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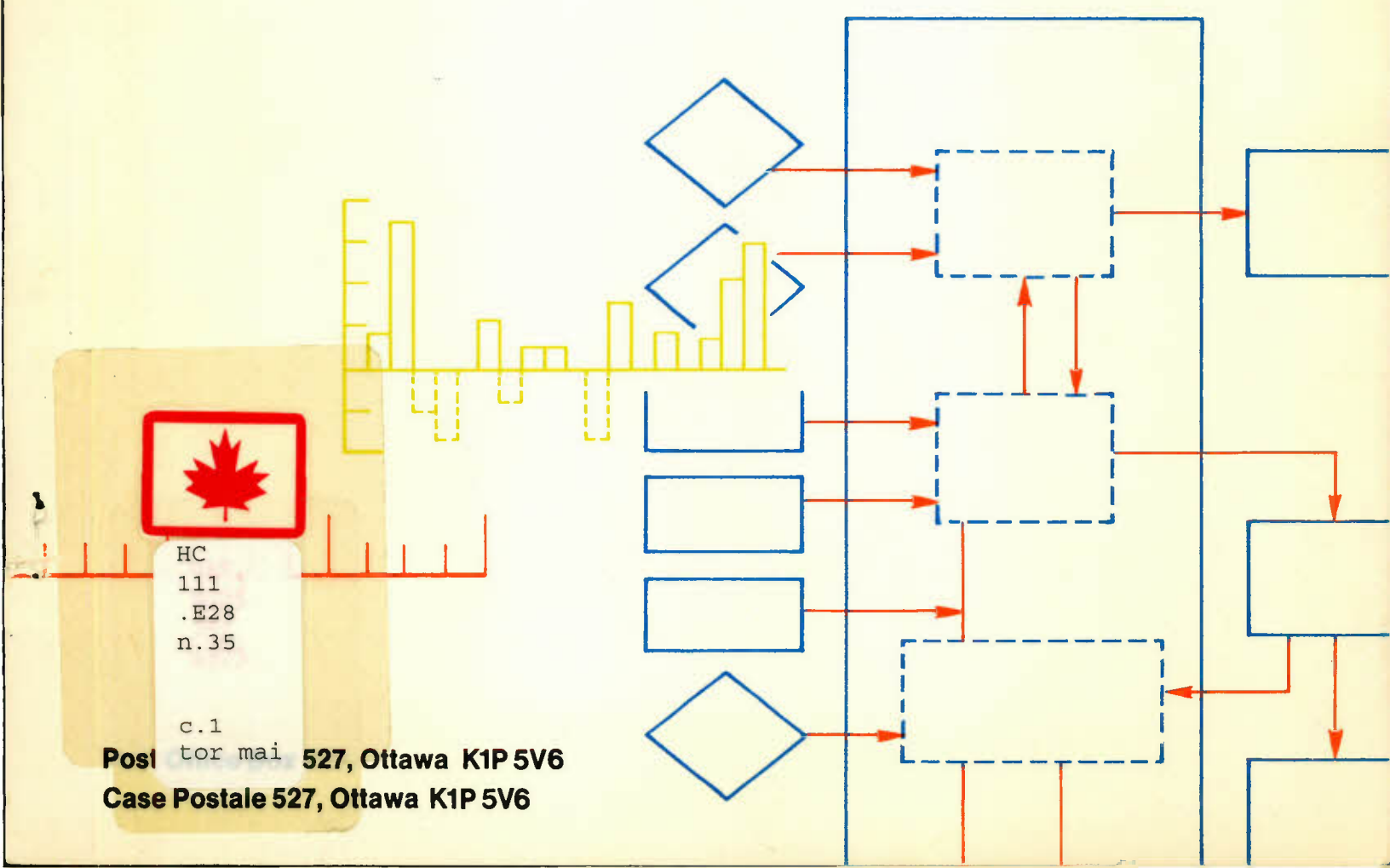

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DISCUSSION PAPER NO. 35

Urban Social Indicators

by Allan M. Maslove

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Preface

This study is one of several being produced by members of the Social Indicators Group of the Economic Council of Canada. As such, it is part of a research programme, the intention of which is to work towards the development of social indicators in a number of specific areas of concern.

Out of the theoretical model of this study emerge a number of criteria that are advanced for the development of policy relevant urban indicators. The empirical portion of the study is intended as a preliminary test of that model and to suggest more exactly the form that some of these indicators might take. It is preliminary and tentative mainly because of the limited data currently available.

For their useful comments and criticisms at various stages of the research, I would like to thank David Emerson, Jeff Greenberg, David Henderson, Dennis Paproski and Robin Rowley. I would also like to thank Norm Leckie who conducted most of the computer programming and data manipulations that were necessary, and Frank Archibald who assisted in gathering information that provided the background to Chapter 3. The expert typing of the early drafts as well as the final version by Suzanne Dorion is much appreciated.

Allan M. Maslove

SUMMARY

Urban Social Indicators

by

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The main goal of this discussion paper is to develop a theoretical framework from which may be derived urban indicators. The theoretical model (Chapter 4) brings together recent research from two areas of economics, consumer theory and local government decision-making. In the model, urban social indicators are the outputs of an urban system that affect consumers' welfare and which are "produced" by, *inter alia*, local government policy actions. Citizen-consumers, in turn, attempt to influence government actions for their own benefit, and government supply decisions are seen as responses to these often competing community demands.

This paper is composed of three main sections. The first (Chapters 2 and 3) sets the stage for the theory by reviewing the literature in the relevant areas of social indicators and urban economics and by briefly noting some of the institutional properties of Canadian municipal governments. The next section (Chapter 4) is the development of the theoretical model. The final main part of the paper (Chapter 5) contains preliminary empirical results dealing with two aspects of the model, the local government reaction (supply) functions and the transformation functions for a small number of the output indicators.

RÉSUMÉ

Les indicateurs sociaux urbains

par

Allan M. Maslove

Dans ce document, l'auteur se propose principalement de mettre au point un cadre théorique à partir duquel pourront être mis au point des indicateurs urbains. Le modèle théorique (chapitre 4) réunit les résultats de recherches récentes dans deux domaines de l'économique, soit la théorie de la consommation et la prise de décisions des pouvoirs locaux. Dans le modèle, les indicateurs sociaux urbains sont des produits d'un système urbain qui influent sur le bien-être des consommateurs et qui sont "fabriqués", *entre autres*, par l'intervention des autorités locales. Les citoyens-consommateurs, en retour, tentent d'influencer les actions du gouvernement à leur avantage, et les décisions des gouvernements apparaissent comme des réactions à ces exigences souvent conflictuelles de la collectivité.

Le document comprend trois sections principales. La première (chapitres 2 et 3) introduit la théorie en passant en revue la documentation existante dans les domaines connexes des indicateurs sociaux et de l'économie urbaine, et en soulignant brièvement certaines des propriétés institutionnelles des gouvernements municipaux canadiens. La section suivante (chapitre 4) est consacrée à la présentation du modèle théorique. La dernière partie du document (chapitre 5) contient les résultats empiriques préliminaires relatifs à deux aspects du modèle, les fonctions de réaction (l'offre) des gouvernements locaux et les fonctions de transformation d'un petit nombre d'indicateurs de production.

CONTENTS

Chapter 1

URBAN SOCIAL INDICATORS

The application of social indicators research to the concerns of urban communities is, to a large extent, a response to the need for a better understanding or urban processes. Problems such as urban poverty, transportation, protective services, housing, and environment, are often the visible symptoms of more fundamental phenomena characteristic of urban structures. Successful public policies, in the final analysis, will be those that properly deal with the more basic processes. Included among them are the workings of urban land markets, the (often implicit) pricing of urban government services and the interrelationships of the urban processes themselves.

It is by shedding new light on some of these more fundamental questions that the social indicators approach may be able to make a contribution to clearer understanding and better policy. For example, social indicators research can hopefully provide a more precise picture of the nature of urban services -- the outputs, the inputs, the relation between them, and the prices and costs associated with them. Much of the current discussion of the services of municipal governments is confused because the services themselves are poorly defined. Expenditures on police services or the number of police in the city has often been taken as the output of police services; social welfare expenditures have been used to measure the level of well-being of the city's poor; the number of buses has served

as a measure of the output of the public transit authority. Each of these examples involves, at worst, a misidentification of inputs for outputs or, at best, a number of implicit assumptions about the relationships between urban government service inputs and outputs. These implicit assumptions in fact, beg many of the questions one would like to answer (e.g., the presence of economies of scale). The approach proposed in this study, perhaps can lead to a better identification of urban service processes and through this to provide answers to questions of allocational efficiency, distribution and the like.

Similarly, much of the misunderstanding about the workings of urban land markets probably stems from a lack of clarity concerning the attributes of urban land that are of most importance to prospective purchasers. Consequently, governmental policies which have an impact upon one or more of these attributes often result in unforeseen disturbances in land values and uses because the role of the attributes themselves was not discerned. While these particular issues are not dealt with in this study because of the lack of sufficient data on urban land markets, it is felt that the social indicators approach employed here is equally applicable to the determination of the key attributes of urban land.

Finally, if this type of analysis brings forth an understanding of some of the individual urban processes like those discussed above, then the identification and analysis of their interrelationships will be greatly facilitated.

For example, knowing the outputs of the various urban services and the contributors (positive and negative) to those outputs, is the basis for determining common contributors and the role of one output as an influence on another.

In summary, it is obvious that the activities occurring in urban communities affect individual human well-being or utility. The goal of the urban social indicator approach in this study is to provide criteria for the selection of indicators that will monitor these activities in such a fashion as to capture their attributes that are the most crucial from the viewpoint of individual utility.

At this writing, no consensus view has developed as to what the term "social indicators" means. The various approaches are discussed in some detail in Henderson [23, 1974]* and the arguments will not be repeated here. It is sufficient to present the definition employed in this study. Social indicators are conceived of as the parameters of a model of a socio-economic subsystem, or, more exactly, the measurable proxies of those parameters. A major subset of these parameters, the outputs, are, in the end, of primary significance. The output variables of the models serve as monitors or indicators of the changes in the subsystems that most directly affect human welfare.

The above emphasis on models of subsystems is intentional. The point is crucial for it implies that with the assistance of a model it will be possible to make analytical statements about the indicators in addition to

*Indicates the sequence number in the list of references and the year of publication.

quantification and comparative measurement. Analysis, within the framework of a model, should at some stage, make it possible to reach conclusions that are relevant for public policy. Applicability to questions of policy is essential if the social indicators approach is to be ultimately successful.

Structure of the Study

The major purpose of this study is to propose a conceptual framework for the construction and analysis of urban social indicators. It is hoped that the general approach will be relevant to a broad range of urban problems and policies. However, it is clearly recognized that the theory presented here, like all theories, is a simplification of reality and thus does not by itself directly address many important questions. In addition, the study presents the results of a preliminary empirical analysis involving a few urban social indicators of the type proposed in the model. This exercise is necessarily limited due to the constraints imposed by currently available data; in that sense the results are incomplete and of limited applicability. However, they do lend enough credence to the theoretical approach to justify further data collection and further analysis.

The following chapter presents a review of portions of the literatures on social indicators and economics that are relevant to the work presented here. The third chapter discusses the institutional framework of Canadian urban municipalities and the roles played by various constituent

groups in influencing urban government policy making. These two chapters set the stage and provide the direction for the theoretical model presented in Chapter 4. The model is the formal conceptual statement of the basic approach to urban social indicators that is proposed in this study. Chapter 5 presents the results of the empirical analysis done as a preliminary test of the model. Chapter 6 contains the conclusions and discusses possible directions of future research.

Chapter 2

A REVIEW OF SELECTED URBAN LITERATURE

Many, and perhaps most, of the concerns and problems related to urban communities are not novel subjects for investigation. Their current prominence lies in the fact that these problems have become more pressing and taken on new, complicated dimensions in modern cities. In response, students of a wide range of assorted disciplines have increasingly directed their attentions toward urban phenomena and in these disciplines relatively recent and extensive bodies of knowledge have developed.

It is not possible here to examine all of these problem areas and the work which has been focused upon them. Rather, the intention is to review two streams of research which are the most relevant to the analysis of this study. First, there exists a relatively small body of literature than can generally be characterized as relating to urban social indicators. Secondly, there is the much more extensive economic literature concerning urban processes in general and the decision-making process of local governments (urban public finance) in particular. It is from these two streams, especially the latter, that the present study takes its lead. Thus, it seems appropriate to examine briefly those literatures so that this study can be placed in the context of that work.

URBAN SOCIAL INDICATORS

While there is no obvious consensus in the literature as to what constitutes an urban social indicator, the definition of Dueker [16, 1970] seems sufficiently general to encompass most conceptions that have been advanced:

> "An urban indicator is a performance characteristic associated with the status of activities or the delivery in terms of a program of urban services. It is an observed value that measures the activity or service. The value, when compared over time or between areas or between services or individuals, conveys quantitative information as to the qualitative performance characteristics of the urban activities or urban services. The purpose of an indicator is to provide a convenient surrogate that measures movement toward or away from a goal over a period of time. As such, indicators must be quantifiable for comparison over a period of time." (pp. 174-175)

Definitions such as the above while broad enough to permit a consensus, tend to sacrifice preciseness; that is, they fail to distinguish social indicators from the much larger collection of social data. This distinction may be provided by a list of purposes and uses envisaged for urban indicators. These rationales include:

(a) providing indicators for management and planning in the public sector;

(b) increasing the general understanding of complex problems much as the familiar economic statistics do today (e.g., unemployment and inflation rates);

(c) highlighting urban trouble spots in order to stimulate public responses towards correcting them;

(d) highlighting national urban problems (e.g., housing shortages); and

(e) detecting emerging trends at an early stage.

The element missing from this list (with the possible exception of the second item) and from most of the social indicator work is a rigorous theoretical construct. Most discussions have dealt with potential uses and time series or cross-section (interurban) comparisons of the indicators but have not developed a framework in which to place them. Thus the indicators provide little information towards understanding the system which they are intended to monitor and little insight as to what influences their magnitude and direction of movement.

Some of the work done in the Urban Institute [19, 1972], for example, is admittedly confined to assembling quantitative indicators that describe certain urban conditions and provide some estimates of how these conditions are changing. They do not, however, explain the conditions, suggest how they change, or attempt to evaluate policies that may affect them. The main thrust of the work was to define areas of urban life for which quality measures were desirable (e.g., poverty, housing, community concern, traffic safety, and others) and then to select data to provide proxy or representative measures in these areas (e.g., per cent of households with income below $3,000, cost of housing a moderate income family of four, per capita contributions to the United Fund, and auto accident deaths per 100,000 population).

Other writers (for example, Land [31, 1972]) have stressed the importance of theoretical models in social indicator analysis and some have used models to explore specific indicator areas. For example, Bryce [12, 1973] attempted to identify

socio-economic differences between high and low income urban areas. Yin [62, 1971] investigated the possibility of fire alarm patterns serving as indicators of certain urban conditions such as physical and social deterioration of neighbourhoods. However, even in these two instances the models presented were strictly empirical in nature. A more sophisticated exercise in modelling was presented by Malizia [33, 1972]. He developed a methodology to evaluate social indicators based on two criteria, correspondence (how well an indicator corresponds to the theoretical construct it purports to measure) and correctness (how correctly the empirical components are combined in constructing an indicator).

In another study that employed the modelling approach, Clark [13, 1973] distinguished between descriptive and analytical social indicators, the latter being those integrated into a model. He then went on to discuss the criteria for selecting analytical community social indicators and to distinguish between "policy outputs" (which correspond to the policy variables in the model of Chapter 4 of this study) and "policy impacts" (corresponding to the outputs). He continued with a discussion of methods that can be employed to measure policy outputs, policy impacts and the models that can be constructed to relate them.

For the most part, however, the body of literature devoted to urban indicators does not appear to provide a sufficiently rigorous base on which further research can build.

Certainly many problems and questions have been raised but, most importantly for this study, no consistent methodologies have been developed that can be followed or further developed in the present analysis.

URBAN ECONOMICS

The attention that economists have directed towards the concerns of urban communities over the last 20 years can be grouped into three broad areas. While they are certainly not independent, the areas of external relations, internal relations and urban public finance can be distinguished because they follow separate paths both with respect to the questions they address and the packages of tools they utilize.

The work on the external relations of cities in terms of the questions it asks roughly corresponds to the traditional area of macro-economics, focusing on the city as part of a larger (national) system, and on its relations with the surrounding region. This stream of analysis adapts location theory and international trade theory to deal with concepts such as urban growth, optimal city size, export multipliers and industrial location and mix. The work in the first part of Thompson [59, 1965] is a good example of the approach of this stream of research.

Most of the theoretical research on internal relations in cities might be described as spatial equilibrium theory. It has been largely directed to the questions of residential site choice, industrial location (within the city), and the configuration

of optimal transportation networks and land use patterns. In this respect, this stream corresponds to the traditional micro-economics with the emphasis being on resource allocation and utility (profit) maximization by rational economic agents allowing for the costs imposed by space. Included in this group are theoretical contributions such as those of Alonso [2, 1964], Strotz [57, 1965], Mills [37, 1967], Beckman [4, 1969], Mohring [38, 1961 and 39, 1972], Solow and Vickrey [55, 1971], Solow [54, 1972], and Kraus [27, 1973]. In addition, many others have attempted to adapt the basic models for empirical testing or to examine more specific questions, for example, Harris et al. [21, 1968], Oates [43, 1969], Maslove [35, 1972], and others.

Much of the remainder of the economics literature that fits into the internal relations classification is concerned with specific problems that become especially critical in an urban environment. Urban renewal, poverty,[1] transportation congestion, and housing are examples. Obviously, a wide variety of work has been done in these areas, but since they are not directly related to the present study, these pieces will not be reviewed here.

The third area of urban research, urban public finance, is the most relevant for the present study. Like the more traditional public finance literature, here too there is a macro-micro division. First, there is a body of literature

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[1] In several U.S. studies the areas of urban renewal and poverty take on additional dimensions when combined with racial problems.

dealing with the financial difficulties of city governments and their financial relations with higher levels of government (revenue-sharing, etc.). Two of the writers associated with this area are Netzer [41,1966] and Heller [22, 1966]. Secondly, and of primary concern here, are the theoretical and empirical works on the subject of the demand for and the supply of local government services and the public decision-making process. Involved in this area are the aspects of scale economies, public goods and externalities or spillovers.

