municipal expenditures that have been published, none have developed a framework for analysis similar to the derived/autonomous distinction.[9] In some cases, capital and operating expenditures were the level of disaggregation, in others, a functional

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[8] Jesse Burkhead, "Public Finance as an Integral Part of Regional Account," in W. Z. Hirsch (ed.), Elements of Regional Accounts, Ibid., pp. 70-71. In an input/output framework, Harlan M. Smith has suggested that in addition to government, foreign trade (imports) and investment inputs be differentiated with respect to an induced/autonomous distinction. See H. M. Smith, "Uses of Leontief's Input-Output Models," in Tjalling C. Koopmans (ed.), Activity Analysis of Production and Allocation, Cowles Commission for Research in Economics, (New York: John Wiley and Sons, Inc., 1951), pp. 132-141, especially "4. An Autonomous-Expenditure Model," p. 139. Ghosh develops an "Augmented Matrix Multiplier" $(I-A_m)^{-1}$ by dividing the components of final demand into endogenous and exogenous portions using a durable and non-durable criterion for private and government expenditures. See A. Ghosh, Experiments with Input-Output Models, (Cambridge, England: Cambridge University Press, 1964), Chapter 8.

[9] Notable efforts to explain levels of public expenditure through statistical correlates are: Harvey E. Brazer, City Expenditures in the United States, Occasional Paper 66, National Bureau of Economic Research, Inc., New York, 1959; Werner Z. Hirsch, "Expenditure Implications of Metropolitan Growth and Consolidation," Review of Economics and Statistics, Vol. XLI, No. 3, August, 1959, pp. 232-241; and in California: Gary H. Elsner and Stephen H. Sosnick, Municipal Expenditures in California: Statistical Correlates, Occasional Paper Series, No. 2, Institute of Governmental Affairs, University of California, Davis, July 1964; P. Shelton and B. F. Davie, "How to Keep Local Expenditures Under Control," in John A. Vieg, et al, California Local Finance (Stanford: Stanford University Press, 1960), Chapter 4, pp. 103-134; and S. Scott and E. L. Feder, Factors Associated with Variations in Municipal Expenditure Levels -- A Statistical Study of California Cities (Berkeley: Bureau of Pub. Adm., University of California, 1957), Seymour Sacks, "Spatial and Locational Aspects of Local Government Expenditures," in Howard G. Schaller, (ed.), Public Expenditure Decisions in the Urban Community, (Baltimore: Johns Hopkins Press, 1963), pp. 180-198.

breakdown was used, and in one, no disaggregation of expenditures was attempted. To the extent that they have been based upon concepts of total expenditure levels, their findings have not been helpful in ascertaining the validity of using interindustry production coefficients for explaining new levels of "service packages." In fact, the chief objective of these statistical regressions on expenditures has been the investigation of scale economies with respect to the size of urban areas.

In addition, none were designed to study one governmental unit over a time series. Variation in expenditure level has been based upon a cross section analysis of a large number of similar governmental unit types. Research questions have been those of scale economies, reasons for per capita expenditure variation, expenditure forecasts, and metropolitan consolidation. In all these studies the results have been quite similar. Gross economic indices like income, retail sales, employment or total production, were not as highly correlated with expenditure levels as property value, land area, or population.

Because the expenditure variations in these studies were based upon different cities, and not a city with historical expenditure information, a continual problem was the fact that different cities provide different mixtures and quality of service. The parameters of an independent variable are therefore likely to vary randomly over the series. Further analysis of public expenditure levels, based upon the patterns of one or two communities and using a disaggregation criterion of autonomous and derived, might also show as high or higher explanatory value for broad economic indices. With the division of a city into spatial economic sectors for expenditure allocation, it need not be assessed value (tax paying ability) which determines service levels, but increments of new employment, new income, or size of new industry measured in total output (service cost).

The broad economic indices used in an interindustry model combined with a spatial breakdown of the community can yield alternative measures of expenditures. These might be population per land area of sector (derived from basic employment forecasts), retail sales per capita (retail sector) ratios of manufacturing wages to personal income, number of establishments, etc. Also, a difficult step when entering public expenditures into an interindustry account is the imputing of benefit levels. To this end the studies noted have provided an indication of what criteria are appropriate for allocating benefits to community economic sectors. Characteristics of the population, particular density and value considerations of land, and other socio-economic weights as explanatory variables for expenditure benefit are needed to aid in the construction of a governmental interindustry account. The assumption that total production, income and employment determines levels of expenditure can still maintained, but the more specific land and population variables determine the size of the coefficient for benefiting sectors of the model.

A constant production coefficient for government then, does present some problems of theory and empirical evidence concerning the expenditure activity of the public market. But, a number of precautions can be used to improve the workability of the idea for both explanatory purposes and as a means of structuring the accounts of a local economy. These precautions would include: (1) Careful disaggregation of the public sector, founded in a derived/autonomous distinction, (2) special studies of the local economy to reveal lead and lag factors associated with inter-related activities between the public and private markets, and (3) utilization of variables which explain expenditure benefits when incorporating the government sector into a general economic model.

6. Note to Section III: Adding an Autonomous Account for Local Government.

In the final section (V) of this thesis, the need for an autonomous sector of local government will become more apparent. We will be placing emphasis on the structure of recurring derived expenditures necessary for prediction of future governmental outlays. This requires an account for non-recurring expenditures. The following note will set out how this might be done.

Taking general equation (3.15) and specifying the local government service account (X_{12}), would result in:

$$X_{12} = a_{12,1}X_1 + a_{12,2}X_2 + a_{12,3}X_3 + \ldots\ldots a_{12,12}X_{12} + Y_{12} \qquad (3.20)$$

If we assume that total output, X_{12}, is also a function of autonomous expenditures, these expenditures could be added to final demand for X_{12}:

$$Y_{12} = y_{12,14} + y_{12,15} + y_{12,16\text{-}17} + y_{12\ exp} + y_{12\ aut} \qquad (3.21)$$

where $y_{12,aut}$ = total autonomous expenditures by local government.

Then, future levels of local government expenditures will be a function of both derived and autonomous expenditures within the study area.

Setting the inverse matrix in (3.18) equal to a matrix B:

$$(I-A)^{-1} = \begin{bmatrix} b_{1,1} & b_{1,2} & \cdots & b_{1,13} \\ b_{2,1} & b_{2,2} & \cdots & b_{2,13} \\ b_{3,1} & \cdots & \cdots & b_{3,13} \\ \vdots & & & \vdots \\ & & b_{ij} & \\ \vdots & & & \vdots \\ b_{13,1} & \cdots & \cdots & b_{13,13} \end{bmatrix} \qquad (3.22)$$

the predicting equation for Y_{12}, from (3.19), becomes:

$$X_{12} = b_{12,1}Y_1 + b_{12,2}Y_2 + \ldots + b_{12,12}Y_{12} + b_{12,13}Y_{13} \qquad (3.23)$$

where autonomous service and construction expenditures are accounted for in Y_{12} and Y_{13} respectively.

IV. THE ALLOCATION CRITERIA

1. Measures of Government Output - Service Cost and Tax Receipts

The "slack" between price paid for government services and quantity received presented an accounting problem for the government row (equations 3.9 and 3.10) when entering values into the interindustry flow table. Actual cash flow representing the property and non-property taxes paid by each sector can be entered. These values would represent a cash transaction similar to the dollar flows for goods and services transaction in the private portion of the accounts table. A major difference between transactions in the private and public portions of the table is the "slack" between tax payments to the public sector, and quantity of the services that will be received for those payments. This slack represents a serious accounting problem.

A report on the use of an interindustry model in metropolitan economic analysis by Werner Z. Hirsch for the St. Louis Metropolitan Area, states how he determined the values for the government row:

> Government outputs are represented by tax receipts. On the basis of an analysis of the tax system and structure of each of the three government sectors, taxes were separated into those received from households, and from business and industry. The issue of tax shifts was altogether neglected. Taxes paid by commerce and industry were allocated according to the sector's employment. Since the counterpart of this entry is obtained from company records, government output allocations were readily checked.[1]

An alternative to the use of tax receipts is the cost of the service level which is actually provided to each of the model's sectors. There are two major reasons why the cost of service was used in the Stockton model, instead of tax receipts.[2] First, although taxes paid are actual cash payments

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[1] Werner Z. Hirsch, "Interindustry Relations of a Metropolitan Area," op. cit., p. 30.

[2] Since the St. Louis model, Hirsch has modified the interindustry accounts formulation, using both tax receipts and service cost to calculate "net

for the sector, it has often been revealed that sectors of a local economy, under varying assumptions, do not pay their way in terms of services demanded when compared to total taxes paid.[3] Because there is this discrepancy it was more important to have an indication of public service costs in the accounts framework than income receipts. It is the cost of services that measures resource allocation. We assumed from the beginning that revenues

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fiscal resources" for impact analysis:

"In order to estimate the local government net fiscal resources, the local government row is split in two. The first row represents 'local government service costs' and reflects the costs incurred by local governments in providing services to specific local beneficiaries on an industry basis. To provide this information requires major imputations. A second row represents 'local government fiscal resources,' i.e., the difference between local government tax receipts from a given industry located in the area and the costs of servicing the industry, with all indirect effects neglected. Industries that pay more for the provision of local government services than they receive in return, show positive local government fiscal resource status, and vice versa."*

The idea of "net fiscal resources" was originally instituted by Buchanan as "fiscal residuum," or, "the balance between the contributions made and the value of public services returned to the individual."**

*Werner Z. Hirsch, "Application of Input-Output Techniques to Urban Areas" in Tibor Barna (ed.), Structural Interdependence and Economic Development, (New York: Macmillan, 1963), p. 160.

**James M. Buchanan, "Federalism and Fiscal Equity," American Economic Review, Vol. 40, (September, 1950), p. 588.

[3] Evidence of the concern over this problem is considerable, but the conclusions are not always convincing or consistent from study to study. A few examples are: George H. Esser, Jr., Are Residential Areas a Tax Liability? (Chapel Hill: Institute of Government, University of North Carolina, 1956); G. H. Esser, Jr., Ruth L. Mace and David L. McCallum, Greensboro Suburban Analysis (Chapel Hill: Institute of Government, University of North Carolina, 1956); Seymour Sacks and William F. Hellmuth, Jr., Financing Government in a Metropolitan Area, (New York: The Free Press, 1961); Julius Margolis, "Municipal Fiscal Structure in a Metropolitan Region," Journal of Political Economy, Vol. 55 (June, 1957), pp. 236-; A general review of the cost-benefit problem for government services is presented in Ruth L. Mace, Municipal Cost-Revenue Research in the United States, (Chapel Hill: Institute of Government, University of North Carolina, 1961).

were constant, or that the need for new revenue levels would be projected from demands for new services.

Second, for purposes of estimating future levels of public sector economic activity, it was the demand for services that would determine costs - not taxes paid. Even if it was assumed that tax receipts could serve as a surrogate value for cost, property taxes, the major source of local revenue in Stockton, are more inelastic in response to increases in sector output than the more elastic demand for public services. As a basis for this argument, one need only consider that a firm could increase total output within the same plant while not increasing property value, but the added employees would create more traffic volume on the streets, demand more public protection and traffic regulation, and increase the load on rubbish, garage and other collection services.

