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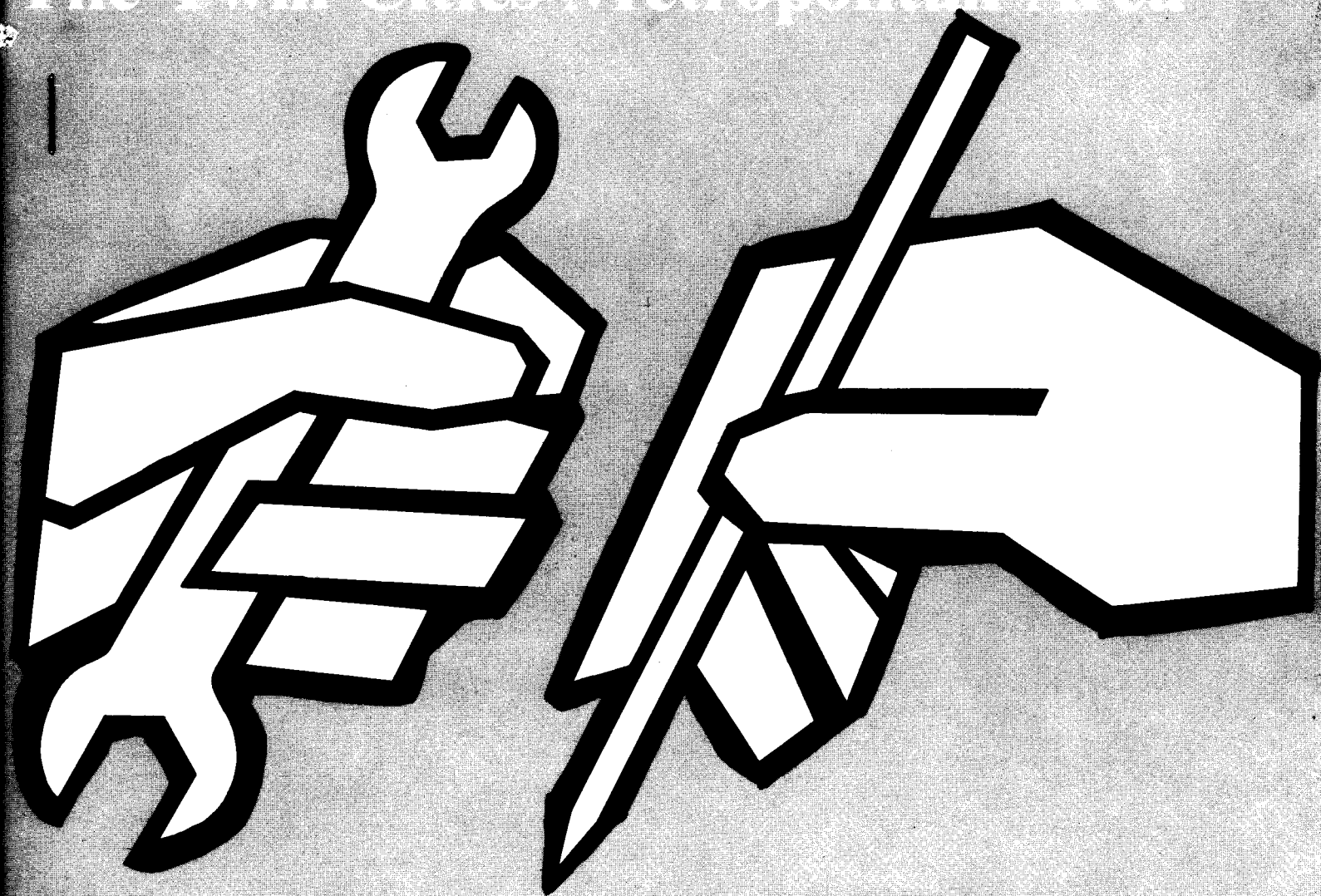
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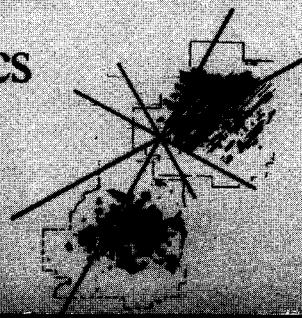
# The Fiscal Impact of Employment in The Twin Cities Metropolitan Area



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Economic Study Report S69-1  
THE FISCAL IMPACT OF EMPLOYMENT  
IN THE TWIN CITIES METROPOLITAN AREA

by  
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## FOREWORD

This is the second of a series of research reports dealing with the effects of changes in land use and socio-economic variables on local revenues (tax base) and expenditures (public services) in the Twin Cities Metropolitan Area. These reports form an integral part of a larger community service and continuing education program conducted by the Department of Agricultural Economics with financial assistance from the Higher Education Coordinating Commission through a grant made available under Title I of the Higher Education Act of 1965.

This program, entitled "Metropolitan Growth, the Impact of Alternative Patterns," forms a part of a larger, and growing, departmental program in Land and Resource Economics and Policy. This program area includes resident instruction, research, and continuing education activities involving the study of alternative uses of Minnesota's land, water, and mineral and human resources. Increased attention is being devoted to community development with special emphasis on the potential for increased industrialization in rural and urban regions of the state.

V. W. Ruttan, Head  
Department of Agricultural Economics

## PREFACE

This study is a part of the University of Minnesota Community Service Program entitled "Metropolitan Growth: The Impact of alternative Patterns". The program includes a community service educational activity and a supporting research effort. This study reports the results of research on the impact of the employment structure on taxable value and public service expenditures for suburban municipalities in the Twin Cities Metropolitan area.

The results were based on data for one year, using the technique of regression analysis. This should be kept in mind while using the study results. The conclusions represent one useful guide in making decisions about the future pattern of growth. However, other factors affecting the planned future must be considered also.

For example, employment is only one phase of developing programs of future development. A comprehensive plan of development should consider the interactions of employment, land use, capital, transportation, and other variables.

Another aspect which should be borne in mind is that this analysis deals with municipal tax base and current municipal expenditures. To assess the total impact of a change in employment (or in other economic factors), its effect on other units of local government (for example, school districts) should be considered also.

Without the fiscal support acknowledged on the title page of this report, this study could not have been done. Appreciation is expressed also to the members of both the Community Advisory Group and the University Faculty Advisors for consistent support of the program. In addition, special acknowledgment is due to the Chief and the staff of Comprehensive Transportation Planning Section of Minnesota State Department of Highways for making available the employment data.