The main body of this latter research area seems to flow from two seminal contributions in 1956-57 by Downs [15, 1957] and Tiebout [58, 1956]. Downs, in essence, advanced a theory of how a government determines the supply quantities of its services. His model was analogous to the classical model of a firm in a market acting to maximize profits. Downs postulated a theory in which the objective function to be maximized by the government was the number of votes in the next election. From this flowed a series of policies and strategies designed to satisfy citizens' demands sufficiently well so that the government achieved its goal. The Downs model accepted the population structure as a set of exogenous parameters and constructed a theory of the supply of government services. Changing government policies constituted the adjustment mechanism in the model. Because it gave rise to numerous empirically testable propositions, a substantial flow of research on local government decision-making employing a Downs-type model has followed. (The Downs model itself, it should be noted, was directed to government behaviour in general, not just municipal governments.)

Tiebout, in contrast, assumed set packages of government services in each community and examined the formation of citizens' demands. In the Tiebout model individual preferences were expressed through decisions to move or not move; these decisions were seen to be analogous to the decisions to buy or not to buy in conventional private markets. Individuals chose the community whose package of services most closely approximated their own preferences. Cities offering popular service combinations would grow (or duplicate) while others would shrink. Tiebout, then, provided a theory of demand; individuals faced a given array of government policy sets and chose among them.

The nature of the Tiebout model makes it generally less adaptable to empirical testing than that of Downs. For example, Tiebout's assumption that employment opportunities are the same in all communities is very limiting; it is difficult to standardize for this factor in empirical research.[2] Nonetheless, when applied in metropolitan areas which contain several separate jurisdictions (in which case the employment opportunity assumption becomes much less crucial), the model does highlight several interesting questions. A major implication, for example, is that a number of small communities offering a variety of public service packages may lead to a preferred allocation of resources (a closer matching of services and citizens' demands) than the standardization of

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[2]Of course, other factors that Tiebout did not discuss (e.g., cultural and family ties) also tend to inhibit mobility, especially in a large and socially diverse country like Canada.

metropolitan governments.[3] Both models, then, posit processes by which government policies are brought (at least approximately) into line with citizens' demands, in one case through changing policies (or governments) and in the other through individuals choosing from a menu of government policy packages.

The studies of the public economies of urban communities since Downs and Tiebout have, to a very large extent, followed the leads established by these two works, combining the supply and demand approaches in them.[4] The problem of determining demands for community services has been examined in a somewhat wider context of determining demand for goods generally in situations where conventional market mechanisms cannot operate or are clearly inadequate. In these cases mainly involving public goods and externalities, the market, because it cannot be relied upon to allocate resources efficiently in response to individual demands, must be replaced by an alternative mechanism,

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[3]Of course, this preferred allocation is only possible, not inevitable. The division of a metropolitan area into several jurisdictions may, on the other hand, lead to inefficiencies if, for example, externalities are present in certain government services and to higher costs if there exist potential economies of scale.

[4]It is worthwhile to clarify at this point what may be a confusion in terminology. Some writers have regarded local government expenditures as demands for goods and services. Tiebout, in fact, spoke of a municipal government approaching a national market to purchase the services which formed the package available to its residents. In the present context, however, the expenditures of the local government (for example) are regarded as supply decisions -- how much of a particular service does the government choose to make available to its constituents. Thus within the city, citizens demand governmental services while the government responds or supplies them. In a national context, one may still regard the city as a purchaser of these goods for its residents.

usually government decisions about the appropriate quantities.[5] On the other (supply) side, the theory of government decision-making has been further refined and extended to analyses of bureaucracies.[6] While there have been considerable theoretical advances in urban public finance, the empirical analyses have been necessarily restricted by the fact that the researchers have been able to observe only actual expenditure points. Thus, as in many other areas, the estimated equations have been essentially reduced-form equations combining elements of both supply and demand.

Breton [11, 1966], for example, followed Downs in assuming that governments act to maximize the probability of their re-election which, in turn, is a function of the policies they adopt. Breton applied this strategy to analyse the provision of public goods. In his model non-benefit taxation (i.e., taxes that do not correspond to marginal utilities) in a world with public goods implies that individuals are not in equilibrium. In an effort to adjust, they attempt to influence their

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[5]The problem of determining demands also arises in the case of a conventional private good which the government supplies at a zero price to the users (e.g., public education). In theory, markets can be established to provide the allocating signals (i.e., determine demands) and, if desired, compensation schemes (e.g., negative head taxes) adopted to return tax revenues to the users. In reality, however, the problem of determining demands is much the same as in the cases where the market is inadequate and demands must be gauged by indirect means.

[6]See Wm. A. Niskanen [42, 1971], for a recent and one of the most important of those works. Niskanen develops a theory of supply for bureaus based on the assumption that bureaucrats act to maximize their agencies' budgets subject to the constraint that they supply the outputs expected by their sponsors.

political leaders to alter the supply of public goods to match their own desires. The resulting equilibrium reflects the prevailing power structure in the community.[7]

Barr and Davis [3, 1966] also followed the lead of Downs and postulated that politicians seek to stay in power by assembling a dominant coalition to support their policies over the opponents. In their model voters seek to minimize their utility losses which depend on government policies and the winning politicians are those who are able to determine and adopt the median level of a spectrum of desired expenditures, thus forcing their opponents towards one of the extremes. Barr and Davis concluded with a preliminary empirical test of their model using as dependent variables Pennsylvania county per capita expenditures on general government, highways, judicial and all other (excluding capital outlays and interest expenses) functions. To adapt the model for testing the authors were forced to make the (admittedly) very strong assumption that all voters had identical incomes and tastes and that therefore, demand differences were due only to differing tax assessments. The problem then reduced to the proposition that per capita expenditure differences

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[7]Breton approached the problem of measuring the output of public goods in a fashion similar to that employed in Chapter 4 of this study. "... when a government buys police officers with or without night sticks, cars, revolvers, and dogs, what it is supplying is police protection and not any of the enumerated items. Each of the individual items should be considered as factor inputs in the production of ... police protection. In other words, the government should be looked on as a production unit purchasing factor inputs, transforming them into public goods, and then supplying these to the individuals in its jurisdiction. Among other things, this approach should make clear why one must focus on policies to analyse government behaviour; policies are the outputs of governments." (p. 458)

in each of the four categories could be explained by variations across counties in the ratios of the assessed value of taxable property of the median taxpayer to the total assessed value. Inverse relationships were expected in all cases. These ratios in turn were proxied by two observed variables, the per capita value of all taxable property and a measure of the proportion of the electorate that owned property. In all cases, the regression coefficients were of the expected signs although in some instances they were not significant at a high (.05) level. Barr and Davis concluded that these results, although very rough because of the necessary assumptions, were an encouraging indication of the value of their basic model.

Davis and Haines [14, 1966] in the same vein, constructed a positive model to explain government decisions. Their model posited the same self-interest behaviour on the part of voters and politicians as did the other models. Voters' behaviour is influenced by a set of taste-determining factors (income, population density, personal property values, industrial property values) and by the hypothesis that a voter will want more of a public good the smaller his share of the cost (its price) and that he will attempt to force the cost onto others. Davis and Haines concluded with an empirical estimation of each of six categories of per capita local government expenditures (general government, public safety, health and sanitation, streets and highways excluding capital outlays, interest charges, and total operations and maintenance which includes the first five categories plus other current expenditures) as linear functions of the taste-determining factors. For the most part the estimated coefficients were of the expected signs.

Pidot [47, 1969] employed principal components analysis to create uncorrelated measures which described certain characteristics of metropolitan areas. He used these factors plus some fiscal data as independent variables in regressions estimating expenditure patterns. On the demand side, citizens were assumed to have a set of preferences from which flowed demands for various public expenditures; supply was determined by the decision-makers weighing the demands and reaching conclusions based on their own objective functions which may include political goals. Pidot's explanatory variables included demographic factors (population size, density, etc.), housing characteristics (age, crowding, form of tenure, etc.), the economic base (incomes, retail sales, non-personal taxable property, etc.), outside funds (grants, and other aid), debt owed by the city and security holdings. Using principal components analysis, 24 of the correlated variables were combined into six components. These were entered as independent variables in the regressions; the results indicated that the degree of metropolitan development, wealth levels, and city size substantially increased per capita expenditures for most functions.

In another variant, Henderson [24, 1968] postulated a social welfare function for the community the arguments of which were public and private expenditures. The city's budget constraint allowed for tax revenues, grants from higher levels of government and debt financing. The city fathers then chose the levels of public and private expenditures that would maximize the social welfare function subject to the budget constraint. Henderson then went on to estimate the parameters of the first-order

maximization conditions and to calculate the income elasticities for some of the public service expenditures. He found that expenditures in smaller centers were more responsive to per capita income changes than in larger centers and that the smaller centers had a relative marginal income preference for local government expenditures while the relative preference in the large cities was for private expenditures. Expenditures in the large cities were more responsive to per capita inter-governmental transfers, and per capita expenditures in small cities varied inversely with population changes while the opposite relationship was found among the larger centers.

The emphasis in the above papers, as in Downs' own work, has been on the government's response to citizens' demands. Other writers, taking their lead more from Tiebout, emphasized the formation of these demands and not the government's supply decisions. Adams [1, 1965], for example, looked for the socio-economic and physical factors that influence the demand for public services. He attempted to explain intercounty differences in per capita expenditures in seven categories as functions of the socio-economic and physical environments, income and wealth, individuals' characteristics, and political or institutional factors all of which were assumed to be demand determining factors. Adams' results indicated that a diverse number of variables affect expenditures and that income had much less explanatory power than other studies indicated.[8]

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[8]It is not clear that Adams' explanatory variables were demand factors. While his exposition was not clear, it appears that his model did not succeed in separating demand from supply (cost) factors. This raises some questions pertaining to his interpretations of the regression results.

Birdsall [6, 1965] evaluated the demand for collectively supplied goods as expressed through voting behaviour on fiscal referenda. Using a sample of 55 New York cities with populations greater than 10,000 people, he regressed the per cent "yes" vote (in favour of more expenditures) on a series of referenda against intercity differences in property values (measures of wealth), local public expenditure and tax rate levels (substitution effects and price factors), population characteristics, education levels, and housing values and needs. Using both stepwise and standard multiple regression techniques, Birdsall was able to explain between 50% and 80% of the variation in the yes vote percentage. In addition he noted negative relationships with the proportion of the city labour force in industry (a proxy variable for the relative unionization of the labour force) which he tentatively related to political alienation and with the level of educational expenditures (a substitution effect) and a positive relationship with wealth measures.

Bergstrom and Goodman [5, 1973] developed and tested a method of estimating individuals' demand functions for municipal services. On the assumption that municipal governments supply the median of the quantities demanded, Bergstrom and Goodman derived estimates of several demand characteristics including income and price (tax share) elasticities, the effects of population change and crowding, and several other variables. Their estimates indicated that income elasticities were always positive and usually less than unity (although the income elasticity of parks and recreation expenditures was almost always greater than one) while the tax share elasticities were negative

and small. Bergstrom and Goodman also found no evidence of economies of scale over the range of city sizes in their sample (826 municipalities in 10 states with populations in 1960 ranging from 10,000 to 150,000).

In a theoretical paper Borukhov [9, 1972] extended the analysis of Tiebout with respect to the financing of local public goods. Starting with the determination of optimal size service areas (local government jurisdictional areas) for local public goods, Borukhov moved on to the problem of tax financing. Working from the base presented by Tiebout, Borukhov developed a model in which optimal size cities and the pattern of land use and rents are determined simultaneously.

Rothenberg [50, 1970] as well, examined the question of optimal city size with respect to local government services. He dealt with the problems of population migration, suburbanization and the fragmentation of government in a metropolitan area and concluded that government divisions smaller than the area of coverage of local public goods leads to a suboptimal allocation of resources.

Other writers have approached the question of optimal service area size from the point of view of scale economies. Hirsch [25, 1959], for example, asked whether metropolitan consolidation of governments was justified from this point of view. He found that in horizontally integrated services (the government controls a number of units all providing the same service) like education, fire protection, police protection, refuse collection, etc., the size of the urban unit had little,

if any, effect on per capita expenditures. Central administration expenditures which Hirsch called a case of circular integration of services (one plant renders a number of complementary services) declined in per capita terms up to some medium size and then increased. Finally, water and sewage services which tended to be vertically integrated (the government controls a number of operations involved in the provision of one service) exhibited declining per capita expenditures up to a very large scale which few cities reached. On the whole, in those activities accounting for up to 85 per cent of all municipal expenditures, Hirsch found no overall efficiencies in the consolidation of metropolitan areas.

Other writers have also discussed scale economies in the provision of various local government services, among them Breton [10, 1965] and Walzer [61, 1972]. Breton, in his note, argued that the relationship between per capita expenditures and city size could be interpreted as a cost factor on the assumption of constant quantities or that with constant prices, service levels must change with population to maintain a given level of amenities. Another interpretation of (for example) increasing per capita expenditures with increasing size may be that larger communities can afford to provide more services; thus higher expenditures might imply more amenities. Breton argued that, because of these two possibilities, other factors must be introduced before an interpretation can be advanced. Walzer examined police services as measured by a service index. Using a sample of Illinois cities, he did find that scale economies were present. However, per capita police expenditures

did not vary with size (the case in most other studies) so that Walzer concluded that the presence of scale economies may depend crucially on the construction of the service index.

Bodkin and Conklin [7, 1971] estimated reduced-form equations explaining per capita expenditures which contained factors influencing both supply and demand. Using 1961 and 1966 data from municipalities in Ontario, they analysed seven expenditure categories. Among their findings were that for most categories per capita expenditures increased with population, that increasing density leads to lower per capita expenditures and, that grants received from other governments increased expenditures by amounts less than the grants. They interpreted this latter result to mean that part of the grants are used to reduce municipal taxes; it is possible, however, that the grants allow the cities to increase expenditures in other areas as well.

Ohls and Wales [44, 1972] combining elements of both the Downs and Tiebout analysis specified demand and supply equations for government services based on demographic variables that enter one but not both equations. Combining these two equations together yields total expenditure as a function of the demographic variables, and, in fact, total expenditure is the observed dependent variable. Ohls and Wales then estimated these total expenditure equations. One of their more interesting findings was that the price elasticities of demand are very small and often approach zero.[9]

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[9]These findings on price elasticities are consistent with the results obtained by Bergstrom and Goodman [5] discussed earlier.

Rivard [49, 1967] dealing with seven functions common to 91 Canadian municipal governments serving populations of 20,000 or more in 1961 attempted to explain the variations in per capita expenditures. While Rivard did not explicitly provide a theoretical model, the physical, economic and demographic variables he did include are implicitly thought of as factors influencing the supply of or demand for these services (or both). The only variable important in influencing several of the per capita expenditure levels was a measure of average income; other important determining variables were specific to one service function. In most cases Rivard's analysis did not reveal any consistent relationship between per capita expenditures and population size. Finally, the variables for population growth and density were usually not significant.

Summary

This short survey, while obviously only sampling the large volume of relevant literature, does give an indication of its orientation and of the strong influence exerted by Downs and Tiebout in their pioneering works. This study also draws on their work in its concern with the formation of citizens' demands for government services and the political response to these demands (the supply). Secondly, the survey has noted the problems that the various writers have encountered in the measurement of public services. This has been especially important in attempts to identify economies of scale. The present study addresses this question as well. It attempts to provide a framework which can be of assistance in identifying and measuring the outputs of collectively supplied services. It is the measurement of these outputs which is the essence of the problem of constructing useful social indicators.

prevalent in smaller municipalities and therefore the share of the total population in their jurisdictions is much less than the proportion of municipal units accounted for by this system. Largely because of the small size of the typical unit, the distinction between policy formulation and administration in the municipal government becomes blurred, with the elected representatives being active in both capacities. Recently, in several provinces, some of the duties of the smaller councils such as public health and social welfare, have been taken over by county, regional or provincial authorities.

As might be expected, the larger municipalities generally have more complicated and more complexly structured administrations. These tend to fall into two groups. In one case, the administration of civic functions is centralized and the policy formulation and administrative roles become more distinct and more separated. In the second case, the municipal governments are more decentralized while policy and administration tend to be more integrated. As the local government's responsibilities become more complicated, a division of these duties appears to occur; in the first case, it is seen as a separation of policy formulation from administration, and, in the second, it appears as a division along the lines of municipal functions (e.g., public works, social welfare services, etc.).

In the first (centralized administration) system, the typical form involves a separate individual or group appointed by the elected members of the government and responsible

Chapter 3

AN ECONOMIC INTERPRETATION OF COMMUNITY ACTION

Canada is a highly urbanized nation. The development of urban Canada has been well chronicled[1] and it is not the purpose of this study to re-argue that history. It is sufficient to recognize past and projected urban population growth patterns to realize the importance of urban problems and policies, currently and in the foreseeable future.

Accepting the importance of examining urban concerns, it is the purpose of this chapter to discuss the institutional framework within which municipal governments operate and the pressures to which they respond. It is important to understand this framework and the general patterns which emerge as a prelude to the theoretical model of the next chapter. The model of Chapter 4, part of which presents a theory of municipal government decision-making, is an attempt to explain these general patterns in a more abstract fashion, suitable to formal empirical examination. As a point of departure, the formal structure of municipal government is very briefly described.

THE STRUCTURE OF MUNICIPAL GOVERNMENT[2]

The most common form of municipal government organization in Canada, in terms of numbers of units, is the simple council or council-committee system. This form is most

[1] See, for example, N. H. Lithwick [32, 1970].