An indication of the difference between tax receipts and service cost per sector of the Stockton model can be seen in Table 4. It is not ourpurpose to discuss the fiscal status of each sector or determine whether they are "paying their way" in terms of total tax receipts, but some conclusions on the fiscal balance of the major land use categories represented in the model are presented in a preliminary version of the community renewal report:

> . . . The composite summary for economic sectors indicate that the following sectors have costs which in 1962 exceeded the property revenue.
>
> 1) Wholesale-Retail Inside the Central Business District;
> 2) The Construction sectors; and
> 3) The two Residential sectors.
>
> When the non-property tax revenue of these sectors is added, a marked shift in net costs and net revenues occurs. The only economic sector remaining with net costs is Household Labor (Other). . .
>
> The most profitable sectors (from the city's point of view) include the wholesale-retail commercial activities and the economic activities associated with finance, insurance, real estate, personal and business services. Net revenue for activities associated with construction is small yet

TABLE 4

Comparison of Service Costs and Tax Revenues per sector, for combined government units of the City of Stockton, San Joaquin County, and Special Districts in the Stockton Urbanized Area (Fiscal Year 1961-1962).

[in dollars]

Sector	1 Total Government Service & Construction Costs per Acre	2 Property Tax Yields per Acre	3 Col. 2 minus Col. 1	4 All Tax Revenue per Acre	5 Col. 4 minus Col. 1
1.	$ 547	$1,062	$ 515	$ 1,213	$ 666
2.	1,207	1,627	420	1,906	699
3.	753	1,349	596	1,771	1,018
4.	1,946	4,162	2,216	6,309	4,363
5.	10,790	5,648	-5,142	16,591	5,801
6.	1,964	3,612	1,648	6,508	4,544
7.	1,582	729	-853	1,708	126
8.	1,410	729	-681	1,443	33
9.	1,461	729	-732	1,473	12
10.	3,527	1,928	-1,599	3,885	358
11.	17,682	2,162	-15,520	14,578	-3,104

Source: Arthur D. Little, Inc., Stockton Community Renewal - Policies and Program, (Preliminary Draft), City of Stockton, California, March, 1965, Following p. 133, Composite Cost/Renewal Summary - Economic Sectors.

> construction benefits greatly from local government construction expenditures. (emphasis added)[4]

The basis for these conclusions is summarized in Table 4.

2. Functional Breakdown of Government Sectors

Total expenditures for each governmental unit were initially disaggregated on the basis of budgetary function. The service cost criteria were then applied to this level of disaggregation. For example, the City of Stockton's budget (Local Government Sector) is functionally divided into the following categories (see also p. 26):

A. General Government

B. Public Safety
   (1) Police
   (2) Fire
   (3) Building Safety
   (4) Animal Pound
   (5) Civil Defense
   (6) Transportation andTraffic Engineering

C. Public Works
   (1) Operations
   (2) Construction
   (3) Water

D. Health
   (1) First Aid Station
   (2) Weed and Pest Control

E. Libraries

F. Parks and Recreation

Where possible and necessary this division was carried to a finer level when further disaggregation helped in the assignment of service cost to a specific sector or combination of sectors. In particular, two functions were given further disaggregation for Local Government; Public Works, and Parks and Recreation:

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[4] Arthur D. Little, Inc., Stockton Community Renewal - Policies and Program (Preliminary Draft), City of Stockton, California, March, 1965, p. 134.

C. Public Works
(1) Operations
(a) Administration andEngineering
(b) Streets
(c) Storm and Sanitary Sewers

F. Parks and Recreation
(a) Administration
(b) Park, Playground and Tree Maintenance
(c) Pixie Woods
(d) City Recreation
(e) Golf Courses
(f) Silver Lake Camp
(g) Civic Auditorium
(h) Metro Recreation

A general rule for disaggregating the budget function, would be to find a level of functional disaggregation that allows the clearest identification of service users.

Other Government and Semi-Public sectors were given the same disaggregation test based upon published budgetary expenditure items.

The next level of government expenditure disaggregation is at the service and construction distinction. This division created the Service and Construction Sectors for each of the government sectors. There were two major reasons for this division. First, for purposes of community renewal impact analysis, the differentiated economic effects of new public construction vs. on-going service expenditures were needed. For renewal purposes, it was apparent that the impact of these two types of expenditures would be greatly different. Public service programs connected with urban renewal would be aimed directly at low income and minority households, while most construction projects would have benefits affecting many community sectors. Second, it was assumed that service expenditures would have a more regular and consistant relationship with the output of the model's sectors than construction expenditures. The sporadic level of capital expenditures for local, state and national governments suggests that they are not easily approximated by simple linear functions. There are two

likely solutions to this problem. Construction activity might be eliminated from the processing portion of the model, or an intermediate disaggregation of the construction sector could be made, founded upon an autonomous/derived distinction.[5] Derived construction expenditures would then be included in the processing portion of the model and autonomous expenditures in final demand.

Rather than eliminate Local Government Construction as an endogenous sector, it was decided to look closely at current construction expenditures in terms of the derived and autonomous distinction. The 1961-1962 Fiscal Year showed only minor outlays for non-recurring capital investments.[6] But, over $2.0 million of the $2.8 million expended for construction in 1961-1962 was allocated for general street construction, widening and extension; parking facilities; remodelling the police department, and building a new sub-station for the fire department; making minor extensions of sewer and water trunk lines; and general park improvements. It was therefore decided to include all of the 1961-1962 construction expenditures in the endogenous portion of the model, and assume that these were for the most part derived construction costs. But, we continued to operate under the assumption that service costs were more highly related to sector output than construction costs.

In the exogenous public sectors of Other Government and Semi-Public, the problem of derived expenditures was not important. For these sectors a procedure was needed to account for expenditures that accrued to residents inside the Stockton Urbanized Area (SUA), and to those residents outside the area. In all cases, the service areas of governments in the Other Govern-

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[5] See Chapter III, Section 5.

[6] That is, no major expenditures were made on new public buildings (City Hall, library, jail, or administrative office), or major public facilities (airport, sewer plant, etc.).

ment and Semi-Public sectors did not coincide with the boundaries of the urbanized area.

The population of the SUA as a proportion of the population in the service area of the government service was used as a distribution ratio. Other criteria, more indicative of benefits actually received by the SUA could have been selected for each expenditure function. But, the frequent lack of appropriate data forced us to accept only the population distinction. The population ratio (SUA population/population of the function's service area) was applied to total service and construction expenditures respectively.[7] The level of expenditures accruing to residents inside the SUA was distributed across the government row, and the remaining expenditures were entered in the export column of final demand.

Figure I summarizes the disaggregation procedure for government expenditures before benefit (service cost) criteria are applied. The functional breakdown in the example is for Local Government. The functions used for Other Government are listed in Table A-1. Note in Figure I that the derived/autonomous distinction is not introduced after the service/construction split. It was not actually needed in the Stockton model, yet other models might include this as an additional step for government sectors in both the endogenous and exogenous portions of the model.

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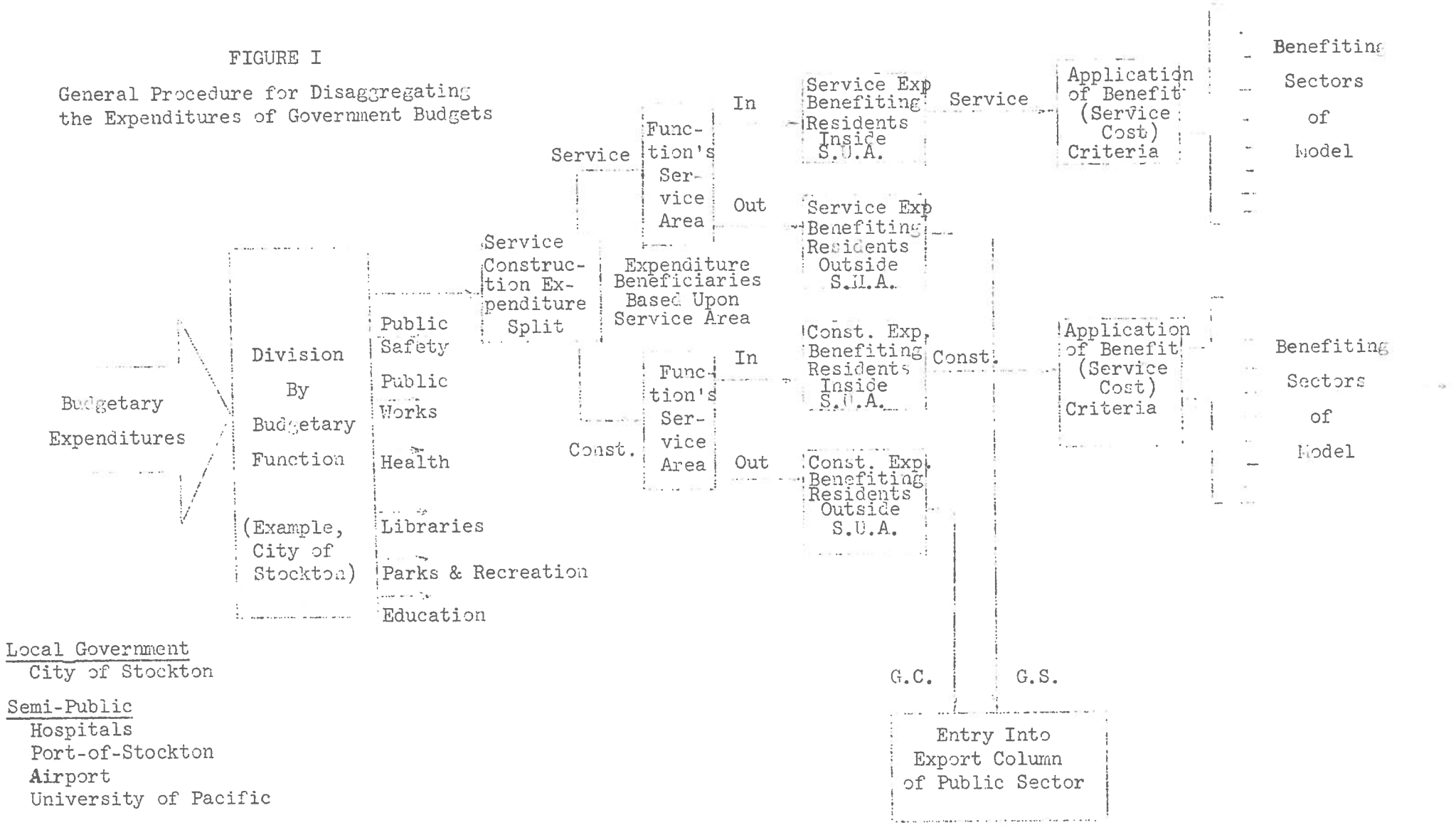
[7] In cases where the service area did not encompass the whole SUA, an estimate of the population in the area included was made from 1960 census tract data.

FIGURE I

General Procedure for Disaggregating the Expenditures of Government Budgets



Local Government
- City of Stockton

Semi-Public
- Hospitals
- Port-of-Stockton
- Airport
- University of Pacific

Other Government
- San Joaquin County
- Special Districts
- School Districts
- State of California

3. Measuring Service Cost

It would be helpful to restate two assumptions that have been made about the measurement of service cost.