John S. Hoyt, Program Director

# THE FISCAL IMPACT OF EMPLOYMENT IN TWIN CITIES METROPOLITAN AREA

Jitendar S. Mann\*

## SUMMARY

In 1967 there were 287 local governments in the Twin Cities metropolitan area authorized to tax property. The increasing demand from the growing suburban population for local services and the problems of meeting the demand require careful study.

The research, the results of which are reported here, was based on data from 45 communities with populations over 2,500 in the seven metropolitan counties of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington. The municipal tax base and current municipal expenditures were studied. The categories of expenditures analyzed here are:

(1) current general government, (2) current public safety, (3) current highway, and (4) other current expenditures. The total of these four, called total current expenditure, also is analyzed.

The independent variables, representing the structure of employment, are the proportion of employment in (1) construction, (2) manufacturing, (3) transport and public utilities, (4) wholesale and retail trade, (5) finance, insurance, and real estate, (6) services, and (7) government. Five other variables included in the analysis are (1) median family income, (2) population, (3) percentage of housing units classed as multiple dwellings, (4) percentage of population under 15, and (5) density.

Using linear multiple regression analysis, estimates were made of the impact of employment and other economic variables on the tax base and public service expenditures. Three important employment categories influencing the fiscal structure of the community are (1) manufacturing, (2) transport and public utilities, and (3) wholesale and retail trade. These three comprise over 58 percent of total employment and represent the major economic activity in the community.

To make the impacts independent of the units of measurement, elasticities were calculated at the points of mean. These elasticities provide an insight into the problem of fiscal disparities. The income elasticity of taxable value (2.772) is higher than that of total current expenditure (1.141), thus favoring the rich communities. On the other hand, the population elasticity of total current expenditure (0.887) is greater than that of taxable value (0.842). These factors together explain the incentive of an exclusive low-population, high-income community.

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In the employment categories, the elasticities of taxable value for wholesale and retail trade (0.128) and transport and public utilities (0.077) are higher than the elasticities of total current expenditure (0.119 and 0.043). For manufacturing, the elasticity of total current expenditure (0.191) is greater than the elasticity of taxable value (0.118). Thus at the municipal level, the benefit of commercial development with the supporting transportation and public utility services is greater than the cost of providing social services. In the case of manufacturing, however, the municipal cost is greater than local benefits. The tax benefits of manufacturing to society are, through statewide taxes, spread beyond the boundaries of the municipality. The costs of public safety, traffic service, etc., however, have to be incurred by the community. A case for intergovernmental transfer of resources is evident.

## INTRODUCTION

The need for guided development has been the concern of several agencies in the Twin Cities metropolitan area. A significant step toward concerted action has been taken by the creation of the Metropolitan Council.<sup>1/</sup> Understanding the implications of the interaction of land use planning, transportation needs, and employment patterns with local tax base and community public service expenditures is indispensable for formulating meaningful and useful planning policies. A review of the development programs being considered for the Twin Cities metropolitan area will help to bring into focus the significance and relevance of this study.

Before the creation of the Metropolitan Council in 1967, the work of the continuing planning program was undertaken by the Metropolitan Planning Commission in collaboration with other public agencies. This program, known as the Joint Program, considered several alternative growth patterns<sup>2/</sup> for the comprehensive development of the metropolitan area:

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<sup>1/</sup>For legal sanction of Metropolitan Council, see Minnesota Statutes, 1967, Chapter 473B. For a lucid discussion of the emergence, functions, and future of the Council, see Metropolitan MAZE: THE COUNCIL-WATCHERS' GUIDE, Council of Metropolitan Area Leagues of Women Voters, December 1967.

<sup>2/</sup>For a discussion of these growth patterns see the Joint Program, Selecting Policies for Metropolitan Growth, Report Number Four, January 1967. The present discussion is based on the Joint Program Report.

- (1) Present trends based on the continuation of the existing development patterns,
- (2) Spread city aimed at "dispersed development incorporating a low-density residential environment, convenient shopping facilities in small clusters, and an extensive highway system",
- (3) Radial corridors, "dominant downtowns and incorporated a radial pattern of rapid-transit lines and freeways as well as the high density residential area necessary to provide riders to the rapid-transit systems", and
- (4) Multiple centers, "large outlying commercial and industrial centers, even larger and more diversified than Southdale, and major shopping centers, such as Har Mar Mall and Apache Plaza. It included the residential, transportation, and other patterns that would best support the development of such centers".

After a good deal of debate and research, a modified alternative called Constellation Cities, combining the features of radial corridors and multiple centers, evolved. This pattern is "an abbreviated form of the radial corridor transportation system, downtowns nearly the sizes of those envisioned for radial corridors and multiple centers, and outlying centers smaller than those of multiple centers but frequently of the same diversified composition. The downtowns would be at least half again as large as they are today. There would also be 20 to 30 large, diversified suburban centers. Each would provide a full range of shopping and office facilities. Supplementing the diversified centers would be 40 to 60 retail centers. All of these concentrations would be linked by a transportation system featuring freeways and a new kind of transit system on radial routes from the two downtowns to the major centers. There would also be grid highway systems serving the centers and carrying local buses and automobile traffic to and from the surrounding neighborhoods. Housing would also exhibit a wide range of type and densities with most of the highest-density, multi-family housing being coordinated with the centers".

The pattern of growth embodied in the plan of Constellation Cities will have an impact on the economic structure of the communities through changes in land uses, employment patterns, residential densities, and other economic factors. A very important question concerns effects of these structural changes on the fiscal balance of the communities. This study addresses itself to this question.

The fiscal balance is construed in two senses. First is the balance between tax revenue and total current public service expenditures. Any deficit here manifests itself either by encroaching upon the capital construction expenditures or generating pressures for external revenue sources, e.g., state aid. Second, balance can refer to the pattern of



expenditure also, particularly administrative expenditure versus public service expenditure proper. Increases in expenditures to run the city government leave less money for other expenditures, e.g., public safety and health.

The impact of land use patterns on public revenue and expenditure was examined in earlier studies.<sup>3/</sup> However, since the land use data are not collected regularly, the analysis cannot be repeated to study possible changes in the relationships. Further, since the interactions between land use and fiscal pattern are spread over a number of years, data for several years are needed to analyze the effect.

The employment levels and patterns provide a good index of economic activity in a community. Data on employment are available on a continuing basis, avoiding one of the serious limitations of land use data. Therefore, this study explores the impact of employment and other economic variables on the tax base and on public service expenditures.