[2] For a complete description of the forms of municipal organization, see Plunkett [48, 1972].

to them. This group (board of commissioners) or individual (the city manager or chief administrative officer) is responsible for implementing the policy decisions of the council and for the general administration of the city. In addition, the administrative authority often advises the council and proposes new policy directions. While the formal distinction is clear, in some instances, the city administrator, acting as a policy advisor, becomes a very influential and powerful figure, thus blurring the policy formation-administrative division. However, it is difficult to draw any general conclusions about the structure of municipal governments from this because this enhancement of the administrator's power is often simply a function of the personalities of the chief administrator and his elected superiors.

In the second (administratively decentralized) system, responsibilities are separated along functional lines and the policy formation and the administrative roles are combined. The usual pattern is the existence of an "upper council" in addition to the regular council. This upper council or board of control has broad administrative and policy responsibilities. The members are not responsible to the lower council but are themselves individually elected. The regular council which is composed of the councillors elected by wards, the mayor who is elected at large, and the members of the board of control, can overrule the upper body only by a two-thirds vote. In this system the mayor acts as the head

of the council but has no special powers other than that which flows to him because of his wider electorate and his personal influence. This type of civic organization used to be mandatory in the larger cities of Ontario (over 100,000 people) and is still the prevailing system in many of them.[3]

An interesting variant of this type of organization is the executive committee system in some of the larger cities of Quebec. The mayor, who is elected at large, chooses the executive committee from among the members of the council, who are elected by wards. The executive committee is responsible for the administration of the city and, in addition, plays a large role in policy formulation, presenting proposals to the council. In many respects the executive committee acts as a cabinet; its members are responsible to the council and, in turn, as councillors, they are responsible to the electorate. In fact, a party system tends to develop with the mayor nominating a team of his supporters to the executive and thereby considerably enhancing his own power within the city government.

A new form of local government organization which falls into neither of the above two categories was established in Winnipeg in January 1972, in which all the previously independent municipalities in the metropolitan area were combined. The members of the council are elected by ward

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[3]Ontario has also established a small number of regional councils in some of the metropolitan areas, the two largest being in Toronto and Ottawa. These bodies are really federations of the separate municipalities in the metropolitan areas. The members of the regional council serve by virtue of being members of the councils of the constituent municipalities.

and the mayor will be chosen by the members from within the council.[4] An executive policy committee, composed of council members formulates and co-ordinates policy proposals for the whole council and, in turn, three standing committees advise the executive policy committee and oversee the operations of their respective civic departments. Each member of council also serves on one community committee; a community is composed of three to six wards. These committees are intended to institutionalize and thus facilitate the access of the communities' residents to their representatives. Administration is the responsibility of a board of commissioners. The chief commissioner and the three others (whose administrative responsibilities parallel those of the three standing committees) are appointed by the council.

Summary

For the purposes of this study, the important observation to be noted from the above brief discussion of structures is the formal link between those who formulate municipal policy and the citizens of the city. The formal structure is such that the final policy makers are responsible to the consumers of the outcomes of those policies. Usually this responsibility is through election, but in a few instances the link is somewhat less direct. The new organization in Winnipeg, which is being studied by other cities, attempts, with its community committees, to strengthen this contact between policy-makers and citizen-consumers.

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[4]The mayor was elected at large for the first term only.

The institutional machinery clearly provides for the transmission of citizens' demands to the local government. The next section of this chapter looks at some of the actual community-government interactions, the process by which citizens communicate with their local government, and the types of pressures to which the government responds. This process of constituents' demands and governments' responses will then be formally incorporated as an important part of the model of Chapter 4.

INFLUENCES ON LOCAL GOVERNMENT DECISION-MAKING

Three sets of factors have an important influence on the policy formulation of municipal governments. They are the actions of the federal and provincial governments, the tight financial constraints within which many municipalities must operate, and the pressures from citizens and institutions within their jurisdictions. This study is concerned with processes internal to cities and therefore the last of these three influences is of most immediate relevance and will be the most fully discussed in this section. However, the first two cannot be ignored; they too affect local decisions and the municipal outputs that are measured by urban social indicators. Thus, this section begins with a brief discussion of these two factors.

External and Financial Influences

In the broadest terms, local governments are affected by the higher levels of government in two ways. First, municipal governments are creations of the provinces and the

structures within which they must operate are established by their provincial superiors. Thus to a large extent their responsibilities and the instruments they may employ to execute them are externally determined. This means that changes in the institutional framework can be imposed upon the municipalities from above. The creation of regional authorities and the new unified government in Winnipeg are examples.

This external authority would tend to suggest that the range of actions of municipal authorities is more constrained than for other governments. However, institutional constraints can be stretched and the increasing pressures from within the cities have forced the civic authorities to assume new responsibilities.[5] In some instances, in fact, the institutional modifications have been little more than belated, formal recognitions of *de facto* changes in local activities and environments. Viewed from this angle the provincial actions are seen as being in response to pressures that have percolated up from local communities through their governments to the provincial legislatures.

The other type of effect results from the actions of the federal and provincial governments that impinge on the urban community. For example, large expenditures such as the construction of an airport, a major highway, or an office complex, result in changes in land use and transportation patterns that often necessitate a response by the local authorities. In addition, such large projects, because of increased employment opportunities, may lead to an inflow

[5]This is not to deny that over time certain responsibilities have shifted to other levels of government.

of people thus causing further local adjustment. Regional industrial incentive programs, if successful, may carry similar consequences for the community -- a major expenditure creates a need for a response by the local government[6] in the form of increased expenditures on items like roads and water and sewer lines. It is true that city tax revenues usually increase at the same time, but it is not clear that they cover the additional costs of the directly and secondarily induced extra expenditures. Even if the additional revenues and expenditures are offsetting, it does not mean that they are neutral; that is, other policies and expenditure patterns may be affected in any event.

These considerations are closely related to the other set of influences, the financial constraints. On the revenue side the basic problem facing the cities is the relative inelasticity of their prime tax revenue source, the real property tax. As a consequence, their own revenues are not growing rapidly enough to keep pace with the rising costs of their traditional and more recently acquired responsibilities. Moreover, being land based, the revenues are sensitive to the government decisions that affect land use patterns. That is, in addition to increasing expenditures, policy decisions in some cases also reduce the tax base by diverting land from the private tax rolls to public uses. This would be the case, for example, with the creation of new transportation rights-of-way or new parkland areas.

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[6]Of course, the city itself may initiate, through incentives or directly, major projects or they may be purely private actions. These too would call for a local response.

On the expenditure side, the major development has been that municipal governments are moving beyond their historical caretaker duties to acquire new, expensive responsibilities (e.g., in the areas of recreation, health, housing, etc.) that put further strains on their budgets. At the same time, these new expenditures can be seen as responses to community pressures to provide a greater range of community services.

These characteristics of municipal finances mean that the budget constraints the cities face are much more stringent than those of the higher levels of government. This leads to two results that are important for the purposes at hand. First, it has led the cities, with some success, to attempt, through a system of grants, to pass the financial responsibility for particular services up to a higher level of government, usually the province. In many instances the administrative duties have remained with the municipality (e.g., social welfare services) where the funds are spent in accordance with general guidelines established by the province.[7] Often the types of responsibilities that have been split in this way are those in which the municipalities have argued that at least part of the demand for these expenditures are generated externally. Thus, the argument runs, if forces external to them are involved, the resources spent should also be from external sources. These arrangements carry implications for efficient resource allocation. The shifting of the financial burden may lead to changes in municipal policy that affect the level of other services as well as

[7]It should be noted that roughly 50% of the funds spent through the Canada Assistance Plan are provided to the provinces by the federal government which in turn has its own set of general guidelines.

of the service directly involved. A considerable literature has developed dealing with the potential efficiency consequences of intergovernmental grants and the supplies of community services. Another effect is the altering of the line of communication between the citizens and the decision-makers. Local community groups now find they must speak to the provincial authorities either through their local representatives or directly themselves. The latter may involve a coalition of local groups with similar interests to argue their case more forcefully to the provincial authorities.

A second consequence of tight municipal budgets and the severe trade-offs that result is a high degree of conflict among competing interests in the decision-making process. That is, a move in the direction of satisfying one group or set of interests may mean an obvious move away from another set in the form of reduced expenditures elsewhere or increased taxes. There may be very visible winners and losers. The higher levels of government with more slack in their budget constraints are typically not faced with such clearcut decisions.[8] The result is not clear. On the one hand, municipal governments may tend to resist the advances of pressure groups and not disturb the status quo, knowing that other interests may also be significantly affected. On the other, they may try to identify those groups that they

[8]This is not intended to imply that they do not face trade-offs; of course they do. However, their trade-offs are much more in the nature of choosing among new alternatives rather than actual cutting back or actual tax increases as is often the case at the municipal level. While from the viewpoint of economic theory this distinction may be meaningless, from the perspective of politics and the satisfaction of electorates, it may be very important.

consider the most important (because they represent the widest coalitions of interests) and respond more actively to them. These patterns of municipal government responses are important in the next chapter and will be further discussed in part of the following section.

Community Interest Groups

In order to more successfully influence the decisions of their civic governments, individuals almost always find it advantageous to join or form a group whose members' goals, at least on a range of issues, are the same. There are at least two basic reasons for this. The first is economic. A single person usually has neither sufficient time nor sufficient resources to devote to his cause, even if he could be assured of success. That is, the personal benefits he would enjoy are outweighed by the costs (time and money) he would incur. However, by joining with others who stand to benefit from the same decision, the individual can reduce his personal costs by sharing them with the other members. In more technical terms, the payoffs (and possibly some of the costs) from this type of activity carry large externalities which justify a social (in this case, group) cost significantly higher than the private cost. At the same time, the group can draw on financial and human resources that may not be available to an individual. For example, programs exist that provide financing for certain types of community organizations. As for human resources, a group may be able to draw on a range of talents from within its membership, for example, legal advice, secretarial assistance, etc.

Thus, at least over some range, there appear to be economies of scale associated with activities of this type.

Community group rather than individual action also enhances the chances of success. Success is often dependent upon the ability to identify the general public interest with a personal position. Obviously, the very existence of a group helps to create this identification. In addition, municipal governments are beginning to open avenues for group participation in the decision-making process. Often, access to this type of institutional apparatus is more difficult for an individual.

Community association activities may be classified into the broad categories of direct action and participation in the electoral process.[9] Direct action which is certainly the more important of the two, involves polling and petitioning, direct communications with decision-makers, sponsoring public meetings and other informational activities, and sometimes, legal action. The use of polls or petitions is a very visible method of demonstrating public opinion on a particular issue. However, their usefulness is quite limited in another respect. These methods can be effective only in clearcut, simple alternative cases. When issues become complicated or the range of alternatives becomes larger, simple polls do not provide answers that are readily interpretable and more complex questionnaires are too expensive.

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[9]See Breton [11a, 1974], Chapter for a good discussion of the range of political actions of consumer-voters.

The most common and probably the most effective type of direct action is direct communication with the municipal decision-makers. The decade of the 1960's saw a great increase in the number of associations whose major method of operation was to deal with their governments in this fashion. It is here that the appearance of broad-based public support is especially important. For example, competing community associations must often come to an agreement themselves with respect to the direction in which they wish to push their government, or neither group may be successful. It seems that governments do respond to group presentations but an extremely important prerequisite is the group's ability to appear to solidly represent a broadly held position.

Association contacts with the community at large through such activities as public meetings are indirect methods of furthering the groups' objectives. These activities serve an informational purpose by making the general public more aware of the groups' objectives and they also strengthen the groups by increasing general popular support and attracting new members.

Community association legal action has occasionally involved actual court proceedings to attempt to have a particular municipal action overruled. But, more frequently, it has involved less dramatic proceedings. Hearings on zoning changes, alterations in governmental institutions, major

public works projects, etc., have all attracted the participation of various community groups. In most cases, a clear institutional apparatus exists permitting initial hearings and a series of appeals up to some final authority (which may involve judicial proceedings).

Participation in the electoral process while much less developed than the various forms of direct action, has been either to support a candidate for office or to attempt to elect a group member directly. The first option involves the endorsement of and possibly the giving of active assistance to a candidate who supports the associations' stand on an important issue or group of issues. Attempting to elect a group member serves two purposes. Obviously, one goal is to elect the candidate and thus secure a voice within the municipal government. In addition, this activity provides a forum for the advancement and discussion of the associations' views even if the candidate fails to win the election.

The formation of many community associations and the expansion of their activities occurred largely in the 1960's. More recently, the process of citizen participation has advanced a step further. Municipal governments have come to recognize the validity and usefulness of this participation or, perhaps more pragmatically, they have decided that their own interests are better served by more actively involving members of the electorate in the decision-making process. Whatever the reason, some municipal governments seem to be actively soliciting citizens' views. Accordingly, they are beginning to establish a process to institutionalize

citizen participation. This has taken several forms -- polls or referenda commissionned by the government, the solicitation of views and co-operation of community associations in planning, public meetings, etc. The community committees that are part of the new unified government in Winnipeg are another example; their major purpose is to facilitate communications between the citizens and their elected representatives.

IMPLICATIONS FOR URBAN INDICATORS

Without dealing in specific cases, this chapter has attempted to demonstrate that both in institutional structure and in actual practice processes exist by which members of the community attempt to influence municipal government policy-formation. While this is true of all levels of government, the processes at the local level tend to be less formal than at the higher levels. Partly this is because of the size of the electorate and the types of issues involved, and partly it is due to the relative closeness of municipal decision-makers to their constituents. Elections are generally held more frequently and the mystique surrounding municipal politicians is less than at the provincial or federal levels.

These processes of citizen participation can be seen in terms of an economic model of rational behaviour. The consequences of government policy decisions affect the feeling of well-being or the utility of the citizens. Because of this, incentives exist on the part of individuals to try to influence the pattern of these policy decisions so as to increase the benefits (or possibly, minimize the costs) that

accrue to them. In a democratic system, where avenues of citizen-to-government communication exist, one result is interaction of the type sketched in this chapter.

Carrying this line of argument a step further, people perceive, sometimes not explicitly, the effects of government policies which contribute to their utility. These effects, in the framework of the social indicators approach adopted here, are the outputs of the relevant societal subsystem. Taking the urban community as one such subsystem, this study focuses on some of the services that are a part of the urban subsystem. Individuals "consume" the outputs of these services and, knowing (sometimes in an inexact manner) that local government policies can affect these outputs in varying degrees, they petition their government to undertake courses of action which will change the pattern of outputs to their advantage.

It would seem, then, that one benefit of social indicator development may be a contribution to better communication between the members of a community and their government and to better policy formulation through a clearer identification the real outputs of the various services involved. As already noted, individuals often possess only a very general sense of the ways in which they are affected by public policies and cannot always identify any specific factors. On the other side, public decision-makers and bureaucrats themselves, often do not have a clear idea of exactly what services they are providing. The tendency is to identify governmental activities as the final outputs. That is, in the absence of clearly

defined outputs, governments and their "consumers" (and, to a considerable extent, researchers as well) have resorted to accepting some measure of the activities of governments as proxies for their effects. Thus, for example, the per capita expenditures or manpower levels of a police force are often accepted as measuring the service levels (outputs) of the department, or the number of vehicles (or passenger spaces) are taken as indicating the output of a public transportation system.

The difficulty involved in identifying outputs and the resulting lack of understanding of the true nature of the services, may also be contributing factors to the lack of success of many urban policies. As noted at the outset of this study, in the final analysis, successful urban policy is dependent upon an understanding of the basic urban phenomena (e.g., urban land markets, and the interrelationships in the various urban processes and services). This basic understanding, in turn, must involve a clear notion of each of the processes separately including how they actually affect individuals (the outputs) and how they are affected by urban policies. This social indicator approach, by identifying the outputs, the inputs (including governmental policies) and the relationships between them may enhance this basic understanding and thereby contribute to better policy.

The foregoing discussion argues directly for a modelling approach to urban social indicators. The next chapter presents a model which identifies a set of service

outputs, the inputs that affect them and the interrelationships involved. Also included is an abstraction of the process by which citizens act to influence their government's policies.

Chapter 4

A CONSUMER-ORIENTED MODEL OF AN URBAN SYSTEM

The economic models discussed in Chapter 2 can, from one point of view, be classified as being of two types. Some are normative models dealing with the properties of optimal resource allocation or the distortions from the optimum that are associated with specific forms of municipal government organization and municipal service characteristics. The remainder are positive models seeking to explain the actual decision-making process and the influences on municipal policy formulation rather than the efficiency aspects of the resulting pattern of resource allocation. The theory presented here falls into this second group.

The first objective of the present model is to present an analytic system that is an abstraction of some of the important processes and interrelationships in urban communities. In dealing with local government services the model organizes variables in terms of service inputs and outputs, and its exogenous and endogenous variables. In this context, the outputs of the model which are basically quantifiable in nature (or, more accurately, which can be proxied by quantifiable variables) and which monitor the attributes of the urban system that affect (contribute to the utility of) its members, are urban (output) social indicators.

Secondly, from the model are derived certain empirically testable hypotheses concerning the determination of one important set of input variables that affect the state of the community as monitored by these social indicators.

This set of (input) social indicators consists of the actions or policies of the local government. These variables are of interest because they measure public policy actions, and the theory of collective action is of special concern. That is, a second principal aim is to shed some light on the determinants and effects of past policy on the outputs of the system (as measured by the urban output indicators) and through this to serve as an aid in the formulation of future policy.

AN OVERVIEW

In the model, government policies are regarded as inputs into the urban system but in contrast to the other inputs (mainly social, economic, and demographic parameters), they are endogenous. Policies are formulated within the system rather than being taken as parametric. The policy instruments available to the city government fall into two groups. First there is a set of policy action decisions (e.g., expenditures, regulatory and control functions) relating to the various areas of concern of the government. Secondly there are the tax policy instruments which the government is free to adjust. (This second set of instruments appears in the model but the implications are not explored.) Policies are influenced by the (possibly competing) demands of the groups of the community depending on how strongly they are expressed and on how responsive the city officials are to these demands. Individuals and groups transmit their desires via the normal political channels such as voting, lobbying, etc. At the same time, the policies of government

may influence the composition of the population over time, contributing to changes if they tend to favour particular groups or interests over others. In the long run the size of the favoured groups may grow as compared to the others. Adjustments of this type are most likely to be observed among jurisdictions that are part of the same metropolitan area, that is, in cases where the level of mobility of the population is relatively high.