Services rendered to individuals in their capacity as workers, shoppers and in other economic functions will be considered a cost of providing the service to the specific economic function. This becomes a direct measure of service cost for each function or sector. As a business increases its activity and demands more services, a direct demand is placed on the public sector to increase expenditure levels on that sector of the private market. Total output of a sector in the future then, is the function which explains the need for new services.[8]

It was also assumed earlier that this direct measure of cost was linearly related to benefits received from the expenditure. The association of benefits with demand, and demand with cost is common to cost-benefit analysis. In the attempt to measure project benefits, cost-benefit studies laborously search out means of approximating consumer demand curves for public goods.[9]

(a) General Rule for Measuring Service Usage.

Setting aside construction expenditures, total expenditures are a function of two factors: (1) "personal demands" for services, and (2) "residual general consumption." Personal demands are actually burdens placed on the service activity by individuals; including fire calls, police

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[8] Note that the problems of indirect benefits and costs have been set aside in this measurement procedure. In order to take in all operating and capital expenditures, the careful consideration given to secondary costs and benefits in project analysis has not been possible.

[9] See Benjamin Chinitz and Charles M. Tiebout, "The Role of Cost-Benefit Analysis in the Public Sector of Metropolitan Areas," in Julius Margolis, The Public Economy of Urban Communities, Committee on Urban Economics, Resources for the Future, (Baltimore: Johns Hopkins Press, 1965), pp. 251-264, for a summary of the procedures commonly used in this approximation procedure.

calls, requests for building permits, use of public facilities, etc. These are daily requests for services that the public body is expected to supply. The second factor, residual general consumption,is more directly a function of the operating standards each department has adopted as policy. Such things as the frequency of fire, health and housing inspection; frequency of police patrol; level of maintenance and repair activity; and level of aesthetic and recreational adornment in public parks represent this residual general consumption category.

General consumption has three important characteristics. First, it is "residual" in the sense that priority must be given to the personal consumption demands that often preoccupy many departmental staffs. Second, the level of expenditures on general consumption is to a great degree a function of broad legislative feeling on what an acceptable standard service is for the community. Third, the initiative for spending funds on general consumption is often an administrative decision to (a) improve the community image regionally or nationally for purposes of attracting new growth; or (b) response to critical problem areas of the city's physical and social resources.

Cost assignment of personal consumption (derived expenditures) can be carried out based upon police, fire and inspection records, etc. Provision of the service unit can be noted and related to the physical dimensions of the interindustry sectors. Cost is thereby related to land parcels and not to specific individuals. For example, for the following selected expenditure functions, one could use the criterion noted to indicate level of demand by each sector of the model:[10]

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[10] Attempts to develop inter-city comparison criteria for municipal functions had early beginnings with the efforts of C.Ridley and H. Simon. Unfortunately there has been largely no follow through for more current city management and planning programs. Clarence E. Ridley, Measuring Municipal Government, Suggested Standards for Measuring the Results of

Measurement of Service Usage

Function	Criterion
Fire	Number of Calls per sector
Police	Number of Calls per sector
Inspection	Number or value of building permits per sector
Parks and Recreation	Frequency and Volume of Facility Usage per sector
Public Works	Sector immediately benefiting from
Street	improvement or construction.
Water	Volume of water used per sector.
Sewer	Volume and B.O.D. of Effluent per sector.
Education	Number of pupils per sector.

For general consumption (autonomous expenditures), a direct control is held over who is to receive the benefits of the new level of service provision. For example, increased building inspection in slum areas, better street maintenance and repair in older sections of the city, improvement of park facilities in lower income areas, extra police patrol in problem areas, etc. Each of these expenditures can be related to the benefiting sector of the model.

Making distinctions between derived and autonomous expenditures in a municipal budget presents some formidable identification problems. Budgets are rarely presented in a fashion that allows a clear distinction between monies spent on reoccuring service activities, and monies allocated for specific service improvement programs. In fact, because of variable demand levels and elasticies in departmental efficiency, there is probably a constant flux between the amount of expenditures actually made on service demands and those made on general consumption.

Fire, Health, Police and Public Works Departments, Pub. No. 4, (Municipal Administration Service and School of Citizenship and Public Affairs: New York and Syracuse, 1927); and H. A. Simon, Fiscal Aspects of Metropolitan Consolidation (Berkeley, California: Bureau of Public Administration, University of California, 1943).

An approximation to the autonomous/derived distinction can be made by differentiating specific program budgets from normal operating budgets in annual financial reports. New programs have the characteristic of being temporary until the operation proves successful and works its way into the budget of an existing department. As these new programs are given long term budget approval, they can be transferred from the autonomous to derived category.

(b) Imputed Cost Measures used in the Stockton Model.

An approximation of service costs per sector was used in the Stockton model by developing a pool of surrogate cost criteria. As each budgetary function was analyzed, the criterion which seemed to be the "best" indicator of demand was chosen to allocate expenditures to sectors of the model. Except for three criteria, these were not actual measurements of service usage, but indicators assumed to be representative of actual service usage. This method is clearly less desirable than having actual usage measurements[11], but the cost of estimating usage was prohibitive. Fourteen criteria were chosen to allocate expenditures:

Criteria Used in Expenditure Allocation for Public Sectors of the Stockton Interindustry Model

1. Full Valuation (land and improvements)
2. Population Time Budgets
3. Land Area/S.U.A. (Stockton Urbanized Area)
4. Land Area/City
5. Motor Vehicle Registration
6. Value and Number of Building Permits
7. General
8. Household Sector/Income
9. Household Sector/Land Area
10. Household Sector/People
11. Volume of Water Used
12. Volume of Effluent weighted by B.O.D.
13. Acres of Street/S.U.A.
14. Acres of Street/City
15. Gross Sales

[11] Further work is needed to see if this is really so. The imputed values might prove to be quite similar to actual cost estimates. Also, the small volume of activity in the public sectors of the model compared to

I will not elaborate on the particular problems of developing each of these criterion, but the idea involved in some of them should be mentioned.

The population time budget criterion is an attempt to weight the amount of time people spend at a job, at home, using public facilities, etc. The purpose of this criterion was to give some weight to the demands people make on public services when they are not at their place of residence. Using population and employment data, care was taken to account for school children's time, location of inmates, people over 65, and other non-employed individuals.[12]

Criteria 8, 9, 10, serve as a means of splitting expenditures that were felt to benefit only households. With two household sectors, it was necessary to distribute the expenditures between them depending upon the most relevant measure--income, land or people.

The "General" criterion was needed to distribute general administrative expenditures of each governmental unit, and general administrative expenditures of each function. All the expenditures of the city and all the functions of a department were allocated, and then an average of each was used to allocate respective administrative expenses. This average is the "general" criterion.

Table 5 shows how three of the criteria have their values distributed across sectors of the model. The proportional distribution calculated is applied to the total function expenditures for which the criterion is used. Estimates were made by the city planning department to determine the full valuation of land and improvements for the public sectors.-X_{12},

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the private sectors, might require less precise estimates of coefficients for government.

[12] I am indebted to Mr. Frank Bollman, co-worker at Arthur D. Little, Inc. and student in the Department of Agricultural Economics, University of California, Berkeley, for the development and calibration of this criterion.

TABLE 5

EXAMPLE OF CRITERIA USED IN GOVERNMENT

EXPENDITURE ALLOCATION

FULL VALUATION/SECTOR
(Land & Improvements) [in thousands]

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{14}	X_{16}
	$57,679	19,554	157,845	67,742	12,520	169,020	2,951	3,124	1,562	629,892	80,119	195,113	67,626	52,295
%	3.80	1.29	10.39	4.46	0.82	11.13	0.19	0.21	0.10	41.47	5.27	12.85	4.45	3.57

LAND AREA/SECTOR[1]
(Stockton Urbanized Area)

Acres														
	997	338	1,229	310	58	753	51	54	27	6,722	855	3,031	1,045	3,947
%	5.13	1.74	6.33	1.60	.30	3.88	.26	.28	.14	34.62	4.40	55.61	5.38	20.33

MOTOR VEHICLE REGISTRATION/SECTOR[2]

Vehicles														
	2,011	681	6,093	4,986	1,154	15,575	1,085	1,149	575	38,550	7,688	85	200	630
%	2.5	0.8	7.6	6.2	1.4	19.3	1.3	1.4	0.7	47.9	9.6	0.1	0.3	0.8

[1] Total Land Area in S.U.A. = 19,417 acres.

[2] Total Vehicle Registration in 1962 = 80,462.

X_{14} and X_{16}. Land area per sector was calculated for the city and S.M.A. depending upon the unit of government making the expenditures.

Tables 6 and 7 present the accounting system used to allocate expenditures for local government. Total expenditures for each function are listed next to the criterion used to allocate those expenditures. The sectors are listed in the same order as Table I, and only the service sector of each government division (X_{12}, X_{14} and X_{16}) is assumed to receive benefits from public expenditures.

The total expenditure entry for each sector (column totals) is identical to the entry listed for local government in Table 1. This entry represents the service cost estimate of the combined functional expenditures. Similar but more brief account tables and service cost criteria for Other Government and Semi-Public expenditures appears in Appendix Tables A-1, A-2, and A-3.

TABLE 6

ALLOCATION OF LOCAL GOVERNMENT SERVICE EXPENDITURES BY

SERVICE COST (BENEFIT) CRITERIA--(City of Stockton only)
1961-1962 Fiscal Year

FUNCTION	TOTAL EXPENDITURE	CRITERION	[In Dollars] COST PER SECTOR* 1	2	3	4	5	6	7	8	9	10	11	12	14	16
General	1,673,745	General	66,113	56,070	101,429	58,749	12,218	140,427	6,193	5,356	2,845	856,623	175,743	35,651	44,689	111,639
Public Safety																
Police	1,555,480	Full Valuation	59,108	20,066	161,614	69,374	12,755	173,125	2,955	3,267		645,058	81,974	69,219	55,531	199,879
Fire	1,731,976	Full Valuation	65,815	22,342	179,952	77,246	14,202	192,769	3,291	3,637		718,251	91,275	77,073	61,832	222,559
Bld. Safety & Inspection	190,530	Value of Bldg. Permits	2,648	895	6,421	14,309	1,349	17,513	133	133		12,710	99,969	3,163	24,504	6,707
Animal Pound & Civil Defense	100,376	H.H./Population										83,734	16,642			
Transportation & Traffic	254,449	Vehicle Registration	6,359	2,153	19,269	15,768	3,649	49,254	3,430	3,634		121,908	24,313	631	1,992	270
Public Works																
Adm. & Engineering	668,701	General	47,812	62,055	22,535	24,475	6,553	55,168	5,350	4,012		349,664	55,034	1,271	15,581	16,851
Streets	550,971	Vehicle Reg.	13,769	4,661	41,725	34,144	7,901	106,650	7,427	7,868		263,978	52,645	1,366	4,314	584
Storm & Sanitary Sewers	464,709	Vol. of Effluent	90,525	111,902	7,481	19,332	6,344	13,732	3,095	949		111,940	31,005	1,395	29,648	36,247
Waste Collection & Disposal	325,612	H.H./Income										289,143	36,469			
Water (Oper. & Maintenance)	43,151	Volume of Water Used	6,904						432			35,815				
Water (Const.)	74,916	"	11,987						749			62,180				
Health																
Weed & Pest Control	14,047	H.H./Land										12,474	1,573			
Libraries	377,511	H.H./People										295,629	81,882			
Parks & Recreation																
Administration	46,860	H.H./People										36,696	10,164			
Park, Playground & Tree Maintenance	423,214	"										331,419	91,795			
Pixie Woods	41,212	"										32,273	8,939			
City Recreation	100,727	"										78,879	21,848			
Golf Courses	49,080	H.H./Income										40,943	8,137			
Silver Lake	32,741	H.H./People										25,639	7,102			
Civic Auditorium	62,142	H.H./Income										51,839	10,303			
Metropolitan Recreation	138,710	H.H./People										108,624	30,086			
TOTAL EXPENDITURES	8,920,860		352,149	299,035	540,426	313,397	64,971	748,638	33,055	28,856	15,420	4,565,419	936,898	189,769	238,091	594,736

* See Table 1 for definition of sectors.