#### THE AREA OF STUDY

The Twin Cities metropolitan area comprises the seven counties of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington, (figure 1). The area had a population of 1,525,297 in 1960. A population of 2,776,890 is projected for 1985. The incorporated communities in the area varied in 1960 population from Lakeland Shores with 52 to Minneapolis with 482,872. However, the study was limited to suburban communities with populations of at least 2,500 excluding the cities of Minneapolis and St. Paul. The 45 incorporated communities in the study are shaded in figure 2.

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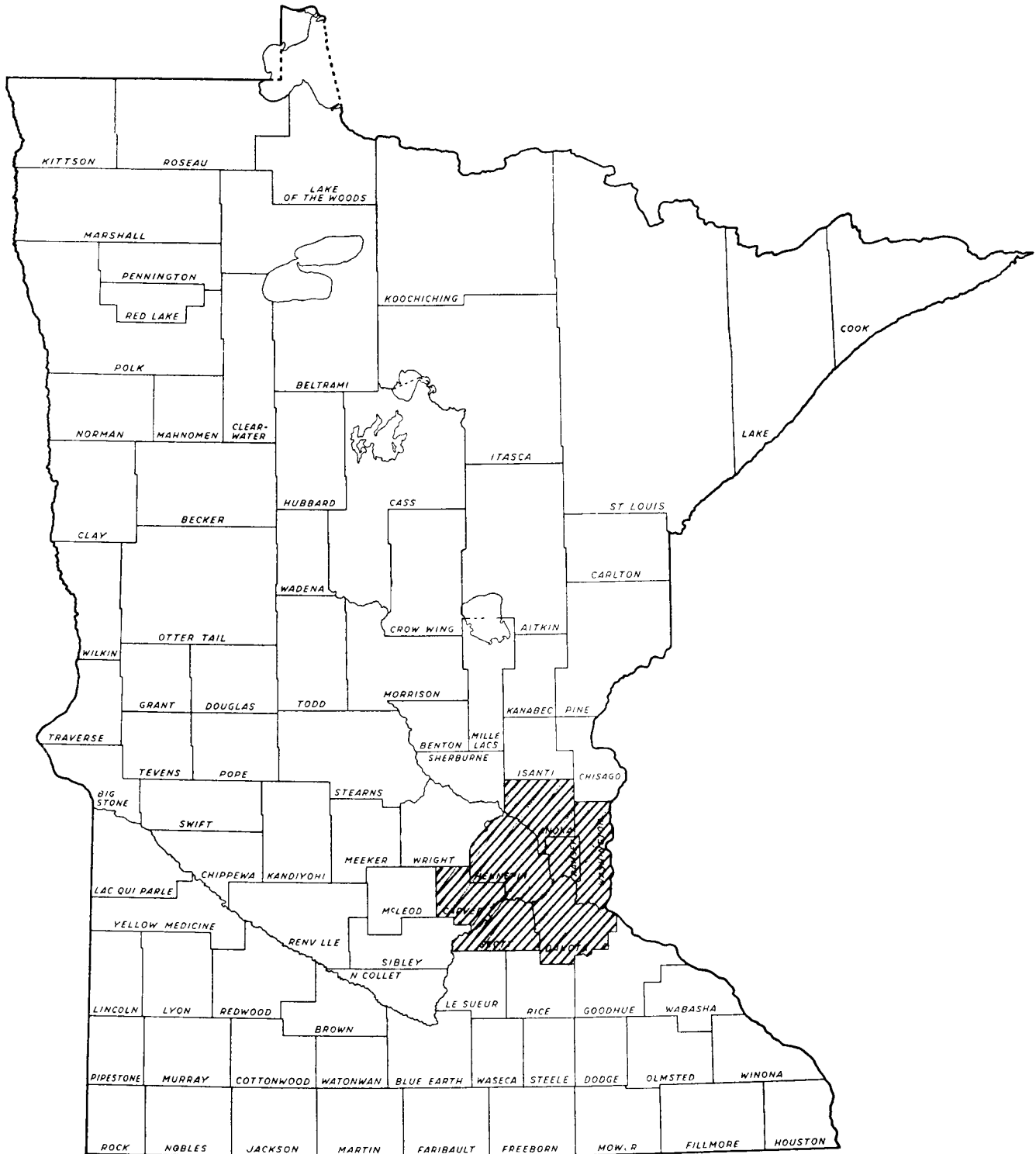
<sup>3/</sup>John Christopher English, The Impact of Land Use Patterns on Public Service Expenditures in the Twin Cities Metropolitan Area, Unpublished Ph.D. Thesis, University of Minnesota, 1967.

LAND USES and Their Fiscal Impact in the Twin Cities Metropolitan Area, Research Report No. 1, Metropolitan Growth: The Impact of Alternative Patterns, A University of Minnesota Community Service Program.