THE MODEL

The Homogeneous Group

The basic unit of identification in the model is the individual or family unit.[1] There are N of these units in the community ($k = 1, \ldots, N$). It is assumed that the members of the community derive utility from a series of commodity attributes[2] (X_i, $i = 1, \ldots, n$). That is, utility is not derived from goods themselves but rather from service characteristics that flow from these goods. For example, a coat itself does not provide utility, but from it flows the services of "warmth" and "style" (and perhaps others); it is these characteristics or attributes which are the arguments of the utility functions.

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[1] It would perhaps be more realistic to speak of community groups composed of individuals with common interests on one or more issues. In fact, as a practical matter, in empirical analysis aggregation into a number of more or less homogeneous groups (that is, individuals who can be represented by the same demand function) is necessary. However, it is simpler to carry through the theoretical analysis in terms of individuals (or family units). The conclusions are not dependent upon this assumption. Throughout this chapter the terms "individuals" and "family units" will be used interchangeably.

[2] See Kelvin Lancaster [29, 1966] and [30, 1971].

Obviously different goods may embody the same characteristic in varying degrees or more generally, the individual may combine two or more goods to produce a desired service. For example, an individual may "produce" a set of characteristics called nutrients by combining various foods in his diet; the combination of foods he chooses will be a function of nutrient contents and prices. Faced with different sets of prices he will combine a given set of foods in a different way to produce the same or a new nutrient combination.[3]

This Lancastrian approach, when adapted to a model of an urban system, carries one major advantage. It provides a convenient method of handling the interdependencies which are so pervasive in these systems. Policies that are directed to one goal or problem very often, in an urban context, affect other concern areas, perhaps even more strongly. If policies are regarded as inputs into a production or transformation process, the outputs of which are the service attributes, the problems of interdependencies among policy functions are subsumed in the production process. Thus, for example, instead of dealing with two conventional problems like urban transportation and police protection and the interrelationships between them, one could envisage an attribute (among several) called "traffic safety" with four of the inputs into its production being measures of capital construction on roads, road maintenance, street lighting and police traffic control. Thus by viewing

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[3] If the objective function and the constraints are linear, this example becomes a problem in linear programming.

policy actions as production inputs which contribute to the outputs (attributes) of the system many of the interdependencies are accounted for implicitly.

In the context of the present model the utility (U) of the individual (or family unit) is derived from a set of service characteristics (X_i). Thus for each family unit (k):

$$(1) \quad U^k = U^k(X_1^k, \ldots, X_n^k) \qquad k = 1, \ldots, N.$$

The service characteristics are "produced", in turn, by combining a set of publicly provided goods and services (A_j) and a set of private market goods (G). For example, attributes of private automobile trips (speed, comfort, safety, etc.) are "produced" by processes which combine public services (roads, police) with private expenditures (automobiles, gasoline). Thus, a set of transformation functions can be specified for the attributes or commodity characteristics:

$$(2) \quad X_i^k = X_i^k(\alpha_{i1}^k A_1, \ldots, \alpha_{im}^k A_m, G^k) \qquad \begin{matrix} i = 1, \ldots, n \\ k = 1, \ldots, N \end{matrix}$$

where $\frac{\partial X_i^k}{\partial A_j} \gtreqless 0$ and $\frac{\partial X_i^k}{\partial G^k} > 0$.

In these transformation functions A_j ($j = 1, \ldots, m$) is the amount of the j^{th} collective good provided to the community as a result of government policy decisions. The variable α_{ij}^k is a distribution parameter which indicates the portion of the collective good A_j which is relevant to individual k in the production of attribute X_i. That is, government policies may

not benefit all members of the community to the same extent and moreover, for one individual, a particular policy may contribute to the production of different attributes in varying degrees.

As equations (2) are specified, the collectively supplied goods and services may contribute positively or negatively to the output of a particular characteristic. The positive relationship is, of course, as expected. The negative possibility is simply to allow for certain of the possible interdependencies discussed above; a policy directed towards one goal may adversely affect another. The first partial derivative of output with respect to private market goods (G) is always assumed to be positive; an individual will always arrange his private expenditures in a manner that he perceives will add to his utility level.

The Policy Variables

The policy action variables (A_j; $j = 1, \ldots, m$) are the measurable results of government decisions. These decisions may range from the provision of services (e.g., police and fire protection, sanitation) to direct transfers (e.g., social welfare payments) to regulation and control functions (e.g., zoning, licensing). The actual measurement of these policy actions can be accomplished by using a number of proxy variables. For example, it may be possible to measure the A_j variables by the expenditure on the service,[4] the actual level of activity, or a measure of one of the key

[4]The cost would be standardized per unit cost thus eliminating the influence of such factors as regional price and wage differences. In other words, the expenditure variable may be regarded as a reliable proxy for the level of input.

inputs. The urban government function "street cleaning" may be measured by expenditures on street cleaning, the actual amount of refuse collected, or the number of man-hours devoted to street cleaning. The actual proxy selected will obviously differ with the activity. Expenditures on regulatory functions would obviously be a poor estimate of the impact of these policies, but expenditures would probably be a very accurate way to estimate the level of social welfare policies.

All or some of the m policy actions enter each of the n x N transformation functions of equations (2) to produce the commodity or service characteristics which in turn provide consumers' utility. To return to the transportation example, auto trips with given characteristics will be generated by incurring private expenditures along with a series of government policy actions in the areas of street maintenance, traffic control and very likely, housing policies which influence population density.

The Distribution Parameters

The distribution parameter α_{ij}^{k} $(0 \leq \alpha_{ij}^{k} \leq 1)$ represents the portion of the total action A_j entering the production function of individual k for the attribute X_i. If (for a given i) $\alpha_{ij}^{k} = 1$ for all k then A_j is a pure public good[5] in the production of X_i in the Samuelson sense of the term. At the other extreme, if $\sum_{k} \alpha_{ij}^{k} = 1$ then A_j is a pure private good with a portion of the good going to each family unit and the

[5]The "publicness" of a good is generally defined as a property of the technology of consumption of the good. Thus for any given i (that is, dealing with one attribute) the sum over k, $\sum_{k} \alpha_{ij}^{k}$, is the description of the public good properties of A_j.

sum exhausting the total with no spillovers or externalities.[6] Between these two extremes is the wide spectrum of cases, the so-called quasi-public goods or goods involving externalities. In these cases $0 < \alpha_{ij}^{k} < 1$ for some k but no restrictions apply concerning the exhaustion of the good or service.[7] The distribution parameters, which reflect properties of the government goods and services, may account for external consumer effects of two varieties: (a) geographical effects involving the distribution of a good or service spatially throughout the city, for example, as a function of the distance from the central business district (CBD) or distance from a particular facility, and (b) demographic effects involving distribution patterns that are independent of

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[6] A special case of the pure private good is the case where $\alpha_{ij}^{k} = 1$ for one k and zero for all others. Then the entire service goes to one identifiable group while others are completely excluded. An example of this might be a local food subsidy paid to all families under a given income level.

[7] The three cases can be identified by the limits on the sums of the distribution parameters:

(1) Samuelson-type pure public goods : $\sum_{k} \alpha_{ij}^{k} = N$ where N is the number of individuals or families in the community;

(2) Pure private goods : $\sum_{k} \alpha_{ij}^{k} = 1$;

(3) Quasi-public goods : $1 < \sum_{k} \alpha_{ij}^{k} < N$.

In addition to the distribution patterns among consumers, it is assumed that externalities in production may be present, that is, $\sum_{i} \alpha_{ij}^{k} \geq 1$ for any one individual, (that is for a given k). The use of an action A_j to produce one output (X_i) may not diminish its contribution to another output. This type of externality is simply another way of stating that policy functions may be interdependent. A policy directed towards one output may influence the production of others as well.

where the families live in the urban area, but are functions of non-spatial characteristics, for example, income, type of residence, or tenure of residence.

Equilibrium

Each individual will seek to maximize his utility subject to his own income. This constraint may be written as:

$$(3) \quad I^k = G^k + t^k$$

where

$$(4) \quad t^k = \beta^k \sum_j C_j(A_j) \text{ and } \frac{\partial t^k}{\partial A_j} = \beta^k \frac{\partial C_j}{\partial A_j} \geq 0.$$

Total disposable (after taxes to other governments) income (I^k) is exhausted on the purchases of the private market goods (G^k, letting the market good be the *numeraire*) and total tax payments to the local government (t^k). The tax assessment falling on each family unit is, in turn, the share (β^k) of the total cost of all government activities, $\sum_j C_j(A_j)$, borne by the family.

The relation between tax payments (t^k) and increasing government activity (A_j) is assumed to be non-negative. A positive relationship is, of course, the case where increasing government activity is associated with increasing costs, a portion of which (β^k) is paid by the k^{th} family. The zero relationship, $\frac{\partial t^k}{\partial A_j} = 0$, may be observed under three circumstances:

(1) the activity (A_j) may be an action, the marginal cost of which is essentially zero, for example, zoning (i.e., $\frac{\partial C_j}{\partial A_j} = 0$);

(2) the funds for the activity may come from a source external to the city, for example, grants from a higher level of government (i.e., the relevant costs in the model are zero);

(3) the cost of the activity may be borne by or shifted to another group of individuals in the community (i.e., $\beta^k = 0$ for particular individuals or family units). It seems intuitively reasonable that the costs of all activities would be shifted equally, given the tax structure. The form of equation (4) implies this since β^k is independent of particular A_j's.

The first-order maximization conditions for the k^{th} individual are:[8]

$$(5) \quad \sum_i \frac{\partial U^k}{\partial X_i^k} \frac{\partial X_i^k}{\partial A_j} - \lambda \beta^k \frac{\partial C_j}{\partial A_j} = 0 \qquad j = 1, \ldots, m$$

$$(6) \quad \sum_i \frac{\partial U^k}{\partial X_i^k} \frac{\partial X_i^k}{\partial G^k} - \lambda = 0$$

$$(7) \quad I^k - G^k - \beta^k \sum_j C_j(A_j) = 0 .$$

Dividing equation (5) by equation (6) yields the familiar first-order maximization ratio for the k^{th} individual:

$$(8) \quad \frac{\sum_i \frac{\partial U^k}{\partial X_i^k} \frac{\partial X_i^k}{\partial A_j}}{\sum_i \frac{\partial U^k}{\partial X_i^k} \frac{\partial X_i^k}{\partial G^k}} = \beta^k \frac{\partial C_j}{\partial A_j} \qquad j = 1, \ldots, m .$$

[8] The first-order conditions are obtained by substituting the transformation functions, equations (2), in the utility function, equation (1), and maximizing subject to the budget constraint, equation (3). The term λ is the Lagrangian multiplier.

If he had the ability to adjust his consumption of all goods and services, the utility of individual k would be maximized at the point where the ratio of the marginal utility gained from a public policy action to that gained from market goods is equal to the marginal tax increase associated with further government action (the price of G being unity).[9] Thus individual k will desire more of a collective good as long as its marginal contribution to his utility is greater than its relative (to market goods) marginal cost through taxes.

The marginal contribution of any A_j or G^k to utility will depend on the marginal productivity of the goods in the production of the X_i^k's and the marginal contribution of these attributes to utility. Note that the marginal productivity terms for collective goods ($\partial X_i^k / \partial A_j$) embody in them the distribution parameters (α_{ij}^k) as well as the actual specification of the production functions. That is, the marginal productivity of a collective good in the production of an attribute consumed by family k depends upon the portions of the good that enters the family's transformation functions as well as the actual form of those functions. Given the production relations, the larger (smaller) the α_{ij}^k's the greater (smaller) will be the change in utility due to an increase in total A_j.

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[9]Note that the m equations in (8) also imply $\frac{m(m-1)}{2}$ marginal rate of substitution relationships between each pair of policy action variables so that the ratio of marginal contributions to utility of any two A_j's will equal the ratio of the tax increments associated with each.

If individual k could select the optimal quantities of collective and private goods, the equilibrium conditions of equations (8) would all prevail. However, this is not the case. The quantities of the m collective goods are determined by the community's government and each community member must accept these as given. The members of the community then will each attain an actual level of utility which must be less than or equal to the optimum possible. Moreover, the actual level will equal the optimal level if and only if the community-decided quantity of each of the A_j's equals the quantity the individuals or families would have chosen for themselves. It then follows that at least $N-1$ family units (and likely all N) will achieve utility levels that are below the possible optimum. This shortfall creates an incentive for these individuals.

In an attempt to reduce the loss between optimal and actual utility levels, each citizen will find it worthwhile to devote some effort to attempting to influence the community government's operations, with the extent of the effort depending upon the potential gain in utility. Based on the equilibrium conditions of equations (8) it is possible to write the following demand functions for the k^{th} unit:

For the collective goods,

$$(9) \quad A_j^k = A_j^k(I^k, \gamma_1^k, \ldots, \gamma_m^k) \qquad j = 1, \ldots, m$$

and for the market good,

$$(10) \quad g^k = g^k(I^k, \gamma_1^k, \ldots, \gamma_m^k)$$

where A_j^k and g^k are the demand quantities for individual k of the collective and private market goods respectively, where

$\gamma_j^k = \beta^k \frac{\partial C_j}{\partial A_j}$, is the marginal tax cost of the j^{th} collective good to the k^{th} individual, and where

$$\frac{\partial A_j^k}{\partial I^k} \gtrless 0; \quad \frac{\partial A_j^k}{\partial \gamma_j^k} \leq 0; \quad \frac{\partial A_j^k}{\partial \gamma_h^k} \geq 0; \quad \frac{\partial g^k}{\partial I^k} > 0; \quad \frac{\partial g^k}{\partial \gamma_j^k} \geq 0.$$

$$j, h = 1, \ldots, m. \quad j \neq h.$$

The demand for a particular collective good may vary inversely with income because of the possibility that the good may be directed primarily to lower income groups. Thus as a family moves up the income scale it benefits less from the particular government service (its α_{ij}^k decreases) and therefore demands less. The conditions on the partial derivatives also imply normal substitution effects among all the goods; the demand for one good (private or collective) will increase with the relative price of any of the others (private or collective), allowing for the possibility that the substitution effect may be zero. The remaining partial derivatives are of the expected sign; the demand for private market goods increases with income and the demands for both types of goods move inversely with their respective relative prices.

If government actions depart from the desired (demanded) levels of equations (9),[10] the individual will attempt to influence policy to increase or decrease A_j. Obviously, the level of effort expended by him to change A_j will depend upon its importance to him; the greater the disparity between actual and potential utility levels that could be reduced through a change in A_j, the

[10] That is, if $A_j - A_j^k \neq 0$.

more effort will be devoted to influence the desired change. The mechanisms by which he may influence government policy include, of course, voting and various lobbying activities.[11]

Government Supply

The previous section determined, for each individual or family unit in the city, a set of demands for local government actions. As the discussion in the previous section indicated, hypotheses concerning the government's supply of these actions, in a democratic system, involve decision-makers' responses to these demands. That is, in contrast to the theory of competitive markets where production and supply decisions are made independently of demand patterns, a democratic government adjusts the supplies of its services in response to constituents' demands.

In its most general form this supply pattern may be expressed as a government response function:

$$(11) \quad A_j = A_j(A_j^1, \ldots, A_j^N) \qquad j = 1, \ldots, m$$

where $\frac{\partial A_j}{\partial A_j^k} \geq 0$. The government will set its priorities and

[11]At this point it perhaps becomes more realistic to speak of group rather than individual action. One could envisage a group composed of individuals who wish to influence a government policy or a set of policies in the same direction. For example, if for each of a group of individuals, $A_j - A_j^k < 0$, then these individuals may be considered as potential members of a community association whose purpose is to try to increase the supply level of that particular A_j. Of course, community associations are, more realistically, coalitions directing their efforts towards a number of issues and policies. The members of a group may then be thought of as those who wish to move the government in the same direction on each of the issues or those who are willing to trade off some issues against others because they will enjoy net positive benefits and because by acting through the group they are more likely to be successful.

supply services in response to citizen demands, perhaps depending on how effectively citizens and citizens' groups transmit their demands to the decision-makers and upon which individuals and groups are the most influential (due to factors such as, for example, their wealth or size). The above specification indicates that the government may not respond positively to the wishes of a particular individual or group but it will never respond negatively, *ceteris paribus*. A desire by member k for more A_j will never lead the government to supply less (other demand quantities remaining the same).[12]

The response functions (11) state a relationship in very general terms, which is consistent with several more specific response pattern (supply) theories that are discussed in the literature. For example, one could follow the Downs approach and argue that the government responds to the individual demands in a manner that would maximize its probability of re-election. At least two strategies could be postulated to attain this goal. First, the government may attempt to minimize the difference between supply and demand for important services to certain citizens below some critical point. That is, the government may attempt to set each A_j so that for some individuals the difference $A_j - A_j^k \neq 0$ is

[12] Of course governments face many competing pressures and often make several decisions simultaneously (or at least not independently). Thus one may find that a government decides to reduce the scope of a given programme even though some members of the community wish to see it expanded. Such behaviour is not inconsistent with the assumed sign of the partials; it only indicates that some individuals or groups are more influential (have greater impact in the government's response function) than others and that when they transmit opposing signals to the decision-makers, the resulting net movement will favour the stronger members.

sufficiently small. Sufficiently small would occur when the citizens feel the alternative government is not likely to do any better. However, as the number of individuals or groups increases beyond a very small number, it is very likely that this strategy will become non-feasible.

Secondly, and more realistically, there is the "median strategy" discussed in the literature.[13] The government seeks to satisfy the demands of the median voter (or the group containing the median voter) and to force its opponent towards one of the extremes. Thus the government attempts to place itself closer to the demands of a majority of voters than its opposition.

Another possible form of equations (11) might be a weighted average of the demands of the members of the community. Thus:

$$(12) \quad A_j = \sum_k \mu^k A_j^k \qquad j = 1, \ldots, m.$$

Equations (12) may imply a "minimum dissatisfaction" strategy as discussed above or they may imply the existence of a social welfare function held by the government policy-makers. In this context maximizing a social welfare function need imply nothing more than "the maximization of proxies for [one's] personal conceptions of what would be good for society."[14]

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[13] See, for example, Barr and Davis [3, 1966], *op. cit.* Tullock [60, 1967] also argues that in a democratic system median tastes will tend to dominate in that successful candidates will reflect these positions.