TABLE 7

ALLOCATION OF LOCAL GOVERNMENT CONSTRUCTION EXPENDITURES

BY SERVICE COST (BENEFIT) CRITERIA--(City of Stockton only)
1961-1962 Fiscal Year

ON	TOTAL EXPENDITURE	CRITERION	COST PER SECTOR* (In Dollars) 1	2	3	4	5	6	7	8	9	10	11	12	14	16
s	254,051	Vehicle Registration	6,349	2,149	19,239	15,744	3,643	49,177	3,425	3,628	1,816	121,718	24,275	[illegible]	630	1,[illegible]
wn Parking	493,608	CBD-Comm. Wholesale H.H./People														
mprove-	1,895															
ng	98,904	H.H./Land														
Dept. lling	55,114	Full Valuation	2,094	711	5,726	2,458	452	6,134	105	116	55	22,855	[illegible]	7,[illegible]	2,453	1,[illegible]
Construc-	19,810	Volume of Water Used		3,170					198			12,670	3,566			
tation	311,652	Full Valuation	11,843	4,020	32,381	13,900	2,556	34,687	592	654	312	129,242	16,424	40,[illegible]	[illegible]	11,[illegible]
Plant	150,122	Volume of Effluent	5,705	1,937	15,598	6,695	1,231	16,709	285	315	150	62,256	7,911	19,[illegible]	6,686	5,359
Street ts	974,715	Vehicle Registration	24,358	8,246	73,815	60,403	13,977	188,676	13,139	13,919	6,969	466,997	93,134	1,033	2,417	7,632
L CAPITAL EMENT																
Safety Fire	352		9	3	27	22	5	68	5	5	2	168	34		1	3
s		Vehicle Registration														
ado Widening	10,014		250	85	758	621	144	1,938	135	143	71	4,798	957	11	25	78
Lane	16,677		417	141	1,263	1,033	239	3,228	225	238	119	7,991	1,593	18	41	131
rnia Widening	43,582		1,089	369	3,300	2,701	625	8,436	588	622	312	20,881	4,164	48	108	341
ado Extension	71		2	1	5	4	1	14	1	1	1	33	7			1
c Avenue	4,000		101	34	303	248	57	774	54	57	29	1,[illegible]	322	[illegible]	[illegible]	31
n Avenue	3,336		83	28	251	207	48	647	45	48	24	1,596	319	4	[illegible]	25
Property	1,558		39	13	118	97	22	302	21	22	11	746	149	2	4	12
ition																
Center s	303		8	3	23	19	4	59	4	4	2	145	29		1	2
ary Sewers		Volume of Effluent														
Stockton Sewer	8,524		1,660	2,053	137	355	116	252		95		2,053	568	[illegible]	[illegible]	544
Plant Ponds	111,440		21,709	26,835	1,794	4,636	1,521	3,293		1,237		26,844	7,435	[illegible]	[illegible]	7,110
est Plant	52,938		10,312	12,747	852	2,202	723	1,564		588		12,753	3,532	[illegible]	153	3,377
Sewers	48,344	Land Area-City														
			2	1	2	1		1				11	1	5	2	6
ir Ditch	32		2,307	782	2,847	720	135	1,745	117	126	63	15,568	1,979	7,[illegible]	2,419	9,142
Stockton Trunk	44,970							4				32	4	[illegible]	5	19
Stormwater Study	93		5	2	6	1										
ood Manor Sewer	3,249		167	57	206	52	10	126	8	9	5	1,124	143	[illegible]	175	66[illegible]
treet Parking																
												755	209			
ry	964	H.H./People										36,197	7,427	4,717	1,[illegible]	1,888
Center	70,724	CBD-IN	2,794	2,369	4,286	2,482	516	5,934	262	226	120					
												43,075	11,931			
ry	55,006	H.H./People														
& Playgrounds		H.H./People														
												13,[illegible]	3,739			
ood Forest	17,240												12,618			
r Citizens Center	12,618											31,518	8,730			
uskirk Park	40,248											8,626	2,389			
Park	11,015															
Hydrants-Subd.	6,321	Full Valuation	240	82	657	282	52	704	12	13	6	2,621	333	81[illegible]	[illegible]	226
			158	124	126	327	105	228	53	16	19	7,338	2,280	[illegible]	[illegible]	497
ocated	11,477															
EXPENDITURES	2,886,623		91,701	65,962	163,720	115,210	519,790	324,700	19,274	22,082	10,086	1,145,547	230,655	94,[illegible]	31,177	52,168

* See Table 1 for definition of sectors.

V. THE MODEL AND EXPENDITURE ALTERNATIVES

We are now prepared to see how the detailed cost assignment and accounting procedure of expenditures for local government can be used to describe the interaction of public and private markets and forecast future public resource needs.

1. The Forecasting Framework

Estimation of local government expenditures on each benefiting sector of the economy, and consequently the derivation of government input coefficients, results in a government output function. Using the inverse $(I - A)^{-1}$ matrix (Table 3) and level of final demand activity in both the private and public sectors of the economy[1], it is possible to forecast future public service expenditures. The predicting equation for local government services is (See equation (3.23)):

$$X_{12} = b_{12,1}Y_1 + b_{12,2}Y_2 + \cdots + b_{12,12}Y_{12} + b_{12,13}Y_{13} \qquad (5.0)$$

where:

X_{12} = Total output (expenditures) for local government services,

$b_{12,1} \cdots b_{12,13}$ = the $12,j^{th}$ elements of the inverse $(I - A)$ matrix, (see (3.22)),

$Y_1 \cdots Y_{13}$ = levels of final demand for the private and public sectors of the economy (see (3.1)).

Replacing $b_{12,1} \cdots b_{12,13}$ (or the coefficients of direct and indirect purchases caused by future exogenous demand), with their actual values from the 12th row of Table 3, equation (5.0) becomes:

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[1] Note that for sectors X_{12} and X_{13}, final demand consists primarily of services provided for other public sectors, and only a small portion of actual export activity (see Table 1). If Stockton began a program of selling services to suburban communities the activity would be entered in the export column. The $209,000 that appears in the Local Government Services export column is the level of benefits accruing to county-wide users of the public library.

$$X_{12} = .007977Y_1 + .006597Y_2 + .010614Y_3 + .012753Y_4 + .005040Y_5 + .004569Y_6 + .010325Y_7 + .011738Y_8 + .009686Y_9 + .021069Y_{10} + .018131Y_{11} + 1.037524Y_{12} + .010062Y_{13} . \quad (5.1)$$

"Forecasts" of local government service expenditures can be made with this equation, given values for the Y's in future years. To test the accuracy of this equation on the short run, two years after 1962 were "forecasted" and compared with actual service expenditures for the city.

Estimation of final demand was made from a rough interpolation of figures developed by Arthur D. Little, Inc. Their assumption when projecting final demand to 1970 and 1975 for the Metropolitan area was a gradual diversification of the economic base.

> We said that at some point in the future (for this forecast 20 years) the Stockton economy will resemble the State of California. That is, non-resource based sectors of Stockton will contribute to the local economy the same proportion of output that they are contributing to the State as a whole. We are saying that the location quotients of non-resource based sectors in Stockton will equal 1 in 1982.[2]

Listed in Table 8 are the 1962 values for final demand taken from Table 1, plus Arthur D. Little's values for 1970 and 1975, and interpolated values for 1964 and 1965.

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[2] Arthur D. Little, Inc., The Metropolitan Stockton Economy, op. cit., p. 45.

Table 8
Projection of Final Demand*
(in thousands)

Sector	1962	1964	1965	1970	1975
1.	135,826	151,428	159,229	198,231	249,610
2.	116,767	136,065	145,714	193,961	252,890
3.	52,936	59,114	62,203	77,645	94,486
4.	42,472	46,592	48,652	58,953	73,914
5.	59,433	64,299	66,732	78,896	88,756
6.	280,953	311,615	326,946	403,602	517,520
7.	31,873	19,749	21,724	47,672	60,424
8.	6,910	7,726	8,134	10,177	12,848
9.	5,090	5,752	6,083	7,738	9,822
10.	112,401	120,163	124,044	143,449	168,772
11.	37,397	41,861	44,093	55,252	73,490
12.	1,042	1,232	1,327	1,798	2,364
13.	146	174	188	259	340

*See Arthur D. Little, The Metropolitan Stockton Economy, ibid., Table 11, p. 46.

Table 9 shows the results of the forecast values for total expenditures when compared to actual expenditure levels taken from the 1963-1964, and 1964-1965 financial reports for the city of Stockton.[3] Estimates of final demand that are founded upon values more closely approximating the

Table 9
Local Government Service Expenditures,
Actual and Forecasted for 1964 and 1965.
(in thousands)

Year	Local Government Services Actual Expenditures	Local Government Services "Forecasted" Expenditures	Percentage Error
1964	$10,254	$ 9,996	-2.5
1965	$10,133	$10,513	+3.7

actual sales to a final bill of goods during 1964 and 1965 would most likely

[3] Annual Financial Report, City of Stockton, California, fiscal years July 1, 1963-June 30, 1964, and July 1, 1964-June 30, 1965. See Statistical Table V, does not include Bond Service Payment.

result in an even better forecast of public expenditures. A closer approximation might be derived from economic activity in the State of California during these two fiscal years.

2. Forecasting and Alternative Expenditure Allocations.

It is important at this stage to recognize a major, and unfortunately limiting, assumption of interindustry models. This is that inputs are used in constant and empirically derived proportions in producing any particular product and that the production functions display constant returns to scale. One result of this assumption is the "hiding" or implicit inclusion of factor prices in the input coefficients. Thus, any shifts in local-metropolitan prices for factors of production or possible external economies or diseconomies of scale resulting from increased output and changing conditions in the suppliers market are not accounted for.

In addition to the limitation the constant input assumption places on the reliability of the model, an "implicit" price model does not provide a structure that is readily amenable to "searching" out optimal arrangements of resources in the economy. Thus, once projected levels of sector final demands are known, and the constant input coefficients, the system becomes completely deterministic without an understanding of the supply and demand process underlying the production of each industry's output. Models have been developed for State and national economies that are more sophisticated than input/output in the sense that they allow resource optimizing procedures without explicit price/cost statements.[4] But, in this instance of a metropolitan interindustry model we must limit ourselves to less precise "search" mechanisms.