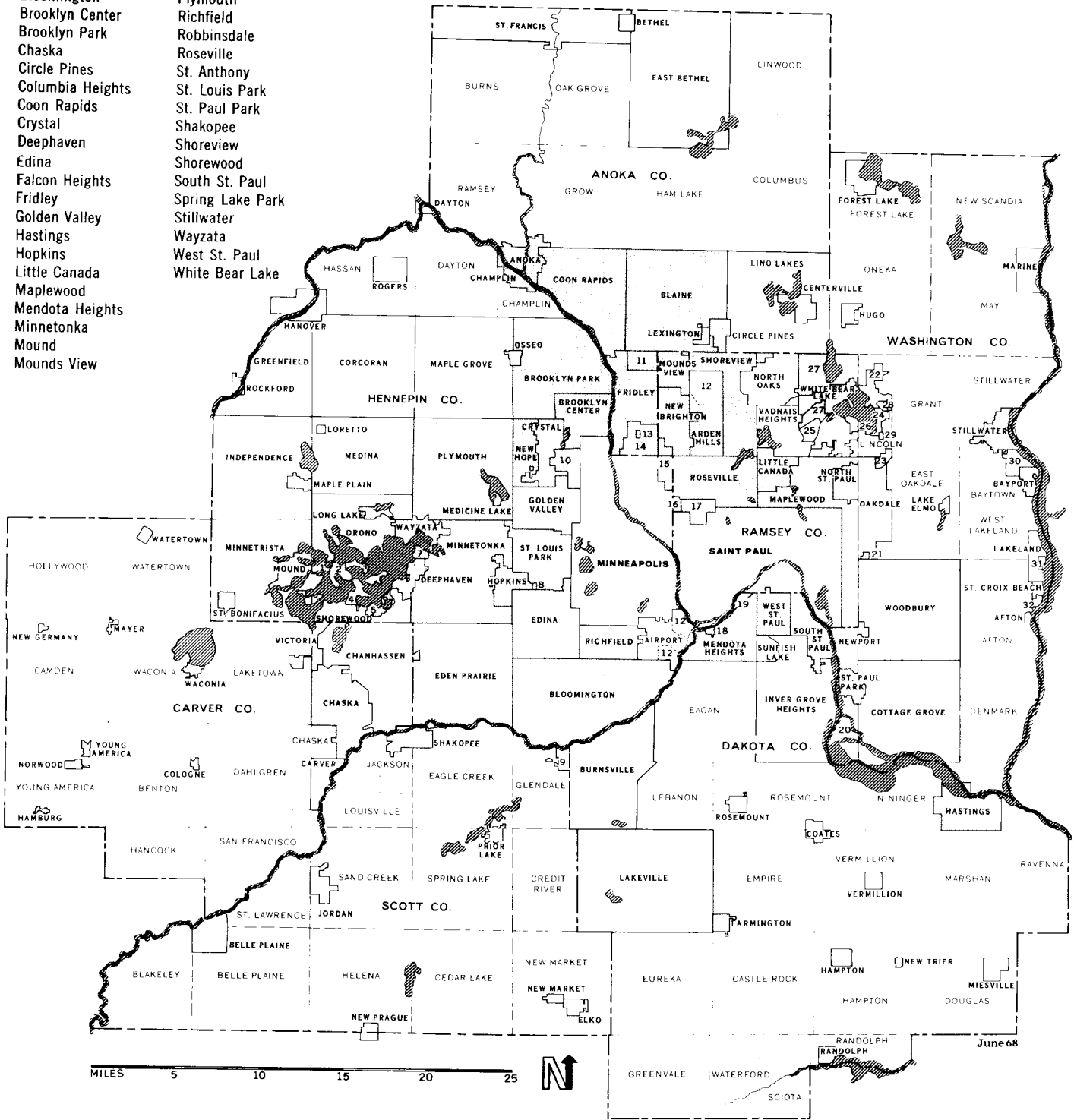
ALTERNATIVE SUBURBAN LAND USES: Their Fiscal Impact on Municipalities, Metropolitan Growth: The Impact of Alternative Patterns, A University of Minnesota Community Service Program, September 1968.

FIGURE 1

Location of Twin Cities Metropolitan Area



- Anoka
- Arden Hills
- Bayport
- Blaine
- Bloomington
- Brooklyn Center
- Brooklyn Park
- Chaska
- Circle Pines
- Columbia Heights
- Coon Rapids
- Crystal
- Deephaven
- Edina
- Falcon Heights
- Fridley
- Golden Valley
- Hastings
- Hopkins
- Little Canada
- Maplewood
- Mendota Heights
- Minnnetonka
- Mound
- Mounds View
- New Brighton
- New Hope
- North St. Paul
- Orono
- Plymouth
- Richfield
- Robbinsdale
- Roseville
- St. Anthony
- St. Louis Park
- St. Paul Park
- Shakopee
- Shoreview
- Shorewood
- South St. Paul
- Spring Lake Park
- Stillwater
- Wayzata
- West St. Paul
- White Bear Lake



- |                    |                     |                   |                     |
|--------------------|---------------------|-------------------|---------------------|
| 1 SPRING PARK      | 9 SAVAGE            | 17 FALCON HEIGHTS | 25 GEM LAKE         |
| 2 ORONO            | 10 ROBBINSDALE      | 18 MENDOTA        | 26 BIRCHWOOD        |
| 3 MINNETONKA BEACH | 11 SPRING LAKE PARK | 19 LILYDALE       | 27 WHITE BEAR       |
| 4 TONKA BAY        | 12 U. S. GOVT.      | 20 GREY CLOUD     | 28 LINCOLN          |
| 5 EXCELSIOR        | 13 HILLTOP          | 21 LANDFALL       | 29 WILLERNIE        |
| 6 GREENWOOD        | 14 COLUMBIA HEIGHTS | 22 DELLWOOD       | 30 OAK PARK HEIGHTS |
| 7 WOODLAND         | 15 ST. ANTHONY      | 23 PINE SPRINGS   | 31 LAKELAND SHORES  |
| 8 MINNETONKA       | 16 LAUDERDALE       | 24 MAHOMETDI      | 32 ST. MARY'S POINT |

FIGURE 2

## SOURCES OF DATA

The analysis is based on three kinds of data obtained from various published and unpublished sources about the 45 communities. Data from 1958 were used for study because 1958 was the year closest to a census year for which employment data were available.

(1) Fiscal Data:-The data on taxable value and public service expenditures are from the Public Examiner's report.<sup>4/</sup> The taxable value is derived from the assessed value of real and personal property. Given the mill rate, this value indicates the property tax yield of the community.<sup>5/</sup> The analysis of expenditure is limited to current expenditure. The major capital outlay is for construction and is influenced by different factors than are current expenditures. The four categories of current public service expenditure studied are (1) general government, (2) public safety, (3) highways, and (4) other current expenditure.

General government expenditure includes the administrative expenses of running the city government. Public safety expenditure includes the cost of police and fire protection. Highway expenditure is mostly for streets and alleys, snow removal, traffic signs and signals, and street lighting. Other current expenditure is the sum of health and charities, recreation, and unallocated expenditures.<sup>6/</sup> The mean values, standard deviations, and coefficients of variation of fiscal variables are given in table 1.

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<sup>4/</sup>Report of Public Examiner on the Revenues, Expenditures and Debt of the Cities and Villages in Minnesota for the calendar year 1958 and the fiscal year ended during the period January 1, 1958, to June 30, 1958, State of Minnesota, St. Paul.

<sup>5/</sup>For a discussion of the method of property tax assessment, see: Report of the Governor's Minnesota Tax Study, 1956, Chapter V.

<sup>6/</sup>For a complete listing of items included under each head of revenue and expenditure see Classification of Accounts for Use by Fiscal Officers in Cities and Villages, State of Minnesota, St. Paul.