[14] R. N. McKean [36, 1973]. McKean goes on to state that "when one speaks of the maximization of a social welfare function, I think it usually means the maximization of some fragmentary, oversimplified proxy for his personal notion of what would be good for society." (p. 19n).

That is, the decision-makers implicitly or explicitly may weight the needs of their constituents in an attempt to determine what is best for the community as a whole.[15]

Conclusion

The model presented here, while it is a much over-simplified sketch of particular aspects of a social system, is intended to illustrate two points. First, it proposes criteria for the selection of urban output indicators. In the model the attribute or characteristic outputs of the system are a set of urban social indicators.[16] Moreover, it attempts to indicate the links between these outputs and the factors that influence them (the input indicators) so that it may be possible to make analytical statements about the social indicators in addition to simply measuring their levels.

Secondly, the model attempts to sketch the process of interaction between individuals and their local government that influences one set of inputs into the attribute production process. In the model the government has two sets of policy instrument variables it can control. It determines its policy actions, the A_j's and it sets the

[15] Several local government actions (e.g., road construction) consist of making essentially marginal adjustments to a large existing stock of capital. In these instances it may be preferable to think of individuals demanding desired stocks. Then variations of equations (11) would be expressions for the government's (composite) desired stock, based on individual demands. The government then would act to bring the actual stock of capital in line with its desired stock via an adjustment process. However the essence of the government response function remains the same.

[16] See Appendix A for a first attempt at identifying some of these outputs.

taxes of the groups under its jurisdiction, the t^k's. By altering tax shares[17] the government may change individual demand patterns for collective goods as a whole. This possibility is not explored here though it raises several interesting questions, especially from the viewpoint of income distribution.

SOME APPLICATIONS

The model, as developed, appears to be consistent with several observations on the pattern of cities. This does not imply that the theory presented sufficiently models all these phenomena but it does suggest that particular adaptations or empirical applications of the model to "explain" them may not be inappropriate.

One might expect that, over a long period of time, interest groups in the community that are favoured by government policies would tend to grow absolutely and relatively to those groups that are not favoured. In most cases this process may involve a considerable time lag since migration would be the main mechanism by which it would occur. In some cases, however, mobility is greater and the pattern may emerge more quickly. Consider, for example, migration among separate jurisdictions within the same metropolitan area or to choice areas within the same community. The pattern

[17] Although this set of instruments was not discussed in the model, taxes of all groups can be changed by changing amounts of debt financing, grants, subsidies, etc. Relative tax shares among people can be altered by changing the β^k's (for example, by changing property assessments), but in practice this is usually not an acceptable alternative. In the development of this model the β^k's have been assumed fixed.

often observed is the growth of relatively affluent, relatively homogeneous suburbs or "high class" enclaves and the emergence of a group of low income areas, each one also being relatively homogeneous. The model presented here does not pretend to be able to explain this process; it is, however, consistent with that pattern and the patterns of local government policies undoubtedly reinforce it.

Many of the policies of local governments affect implicit prices of goods and services and as a result they influence the allocation of resources within the city and subsidize certain individuals and groups over others. In terms of the model, these subsidies could be interpreted as being the results of governments responding strongly to the demands of certain groups in the community at the expense of others. One example is the system of transportation dominant in urban communities. Without doubt private automobile drivers are being significantly subsidized over those who must rely on public transportation. This pattern could be viewed as the result of government reactions to the demands of higher income, influential members of the population at the cost of those who are poorer and often politically inarticulate.

Finally, it is possible to estimate some of the relationships in the model. Two, in particular, are candidates for estimation. Specifications of the transformation relations, equations (2), can be tested to examine the inputs (government policies and others) that affect the output indicator variables.

Secondly, as suggested above, various types of government response functions can be formulated; empirical estimates of these specifications may provide some insight as to the influences on local government policy decisions. The next chapter is a start in this direction.

Chapter 5

SOME EMPIRICAL RESULTS

Thus far, this study has presented a model dealing with the criteria for selecting urban indicators, the influences on those indicators (especially government policies) and a feedback process through which citizens transmit their demands for services as monitored by these indicators to their government. Preceding that, some of the relevant earlier research was summarized and the actual mechanisms of community-to-local government communications were briefly discussed. The fourth major task remaining is to move towards operationalizing the concepts presented in the model. This chapter is a first step in that direction.

Sufficient data are not yet available to permit the construction of a full range of disaggregated urban indicators of the type discussed in the previous chapter and suggested in Appendix A. However, the position taken here is that, given an overall framework, it is preferable to begin the empirical process of indicator development with whatever data are currently available rather than wait for a more acceptable data set to emerge. It is agreed that the indicators developed at this early stage will not be directly applicable for policy formulation purposes but they hopefully will represent a start in that direction. Meanwhile the indicators can be strengthened and improved as more data become available. Beginning the development now will help to point out the data gaps and the directions for future data collection.

With that caveat in mind this chapter presents the results of empirical tests of two of the hypotheses that emerged from the theoretical model. The first set of tests deals with the government response functions formulated in Chapter 4. The intention is to explore how governments' policies are influenced by the demands of their constituencies. Secondly, an attempt is made to relate inputs to outputs in three urban indicator areas. These results are thus related to the transformation functions of Chapter 4.

The theory of Chapter 4 deals with intracity relationships. Therefore, to properly test aspects of that theory requires a data set that describes characteristics of small groups and small areas within a city and the outputs of government services that flow to them. Urban indicators constructed in this manner would embody the distributive aspects of these services. At present, however, for most services, data are not available at this level of disaggregation. Only scattered bits of detailed data can be collected but not in sufficient quantities to permit statistical analysis.

Currently available data provide one observation for each city for each variable. While they do not directly relate to the model of Chapter 4, it was felt that these data could still be useful for providing some indications of the influences on local government policies, and, in those cases for which they are available, a preliminary look at some of the outputs (urban social indicators).

However, in order to adapt the empirical model to an intercity (that is, across jurisdictions) analysis rather than the intracity relationships in the theoretical model, it is necessary to make three further assumptions, which are not made in the construction of the theory itself. The assumptions are:

(1) Arguments in the local government response functions can be fairly represented by the single observations on each variable (in each city or jurisdiction). That is, if the government pursues the "median strategy" discussed in the previous chapter, for example, then the observations on the demographic variables are assumed to characterize the median group in that city or jurisdiction.

(2) Local governments have the same response patterns in dealing with the demands of their constituents.

(3) The transformation relationships for the outputs are the same for each city.

The first assumption is basically that demographic differences among cities which may affect policy decisions are captured in the limited data available. It is fully realized that these assumptions (and especially the first) are more restrictive than those employed in the construction of the theoretical model itself; the fact that they are now being made results entirely from the inadequacies of the available data. The results presented in the remainder of this chapter are subject to the limitations imposed by these three additional assumptions.

The data used in the empirical analysis that follows pertain to a set of Ontario municipalities having a population of 15,000 or more in 1971. Data sources and a brief discussion of some of the characteristics of the data that affect the analysis are presented in Appendix B.

COMMUNITY CHARACTERISTICS AND GOVERNMENT POLICIES

The model of Chapter 4 argued that government policies are shaped by the competing demands of the members of the local electorate. If that is the case, one would expect to find that differences across communities (and across neighbourhoods within a city) in government policies would be associated with differences in the socio-economic composition of the constituent populations. The variables describing the socio-economic characteristics serve as proxy measures for the demand variables in equations (11) of Chapter 4. That is, individuals or families expressing the same demands are expressing a communality of interests which are likely to be associated with similar characteristics such as income, ethnic background, family composition, etc. By identifying differences of these sorts across populations, it may be possible to identify the sources of differences in their demands for various public services.

On that basis, an attempt was made to identify the potential associations between differences in government policies (measured by expenditure levels) and differing citizens' interests (proxied by socio-economic differences). As suggested in Chapter 4, policies could be measured with other variables

such as the actual service levels (e.g., the number of policemen on the force rather than the expenditures by the police department). However, these types of measures are generally not collected in a consistent fashion that would permit a comparison across jurisdictions and, often, they are not tabulated at all.

The attempt to explain the variances in government expenditure levels for a group of policy areas in terms of socio-economic differences among the communities was undertaken, first of all, using multiple linear regression analysis. The dependent variables were entered in two forms, expenditure levels per 10,000 people and as a share of total current expenditures exluding education. The first form provides an absolute measure of resources devoted to a particular policy area while the second provides a measure of the relative importance of that concern in terms of the overall budget. The results of this analysis are reported in Table 5-1 and Table 5-2.

In the first case, the current expenditure levels per 10,000 people in each of eight categories were regressed against a series of variables describing characteristics of the citizens, the size of the communities, and the real property assessment levels in the communities. As reported in Table 5-1, the equations for "other protective services" (3), "community planning" (7) and, to some extent, "general government" (8) were not particularly successful. It is thought that one main reason for this is due to the conglomerative nature of these

three expenditure categories. That is, each classification contains a number of more specific items and the exact composition of the categories varies from city to city. Thus they are not strictly comparable across cities.

Per capita police expenditures were found to decrease with city size as the proportion of non-French (English)[1] speaking people in the population increased; these expenditures increased with the ratio of commercial to total assessment. Fire protection services increased with the proportion of rented dwellings, possibly indicating a greater expense in the servicing of larger structures. Fire services also tended to diminish as the rented dwellings became more crowded; higher rental crowding conditions in turn were associated with generally lower economic status. Fire expenditures were less in cities that were part of a metropolitan area. Finally, it is of interest to note that higher expenditures were associated with higher total assessment values and with relatively higher commercial assessments in the municipality. Larger commercial establishments appeared to be more expensive to service or demanded a higher level of protection.

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[1] A higher proportion of non-French people is almost completely the same as a larger English population as the variances for other national backgrounds were minimal.

Table 5-1

MUNICIPAL GOVERNMENT POLICY EQUATIONS
58 ONTARIO MUNICIPALITIES, 1970-72[1]
(Expenditures per 10,000 people)

Dependent Variable[2] (Expenditures per 10,000 People)	Independent Variables: Population 10,000 (1)	Population Density (2)	Ratio of Rented to Total Dwellings (3)	Persons per Room Owner-Occupied Dwellings (4)	Persons per Room Renter-Occupied Dwellings (5)	Average Personal Income (6)	Percentage of Earners With Incomes Under $4,000 per Year (7)	Percentage of Earners With Incomes Over $15,000 per Year (8)
1. Police protection[4]	-12,219.19 (2.47)	-2.85 (.96)	135,111.44 (1.43)	-92,655.91 (.38)	-382,344.70 (1.63)	38.06 (1.36)	1,505.57 (.48)	-9,286.55 (1.38)
2. Fire protection	13.58 (.03)	.52 (.29)	147,973.90 (1.95)	132,003.49 (.67)	-384,671.43 (2.01)	-24.83 (1.12)	-2,654.45 (1.01)	3,761.14 (.66)
3. Other protective services[5]	- 87.88 (.31)	- .76 (.71)	58,372.04 (1.30)	-115,479.41 (.99)	32,462.68 (.29)	21.69 (1.66)	- 301.42 (.19)	-7,184.45 (2.13)
4. Health services	357.74 (2.87)	1.54 (2.94)	8,532.42 (.43)	--	--	- 6.83 (1.25)	- 705.00 (1.03)	222.26 (.16)
5. Social welfare	- 164.08 (.32)	-2.84 (1.34)	10,653.10 (.12)	--	--	-15.30 (.65)	-2,546.42 (.88)	-2,601.88 (.42)
6. Recreation	315.89 (.44)	1.92 (.70)	125,290.43 (1.12)	--	--	-14.58 (.46)	-3,739.54 (.95)	4,132.23 (.51)
7. Community planning	- 150.30 (.38)	.16 (.11)	20,292.66 (.32)	167,896.88 (1.02)	15,837.65 (.10)	-13.62 (.73)	644.61 (.29)	2,418.28 (.50)
8. General government	182.53 (.36)	1.69 (.86)	-57,453.15 (.70)	- 69,776.88 (.33)	- 89,222.38 (.43)	-23.11 (.96)	-2,162.34 (.76)	-3,085.33 (.50)

Table 5-1 (cont'd.)

Dependent Variable	Independent Variables								R^2
	Percentage of Households With Female Heads (9)	Percentage of Families with Children Under 14 Years (10)	Percentage of Population Non-French (11)	Metro Dummy (12)	Total Assessment per 10,000 People (13)	Ratio of Commercial to Total Assessment (14)	Ontario Subsidies per 10,000 People[3] (15)	Constant (16)	
1. Police protection	--	--	-135,078.78 (1.89)	840.49 (.07)	$.6x10^{-3}$ (1.06)	28,530.79 (2.66)	--	334,686.13 (1.11)	.42
2. Fire protection	--	--	12,741.67 (.23)	-19,535.59 (2.02)	$.1x10^{-2}$ (2.76)	246,824.98 (4.06)	--	390,182.43 (1.58)	.70
3. Other protective services	--	--	24,390.08 (.74)	- 2,858.37 (.50)	$.6x10^{-3}$ (2.15)	35,468.80 (.99)	--	- 44,670.96 (.31)	.35
4. Health services	-20,212.26 (.47)	--	27,909.17 (2.52)	- 5,135.48 (1.90)	$.4x10^{-4}$ (.28)	27,154.22 (1.67)	.88 (4.08)	34,889.76 (.65)	.79
5. Social welfare	246,684.56 (1.34)	--	-28,587.40 (.61)	-18,916.41 (1.67)	$-.6x10^{-5}$ (.01)	132,124.14 (1.92)	1.43 (18.24)	199,008.91 (.87)	.94
6. Recreation	--	383,126.73 (2.35)	195,963.54 (2.89)	-11,424.27 (.79)	$.2x10^{-2}$ (2.28)	266,293.23 (2.96)	--	-169,727.23 (.50)	.46
7. Community planning	--	--	72,083.78 (1.55)	- 4,103.75 (.50)	$.6x10^{-3}$ (1.52)	41,998.95 (.83)	.38 (.75)	-124,014.96 (.60)	.20
8. General government	--	--	-59,342.72 (.98)	- 7,183.89 (.68)	$.2x10^{-2}$ (3.90)	99,827.26 (1.51)	--	472,563.48 (1.77)	.37

(1) The observations on the variables (1)-(11) are for 1971. The observations on the variables (13)-(15) and the dependent variables are for the three years 1970-72.

(2) The values in parentheses are t-statistics (absolute values).

(3) This variable is different in each of the three equations where it appears. In equations (4), (5) and (7) it refers to health, social welfare, and other subsidies, respectively.

(4) There are 52 observations for this equation. Six jurisdictions in Metropolitan Toronto are omitted because of insufficient data.

(5) This includes mainly inspection services of various types.

Health service expenditures increased with city size and density and were relatively smaller in cities that were part of metropolitan areas. They were higher as the non-French population increased. As provincial government health subsidies increased, so did local health expenditures with a one dollar increase in the subsidy being associated with a .88 dollar increase in expenditures. In Chapter 3 it was noted that certain financial responsibilities have largely been assumed by the province while the administrative functions remain with the municipality. In Ontario, social welfare expenditures fall into this category and in the fifth equation in Table 5-1 the provincial subsidies variable was clearly the dominant independent variable in the regression. The coefficient indicates that per capita welfare subsidies are associated with proportionately larger per capita increases in welfare expenditures. This relationship may be partially explained by the definitions of the variables; specifically, social welfare expenditures may include some forms of assistance that are supported by other provincial subsidies.

Higher recreation expenditures were associated with a larger proportion of families with young children (under 14 years of age) and a larger English (non-French) population. These relationships may describe part of a profile of the groups that make the most use of and thus demand more municipal recreation facilities. In addition, richer communities

(those with higher per capita total assessments), and communities with relatively larger commercial assessments, tended to spend more on recreational facilities.

It has already been noted that the results of the final equation dealing with expenditures on general governmental activities were somewhat less satisfactory, again perhaps because of the conglomerative nature of the classification. However, these expenditures were associated with relatively higher total assessment values.

It is interesting to note that in the equations for fire protection, health services, and social welfare services the metro dummy variable was at an acceptable significance level and in all cases indicated that cities in larger urban areas tended to spend less on these functions than more isolated cities. These results are interesting when compared with the several theoretical studies arguing that in the presence of externalities or spillovers between communities a less than optimal amount of a collectively supplied service will be provided.

In Table 5-2 the results of the analysis are reported using current expenditures in each category as a share of the total current budget (excluding education) as the dependent variables. Generally, the results are not qualitatively different than those in Table 5-1 although certain differences worth noting did appear.