One use of the interindustry model for determining "better" rather

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[4] See H. Theil, Optimal Decision Rules for Government and Industry, (Amsterdam: North-Holland Publishing Company, 1964).

than optimal allocations of scarce resources would be the establishment of target or goal values for important sectors of the economy.[5] The values could be set by local decision makers and then a new formulation of the input/output system's equations made to solve for, say, total public expenditures necessary to achieve the desired result. For example, in the Stockton economy, government representatives may be interested in knowing the level and allocation of expenditures necessary for a specified increase in permanent and seasonal household income. Setting the target values for the permanent and seasonal household sectors, a new set of simultaneous, linear and homogenous equations could be stated with government expenditures unknown. The solution would result in an estimate of total expenditures for local government necessary to achieve the target income values.

An alternative to the goal or target value approach was chosen for the Stockton model. Rather than requiring decision makers to judge upon desired levels of activity in future years, it seemed that a more realistic framework would be the testing of alternative expenditure choices that the City of Stockton might be considering for the next few years. The incremental nature of many local government budgetary decision necessitates that the budget designers and policy makers have an indication of what marginal values will result from new programs or budgetary re-allocations. A test procedure of this sort does not require the policy maker to place specific

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[5] A valuable development on the goal or objective statement in a model for the Hawaiian economy has been made by Roland Artle, "External Trade, Industrial Structure, Employment Mix, and the Distribution of Incomes: A Simple Model of Planning and Growth," The Swedish Journal of Economics, 1965. See J. Tinbergen, On the Theory of Economic Policy, and Economic Policy: Principles and Design (Amsterdam: North-Holland Publishing Company, 1963 and 1965), for a full elaboration of the target seeking model. An elucidating discussion of the difference between the Theil and Tinbergen models is presented by Bert Hickman in the Introduction to: B. Hickman (ed.), Quantitative Planning of Economic Policy, (Washington, D.C.: Brookings Institution, 1965), pp. 1-17.

dollar values on sector outputs in the future. And, the real value from an expenditure testing framework would be its emphasis on indicating general trends in the economic productivity of the economy, rather than emphasizing values of total output. In either case, whether a target achieving solution is chosen or an expenditure testing solution, the expenditure pattern of the public sector, and therefore the government equation, can be looked upon as the instrumental variable of the model.

A. Program for Incorporating Changes of Government Expenditure Levels in the Interindustry Account.

Given that the City of Stockton has a budgetary expenditure framework for evaluating the comparative magnitudes and feasibility of alternative allocations, a program is needed for incorporating each alternative in the model and measuring the impact of the change both on future expenditures and the total economy. A computer program was written to account for the changes in total output of the 13 endogenous sectors for future levels of final demand if shifts are made in the level of local government input coefficients. From this program, two major observations can be made about the effects of the change on the mixed-market economy.

First, the whole system and each sector of the system can be tested for sensitivity to incremental differences in the service cost/benefit values per sector. In the same manner, incremental changes in supply and contract allocation can be tested. Second, the effects of a new program benefiting specific sectors of the economy at the 1962 level of final demand and total output, can be measured in terms of future local government expenditure needs (assuming that the program is operated at a constant level of benefit incidence in the future). In both cases we can assume a constant level of 1962 public expenditures or we can assume an absolute increase in the 1962 expenditure level.

Figure II demonstrates how a new expenditure allocation is

incorporated into the account system, and Figure III, how this new allocation is manipulated in the computer program to give a new matrix of coefficients, a new inversion, and a new solution for total output.

Figure II is a symbolic representation of the interindustry account shown in Table 1. As indicated earlier, the sum of the values in any row, say $\sum_{j=1}^{13} X_{12,j}$, must be equal to the sum of the values in the corresponding column, $\sum_{i=1}^{13} X_{i,12}$. Whereas the column for local government supply and contract allocation ($X_{i,12}$, $X_{i,13}$) has its values determined by the goods and services the City actually purchased from local and non-local sectors during 1962, beneficiary allocation, the local government rows ($X_{12,j}$, $X_{13,j}$), have been estimated by service cost/benefit criteria. It is therefore possible to change the row values to reflect new incidences of cost/benefit suggested by policy alternatives.

For example, suppose the City's planners were to assume that inputs of local government services and construction were to be equally distributed between the endogenous sectors of the model.

That is,

$$X_{12} - Y_{12} = \sum_{j=1}^{13} X_{12,j} \qquad (5.2)$$

and

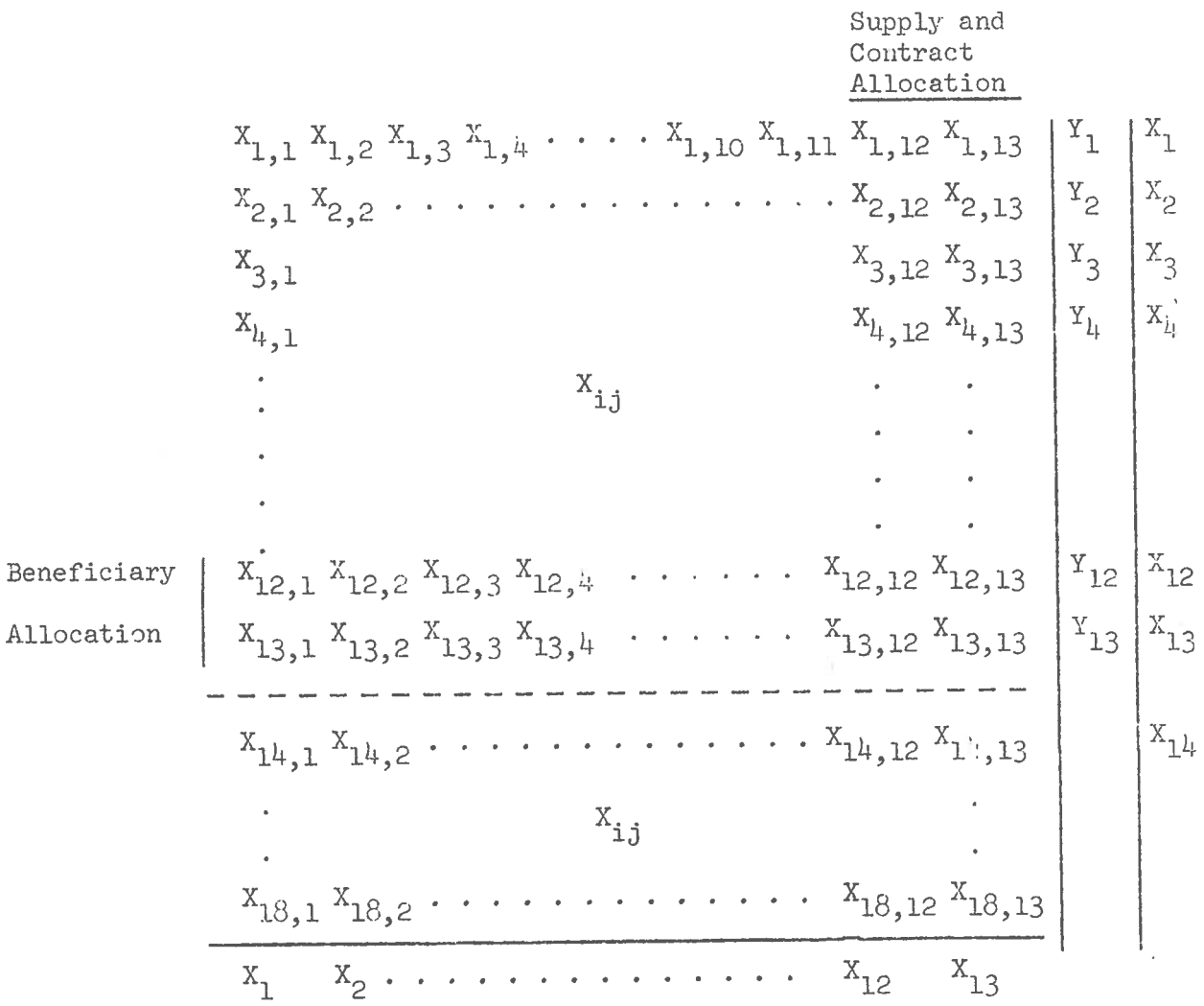
$$X_{13} - Y_{13} = \sum_{j=1}^{13} X_{13,j} \quad , \qquad (5.3)$$

where:

X_{12} = Total expenditures on Local Government Services

Y_{12} = Expenditures of Local Government Services allocated to final demand,

Figure II


Supply and Contract Allocation
Beneficiary Allocation
$X_{1,1}$ $X_{1,2}$ $X_{1,3}$ $X_{1,4}$ . . . . $X_{1,10}$ $X_{1,11}$ $X_{1,12}$ $X_{1,13}$ Y_1 X_1
$X_{2,1}$ $X_{2,2}$ . . . . . $X_{2,12}$ $X_{2,13}$ Y_2 X_2
$X_{3,1}$ $X_{3,12}$ $X_{3,13}$ Y_3 X_3
$X_{4,1}$ $X_{4,12}$ $X_{4,13}$ Y_4 X_4
X_{ij}
$X_{12,1}$ $X_{12,2}$ $X_{12,3}$ $X_{12,4}$ . . . . . $X_{12,12}$ $X_{12,13}$ Y_{12} X_{12}
$X_{13,1}$ $X_{13,2}$ $X_{13,3}$ $X_{13,4}$ . . . . . $X_{13,12}$ $X_{13,13}$ Y_{13} X_{13}
$X_{14,1}$ $X_{14,2}$ . . . . . $X_{14,12}$ $X_{14,13}$ X_{14}
X_{ij}
$X_{18,1}$ $X_{18,2}$ . . . . . $X_{18,12}$ $X_{18,13}$
X_1 X_2 . . . . . X_{12} X_{13}

$\sum_{i=1}^{13} X_{12,j}$ = Expenditures of Local Government accruing to the local economy;

and the same for X_{13} and Y_{13} (Local Government Construction);

then make,

$$X_{12,1} = X_{12,2} = X_{12,3} = \ldots\ldots\ldots = X_{12,13} \qquad (5.4)$$

and

$$X_{13,1} = X_{13,2} = X_{13,3} = \ldots\ldots\ldots = X_{13,13} \ . \qquad (5.5)$$

This would result in a total shifting of values for rows X_{12} and X_{13}, making each sectors cost/benefit entry from local government equal to every other sector's entry.