Table 1.--Mean, standard deviation, and coefficient of variation of fiscal variables

	Mean	Standard deviation	Coefficient of variation (percentages)
Taxable value	\$4,933,828	\$5,348,692	108.4
General government expenditure	50,649	35,057	108.7
Public safety expenditure	69,868	84,818	121.4
Highway expenditure	58,457	57,356	98.1
Other current expenditure	31,945	43,024	134.7
Total current expenditure	210,918	222,258	105.4

The coefficient of variation enables us to compare the variability of the expenditure categories. The current highway expenditure has the lowest coefficient of variation. The standard practices from community to community for street lighting, traffic signs, and signals may explain this. Other current expenditure has the highest coefficient of variation due to the heterogeneous nature of the variable. It is the sum of health and charities, recreation and unallocated expenditure.

(2) Employment Data:-Employment data are collected by the Minnesota Highway Department in cooperation with the Office of Employment Security. The data for 1958 were made available for this research. These data are collected at the place of employment; the workers may not necessarily live in the municipality where they work. However, since the employment pattern is taken as an indicator of the economic structure of the community, the residence is not a very important factor.

These data are by Standard Industrial Classification one-digit categories.<sup>7/</sup> The agriculture, forestry, and fisheries category was eliminated, since it was considered unimportant in the metropolitan area.<sup>8/</sup> The two categories in manufacturing and in service were combined into single categories. The seven employment categories used in the analysis are (1) mining, contract construction, ordnance and accessories,<sup>9/</sup> (2) manufacturing, (3) transportation, communication, electric, gas, and sanitary services, (4) wholesale and retail trade, (5) finance, insurance, and real estate, (6) services, and (7) government. The data for employment categories were converted to ratios by dividing by the total employment in each community. The means, standard deviations, and coefficients of variation of employment data (in total numbers and ratios) are given in table 2.

Total nonagricultural employment is distributed over the categories as follows: construction, 18.47 percent; manufacturing, 31.16 percent; transportation, communication, electric, gas, and sanitary services, 4.05 percent; wholesale and retail trade, 23.16 percent; finance, insurance, and real estate, 3.08 percent; services, 14.79 percent; and government, 5.29 percent. Manufacturing and wholesale and retail trade accounting for 54.32 percent of total nonagricultural employment, represent the major permanent economic activities of the study area.

(3) Other Economic Variables:—Other economic factors included in the analysis are (a) median family income, (b) population, (c) percent of housing units classed as multiple dwellings, (d) percent of population under age 15, and (e) density of population.

The 1958 population of each community was estimated from the 1960 Census of Population data by an adjustment based on the number of housing permits issued in each community and an estimate of the

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<sup>7/</sup>These categories are: 0, Agriculture, Forestry, and Fisheries; 1, Mining, Contract Construction, and Accessories; 2 & 3, Manufacturing; 4, Transportation, Electric, Gas, and Sanitary Services; 5, Wholesale and Retail Trade; 6, Finance, Insurance, and Real Estate; 7 & 8 Services; 9, Government. For a detailed listing of the industries included in each category see Bureau of Budget, Standard Industrial Classification Manual.

<sup>8/</sup>This also obviated the problem of linear dependence in the independent variables.

<sup>9/</sup>In the category mining, contract construction, ordnance and accessories, most of the employment is for construction. Therefore, in the rest of the discussion this category will be referred to as "construction".

Table 2.--Mean, standard deviation, and coefficient of variation of employment categories

SIC code	Employment category	Total			Ratio to total employment		
		Mean	Standard deviation	Coefficient of variation	Mean	Standard deviation	Coefficient of variation
1	Mining, contract construction, ordnance, and accessories	342	675	197.4	0.16632	0.16456	98.9
2-3	Manufacturing	577	1,237	214.4	0.20362	0.20588	101.1
4	Transportation, communication, electric, gas, and sanitary services	75	132	176.0	0.03770	0.04224	112.0
5	Wholesale and retail trade	429	712	166.0	0.21772	0.14301	65.7
6	Finance, insurance, and real estate	57	101	177.2	0.2918	0.03860	132.3
7-8	Services	274	314	115.0	0.24159	0.16264	67.3
9	Government	98	2,514	134.5			

number of individuals per household. For median family income and the percentage of the population under age 15, the data from the 1960 Census of Population were used without adjustment.

The percentage of housing units classed as multiple units was calculated for each community from the 1960 Census of Housing data.

The density of population for each community is calculated in developed area rather than total geographic area, because the former is considered more relevant to current economic activity.<sup>10/</sup> The mean values, standard deviations, and coefficients of variation of the economic variables are given in table 3.

Table 3.--Mean, standard deviation, and coefficient of variation of economic variables

	Mean	Standard deviation	Coefficient of variation (percentages)
Population (numbers)	13,152	16,596	126.2
Median family income (dollars)	7,401	1,141	15.4
Percent of dwelling units classified as multiple dwellings (percent)	7.52	7.26	96.5
Density of population (persons per acre)	7.84	9.23	117.7
Percent of population under 15 (percent)	39.5	6.4	16.2

<sup>10/</sup>The developed area is the area devoted to the following uses: Residential, Manufacturing, Nonmanufacturing, Commercial, Public Buildings, Public Open Space, Streets and Alleys. For data and background information on land use see State of Minnesota, Department of Highways, Twin Cities Area Transportation Study, Volume I, May 1962.



A Glossary of Symbols

To facilitate the discussion mnemonic symbols are used in the following pages for the variables. These symbols are explained in table 4.

Table 4.--Abbreviations used for variables

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Abbreviation	Variable
TV	Taxable value of real and personal property
GGE	Current general government expenditures
PSF	Current public safety expenditures
HWE	Current highway expenditure
OCF	Other current expenditure
TCF	Total current expenditure
MFI	Median family income
POP	Population
MU	Percent of housing units classed as multiple dwellings
Pop U 15	Percent of population under age 15
MCM	Employment in mining, contract construction, ordnance, and accessories
MFM	Employment in manufacturing
TCEGSM	Employment in transportation, communication, electric, gas, and sanitary services
WRM	Employment in wholesale and retail trade
FIRFM	Employment in finance, insurance, and real estate
SEM	Employment in services
GOM	Employment in government
TM	Total employment
DFNS	Density of population

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## METHOD OF ANALYSIS

The method of multiple regression is used to study the influence of employment and other economic variables on the tax base and public service expenditures. The dependent variables -- taxable value and current expenditures -- are in actual numbers, unlike in several studies where per capita or per acre values of the variables are analyzed. It is believed that for practical purposes (e.g., making projections or studying problems of fiscal balance), total revenue and expenditures are more meaningful than per capita figures.