Table 5-2

MUNICIPAL GOVERNMENT POLICY EQUATIONS
58 ONTARIO MUNICIPALITIES, 1970-72[1]

(Budget shares)

Dependent Variable[2] (Expenditures as Proportions of Total Budget)	Independent Variables							
	Population 10,000	Population Density	Ratio of Rented to Total Dwellings	Persons per Room Owner-Occupied Dwellings	Persons per Room Renter-Occupied Dwellings	Average Personal Income	Percentage of Earners With Incomes Under $4,000 per Year	Percentage of Earners With Incomes Over $15,000 per Year
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Police protection[4]	$-.002$ (.63)	$.7\times10^{-6}$ (.30)	$-.087$ (1.23)	$-.074$ (.41)	$-.256$ (1.46)	$.4\times10^{-4}$ (2.14)	.003 (1.27)	$-.004$ (.86)
2. Fire protection	$.9\times10^{-4}$ (.21)	$.4\times10^{-5}$ (2.26)	.006 (.09)	$-.119$ (.67)	.015 (.09)	$-.2\times10^{-4}$ (.93)	$-.002$ (.72)	.007 (1.30)
3. Other protective services	$.7\times10^{-4}$ (.33)	$.5\times10^{-6}$ (.57)	$-.009$ (.26)	$-.137$ (1.56)	.090 (1.06)	$.2\times10^{-4}$ (1.63)	$-.000$ (.13)	$-.004$ (1.68)
4. Health services	$.3\times10^{-3}$ (2.06)	$.2\times10^{-5}$ (2.89)	.014 (.57)	--	--	$-.1\times10^{-4}$ (1.59)	$-.001$ (1.04)	.001 (.57)
5. Social welfare	$.2\times10^{-4}$ (.08)	$-.2\times10^{-5}$ (1.23)	.050 (.99)	--	--	$-.1\times10^{-4}$ (.90)	$-.001$ (.46)	$-.005$ (1.37)
6. Recreation	.001 (1.22)	$.3\times10^{-5}$ (.79)	$-.050$ (.43)	--	--	$-.2\times10^{-4}$ (.72)	$-.004$ (.89)	.014 (1.60)
7. Community planning	$-.7\times10^{-4}$ (.29)	$.4\times10^{-6}$ (.38)	$-.011$ (.28)	.087 (.85)	.070 (.70)	$-.9\times10^{-5}$ (.75)	.001 (.60)	.003 (.97)
8. General government	$.2\times10^{-3}$ (.81)	$.4\times10^{-5}$ (3.64)	$-.162$ (3.60)	$-.165$ (1.40)	.088 (.78)	$-.7\times10^{-5}$ (.57)	$-.000$ (.08)	$-.001$ (.15)

Table 5-2 (cont'd.)

Dependent Variable	Independent Variables								
	Percentage of Households With Female Heads (9)	Percentage of Families with Children Under 14 Years (10)	Percentage of Population Non-French (11)	Metro Dummy (12)	Total Assessment per 10,000 People (13)	Ratio of Commercial to Total Assessment (14)	Ontario Subsidies per 10,000 People (3) (15)	Constant (16)	R^2
1. Police protection	--	--	-.148 (2.76)	.031 (3.62)	-.000 (2.76)	.002 (.30)	--	.146 (.65)	.53
2. Fire protection	--	--	.017 (.35)	.008 (.91)	-.000 (.32)	.118 (2.15)	--	.233 (1.05)	.52
3. Other protective services	--	--	.016 (.63)	.005 (1.21)	.000 (.02)	-.007 (.27)	--	-.025 (.23)	.29
4. Health services	-.063 (1.18)	--	.032 (2.36)	-.002 (.57)	-.000 (.26)	.017 (.85)	.000 (1.85)	.064 (.96)	.65
5. Social welfare	.034 (.32)	--	-.032 (1.14)	-.010 (1.55)	.000 (.26)	.039 (.95)	.000 (16.43)	.156 (1.16)	.93
6. Recreation	--	.045 (.26)	.113 (1.56)	.018 (1.18)	-.000 (.29)	.048 (.50)	--	.209 (.58)	.38
7. Community planning	--	--	.044 (1.54)	.000 (.07)	.000 (.71)	.018 (.57)	.000 (.25)	-.112 (.88)	.14
8. General government	--	--	-.046 (1.40)	.012 (2.08)	.000 (.83)	-.014 (.38)	--	.261 (1.78)	.48

(1) The observations on the variables (1)-(11) are for 1971. The observations on the variables (13)-(15) and the dependent variables are for the three years 1970-72.

(2) The values in parentheses are t-statistics (absolute values).

(3) This variable is different in each of the three equations where it appears. In equations (4), (5) and (7) it refers to health, social welfare, and other subsidies, respectively.

(4) 52 observations.

As in the first set of regressions, the equations for "other protective services" and "community planning" were not very satisfactory. The suspected explanation for this has already been mentioned. Police expenditures as a share of total expenditures increased as average personal income levels rose, and in metropolitan areas (which may contradict some of the previously referenced theoretical literature), and decreased as the proportion of non-French in the population increased as in the per capita form of the equation. Total assessment levels exerted a negative but minutely small influence on the dependent variable. The results of fire protection equation were not as satisfactory in this form, but again, a positive relationship between expenditure share and the importance of commercial assessment in the community was observed.

The share of health service expenditures tended to increase with population, density, the size of the non-French population, and Ontario health subsidies as in the earlier version. Social welfare subsidies from the Ontario government again was an important explanatory variable of social welfare expenditures in equation (5). The sixth equation, dealing with recreation facilities was not as successful in this form; however, at a low significance level, a larger proportion of high income earners and a higher proportion of English people in the population were associated with higher civic expenditures. These relationships are consistent with those observed in the per capita form of the equation.

Finally, the eighth equation indicated that general government expenditures as a share of the total budget increased with population density, with a larger proportion of owner-occupied dwellings and in communities that were part of a metropolitan area. The last result seems, on the surface, to be opposed to those shown in Table 5-1, but it may imply that being part of a larger metropolitan area imposes more general expenses on a municipality in the form of costlier administration and in the costs of negotiating and co-ordinating activities with its neighbours.

The results presented in Tables 5-1 and 5-2 do provide some empirical evidence of the manner in which population differences affect local government spending policies. While this evidence is tentative and indirect it does indicate that the variance in certain municipal expenditures can be partly explained by socio-economic differences in the constituent populations, as the model in Chapter 4 predicted.

To obtain another picture of the influences of these characteristics on the various expenditure categories it was decided to group the independent variables into a smaller number of composite variables that woule still capture most of the essential aspects of these characteristics. The method selected was factor analysis employing a principal-component solution. This method defines a new set of variables or factors as an exact mathematical transformation of the original data.

Seventeen original variables were summarized in four factors using this procedure. The results of this exercise after orthogonal (varimax) rotation (to obtain uncorrelated factors) are presented in Table 5-3.[2]

The pattern of the factor loadings in Table 5-3 is such that the four factors can be identified as representing aspects of the municipalities. The first factor, which has been identified as "Socio-economic (A)" loads positively the variables city size and density and variables on the populations including the percentage of renter-occupied dwellings and the percentage of households with female heads. The percentage of households with children under 14 years of age is negatively loaded as is the total assessment variable. The commercial assessment ratio is positively loaded. Generally speaking then, increasing factor scores represent greater population and density and socio-economic characteristics such as higher proportions of renters and female heads of households and a lower proportion of households with young children.

The second factor, which has been designated as a wealth factor, is positively loaded by the variables describing average incomes, the percentages of earners in the upper ($15,000 and over) and middle ($7,000-$10,000) income ranges, and total per capita assessment values. The variable describing the percentage of earners in the lowest income group (less than $4,000) loaded negatively. Thus higher factor scores for the wealth factor are associated with wealthier communities.

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[2]Table C-1 in Appendix C presents the factor patterns with two oblique rotations which permit different amounts of correlation among the factors.

Table 5-3

FACTOR LOADINGS
(PRINCIPAL COMPONENTS SOLUTION)
58 ONTARIO MUNICIPALITIES
(Varimax rotation)

Variables	1 (Socio-Economic-A)	2 (Wealth)	3 (Socio-Economic-B)	4 (Subsidy)
1. Population/10,000	.621	.460		
2. Population density	.873			
3. Ratio of rented to total dwellings	.897			
4. Persons per room - owner-occupied dwellings			.862	
5. Persons per room - renter-occupied dwellings			.883	
6. Average personal income		.901		
7. % of earners with incomes under $4,000		-.913		
8. % of earners with incomes of $7,000-$10,000		.402		.593
9. % of earners with incomes over $15,000		.649		-.515
10. % of households with female heads	.769	-.474		
11. % of families with children under 14	-.658		.443	
12. % of population non-French			-.805	
13. Total assessment per 10,000 people	-.308	.345		
14. Ratio of commercial to total assessment	.520			.423
15. Ontario welfare subsidies per 10,000 people				.646
16. Ontario health subsidies per 10,000 people				.475
17. Ontario other subsidies per 10,000 people				.664
Variance explained by factor (%) (prior to rotation)	28.3	18.3	13.4	9.7

The two persons-per-room variables loaded positively on the third factor and the variable measuring the proportion of the non-French population loaded negatively. Thus higher scores of this factor, which is designated as the "socio-economic (B)" factor, are associated with a greater degree of crowding and a higher proportion of French-speaking people in the community.

Finally, the three subsidy variables load positively on the fourth factor (subsidy factor) along with the commercial assessment ratio and middle income group variables. The high income group variable loads negatively. Higher factor scores would thus be associated with higher subsidy levels and fewer high income earners.

The 17 variables were thus summarized by the four factors described above. The next step was to use these factors as explanatory variables in the two sets of municipal government expenditure equations. The results, using as the dependent variables expenditures per 10,000 people in standardized form,[3] are presented in Table 5-4. The standardized form of the variables means that the reported coefficients are *Beta* coefficients. They indicate the number of standard deviations change in the dependent variable associated with a one standard deviation change in the independent variable.

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[3]The means and standard deviations of all the variables are reported in Appendix C, Table C-2.

Table 5-4

MUNICIPAL GOVERNMENT POLICY EQUATIONS
58 ONTARIO MUNICIPALITIES, 1970-72
(Expenditures per 10,000 people and orthogonal factors)

Dependent Variables[1] (Expenditures per 10,000 People)	Factors 1 (Socio-Economic-A)	2 (Wealth)	3 (Socio-Economic-B)	4 (Subsidy)	R^2
1. Police Protection[2]	.567 (3.68)	.010 (.08)	-.198 (1.67)	.282 (.75)	.34
2. Fire Protection	.579 (6.00)	-.187 (1.94)	-.288 (2.99)	.268 (2.78)	.52
3. Other Protective Services	-.028 (.21)	.116 (.89)	-.279 (2.16)	.198 (1.53)	.13
4. Health Services	.690 (7.92)	.154 (1.77)	-.236 (2.71)	.245 (2.81)	.60
5. Social Welfare	.170 (2.06)	-.387 (4.69)	.113 (1.37)	.682 (8.26)	.64
6. Recreation	.146 (1.17)	.292 (2.33)	-.280 (2.23)	.045 (.36)	.18
7. Community Planning	-.018 (.14)	-.176 (1.33)	-.098 (.74)	.225 (1.71)	.09
8. General Government	.080 (.62)	-.103 (.79)	-.202 (1.56)	.272 (2.11)	.13

(1) The dependent variables are all in standardized form. Accordingly, the coefficients reported in the table are Beta coefficients. A Beta coefficient indicates the number of standard deviations change in the dependent variable associated with a change of one standard deviation in the independent variable. The numbers in parentheses below the coefficients are *t*-statistics (absolute values).

(2) 52 municipalities.

In the first equation, police expenditures were relatively strongly and positively associated with the first socio-economic factor and, at a lower level of significance, negatively and less strongly associated with the third factor. The interpretation that emerges is that police expenditures tend to be relatively higher in larger and lower economic status communities. Fire expenditure levels were strongly associated with the first factor indicating that these expenditures tend to be greater in larger, denser communities and in communities with more renters and female-headed households. These latter variables tend to be associated with lower economic status, although this is somewhat of a rough generalization. The negative coefficient of the wealth factor and the positive coefficient on the fourth factor are consistent with this relationship while the negative association with the third factor is somewhat offsetting.

As in the earlier regressions, the third equation was less satisfactory. However, the coefficient of the third factor indicates a positive association between socio-economic status (lower crowding levels) and the level of other protective services. Health expenditures were strongly and positively associated with the first factor and more moderately linked with the wealth and subsidy factor. Again, the negative coefficient of the third factor is partially offsetting but its value is smaller than the value of the *Beta* coefficient of the first. Welfare expenditures were strongly linked to the subsidy factor and this result is consistent with those in the earlier regressions. In addition, from the *Beta*

coefficient of the second factor, it is noted that lower wealth levels implied higher welfare expenditures. Recreation expenditures were positively associated with the measures of community wealth and negatively with the socio-economic characteristics summarized in the third factor. Again, repeating the results of the earlier regressions, because of the nature of the community planning expenditure variable, this equation did not yield very satisfactory results. The final equation reports a positive association between the subsidy factor and general government expenditures, perhaps indicating that provincial grants enable municipal governments to direct more funds into other areas as well as into the subsidized activities.

The links between the factors and local government expenditures were further explored with the budget share form of the expenditures as the dependent variables. These results are shown in Table 5-5.

In this case, the variance in the proportion of the budget devoted to police expenditures was not successfully explained using the factors as the independent variables. This result is surprising in view of the satisfactory results of the other equations dealing with police expenditures. As in the per capita form of the equation, the share of fire expenditures in the budget was strongly and positively associated with the first factor and thus with larger and denser municipalities and, generally speaking, with poorer socio-economic status.

Table 5-5

MUNICIPAL GOVERNMENT POLICY EQUATIONS
58 ONTARIO MUNICIPALITIES, 1970-72
(Budget shares and orthogonal factors)

Dependent Variables[1] (Expenditures as Proportions of Total Budget)	Factors 1 (Socio-Economic-A)	2 (Wealth)	3 (Socio-Economic-B)	4 (Subsidy)	R^2
1. Police Protection[2]	.090 (.49)	.129 (.85)	.097 (.69)	-.160 (1.15)	.05
2. Fire Protection	.659 (6.74)	.075 (.77)	-.196 (2.01)	-.181 (1.86)	.50
3. Other Protective Services	-.065 (.53)	.379 (3.08)	-.225 (1.82)	-.125 (1.01)	.21
4. Health Services	.625 (6.22)	.220 (2.20)	-.207 (2.06)	-.025 (.25)	.47
5. Social Welfare	.105 (1.80)	-.301 (5.18)	.110 (1.90)	.456 (7.85)	.64
6. Recreation	.175 (1.55)	.431 (3.81)	-.181 (1.60)	-.301 (2.66)	.33
7. Community Planning	-.076 (.56)	-.115 (.84)	.022 (.16)	.013 (.09)	.02
8. General Government	.017 (.13)	.193 (1.45)	-.100 (.76)	-.197 (1.49)	.08

(1) The dependent variables are all in standardized form. Accordingly, the coefficients reported in the table are *Beta* coefficients. A *Beta* coefficient indicates the number of standard deviations change in the dependent variable associated with a change of one standard deviation in the independent variable. The numbers in parentheses below the coefficients are *t*-statistics (absolute values).

(2) 52 municipalities.

Again, this latter association is partially offset by the smaller, negative coefficient of the third factor (that is, if higher crowding levels are associated with lower status). Other protective service expenditures as shares of the budgets were positively related to wealth and socio-economic status as indicated by the positive coefficient of the second factor and the negative coefficient of the third.

The coefficients of the first two factors indicate that health expenditures were positively associated with city size and wealth. The negative coefficient on the third indicates a negative association with crowding levels and the size of the French-speaking population. As in the other factor regression, welfare expenditures were strongly associated with Ontario subsidy payments and negatively associated with wealth levels in the communities. Recreation expenditures were positively related to wealth levels and (at a lower significance level) to higher economic status. These results were consistent with those reported for the per capita form of the equations. As in the earlier regressions the community planning equation was not successful in identifying associations with characteristics of the communities. The equation for general government expenditures was also not very satisfactory in this form although the other tests of this expenditure category did yield interpretable results.

To sum up, by forming a set of four factors from the original explanatory variables, it was possible to more clearly identify some of the associations between municipal government policies as measured by expenditure patterns and characteristics of the communities. In particular, the coefficients of the first three factors which are the most directly relevant to the theoretical model, often were significant and indicated that city size and density and that characteristics of the citizens of the city such as wealth and socio-economic status did explain some of the variance in municipal expenditures. These results are consistent with testable hypotheses emerging from the theory of Chapter 4, namely that governments respond to the expressed demands of their electorates. What has been done here, is to employ socio-economic variables as proxy measures of characteristics that would be expected to lead to differences in demand patterns to explain expenditure differences. The results discussed above tend to support this hypothesis, especially in view of the fact that the analysis was carried out using more highly aggregated data than called for by the composition of the theoretical model itself.[4]

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[4]As an aside, an interesting result involving the subsidy factor may be noted. In the per capita form of the equations, the coefficients of this factor were always positive and generally significant. In the budget share form of the equations, the coefficients, where they were significant, were negative except in the regression dealing with social welfare expenditures, the most subsidized of the eight categories. This pattern of results is consistent with a general conclusion emerging from the literature on intergovernmental conditional grants, namely, that these grants while increasing expenditures on the subsidized activities will also free funds for smaller expenditure increases in other areas. Thus, all expenditures would tend to increase when measured in absolute amounts while as a proportion of total expenditures the subsidized activities would increase and the others would diminish.

Other Studies

Other researchers have, of course, undertaken the same kinds of empirical analysis as was done for this study. Some of their results were discussed earlier in Chapter 2. It may be appropriate to return briefly to them at this point and to reconsider their findings in the context of this study. In particular, two Canadian studies are relevant.

Bodkin and Conklin [7, 1971, *op. cit.*] found that population size, per capita assessment levels, average family incomes, and, in some instances, the ratio of commercial to total assessment influenced per capita expenditure levels in some of the seven expenditure categories they analysed. They did not have available other socio-economic data on the constituent populations. The results they did report are consistent with those of this study to the extent they are comparable and thus also tend to support the theory of Chapter 4.

Rivard [49, 1967, *op. cit.*] also found that certain socio-economic variables could explain variances in intercity expenditure patterns including, depending on the expenditure function, average income, population size, age of dwellings, employment levels, and regional dummies (accounting in part for ethnic differences). These results can also be interpreted as lending support to the theory presented here, in that variances in government policy decisions as measured by expenditures can be explained, to some degree, by differences in the demands of the residents of the city.

GOVERNMENT POLICIES AND OUTPUT INDICATORS

In Chapter 4, urban output indicators were defined in terms of service attributes that could be thought of as contributing to the utility levels of members of the communities. These attributes were not the service activities themselves but were "produced" by these activities acting within the overall structure of the community. Thus the transformation functions, equations (2) of Chapter 4, were abstractions of the processes by which local government services interacting with private actions and expenditures, resulted in a series of service attributes which formed the outputs of the systems and which became the arguments in the utility functions.

To illustrate these relationships, output indicators were selected for three areas of concern for which some data were available. These were the areas of public safety (crime), traffic safety and housing.[5] These output indicators were entered as dependent variables in regression equations in an effort to determine some of the factors that influence their levels and directions of change. These equations thus represent, at a crude level, empirical analogs of the transformation functions in the theoretical model.