Making this change in the account system permits us to carry through the procedure of calculating coefficients of constant input, shown as the second step of the computer program in Figure III, where a_{ij} is a coefficient, and:

$$a_{ij} = \frac{X_{ij}}{X_j} \ .$$

The matrix of a_{ij}'s is then a (13 x 13) square matrix. Figure III shows how the program goes through the calculation of an (I - A) matrix (Step III), the matrix inversion (Step IV), and pre-multiplication of the inverse by a column vector of final demands (Step V), in this case for 1970 and 1975. The pre-multiplication gives values for total sector outputs in 1970 and 1975 (Step VI), from which a value for future local government expenditures can be extracted.[6]

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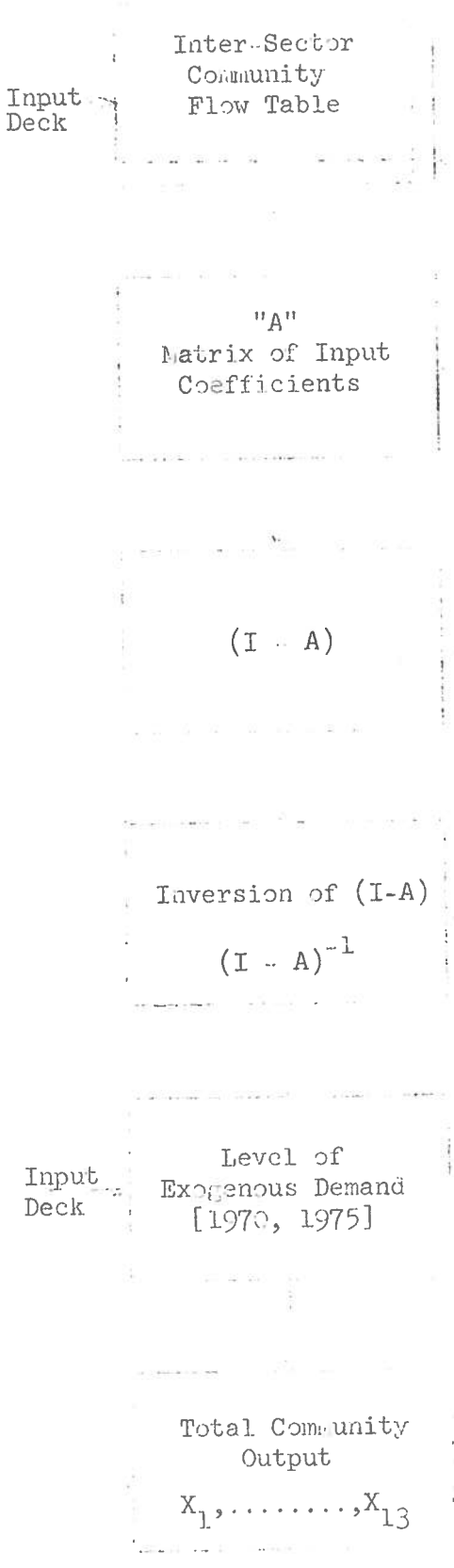
[6] Note that this procedure for altering the government account does not reconcile the interindustry table before beginning the iterative process on new final demand statements. Specifically, it does not include a re-tabulation of sector row accounts to equate them with the new column totals arising from the local government re-allocation. (An exogenous dummy column could be added with appropriate positive or negative entries to reconcile corresponding rows and columns.) Thus, with each new allocation, we are in essence making a unique modification of the original, empirically derived, flow account.

FIGURE III

Flow Diagram of the Computer Program for Public Expenditure Model



Following through this example with the new allocation actually carried out, the values for each local government row entry would be $X_{12,j}$ = 674,000, and $X_{13,j}$ = 228,000, where (j = 1,. . . . ,13). The coefficients of constant input with these values inserted are shown in Table 10A. Compare these entries with Table 2, for an indication of the relative effect the new government allocation has on each industry's production function. Table 10B presents the (I - A) matrix, and Table 11, the (1 - A) inverse. Table 11 should be compared with Table 3. Comparable total output values for the original local government allocation (entitled Run I) and the equal distribution of local government cost/ benefit per sector (Run II), are shown for 1970 and 1975 levels of final demand in Table 12.

TABLE 10

Matrix of Input Coefficients (A) and (I - A) for Expenditure Model Using an Equal Distribution of Local Government Cost/Benefit Per Sector.

TABLE 10A

.068035	.047752	.016075	.002679	.035460	.005460	.060806	.072992	.015887	.001718	.000438	.062385	0.000000
.000012	.000446	0.000000	0.000000	.016518	.005767	0.000000	0.000000	0.000000	.004472	.004738	0.000000	0.000000
.072981	.054801	.024053	.006025	.026241	.008236	.007804	.016359	.053092	.102156	.006844	.007747	0.000000
.013936	.003976	.020970	.035270	.020091	.005256	.032127	.084235	.028694	.187644	.063941	.037920	0.000000
.022316	.015658	.015221	.023069	.029823	.026565	.051796	.113979	.113641	.193672	.120449	.058613	0.000000
.063384	.033109	.075891	.013052	.111410	.060227	.092370	.321177	.366701	.361666	.159577	.120591	0.000000
.009024	.015966	.018510	.001275	.003052	.006565	.072652	.031926	.034692	.013690	.000632	0.000000	.735019
.000398	.000792	.003364	.002699	.001647	.000711	.007007	.033395	.007619	.017309	.003469	0.000000	.207828
.000310	.000240	.000565	.002269	.001132	.000137	.008156	.070196	.061603	.008729	.006978	0.000000	.003463
.187522	.087543	.211340	.424180	.116971	.097570	.297634	.174301	.144686	0.000000	0.000000	.611620	0.000000
.011369	.044695	.006761	.024227	.011286	.009415	.037540	.022010	.018237	.011465	0.000000	0.000000	0.000000
.004192	.005392	.005040	.005274	.003816	.001321	.012494	.040095	.054632	.002071	.010938	.068705	0.000000
.001418	.001824	.001907	.001784	.001291	.000447	.004226	.013563	.018480	.000700	.003700	.023241	0.000000
.001505	.000920	.004401	.003748	.000804	.002352	.001742	.004516	.003647	.068508	.433632	.007339	0.000000
.000143	.000064	.000569	.000430	.000073	.000331	.000222	.000715	.000486	.007091	.009704	.000407	0.000000
.000695	.000952	.000535	.001299	.000305	.000227	.000500	.003475	.000810	.016256	.021503	.001223	0.000000
.000124	.000128	.000117	.000269	.000067	.000049	.000111	.000118	.000162	.002406	.004136	.000203	0.000000
.092428	.068512	.593251	.452218	.550003	.749313	.312798	0.000000	.076923	0.000000	.147292	0.000000	.053688
1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

TABLE 10B

.931964	-.047752	-.016075	-.002679	-.035460	-.005460	-.060806	-.072992	-.015887	-.001718	-.000438	-.062385	0.000000
-.000012	.999552	0.000000	0.000000	-.016518	-.005767	0.000000	0.000000	0.000000	-.004472	-.004738	0.000000	0.000000
-.072981	-.054801	.975140	-.006025	-.026241	-.008236	-.007804	-.016359	-.053092	-.102156	-.006844	-.007747	0.000000
-.013936	-.003976	-.020970	.964723	-.020091	-.005256	-.032127	-.084235	-.028694	-.187644	-.063941	-.037920	0.000000
-.022316	-.015658	-.015221	-.023069	.970176	-.026565	-.051796	-.113979	-.113641	-.193672	-.120449	-.058613	0.000000
-.063384	-.033109	-.075891	-.013052	-.111410	.919772	-.092370	-.321177	-.366701	-.361666	-.159577	-.120591	0.000000
-.009024	-.015966	-.018510	-.001275	-.003052	-.006565	.927347	-.031926	-.034692	-.013690	-.000632	0.000000	-.735019
-.000398	-.000792	-.003364	-.002699	-.001647	-.000711	-.007007	.966605	-.007619	-.017309	-.003469	0.000000	-.207828
-.000310	-.000240	-.000565	-.002269	-.001132	-.000137	-.008156	-.070196	.938396	-.008729	-.006978	0.000000	-.003463
-.187522	-.087543	-.211340	-.424180	-.116971	-.097570	-.297634	-.174301	-.144686	1.000000	0.000000	-.611620	0.000000
-.011369	-.044695	-.006761	-.024227	-.011286	-.009415	-.037540	-.022010	-.018237	-.011465	1.000000	0.000000	0.000000
-.004192	-.005392	-.005040	-.005274	-.003816	-.001321	-.012494	-.040095	-.054632	-.002071	-.010938	.931294	0.000000
-.001418	-.001824	-.001907	-.001784	-.001291	-.000447	-.004226	-.013563	-.018480	-.000700	-.003700	-.023241	1.000000

TABLE 11

Matrix Inverse for Expenditure Model Using an Equal Distribution of Local Government Cost/ Benefit Per Sector

1.018356	.056129	.026997	.017024	.047690
.011756	.082770	.104099	.044666	.025152
.011701	.092239	.082627		
.004469	1.003465	.004703	.007355	.021835
.008759	.008035	.019992	.01 312	.014286
.009582	.012754	.005220		
.113637	.083223	1.068397	.078105	.063359
.030379	.079671	.097036	.121179	.152127
.030311	.129485	.079146		
.081754	.048070	.094429	1.161862	.075164
.041343	.150750	.206715	.134827	.256103
.096028	.242276	.154645		
.104986	.072415	.104618	.173621	1.164836
.073405	.201763	.287606	.265401	.306728
.171535	.305760	.208992		
.222062	.140721	.246292	.293215	.251868
1.169020	.374373	.665928	.069925	.079705
.253775	.587185	.415890		
.021350	.026168	.032018	.018706	.013743
.012985	1.098985	.070797	.074738	.032010
.010358	.046560	.822747		
.007596	.005674	.011280	.015633	.007512
.004456	.020263	1.050349	.023429	.026189
.007726	.025310	.233267		
.004462	.003219	.005375	.010161	.004664
.002412	.016959	.085136	1.073128	.015490
.009718	.012382	.033876		
.297401	.173378	.326050	.578966	.227823
.156723	.503392	.479617	.413004	1.266358
.110033	.924276	.471111		
.022263	.052713	.018810	.041790	.022668
.015995	.059077	.049733	.041987	.033925
1.009417	.030472	.053904		
.006304	.009125	.010109	.011599	.007836
.003525	.021539	.057241	.070172	.010393
.015040	1.083350	.027971		
.002809	.003086	.003419	.003923	.002650
.001192	.007286	.019363	.023737	.003515
.005086	.026199	1.009462		

Table 12

Comparison of Total Output Values for 1970 and 1975 with Different Local Government Cost/Benefit Allocations

Total Output
[000's]

Sectors	1970		1975		Percent Change Run I - Run II
	Run I	Run II	Run I	Run II	
1.	234,427	234,157	294,971	294,641	-.12
2.	204,724	204,759	266,180	266,223	+.02
3.	172,636	172,963	212,565	212,965	+.19
4.	177,499	178,283	220,167	221,140	+.44
5.	243,060	243,711	291,798	292,610	+.27
6.	726,725	727,566	918,035	919,081	+.12
7.	78,466	78,373	98,962	98,897	-.12
8.	22,879	22,922	28,535	28,602	+.12
9.	16,769	16,636	21,043	20,878	-.79
10.	456,271	454,855	559,493	557,802	-.31
11.	91,237	91,162	118,759	118,663	-.12
12.	13,258	13,356	16,631	16,870	+.74
13.	4,123	4,169	5,122	5,247	+1.12

Run I = Original 1962 Local Government Allocation.