The numbers in employment categories in each community were divided by the total employment in each community to obtain the ratio of each category to total employment. This was necessary to overcome the problem of intercorrelation among the independent variables.

## RESULTS OF REGRESSION ANALYSIS

The results of regression analysis are presented in table 5. The values in parentheses under the coefficients are the t-values of the regression coefficients.

Before discussing the results of each regression, a general observation should be made about the POP (population) and DENS (density) variables. Population is included as an independent variable to account for differences in the size of the municipalities. Since the dependent variables taxable value and current expenditures are total magnitudes, including population as an independent variable adjusts for differences, due to population, in the values of dependent variables. The density reflects the dispersal of population, whether a given population is spread over a large area or concentrated in a small area. Since population equals density times area, the two variables should be considered together and no separate discussion is necessary.<sup>11/</sup>

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<sup>11/</sup>Let X be the dependent variable; P, population; D, density; and A, area. Then the relation can be expressed in an abbreviated fashion

$$X = a + bP + cD$$

Since  $D = \frac{P}{A}$ , we have  $X = a + bP + c\frac{P}{A}$ , and  $\frac{dx}{dp} = b + \frac{c}{A}$

Thus the effect on X of a given change in population depends both on b (the coefficient of population) and c (the coefficient of density) adjusted for area.

Similarly, substituting  $P = AD$   $X = a + bAD + cD$  and  $\frac{dx}{dD} = bA + c$

The effect on X of a given change in density depends on b (the coefficient of population) adjusted for area and c (the coefficient of density).

Table 5.--Summary of regression analysis of taxable value and public service expenditures

Dependent variables	R <sup>2</sup>	Independent variables							
		MFI	POP	MU	Pop U 15	MCM/TM	MFM/TM	TCFGSM/TM	
TV	0.82499	1847.76400 (4.26292)	320.61440 (8.23456)	15151.64000 (0.21940)	34178.60000 (0.40374)	-79047.41000 (0.01725)	2858298.00000 (0.60643)	9963592.00000 (0.91233)	
GGE	0.86961	12.38638 (3.21619)	3.69517 (10.68142)	1169.81400 (1.90649)	865.75430 (1.151002)	3584.99400 (0.08807)	43661.11000 (1.04257)	107087.70000 (1.10350)	
PSF	0.78446	13.09100 (1.71614)	5.34521 (7.80084)	2260.31000 (1.85981)	1133.74700 (0.76099)	14577.86000 (0.18080)	88729.69000 (1.06970)	61915.21000 (0.32214)	
HWE	0.65008	-2.60318 (0.39607)	3.63476 (6.15663)	1023.63200 (0.97754)	346.24770 (0.26974)	-15871.96000 (0.22847)	59596.34000 (0.83388)	111668.70000 (0.67433)	
OCE	0.57680	9.63756 (1.77754)	1.72844 (3.54898)	2329.06200 (2.69622)	85.06519 (0.08033)	3359.43300 (0.05862)	5650.34600 (0.09584)	-38286.33000 (0.28027)	
TCE	0.81306	32.51177 (1.74651)	14.40358 (8.61385)	6782.81800 (2.28697)	2430.81400 (0.66860)	5650.33100 (0.97637)	197637.50000 (0.97637)	242385.30000 (0.51678)	

Table 5.--Summary of regression analysis of taxable value and public service expenditures--continued

Dependent variables	Independent variables						Constant
	WRM/TM	FIREM/TM	SEM/TM	GOM/TM	DENS		
TV	2906920.0000 (0.57705)	-9483488.0000 (0.77585)	-6707706.0000 (1.28784)	-2307747.0000 (0.36475)	-310270.70000 (4.46162)		-11479960.00000
GGE	16920.96000 (0.37804)	-152477.20000 (1.40394)	-52272.71000 (1.12953)	-54332.11000 (0.96649)	-3275.56500 (5.30120)		-102632.60000
PSE	85369.34000 (0.96294)	-225404.40000 (1.04783)	-65805.36000 (0.71791)	-53086.98000 (0.47677)	-4598.43700 (3.75735)		-137624.70000
HME	-13356.80000 (0.17486)	19533.67000 (0.10539)	-7601.59900 (0.09625)	-41033.20000 (0.42771)	-2988.12600 (2.83374)		25750.54000
OCE	26325.96000 (0.41779)	-206692.40000 (1.35184)	-58038.22000 (0.89083)	-28986.14000 (0.36626)	-1066.34500 (1.22586)		-58164.72000
TCE	115259.50000 (0.53275)	-565040.40000 (1.07636)	-183717.90000 (0.82131)	-177438.40000 (0.65301)	-11928.47000 (3.99398)		-272671.50000

(The figures in parentheses below the regression coefficients are t-values.)

Taxable Value:-As indicated by  $R^2$ , over 82 percent of the variation in taxable value is associated with the independent variables included in the regression. The median family income has a highly significant positive coefficient. High income, indicative of the economic prosperity, of a community, is reflected in the tax base. The percentage of dwelling units classed as multiple units has a positive but insignificant coefficient. The housing units classed as multiple units are assessed at higher rates than single-family residential units. Therefore, a priori, this variable makes a positive contribution to taxable value.

The percentage of population under age 15 has a nonsignificant positive coefficient. Its direct impact on taxable value is not clear.

Among the employment categories, (1) manufacturing (MFM/TM), (2) transportation, communication, electric, gas, and sanitary services (TCEGSM/TM), and (3) wholesale and retail trade (WRM/TW) have positive coefficients. These categories (about 58 percent of total nonagricultural employment) represent major economic activities of the communities. The t-values for these three variables are low. In the case of transportation, communication, electric, gas, and sanitary services employment (TCEGSM/TM), however, a strong positive relation is not expected a priori. The service corporations, especially those in communications and transportation, pay a gross earnings tax. "The gross earnings taxes are regarded as property taxes upon real and personal property used for operating purposes."<sup>12/</sup> In this study of the taxable value of real and personal property, this variable may not be of crucial value.

All other employment categories have negative coefficients. The construction employment (MCM/TM) has a very low t-value. This variable, not a good index of sustained economic activity, is likely to reflect the mercurial behavior of cyclically vulnerable or seasonal industries. Also, since this represents the ongoing construction, the impact on tax base may be delayed until the construction is completed.