The results of this exercise for the public safety outputs are reported in Table 5-6 and for the traffic safety outputs in Tables 5-7 and 5-8. For public safety two output measures were used, total criminal offences per 10,000 people and the number of motor vehicles stolen per 10,000 people.

[5]These indicator values are shown in Tables C-3 and C-4 of Appendix C. Table C-3 reports the levels for those Ontario cities in the analysis and Table C-4 for a number of other Canadian cities.

The two measures used in the area of traffic safety were the number of non-fatal traffic accidents per 10,000 people and the number of accidents involving damage greater than $100. per 10,000 people.[6] As measures of output levels, two forms of the dependent variables were tested, a four-year (1969-72) average and the 1972 level by itself. The government policy variables for the first measure were for the three years 1970-72 and for the second they were lagged to measure policy inputs in the two previous years, 1970-71. A third set of equations dealing with the change in each output was also tested. These regressions entered the percentage change in the output indicator between 1971 and 1972 as the dependent variable and the percentage change in government expenditures between the two years 1970-71 as the policy input variables. The other variables in the equations represented characteristics of the municipalities and their populations.

The equations dealing with the output levels were tested with the log form of the variables entered linearly. This form was used because of the *a priori* hypothesis that the outputs emerged from a complicated process in which government actions worked through the underlying structure of the community to produce their effects. A multiplicative relationship among the variables would automatically allow for all these unspecified (and often unknown) interactive effects. Thus the output level equations were estimated in the form:

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[6]It is of course recognized that the true output measures should be the number of crimes and accidents prevented. However, these variables are not observable. Thus the variables actually employed here are proxies for the true outputs and are presumably inversely related to them.

$$(1) \quad X = A_0 A_1^{\delta_1} A_2^{\delta_2} \ldots A_n^{\delta_n}$$

where the δ_i's were the regression coefficients. Then, for example, the hypothesis that government policies contribute to the outputs of public safety (lower crime rates) and traffic safety (lower accident rates) leads to the expectation of negative coefficients for the policy variables so that:

$$(2) \quad \frac{\partial X}{\partial A_i} = \frac{\delta_i X}{A_i} < 0$$

where A_i is a policy input, and X is the output.

In the four equations of Table 5-6 that deal with output levels (equations 1, 2, 4, and 5) the coefficient of the police expenditure variables are all negative as expected. They thus indicate that higher levels of police expenditures in a community are associated with lower crime rates (a higher level of public safety) as measured by the two output indicators. The coefficients of the other policy variable, street lighting expenditures, either had signs opposite to that expected or were not significantly different from zero. A possible explanation for the perverse sign in the equations dealing with total criminal offences is that, while resources devoted to police protection may be concentrated in areas of the city where crime is a greater problem, better street lighting may be intended for different purposes and not installed in higher crime areas. Thus if these expenditures were not directed to reducing crime rates, a positive relationship may be observed as a statistical oddity. For the most part, the coefficients of the other variables in the four equations are not significantly different from zero. Exceptions are those for persons per room in renter-occupied dwellings

(entered here as a measure of socio-economic status) which has a negative sign (at a low level of significance) in one equation and for the ratio of rented to total dwellings which has a positive sign (at low significance levels) in two other regressions. It is interesting to note that population size and density do not significantly affect the crime rates in these equations. The third and sixth equations in Table 5-6 deal with changes in the output indicators. These equations were less successful in that the coefficients of the policy variables were not significant.

Table 5-6

URBAN INDICATOR OUTPUT EQUATIONS
PUBLIC SAFETY
52 ONTARIO MUNICIPALITIES

Dependent Variable[1]	Independent Variables: Police Expenditures per 10,000 People (1)	Street Lighting Expenditures per 10,000 People (2)	Population 10,000 (3)	Population Density (4)	Ratio of Rented to Total Dwellings (5)	Persons per Room Owner-Occupied Dwellings (6)	Persons per Room Renter-Occupied Dwellings (7)	Average Personal Income (8)	Percentage of Earners With Incomes Under $4,000 per Year (9)	Percentage of Population Non-French (10)	Metro Dummy (11)	Constant (12)	R^2
Total Criminal Offences per 10,000 People													
1. Four-year average, 1969-72 (log form)[2][3]	-.211 (1.82)	.261 (2.01)	.069 (.81)	.014 (.26)	.195 (.75)	.804 (.63)	-2.249 (1.67)	1.132 (1.03)	1.166 (1.04)	-.488 (1.18)	.879 (1.15)	-8.505 (.65)	.41
2. 1972 level (log form)[2][4]	-.327 (1.64)	.274 (1.71)	.073 (.73)	.016 (.25)	.296 (.95)	.636 (.42)	-1.685 (1.06)	1.042 (.80)	1.214 (.91)	-.250* (.52)	.870 (1.04)	-6.260 (.40)	.34
3. Percentage change, 1971-72 (linear form)[4]	-.0010 (.63)	.1050 (1.77)	.0013 (.29)	.0000 (.66)	.3225 (.86)	.1821 (.20)	1.3744 (1.47)	-.0001 (.99)	-.0075 (.60)	.5194 (1.84)	-.0429 (.94)	-.8329 (.72)	.23
Number of Vehicles Stolen per 10,000 People													
4. Four-year average, 1969-72 (log form)[2][3]	-.484 (2.84)	.080 (.42)	.185 (1.48)	.029 (.37)	.620 (1.62)	.924 (.50)	-2.519 (1.27)	.789 (.49)	-.006 (.01)	-.847 (1.40)	.848 (1.00)	1.030 (.05)	.47
5. 1972 level (log form)[2][4]	-.691 (2.44)	.030 (.13)	.179 (1.24)	-.003 (.04)	.852 (1.92)	.564 (.26)	-2.084 (.92)	-.114 (.06)	-.736 (.39)	-.877 (1.27)	.865 (.76)	15.101 (.68)	.41
6. Percentage change, 1971-72 (linear form)[4]	-.0016 (.43)	.1579 (1.20)	-.0045 (.43)	-.0000 (.28)	1.8735 (2.25)	.9364 (.45)	1.3626 (.65)	-.0003 (1.56)	-.0229 (.82)	.7569 (1.20)	.0653 (.65)	-.1667 (.06)	.26

(1) The numbers in parentheses below the coefficients are t-statistics (absolute values).

(2) The reported coefficients are those pertaining to the log form of the variable. Thus in its multiplicative form the equation is $Y = AX_1^{a_1} X_2^{a_2} \ldots$ where the a_i's are the coefficients. In the case of the metro dummy, the exponent takes on the value "1" or "0" and the reported coefficient is the X_i value. The reported value of the constant is the estimate of $\log_e A$.

(3) Observations on the two policy variables are a three-year average (1970-72). Observations on the other independent variables are for 1971.

(4) Observations on the two policy variables are the percentage changes between 1970 and 1971. Observations on the other independent variables are for 1971.

Tables 5-7 and 5-8 present the results of the regression analyses involving the traffic safety indicators.[7] In the four traffic safety level equations (1, 2, 4 and 5) of both tables the coefficients of the police expenditure variables are again of the expected sign although in some cases the levels of significance are very low. The other three policy variables, street lighting, street maintenance and traffic control, have coefficients that are either the opposite of the expected sign or are not significant. In equations (5) it is also interesting to note that the accident rate is positively associated with population size and with the percentage of high income residents (possibly due to a greater number of cars per family in high-income families). The variable measuring the percentage of non-French people in the population is positively associated with the accident rate in equations (1) and (2) but yet is negatively associated with the accident rate in equations (4) and (5). As in the public safety equations, the regressions dealing with rates of change of traffic accidents did not yield meaningful results.

[7] Table 5-8 includes an extra potentially relevant policy input, namely, traffic control expenditures, as an independent variable. In order to include this variable, it was necessary to drop seven jurisdictions from the sample because observations on this variable were missing. Thus the results in Table 5-8 are for 45 observations while those in Table 5-7 are for 52.

Table 5-7

URBAN INDICATOR OUTPUT EQUATIONS
TRAFFIC SAFETY
52 ONTARIO MUNICIPALITIES

Dependent Variable[1]	Independent Variables: Police Expenditures per 10,000 People	Street Lighting Expenditures per 10,000 People	Street Maintenance Expenditures per 10,000 People	Population 10,000	Population Density	Average Personal Income	Percentage of Earners With Incomes Under $4,000 per Year	Percentage of Earners With Incomes Over $15,000 per Year	Percentage of Population Non-French	Metro Dummy	Constant	R^2
Nonfatal Accidents per 10,000 People												
1. Four-year average, 1969-72 (log form)[2][3]	-.191 (1.86)	.243 (1.76)	.316 (2.09)	.044 (.70)	.022 (.53)	.025 (.02)	.502 (.47)	.233 (1.03)	.475 (1.88)	.085 (.98)	-7.246 (.45)	.37
2. 1972 level (log form)[2][4]	-.140 (1.52)	.291 (1.64)	.258 (1.50)	.090 (1.17)	-.018 (.36)	.092 (.05)	.687 (.52)	.232 (.84)	.538 (1.73)	.074 (.69)	-7.203 (.37)	.33
3. Percentage change, 1971-72 (linear form)[4]	.0004 (.11)	-.0710 (.46)	-.0371 (.22)	-.0017 (.16)	.0001 (.16)	.0001 (.43)	.0349 (1.18)	.0359 (.52)	.3755 (.78)	-.0685 (.65)	-2.3482 (.93)	.07
Accidents With Damage Over $100 per 10,000 People												
4. Four-year average, 1969-72 (log form)[2][3]	-.172 (1.72)	.195 (1.31)	.347 (2.13)	.098 (1.45)	.020 (.44)	-.845 (.55)	.987 (.86)	.378 (1.55)	-.556 (2.04)	-.030 (.32)	-.554 (.03)	.36
5. 1972 level (log form)[2][4]	-.548 (1.89)	.466 (2.40)	.251 (1.33)	.159 (1.89)	-.006 (.11)	-2.634 (1.37)	-.332 (.23)	.619 (2.06)	-.844 (2.49)	-.010 (.09)	26.896 (1.25)	.31
6. Percentage change, 1971-72 (linear form)[4]	-.0034 (.99)	-.0662 (.48)	.0018 (.01)	.0161 (1.79)	.0000 (.15)	-.0004 (1.54)	-.0378 (1.45)	.0646 (1.05)	.1294 (.30)	.0209 (.22)	3.2696 (1.46)	.13

[1] The numbers in parentheses below the coefficients are t-statistics (absolute values).

[2] The reported coefficients are those pertaining to the log form of the variable. Thus in its multiplicative form the equation is $Y = AX_1^{a_1} X_2^{a_2} \ldots$ where the a_i's are the coefficients. In the case of the metro dummy, the exponent takes on the value "1" or "0" and the reported coefficient is the X_i value. The reported value of the constant is the estimate of $\log_e A$.

[3] Observations on the four policy variables are a three-year average (1970-72). Observations on the other independent variables are for 1971.

[4] Observations on the four policy variables are the percentage changes between 1970 and 1971. Observations on the other independent variables are for 1971.

Table 5-8

URBAN INDICATOR OUTPUT EQUATIONS
TRAFFIC SAFETY
45 ONTARIO MUNICIPALITIES

Dependent Variable[1]	Independent Variables: Police Expenditures per 10,000 People	Street Lighting Expenditures per 10,000 People	Street Maintenance Expenditures per 10,000 People	Traffic Control Expenditures per 10,000 People	Population 10,000	Population Density	Average Personal Income	Percentage of Earners With Incomes Under $4,000 per Year	Percentage of Earners With Incomes Over $15,000 per Year	Percentage of Population Non-French	Metro Dummy	Constant	R^2
Nonfatal Accidents per 10,000 People													
1. Four-year average, 1969-72 (log form)[2][3]	-.169 (1.75)	.082 (.51)	.330 (2.01)	.014 (.17)	-.193 (.28)	.035 (.76)	.928 (.58)	.464 (.38)	.001 (.02)	.672 (2.57)	.079 (.83)	-16.592 (.91)	.40
2. 1972 level (log form)[2][4]	-.293 (1.69)	.170 (.92)	.252 (1.48)	-.069 (.80)	.035 (.45)	-.013 (.25)	.799 (.45)	.373 (.27)	-.044 (.16)	.739 (2.50)	.061 (.57)	-12.359 (.61)	.38
3. Percentage change, 1971-72 (linear form)[4]	.0005 (.12)	-.2817 (1.36)	.0757 (.39)	.0073 (.74)	-.0029 (.25)	.0001 (.29)	.0002 (.66)	.0492 (1.20)	-.0035 (.04)	.5434 (1.00)	-.0547 (.47)	-3.0413 (1.08)	.12
Accidents With Damage Over $100 per 10,000 People													
4. Four-year average, 1969-72 (log form)[2][3]	-.143 (1.33)	.187 (1.09)	.351 (1.99)	-.083 (.93)	.096 (1.30)	-.001 (.02)	-.967 (.57)	.779 (.60)	.307 (1.15)	-.527 (1.88)	-.010 (.09)	.194 (.01)	.36
5. 1972 level (log form)[2][4]	-.500 (1.67)	.560 (2.86)	.286 (1.58)	-.153 (1.66)	.166 (2.05)	-.048 (.87)	-3.232 (1.70)	-.798 (.55)	.582 (1.95)	-.890 (2.83)	.030 (.26)	33.675 (1.56)	.38
6. Percentage change, 1971-72 (linear form)[4]	-.0038 (1.10)	-.2173 (1.24)	.0610 (.37)	.0075 (.89)	.0173 (1.87)	.0000 (.24)	-.0003 (1.25)	-.0323 (1.11)	.0171 (.25)	.1971 (.43)	.0603 (.61)	2.8080 (1.17)	.16

(1) The numbers in parentheses below the coefficients are t-statistics (absolute values).

(2) The reported coefficients are those pertaining to the log form of the variable. Thus in its multiplicative form the equation is $Y = AX_1^{a_1}X_2^{a_2}$ ... where the a_i's are the coefficients. In the case of the metro dummy, the exponent takes on the value "1" or "0" and the reported coefficient is the value. The reported value of the constant is the estimate of $\log_e A$.

(3) Observations on the four policy variables are a three-year average (1970-72). Observations on the other independent variables are for 1971.

(4) Observations on the four policy variables are the percentage changes between 1970 and 1971. Observations on the other independent variables are for 1971.

To summarize the results of these two sets of regression equations, the policy variable indicating the level of police expenditures was generally significant and of the expected sign. These results are consistent with the hypothesis in the theoretical model that government actions contribute to urban outputs that are of concern to individuals. In terms of the theory, local government activities are important to the residents of the city because they contribute to individual utility levels through their contributions to various urban service outputs. These outputs are monitored by urban indicators.

The third area of urban concern in which available data permitted the derivation of output indicators was housing. Two indicators were chosen to represent housing quality as it contributed to human welfare; they were the number of persons per room in owner-occupied and renter-occupied housing. While it would be desirable to develop a range of indicators to cover the various aspects of housing (as suggested in Appendix A), it is felt that the indicator selected here is a good approximation for an important aspect of housing quality and thus provides an acceptable starting point. This measure has been used in several studies as a proxy for housing quality and it was chosen by the Economic Council of Canada in its *Eleventh Annual Review* [18, 1974] as an appropriate first-approximation principal indicator of housing quality both because of its own properties and because it was reasonably well correlated with other variables that could be used to measure other aspects of quality.

Table 5-9

URBAN INDICATOR OUTPUT EQUATIONS, HOUSING
58 ONTARIO MUNICIPALITIES[1]

Dependent Variables[2] (Linear Form)	Independent Variables: Average Personal Income	Percentage of Earners With Incomes Under $4,000	Percentage of Earners With Incomes Over $15,000	Percentage of Population Non-French	Percentage of Families with Children Under 14 Years	Percentage of House-holds With Female Heads	Population / 10,000	Population Density	Social Welfare Expenditures/ 10,000 People[4]	Community Planning Expenditures/ 10,000 People[4]	Total Expenditures on Protective Services per 10,000 People[3][4]	Constant	R^2
Persons per room, owner-occupied dwellings, 1971	$.3x10^{-4}$ (1.65)	$-.9x10^{-4}$ (.04)	-.019 (3.92)	-.206 (5.55)	.314 (2.30)	-.221 (1.15)	$.3x10^{-3}$ (.98)	$.3x10^{-5}$ (2.05)	.000 (.71)	.000 (1.00)	--	.505 (2.39)	.69
Persons per room, renter-occupied dwellings, 1971	$-.1x10^{-4}$ (.54)	$-.6x10^{-4}$ (.03)	-.005 (1.08)	-.190 (5.48)	.169 (1.33)	-.558 (3.09)	$.5x10^{-3}$ (1.51)	$.3x10^{-5}$ (2.31)	.000 (1.84)	.000 (.09)	--	.866 (4.38)	.71
Persons per room, owner-occupied dwellings, 1971	$.4x10^{-4}$ (2.21)	$-.3x10^{-3}$ (.14)	-.019 (3.98)	-.203 (5.61)	.425 (2.94)	.042 (.18)	$.9x10^{-4}$ (.23)	$.3x10^{-5}$ (1.60)	.000 (1.50)	.000 (1.98)	-.000 (1.95)	.375 (1.74)	.71
Persons per room, renter-occupied dwellings, 1971	-.000 (.03)	$-.2x10^{-3}$ (.11)	-.005 (1.06)	-.188 (5.50)	.257 (1.89)	-.349 (1.60)	$.3x10^{-3}$ (.83)	$.3x10^{-5}$ (1.91)	.000 (2.40)	.000 (1.04)	-.000 (1.64)	.762 (3.73)	.72

(1) There are 58 observations for the first two equations and 52 for the last two.

(2) The numbers in parentheses below the coefficients are t-statistics (absolute values).

(3) Includes police, fire, and other protective services.

(4) Observations are a three-year average (1970-72).