Run II = Equal Distribution of Local Government Cost/Benefit Per Sector

B. A Conclusion on the Impact of Government Expenditure Re-allocation.

No attempt will be made to interpret what the theoretical or practical implications are of this example distribution of cost/benefit. A more carefully designed allocation will follow below. But, the impact of this rather extreme re-adjustment of the government row on estimates of future total output are considerably less extreme. Whereas for many sectors the even distribution of government expenditures was a major change of the input value from the public sector, the effect of this change on input coefficients and projected levels of total output is considerably less. The Percent Change column in Table 12 is the best indicator of the minor impact the government re-allocation had on the whole economy.

A conclusion that can be drawn from this is that local government expenditures are such a small part of the productive capacity of a metropolitan area, that their usefulness as a policy instrument affecting macro-economic activity should not be over-emphasized. Further research is needed to verify this conclusion, and to outline categories of expenditures in local government that have an incidence of individual productivity benefit relatively greater than other expenditures. It then would be possible to give these expenditures special consideration through the use of a "shadow pricing" mechanism, thereby acknowledging their importance with respect to the remainder of the economy.

A corollary to the above conclusion is an observation which applies specifically to the Stockton Urbanized Area, and is important to the predictive accuracy of the interindustry model for public expenditures. A significantly large proportion of industry inputs (particularly the first six sectors) are included in the Unallocated Input category. No official tabulation was made from industry questionnaires, but a major portion of this sector is imports of goods and services from outside the S.U.A. Because

Stockton has not as yet developed into a diversified economy, much of the potential multiplier effect from export sales is lost to the rest-of-the-world on purchases of basic input resources (largely intermediate and finished products). The meaning of this existing market relationship for the model, is a relatively low explanatory value of sectors that are endogenous to the economy. Much of their productivity relationships are a function of forces exogenous to the local area. The economy may diversify and increase purchases of local products, or the existing importance of exogenous activity might continue. In both cases, the coefficients are likely to be susceptable to some structural changes. In the use of this model for public expenditure forecasting, and other metropolitan interindustry models, it would be important to have periodic re-estimates of the structural coefficients.[7]

The difficulty of interpreting the minor differential impact of public sector re-allocations places the most significant use of the expenditure model on its ability to forecast future expenditure levels.

C. Use of the Model, An Example: New Government Programs for for Seasonal Employment.

In the next few years, it is likely that the City of Stockton will embark upon a number of new programs aimed at improving the housing

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[7] Karl Fox and Erik Thorbecke have made a valuable investigation on the stability of coefficients for interindustry activities in the Netherlands. As a general rule they state:

> the revision of the input-output coefficients should be undertaken when the loss of welfare for a given set of the instruments is equal to the cost of preparing a new set of estimates for the a_{ij}'s. It is, of course, obvious that there exists the inherent difficulty in the above calculus of measuring the welfare benefits and the computational and statistical costs of better parameters in comparable units. (p. 52)

After specifying a number of variables which account for the change in coefficients, their Dutch study concludes that there is:

> . . . some evidence that forecasts are superior to naive extrapolations as long as the input-output matrix used to generate them is not more than two or three years older than the ratios of final

and job environment for its low income seasonal employment households. For any one of the whole package of new services and programs that may be offered, it will be desired by the project designers and operators to maintain the effectiveness of the projects regardless of new demands on available resources. One way of measuring effectiveness would be the level of expenditure per household, and a goal of a project might be to maintain the current per household expenditure in the future. Given the additional demands of new seasonal households, a planner would want to know what additional budget requirement will be required, and the City budget officer would in turn want to know what demands this project would place on available tax revenues.

Let us assume we are going to compare the differential impact of three alternative programs. To include these programs in the expenditure model we can make them additions to the budgetary expenditures made in 1962. Let Program A = $50,000, Program B = $250,000, and Program C = $500,000. If the new expenditures are going to provide direct benefits to no other sector of the economy than seasonal households, Figure VI shows the impact of each program on the value of the local government service coefficient to seasonal households. The progressively larger scale programs push the homogenous and linear input function for local government services into a position of correspondingly greater slopes. For a constant level of output from seasonal households (E), the requirements for government inputs are increased to DOA for Program A, DOB for Program B, and DOC for Program C, representing the intensity of the program investment on seasonal households. This indicates that as activity in the seasonal household sector increases,

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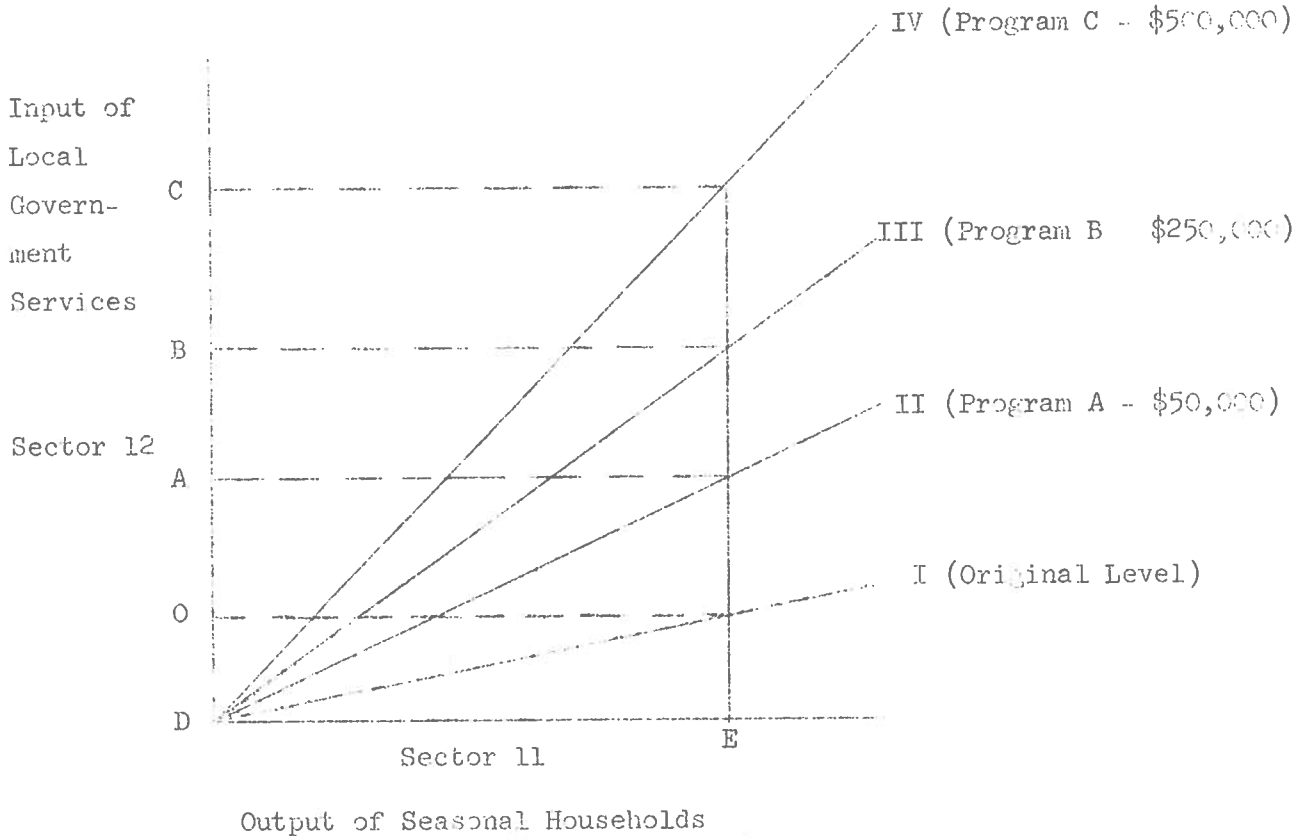
demand to total production on which the extrapolations are based. (p. 56)

See Karl Fox and Erik Thorbecke, "Specification of Structures and Data Requirements in Policy Models," in Bert Hickman (ed.), Quantitative Planning of Economic Policy, op. cit., pp. 43-86.

FIGURE VI



proportionately more inputs of government services will be required than under the original value used in the model without Programs A, B or C. To give this relationship meaning we must explain "activity in the seasonal household sector."

The explanatory or "independent" variable in an interindustry model is the Y value, or level of final demand. In terms of the low income, seasonal employment projects being considered, we must evaluate the variables which comprise final demand for Sector 11, Seasonal Households. Referring to Table 1, the only exogenous "sales" to final demand for Sector 11 are payments from Other Government Services, specifically the State of California, for $37,397,000. The remaining governmental units, San Joaquin County, U.S. Federal Government, Special Districts, and the semi-public agencies, did not report a significantly large enough outlay for seasonal work to be considered in the account. Because only local

firms were used to determine the level of seasonal payrolls, it was not possible to estimate t e amount of seasonal employment that exported its services. This explains the lack of an entry for the export column, Sector 18. Thus the chief "explanatory" value for seasonal household activity in the future will be cash payments from the State of California.

Of the $37 million paid by departments from the State of California, approximately $9 million was given out in the form of welfare payments (see Table A-1 in the Appendix under Public Assistance) and the remaining $28 million as wage and salary payments for seasonal work. To what degree can we assume that an increase in the value of these two expenditures by the State of California in Stockton reflects a greater absolute demand on the locally sponsored seasonal household project? The accuracy and dependability of the model will be improved if we do isolate State expenditures that reflect a general increase in local seasonal employment.

An estimation of these State expenditures could be made by distinguishing new expenditures that are a function of per-capita increases in payments (either welfare or wages) to seasonal households, from those that are resulting from an increased population of seasonal workers.[8] Only new expenditures resulting from a population increase would be used to forecast demands on the local project. Projections of final demand for seasonal households would then be divided into two figures, one accounting for increases in income due to population increases, and the other accounting for increases in per-capita wage and welfare payments. The same split should be made for permanent households, as it has been suggested that with per-

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[8] The concepts of per-capita income change and population income change has been introduced formally by Charles Tiebout in evaluating income growth for local areas. See: Charles M. Tiebout and Theodore Lane, The Local Service Sector and the Structure of Income Growth, University of Washington and University of Wisconsin, 1965, mimeo.

capita increases in income, individuals tend to change their consumption patterns.[9] Such per-capita increases would therefore result in a shifting of the constant input coefficients for the household sectors. Thus, with respect to the appropriate explanatory variable for both seasonal and permanent households, increased income due to population change is the relevant and best forecasting variable.

With good estimates of the Y values for the planning period, our proposed seasonal household projects can forecast what demands they will place on municipal resources in future years. Using the Arthur D. Little, Inc., estimates of final demand, unadjusted for the per-capita - population distinction, we can show what the effect of the alternative programs are on forecasted local government expenditures. Table 13 shows what the original model forecasts for 1970 and 1975 local expenditures, and comparison values for the three alternative Programs, A, B and C.

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[9] Tiebout, Ibid.

Table 13

Forecasted Local Government Expenditures in 1970 and 1975 With Three Alternative Programs. (000's dollars)

		1970				1975			
	1962 Expenditures	Original Model	Program A	Program B	Program C	Original Model	Program A	Program B	Program C
Local Government Services	9,129	13,258	13,333	13,362	14,003	16,631	16,729	17,119	17,602
Local Government Construction	2,887	4,123	4,124	4,125	4,126	5,122	5,123	5,124	5,126

VI. SUMMARY AND CONCLUSIONS

This thesis has studied the usefulness of interindustry models as a framework for government expenditure analysis. Its main objective has been to explore the possibility of including local government in the endogenous portion of a "working" model. To do this, a large proportion of the presentation has been devoted to a description of the problems which arise when designing and carrying out the accounts in a metropolitan area. The final section has been devoted to testing the impact of expenditure alternatives.