It may be difficult to disentangle the direct and indirect effects of the other three categories of employment (1) finance, insurance, and real estate (FIREM/TM), (2) services (SEM/TM), and (3) government (GOM/TM) on the taxable value of real and personal property. Caution is necessary in interpreting the coefficient of

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<sup>12/</sup>State of Minnesota, Department of Taxation, Report to the Governor and the Legislature, Biennial Report #14, Fiscal Years 1965 and 1966, Commissioner of Taxation, St. Paul, Minnesota, p. 64.

government employment. This variable aggregates federal, state, and local employment. Local government employment is the relevant variable in local fiscal structure; but here the impacts of three employment classes are confounded.

The differences in the relations of various employment categories to taxable value depend also on the differences in the capital-labor ratios in different industries. Since the capital assets are assessed for taxation, a high capital-labor ratio will give a higher taxable value. This ratio is expected to be high in manufacturing and trade and low in finance, insurance, and real estates, also service industries.

Current General Government Expenditure:-The independent variables account for 87 percent of the variation in general government expenditure. The median family income has a highly significant positive coefficient. Rising prosperity leads to a greater demand for public services. The percentage of housing units classed as multiple units has a positive coefficient.

The school districts and the municipalities are not coterminous. Therefore, it was not possible to include school expenditure in the present analysis. To overcome this lack of coverage, the percentage of population under age 15 (pop U 15) was included as an independent variable. The hypothesis was that a high value of this variable would generate demand for school services resulting in fewer available resources for other expenditures. Thus, a negative relationship between percentage of population under age 15 (Pop U 15) and current expenditure categories was expected. As table 5 shows, positive coefficients were obtained for all classes of public service expenditure. However, the significance level of these regression coefficients is very low.

The coefficients of the following four employment categories have positive signs: (1) construction (MCM/TM), (2) manufacturing (MFM/TM), (3) transportation, communication, electric, gas, and sanitary services (TCFGSM/TM), and (4) wholesale and retail trade (MRM/TM). These categories represent 77 percent of total nonagricultural employment and reflect demand for public administration originating from industrial, commercial, and supporting economic activities.

The coefficients for the other three employment categories (1) finance, insurance, and real estate (FIREM/TM), (2) services (SFM/TM), and (3) government (GOM/TM) are negative. The negative coefficient for finance, insurance, and real estate could be interpreted as a substitute relationship between private and public services. More private financial assistance and insurance protection lower the demand for public services.

The negative regression coefficients for government employment in various categories of public service expenditure call for some reflection. As pointed out above, this variable includes employment by federal, state, and local governments. The aggregation of various employment categories may be responsible for confounding with other factors the basic relationship between higher expenses and a larger number of government employees. Further work on disaggregating this variable is required.

Current Public Safety Expenditure:—Over 78 percent of the variation in current public safety expenditure is associated with the independent variables. The median family income has a positive regression coefficient. The percentage of housing units classed as multiple units has a positive coefficient, consistent with the observation that this type of dwelling unit generates demand for public safety measures. The percentage of population under age 15 has a positive coefficient but with a low t-value. Although a negative impact of young population on current expenditure (through its effect on school expenditure) was postulated, a positive coefficient for public safety expenditure is not surprising.

These four employment categories have positive regression coefficients: (1) construction (MCM/TM), (2) manufacturing (MFM/TM), (3) transportation, communication, electric, gas, and sanitary services (TCFGSM/TM), and (4) wholesale and retail trade (WRM/TM). These categories represent 77 percent of the total nonagricultural employment and are associated with a demand for public safety measures originating from industrial, commercial, and related economic activities.

Employment in (1) finance, insurance, and real estate (FIREM/TM), (2) services (SEM/TM), and (3) government (GOM/TM) has negative coefficients. Services like insurance provided by the private sector seem to alleviate the demand for public safety measures.

Current Highway Expenditure:—Slightly over 65 percent of variation in current highway expenditure is associated with the independent variables. The median family income has a negative coefficient but the t-value of the coefficient is very low. Maybe income is not a relevant variable for current highway expenditure (mainly for streets and alleys, snow removal, traffic signs and signals, and street lighting).

Percentage of dwelling units classified as multiple units has a positive coefficient. Multiple units increase the traffic flow and the cost of traffic maintenance.

The percentage of population under age 15 has a positive coefficient with a low t-value.

Three employment categories (1) manufacturing (MFM/TM), (2) transportation, communication, electric, gas, and sanitary services (TCFGSM/TM), and (3) finance, insurance, and real estate (FIREM/TM) have positive coefficients. These categories represent about 38 percent of total nonagricultural employment. The other four categories of employment (1) construction (MCM/TM), (2) wholesale and retail trade (WRM/TM), (3) services (SEM/TM), and (4) government (GOM/TM) have negative coefficients. However, the t-values for the coefficients are low.

Other Current Expenditure:—Of the regressions in table 5, other current expenditure, with about 58 percent of its variation associated with the independent variables, has the lowest  $R^2$ . This may be attributed to the heterogeneous nature of this variable. It includes expenditures on health, charities, recreation, and unallocated expenditure.

Median family income has a positive coefficient with a moderate t-value. The percentage of housing units classified as multiple units (MU) has a positive coefficient with a significant t-value. Multiple dwelling units necessitate expenditure for recreation. The percentage of population under 15 (Pop U 15) has a positive coefficient with low t-value.

Of the employment categories, the regression results give positive coefficients for (1) construction (MCM/TM), (2) manufacturing (MFM/TM), and (3) wholesale and retail trade (WRM/TM). These three classes represent about 73 percent of total nonagricultural employment.

The other four categories of employment (1) transportation, communication, electric, gas, and sanitary services (TCFGSM/TM), (2) finance, insurance, and real estate (FIREM/TM), (3) services (SEM/TM), and (4) government employment (GOM/TM) have negative coefficients.

Total Current Expenditure:—This is the total of the four classes of current public service expenditure. Over 81 percent of the variation in this variable is associated with the independent variables.

The signs of the coefficients of independent variables in the regression for total current expenditure agree with the general pattern which emerges from the separate regressions for four categories of expenditure which are included in this total. Median family income has a positive coefficient with a moderate t-value. The percentage of housing units classed as multiple dwelling units has a positive coefficient with a high t-value. The percentage of population under age 15 has a positive coefficient with a low t-value.

The following employment categories have positive coefficients: (1) construction (MCM/TM), (2) manufacturing (MFM/TM), (3) transportation, communication, electric, gas, and sanitary services (TCFGSM/TM),



and (4) wholesale and retail trade (WRM/TM). With over 77 percent of total nonagricultural employment, these four classes represent demand for public services generated by the economic activity in the community.