Together, the description and test computer runs have resulted in a number of findings that are useful to the development of techniques for metropolitan economic analysis. If an interindustry approach is used, it is clear that a careful disaggregation of government expenditures must be made that is founded upon a distinction between recurring allocations, and allocations that are "autonomous" with respect to a fiscal year budget. In addition to this distinction, public outlays need to have finer disaggregation on the basis of their type, e.g., whether allocations are made in the form of transfer payments or wages and salaries. Eventually, a number of sub-models need to be designed that can account for the many categories of benefits that accrue both to the individual and the community as a result of expenditures made in differential forms. Such sub-models will need to utilize a well designed shadow-price format. These sub-models could be related to the parent interindustry model (which would utilize the proper tax paid entries for government) by comparing the impact of alternative benefit distributions which incorporated shadow values. The shadow values might be designed to reflect the increase in sector capacity for production resulting from expenditures, rather than the service cost/benefit weighting utilized in this study.[1]

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[1] I have benefited from the comments of Roland Artle on the applicability of "capacity" measurements rather than cost/benefit measures.

The test runs of the model have revealed some definite limitations of local expenditures as a counter-cyclical policy variable of the metropolitan Stockton economy. While this again suggests the need for more sophisticated models of metropolitan public expenditures than those incorporating purely dollar quantities, the use of private sector interindustry models to forecast public expenditures certainly holds promise, and is worthy of further investigation.

APPENDIX

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TABLE A-1

Local (Stockton Urbanized Area) Expenditures
and Benefit/Cost Criteria
For Other Government Services - Sector 14
Fiscal Year 1961-62

Agency and Function	Local (S.U.A.) Expenditures	Benefit/Cost Criterion	Export Expenditures
SAN JOAQUIN COUNTY			
General Government	1,303,383	General (weighted average)	
Public Protection			
Judicial	271,622	Pop. Time Budg.	209,468
Stockton Municipal Court	227,266	Pop. Time Budg.	1,707
Police Protection			
Sheriff	312,420	Full Valuation	355,850
Stockton Marshall	37,443	Pop. Time Budg.	---
Detention & Correction	588,033	Time Budget	453,480
Fire Warden	5,331	Full Valuation	6,072
Flood Control	29,695	Full Valuation	22,677
Inspection	57,183	Value Bldg. Permits	65,133
Other	142,425	Time Budget	109,837
Roads			
Administrative	39,552	Veh. Reg.	45,052
Maintenance	664,689	Veh. Reg.	757,108
Bridges & Ferries	45,558	Veh. Reg.	51,892
Health & Sanitation			
Mental Health	138,089	H.H.-people	105,454
Alcoholic Rehab.	14,498	H.H.-people	11,072
Utility Districts	20,678	H.H.-people	23,553
Rubbish Disposal	20,339	Time Budget	15,732
Public Assistance			
Administration	679,597		518,987
Aid Programs			
Aged	4,367,684	H.H.-Seasonal	35,659
Blind	539,395	H.H.-People	1,020
Potentially Self-Supporting Blind	-871	H.H.-Seasonal	8,142
Needy Children	2,666,454	H.H.-Seasonal	312,145

TABLE A-1 (Con't.)

Agency and Function	Local (S.J.A.) Expenditures	Benefit/Cost Criterion	Export Expenditures
Disabled	343,610	H.H.-Seasonal	384,351
Medical Assistance	189,130	H.H.-Seasonal	266,861
Medical Care - Trans.	10,948	H.H.-People	8,360
Medical Care Program	640,009	H.H.-People	488,754
Crippled Children	150,310	H.H.-People	---
Adoptions-Maternity	1,414	H.H.-People	1,079
General Relief	74,565	H.H.-Seasonal	56,943
Total	8,984,390		
Burials	3,390	H.H.-Seasonal	2,590
Veterans Service Officer	14,879	H.H.-People	18,879
Recreation			
Micke Grove Park & Zoo	74,661	H.H.-People	57,016
Recreation	44,043	H.H.-People	---
Museum	3,402	H.H.-Income	2,598
Veterans' Mem. Bldgs.	3,385	H.H.-Income	---
TOTAL SAN JOAQUIN COUNTY	13,964,178		4,573,167
SCHOOL DISTRICTS			
Lincoln) Stockton City)	15,525,747	H.H.-People	
STATE OF CALIFORNIA			
Alcoholic Beverage Control	47,201	Wholesale-Retail Sectors	77,015
Board of Equalization	41,904	Gross Sales	---
Bureau of Livestock	---	---	18,400
Dept. of Corrections	49,328	Time Budget	37,969
Calif. Youth Authority	---		---
Dept. of Employment	756,153	Time Budget	---
Dept. of Mental Hygiene	111,750	H.H.-Seasonal	---
Dept. of Motor Vehicles	138,000	Veh. Registration	---
Division of Architecture	---	---	---
Division of Beaches and Parks	---		100,000
Division of Highways	3,425,000	Veh. Registration	
Franchise Tax Board	16,913	H.H.-Income	39,463
Ind. Relations Dept.	85,910	Time Budget	177,135
Dept. of Agriculture	---		137,042
Highway Patrol	566,552	Veh. Registration	45,324
TOTAL STATE OF CALIFORNIA	5,238,711		1,335,803

TABLE A-1 (Con't.)

Agency and Function	Local (S.U.A.) Expenditures	Benefit Cost Criterion	Export Expenditures
Farmers Home Administration	---	---	19,035
Soil Conservation Service	---	---	75,000
Other	---	---	785,760
FEDERAL GOVERNMENT TOTAL	17,009,679		33,006,346
TOTAL OTHER GOVERNMENT SERVICE EXPENDITURES	37,094,172		57,503,000

TABLE A-1 (Con't.)

Agency and Function	Local (S.U.A.) Expenditures	Benefit Cost Criterion	Export Expenditures
SPECIAL DISTRICTS			
San Joaquin Local Health	188,675	Land Area S.U.A.	510,121
San Joaquin Mosquito Abatement	102,284	"	174,160
Zone #8 Flood Control and Water Conservation	25,400	"	19,957
Zone #2 Flood Control and Water Conservation	9,237	"	6,688
Stockton-East San Joaquin Water Conservation	41,577	"	34,018
Tuxedo Country Club - Fire	123,044	H.H.-S.D.*	---
Waterloo-Morada Fire	21,185	H.H.-S.D.	25,893
Lincoln Village (Light, Sewer, Water)	32,059	H.H.-Permanent	21,372
N.E. Stockton - Lighting	14,445	H.H.-S.D.	---
No. 1614 Reclamation	11,440	H.H.-S.D.	---
Country Club Sanitation Dist.	9,801	H.H.-S.D.	---
Pacific Gardens - City Sanitation	39,017	H.H.-Permanent	---
San Joaquin County Flood Control	11,139	H.H.-S.D.	31,702
SPECIAL DISTRICTS TOTAL	881,604		1,067,853
FEDERAL GOVERNMENT			
Post Office	2,522,520	Pop./Time	---
Internal Revenue Service	311,000	Pop./Time	---
Social Security Adm.	11,511,159	H.H.-Seasonal	10,927,747
Veteran's Administration	2,665,000	H.H.-People	2,113,000
Sharpe Army Depot	---	---	14,313,744
Stockton Army Reserve	---	---	85,500
Naval Supply Annex	---	---	2,890,000
Naval Communication	---	---	1,754,000

*Based upon land area in all Special Districts.

TABLE A-2

Local (Stockton Urbanized Area) Expenditures
and Benefit/Cost Criteria
For Other Government Construction - Sector 15
Fiscal Year 1961-62

Agency and Function	Local (S.U.A.) Expenditures	Benefit/Cost Criterion	Export Expenditures
SAN JOAQUIN COUNTY			
Court House	42,469	General	
Jail and Honor Farm	4,180	People/Time	
Road Construction	24,984	Vehicle Registration	1,370,724
District #1	566,767	Vehicle Registration	
Veterans Bldgs.	414	H.H.-People	
TOTAL SAN JOAQUIN COUNTY	638,814		1,370,724
SCHOOL DISTRICTS			
Lincoln Stockton City	2,329,111	H.H.-People	
STATE OF CALIFORNIA			
Highway	30,000	Veh. Registration	
Dept. of Employment	22,387	People/Time	
Dept. of Motor Vehicles	181,809	Veh. Registration	3,356,107
Military Dept.	17,000	People/Time	
TOTAL STATE OF CALIFORNIA	251,196		
SPECIAL DISTRICTS			
Fire			
Boggs Tract	4,601	Full Valuation	---
East Side Rural	7,583	Full Valuation	22,750
French Camp-McKinley	7,640	Full Valuation	---
Lincoln Rural	11,631	Full Valuation	11,631
Tuxedo-Country Club	18,326	H.H.-S.D.	---
Waterloo-Morada	4,155	H.H.-S.D.	5,078
Montezuma	5,045	Full Valuation	3,964
Lincoln Village (Light, Sewer & Water)	12,810	H.H.-Permanent	8,540
San Joaquin Flood Control and Water Conservation	68	H.H.-S.D.	205
TOTAL SPECIAL DISTRICTS	71,859		52,168
TOTAL OTHER GOVERNMENT CONSTRUCTION EXPENDITURES	3,290,980		5,016,255

TABLE A-3

Local (Stockton Urbanized Area) Expenditures
and Benefit/Cost Criteria
For Semi-Public Services and Construction - Sectors 16 and 17
Fiscal Year 1961-62

Agency and Function	Local (S.U.A.) Expenditures	Benefit/Cost Criterion	Export Expenditures
SERVICE EXPENDITURES			
Stockton Port District	119,631	Mfg. & Food* Processing	5,861,957
Stockton Airport	112,347	Pop./Time	77,639
University of the Pacific	1,076,412	H.H.-Permanent	3,299,247
Stockton State Hospital	612,591	H.H.-People	8,739,952
San Joaquin General	2,386,993	Pop./Time	1,840,797
Emergency Hospital	74,075	Pop./Time	21,206
St. Joseph's Hospital	2,038,088	Pop./Time	374,968
County (Care of Court Wards)	32,139	H.H.-Seasonal	24,543
Dameron Hospital	1,232,770	Pop./Time	317,451
TOTAL SERVICE EXPENDITURES	7,685,046		20,557,760
CONSTRUCTION EXPENDITURES			
Stockton Port District	4,845	Mfg. and Food* Processing	237,393
Stockton Airport	406,138	Pop./Time	313,204
University of the Pacific	91,020	H.H.-Permanent	278,980
Stockton State Hospital	2,004	H.H.-People	303,904
San Joaquin General	393,022	Pop./Time	302,090
St. Joseph's Hospital	483,729	Pop./Time	88,997
TOTAL CONSTRUCTION EXPENDITURES	1,380,758		1,524,568

*Manufacturing and Food Processing are the major local users of Port facility.