Like the pattern observed in individual regressions, the other three employment categories (1) finance, insurance, and real estate (FIREM/TM), (2) services (SEM/TM), and (3) government (GOM/TM) have negative coefficients.

### ELASTICITIES, FISCAL DISPARITIES

The above discussion indicates the direction of change of the dependent variables studied in response to a given change in an independent variable. To put this analysis in the dynamics of economic growth, the differential impacts of changes on several variables must be studied simultaneously. For example, how is the balance between tax revenue and current expenditure affected by growth of population? Are these responses different? If so, what are the implications for policy making?

To give these impacts a common denominator, several elasticities are calculated. (see table 6.)

Table 6.--Coefficients of elasticity estimated at points of mean

Dependent variables	Independent variables					
	MFI	POP	MU	MFM/TM	TCEGSM/TM	WRM/TM
TV	2.772	0.842	0.023	0.118	0.077	0.128
GGE	1.810	0.947	0.174	0.176	0.080	0.073
PSE	1.387	0.993	0.243	0.259	0.033	0.266
HWE	0.330	0.808	0.132	0.208	0.072	0.050
OCE	2.233	0.705	0.548	0.036	-0.045	0.179
TCE	1.141	0.887	0.242	0.191	0.043	0.119

In going from a study based on a point in time to the problems of the dynamics of economic growth, a note of caution is in order. The situation here is analogous to the Engel's curve in consumer analysis (based on budget studies primarily but used for predicting the future course of action). In the present study it is assumed that the community at the lower end of the line, when it moves up would be like the community there now. This analysis must be supplemented with factors which may change with the passage of time.

The population elasticity<sup>13/</sup> of total current expenditure (0.887) is greater than the population elasticity of taxable value (0.842). In other words, the increased demand for public services by the increasing population is greater than the rise in tax base.

For median family income, the elasticity of tax base (2.772) is higher than that of total current expenditure (1.141). This means that as family incomes in the community grow, the tax base increases faster than the public service expenditure.

This differential response of tax base and public service expenditure is called "fiscal disparity". A low-income, high-population community is worse off than a high-income, low-population community. The pressure from demands for public services from a large population and the squeeze on taxable resources from a low level of prosperity are self-perpetuating. For a high-income, low-population community, however, the taxable value is responsive to the economic prosperity of the community (which attracts more economic enterprise). Also, the response of demand for public services to increased prosperity is not as great as the response of taxable value.

The community in the bind must look for another way to promote fiscal balance. Table 6 provides a guide to several developmental policies. Considering the elasticities for employment, the differential here provides a key to policies for correcting fiscal disparities. For two categories of employment, (1) transportation, communication, electric, gas, and sanitary services (TCFGSM/TM), and (2) wholesale and retail trade (WRM/TM), the elasticity of taxable value is greater than the elasticity of total current expenditure. The indicated growth pattern is commercial development with supporting transportation and public utility services.

On the other hand, for manufacturing employment (MFM/TM), the elasticity of total current expenditure (0.191) is greater than the elasticity of taxable value (0.118). Industrial development necessitates local expenditure on public safety, highways, and other public

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<sup>13/</sup>In calculating the population elasticities, the adjustment explained in footnote 11 was made.

services. The tax advantage, however, accrues on a much wider scale through state and federal taxes. In realization of this disparity, the Minnesota Tax Reform and Relief Act of 1967 provided that revenue under one percent point temporary increase corporate income tax be transferred to the property relief fund.

It may be instructive at this stage to compare the distribution of nonagricultural employment in the 45 communities (see table 7) with the pattern at a higher level of aggregation.

In 1958 the structure of nonagricultural employment in the study area was not very different from that in the U.S. and in Minnesota. In 1967, however, the percentage of nonagricultural employment in manufacturing in Minneapolis-St. Paul SMSA (28.2) was very close to that in the U.S. (29.3), while the percentage in wholesale and retail trade in Minneapolis-St. Paul (23.9) is slightly higher than that in the U.S. (20.7). A change may be on its way already.

#### CONCLUSION

This analysis provides tools for studying the impact of changes in the economy of the area on the fiscal structures of the local communities. The differential effects of these changes on taxable resources and public service expenditure demands pinpoint the nature of fiscal disparities. This differential also enables us to formulate an indicative growth pattern to meet the problem of fiscal disparities.

However, these conclusions are based on an analysis of employment only. In formulating a comprehensive plan, other factors also should be considered. Changes in the employment pattern involve concomitant changes in capital investment and other supporting facilities. The results of this research should be used as inputs in the broader process of resource allocation.

Table 7.--Distribution of nonagricultural employment, U.S., Minnesota, and Twin Cities, 1958 and 1967

Employment category	Percentages					
	U.S. 1958	U.S. 1967	Minnesota 1958	Minnesota 1967	45 Communities 1958	Minneapolis- St. Paul (5 counties) SMSA 1967
Mining and contract construction	6.7	5.8	7.9	6.3	18.5	4.9
Manufacturing	30.6	29.3	23.4	25.3	31.2	28.2
Transport and public utilities	7.7	6.5	9.4	7.1	4.0	7.7
Wholesale and retail trade	22.0	20.7	25.5	23.6	23.2	23.9
Finance, insurance, and real estate	4.7	4.9	5.1	4.8	3.1	5.8
Services and miscellaneous	12.6	15.2	13.2	15.3	14.8	16.3
Government	15.6	17.6	15.5	17.6	5.3	13.2

Source: U.S. Department of Commerce, Bureau of Census, Statistical Abstract of the United States, 1968, and 1959, and Comprehensive Transportation Planning Section, Minnesota State Department of Highways.

Other Publications Under the Program

METROPOLITAN GROWTH: The Impact of Alternative Patterns.

METROPOLITAN MAZE: The Council-Watcher's Guide (Published jointly with the League of Women Voters)

LAND USES: and their Fiscal Impact in the Twin Cities Metropolitan Area, Research Report #1.

WHAT KIND OF TOMORROW?: A fifteen minute sound and color film on the Twin Cities of today and the problems of metropolitan growth (Available on a loan basis)

MINNESOTA'S TWIN CITIES: Metropolis on the Move, December 1967

ALTERNATIVE SUBURBAN LAND USES: their Fiscal Impact on Municipalities, September, 1968.

Copies of this report and the publications listed above may be obtained by writing to Dr. John S. Hoyt, 190 Coffey Hall, Institute of Agriculture, University of Minnesota, St. Paul, Minnesota 55101.

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