The results of the analysis using these two indicators are shown in Table 5-9 for the additive form of the equations and in Table C-5 of Appendix C for the multiplicative form. These equations were tested in these two forms because the relationship between local government actions and housing quality (at least as measured by persons per room) was believed to be much more tenuous than in the other output indicators. Housing quality appears to be affected as much or even more by federal and provincial policies than by local actions. Thus it was not clear that the complicated interactions with local government activities that were believed to be involved in the earlier outputs would be present in this instance. Therefore, the two forms of the equations were tested and are reported. The results in the two tables are compatible and therefore only those in Table 5-9 will be discussed here.

The policy variables entered into the housing equations all had a negligible impact on the dependent variables. As for the significance levels, the coefficients of the social welfare variable were significant in the equations dealing with renter-occupied dwellings and those of the protective services variable were significant in the two equations in which they appear. The average income variable and the variable measuring the proportion of high income earners appeared with significant coefficients in the equations dealing with homeowners indicating that crowding levels in these dwellings were weakly and positively associated with average income levels but that high-income

households tended to live in less crowded dwellings. The variable indicating the percentage of households headed by women was important in the renter-occupied dwelling equations; the negative sign of the coefficient indicated that they tended to be less crowded reflecting the fact that female-headed households are on average smaller than the overall household size. The coefficients of the three variables measuring the non-French population, the proportion of families with children under 14 years of age, and population density were generally significantly different from zero in all four equations. These results indicated that in both owner- and renter-occupied dwellings average crowding levels tended to vary inversely with the relative size of the non-French population (directly with the French population proportion), directly with the average number of children in the household, and directly with average population densities.

The negligible effect of the local government policy variables on the level of the housing quality indicators is not unexpected. As already mentioned, the main governmental influences would be expected to flow from federal and provincial actions since it is these governments that pursue specific housing policies. Municipal governments, for the most part, do not. The actions of municipal governments do, nonetheless, carry potential implications for the pattern and quality of the communities' housing stocks. However, these effects are generally more indirect and thus it is not surprising that, at this level of empirical analysis, they would not be observed.

* * * * * *

The purpose of this chapter has been to take some first steps towards operationalizing the concepts that were more abstractly discussed in Chapter 4. The exercise was necessarily limited and preliminary because sufficient data that would permit more detailed analysis do not yet exist. Within those constraints, this chapter has examined empirically two hypotheses of the theoretical model namely, that municipal governments, in deciding policy, respond to the demands of their electorates, and that government actions affect, in a measurable way, the service attributes or outputs that contribute to individual utility levels. These attributes are measured by urban social output indicators.

Chapter 6

CONCLUSIONS AND FUTURE DIRECTIONS

The purpose of this study has been twofold. First, it has proposed a theoretical model relevant for the analysis of urban social indicators and, secondly, it has moved towards operationalizing and testing that conceptual framework.

The model encompasses four major aspects:

(1) criteria for identifying urban social indicators based on consumer-oriented attributes, characteristics or outputs of the urban systems;

(2) a stress on the distributive aspects of the urban processes as monitored by the indicators;

(3) the modelling of the processes by which these outputs are produced in an urban community with special attention to the role of government actions;

(4) a model of government decision-making in which actions or policies are influenced by the demands of citizens in the community.

As to the first aspect, the key to the approach of this study is its consumer orientation. The significance of this is the following. Much of the impetus for social indicators research, at least among economists, stems from the well-known inadequacies and limitations of using Gross National Product and related statistics as measures of welfare or the well-being of the society. In the final analysis, the most fundamental shortcoming of the GNP-type measures from this point of view,

and the one that cannot be corrected by the various suggested modifications of GNP, is that GNP is a measure of production while all economic theory argues that individual and social welfare depends upon consumption. It is for this reason that the consumer-oriented approach in this study is crucial if the developed social indicators are to be potentially better measures of elements of a society's welfare.

The importance of considerations of distribution is emphasized by the fact that they are implicit throughout virtually all of the model of Chapter 4. For example, public policy decisions emerge from a process in which the interests of competing individuals and groups play a role and the services of the municipal government are distributed among the members of the community as specified by the distribution parameters. This stress on the redistributive consequences of government policy goes hand in hand with the consumer orientation discussed above. It is believed that this concern is equally important as a concern with the total levels of the parameters and their average values. The last two main aspects of the theoretical model have already been fully discussed throughout this study and need no further elaboration here.

Future extensions of the theory in this study (aside from the improvement of the basic model itself) could take two directions. First, the approach could be employed to investigate in more detail the properties of specific urban services. One would expect that a concentration on narrower, more tightly defined areas of concern would permit a considerable

advancement in the modelling of that system over the more general, broad-based approach followed here. Secondly, the conceptual framework could be adapted to examine other aspects of urban communities that are less directly related to local government services. For example, in a study of urban land markets one might define the commodities (land attributes) traded in terms of the consumer theory used in this study. By doing so, it may be possible to more clearly identify the characteristics of urban land that are important to the purchasers and to include in the analysis at least some of the interrelationships with other goods and services that affect land values.[1]

On the empirical side, the intent has been to conduct preliminary tests of some of the hypotheses and, at the same time, provide an illustration of future directions for applying the concepts to aid in the public decision-making process. It is worth repeating that the results of the work presented in Chapter 5 are subject to the further assumptions that it was necessary to make. The observed associations did indicate that differences in local government policies (as measured by their expenditure patterns) could be partially explained by differences in their constituent populations and therefore presumably by differences in the demands they exhibit. In addition, the results in the second part of that chapter do

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[1]A third direction for further theoretical research would be to explore the consequences of manipulating some of the parameters that were not handled in this study. For example, it would be interesting to investigate the tax share parameters that were accepted as being fixed in this study. However, these types of extensions would be less relevant to urban indicators *per se*.

provide some modest indication that, with more appropriate data, it will be possible to specify the links between government activities and service outputs.

The preliminary nature of the empirical analysis and the hesitancy to draw firm conclusions from it are both due to the inadequacies in the data in the tested sample. At the same time, it is believed that future empirical research can significantly contribute to a better understanding of urban indicators and urban policy assuming the creation and compilation of data that do not presently exist or that are not comparable. These additional data requirements are of two types. First, there should be a wider range of data dealing with municipal government activities than currently exist. While fairly adequate financial statistics exist, non-financial service data that could be used to monitor governmental activities either do not exist or are non-comparable across jurisdictions. It would be desirable to begin to collect a wide range of such data in accordance with a standardized format as currently exists for the financial statistics.

The second requirement in addition to wider coverage is more detailed coverage. At present, most data are aggregated to the level of the municipality and very few are available at a more detailed level. Information dealing with the distribution of governmental activities spatially throughout the municipality is necessary to undertake analyses at the level of disaggregation of the theory

of Chapter 4. For example, these data would permit investigations of intracity relationships and of the redistributive consequences of government policies.

Given the availability of better data, further empirical analyses of urban social indicators could take several directions. First, of course, the relationships discussed in this study could be more precisely tested and estimated. Work could be undertaken to analyse in detail relationships like the transformation functions, equations (2), of Chapter 4. For particular municipal government services, this work potentially could provide answers to questions such as the economies of scale associated with and the cost effectiveness of alternative policy inputs.

Appendix A

TAXONOMY OF URBAN OUTPUTS

The charts in this Appendix represent a first attempt at identifying some of the outputs of an urban system in a format that is amenable to empirical analysis. The first column of each chart identifies one of seven conventional urban government policy areas. The second column contains what may be regarded as the primary output characteristics or attributes associated with (produced by) policy actions in those areas. The third identifies some (but certainly not all) of the other associated outputs and through them the interdependencies in the policy functions. The final column contains suggestions on the actual variables or urban social indicators that could serve as proxy measures for each of the outputs.

Chart A-1

Policy Area	Primary Attributes or Output Characteristics		Possible Interdependencies	Social Indicators: Possible Proxy Variables
1. TRANSPORTATION	i. Public	a. speed-congestion	6iib; 7ib; 7iib	mph in rush hour; mean trip time
		b. convenience		mean wait time; mean walk distance
		c. comfort		age of vehicles; vol.: capacity ratio on vehicles
		d. sprawl	3ie; 3iid; 3if; 3iie	mean route density; miles of route/100,000 people
	ii. Private	a. speed-congestion	3ie; 3iid; 3if; 3iie	mph in rush hour; mean time from edge to CBD
		b. safety	2iib	accidents/100,000 passenger-miles
		c. sprawl	3ie; 3iid; 3if; 3iie	miles of road/100,000 people; people/acre

Chart A-2

Policy Area	Primary Attributes or Output Characteristics	Possible Interdependencies	Social Indicators: Possible Proxy Variables
2. POLICE	i. Property Protection		
	a. home protection		home burglaries/100,000 people
	b. personal property		property crimes/100,000 people; auto thefts/100,000 people
	c. commercial property		commercial burglaries/100,000 people; shoplifting losses/retail sales
	ii. Personal Protection		
	a. crimes		personal assaults/100,000 people
	b. traffic safety	liib	accidents/100,000 passenger-miles

Chart A-3

Policy Area	Primary Attributes or Output Characteristics		Possible Interdependencies	Social Indicators: Possible Proxy Variables
3. HOUSING	i. Multiple	a. basic shelter	6ib	% population in substandard housing; mean cost for family of 4; persons/room
		b. land	7ia; 7ib	land area/resident person; mean distance from park land
		c. amenities	7iia; 7iib	facility capacity/people served
		d. utilities	5ia; 5ib; 5ic	% residences served; frequency of pickup
		e. location	lid; liia; liic	mean time to CBD
		f. density	lid; liia; liic	people/acre
	ii. Single	a. basic shelter	6ib	% population in substandard housing; mean cost for family of 4; persons/room
		b. land	7ia; 7ib	mean lot size
		c. utilities	5ia; 5ib; 5ic	% residences served; frequency of pickup
		d. location	lid; liia; liic	mean time to CBD
		e. density	lid; liia; liic	people/acre

Chart A-4

Policy Area	Primary Attributes or Output Characteristics	Possible Interdependencies	Social Indicators: Possible Proxy Variables
4. FIRE	i. Property Protection — a. prevention		alarms/100,000 people/year; number of structures inspected per year
	i. Property Protection — b. efficiency		total fire damage/100,000 people
	ii. Personal Protection — a. prevention		alarms/100,000 people/year
	ii. Personal Protection — b. efficiency		total casualties/100,000 people; total deaths/100,000 people

Chart A-5

Policy Area	Primary Attributes or Output Characteristics	Possible Interdependencies	Social Indicators: Possible Proxy Variables
5. SANITATION	i. Housing Services		
	a. water supply	3id; 3iic	% residences served
	b. sewerage	3id; 3iic	% residences served
	c. solid waste	3id; 3iic	% residences served; frequency of pickup
	ii. General Services		
	a. streets & parks maintenance		volume of refuse collected/acre; maintenance personnel/acre
	b. pollution control		air (water) pollution levels
	c. commercial utilities		% establishments served

Chart A-6

Policy Area	Primary Attributes or Output Characteristics		Possible Interdependencies	Social Indicators: Possible Proxy Variables
6. SOCIAL WELFARE	i. Income	a. money		money grants/person; % of people below minimum income receiving grants
		b. shelter	3ia; 3iia	housing subsidy/welfare person
		c. food		food subsidy/welfare person
	ii. Recreation	a. programmes	7ia; 7iia; 7iic	% population of low income served
		b. accessibility	lia; 7ib; 7iib	mean travel distance; mean trip time
	iii. Health	a. hospital		welfare morbidity rate
		b. other		welfare morbidity rate
		c. drugs		drug subsidy/welfare person

Chart A-7

Policy Area	Primary Attributes or Output Characteristics		Possible Interdependencies	Social Indicators: Possible Proxy Variables
7. RECREATION	i. Land	a. parkland	3ib; 3iib; 6iia	acres/100,000 people
		b. accessibility	1ia; 3ib; 3iib; 6iib	mean trip time
	ii. Services	a. facilities	3ic; 6iia	capacity/100,000 people; % population served; public library facilities
		b. accessibility	1ia; 3ic; 6iib	mean trip time
		c. public programmes	6iia	% population served; % population of low income served

Appendix B

THE DATA

Most of the data used in this study are from two sources. The financial statistics dealing with the Ontario municipalities are those collected and published annually by the Government of Ontario. Data for the three years 1970-72 were obtained. The other major data source was the 1971 Canadian Census. All the variables pertaining to the socio-economic characteristics of the populations were constructed from Census data. Finally, other minor sources were Statistics Canada (crime and traffic safety data) and Taxation Statistics (average incomes and income distributions).

Two aspects of the data merit comment. First, some of the expenditure categories in the Ontario municipal data were broadly defined and thus included a variety of expenditures. As mentioned in the text of Chapter 5, for example, the categories "other protective services" and "community planning" were ambiguous enough to include a variety of specific functions. Thus these variables may not have been strictly comparable across municipalities and this factor may account for the poor regression analysis results where they were involved.

Secondly, observations on some of the variables were not available over the period covered due to the formation of regional governments during that time or for other reasons

specific to that observation. In some cases, the level of data collection changed to the regional level and observations for the individual municipalities were no longer available. Where possible, the individual readings were estimated from the regional figures; otherwise the affected municipalities were dropped from the sample for the regressions in which these variables were involved. These latter adjustments are indicated in the appropriate tables.

Table C-1

ROTATED FACTOR PATTERNS
(PRINCIPAL COMPONENTS SOLUTIONS)
58 ONTARIO MUNICIPALITIES

(Oblique rotations)

Variables	Moderate Correlation				Less Correlation			
	Factor							
	1	2	3	4	1	2	3	4
1. Population/10,000	-.481	.664				.767		
2. Population density		.902				.813		
3. Ratio of rented to total dwellings		.899			.597	.662		
4. Persons per room - owner-occupied dwellings			-.859				-.856	
5. Persons per room - renter-occupied dwellings			-.877				-.870	
6. Average personal income	-.892				-.758	.543		
7. % of earners with incomes under $4,000	.920				.827	-.462		
8. % of earners with incomes of $7,000-$10,000	-.460			.628	-.493			.660
9. % of earners with incomes over $15,000	-.598			-.492	-.415	.631		
10. % of households with female heads	.443	.705			.822			
11. % of families with children under 14 years		-.601	-.414		-.645		-.401	
12. % of population non-French		-.319	.821				.822	
13. Total assessment per 10,000 people	-.342				-.476			
14. Ratio of commercial to total assessment		.466		.399	.556			
15. Ontario welfare subsidies per 10,000 people				.644				.581
16. Ontario health subsidies per 10,000 people		.359		.479				.517
17. Ontario other subsidies per 10,000 people				.660				.610
Variance explained by factors (%) (prior to rotation)	28.3	18.3	13.4	9.7	28.3	18.3	13.4	9.7

Factor Correlations

1	1.000	.115	.110	.157	1.000	.054	.109	.150
2	.115	1.000	.068	.070	.054	1.000	-.013	-.020
3	.110	.068	1.000	.054	.109	-.013	1.000	.013
4	.157	.070	.054	1.000	.150	-.020	.013	1.000

Table C-2

MEANS AND STANDARD DEVIATIONS OF VARIABLES
INVOLVED IN THE FACTOR ANALYSIS
58 ONTARIO MUNICIPALITIES

Variables	Mean	Standard Deviation
Population/10,000	9.2317	12.7090
Population density	3,621.6250	4214.6094
Ratio of rented to total dwellings	.3514	.1141
Persons per room - owner-occupied dwellings	.5853	.0453
Persons per room - renter-occupied dwellings	.6426	.0436
Average personal income	5,946.2070	515.8494
% of earners with incomes under $4,000	39.7661	3.3080
% of earners with incomes of $7,000-$10,000	19.4989	2.6965
% of earners with incomes over $15,000	3.9288	1.5036
% of households with female heads	.1592	.0571
% of families with children under 14	.5627	.0625
% of population non-French	.9450	.1231
Total assessment per 10,000 people	10,063,081.0000	9,107,186.0000
Ratio of commercial to total assessment	.3783	.0970
Ontario welfare subsidies per 10,000 people	63,109.6367	73,965.6250
Ontario health subsidies per 10,000 people	3,613.6582	5,870.6953
Ontario other subsidies per 10,000 people	9,306.1992	7,914.5703
Expenditures per 10,000 people on:		
Police Protection(1)	198,811.26	42,048.4380
Fire Protection	144,344.05	49,601.0043
Other Protective Services	55,411.87	19,886.0752
Health Services	12,812.62	15,405.2781
Social Welfare	130,528.19	126,150.2129
Recreation	175,512.95	56,663.8789
Community Planning	35,883.95	25,154.0897
General Government	126,286.27	37,288.5548
Expenditures as a share of total budget on:		
Police Protection(1)	.1364	.0350
Fire Protection	.1014	.0355
Other Protective Services	.0395	.0144
Health Services	.0097	.0148
Social Welfare	.0776	.0981
Recreation	.1279	.0560
Community Planning	.0239	.0150
General Government	.0896	.0225

(1) 52 Ontario municipalities.

Table C-3

SELECTED URBAN INDICATOR OUTPUT VALUES
58 ONTARIO MUNICIPALITIES

City	Population (1971)	Housing (1971)		Public Safety (1969-72 Average)		Traffic Safety (1969-72 Average)	
		Persons per Room, Owner-Occupied Dwellings	Persons per Room, Renter-Occupied Dwellings	Total Criminal Offences per 10,000 People	Number of Vehicles Stolen per 10,000 People	Number of Nonfatal Accidents per 10,000 People	Number of Accidents With Damage >$100 per 10,000 People
Hamilton	309,225	0.590	0.635	867.2569	57.0539	91.8506	154.6123
Ottawa	302,205	0.550	0.620	728.9009	72.3515	53.9286	181.7392
London	223,295	0.545	0.605	627.1076	27.1726	75.9869	182.7291
Windsor	203,300	0.590	0.625	816.0477	55.8042	87.3586	159.5794
Mississauga	155,955	0.590	0.670	444.3589	17.8257	51.8739	125.1322
Kitchener	111,940	0.580	0.640	430.2975	17.5987	68.9655	237.0243
St. Catherines	109,865	0.585	0.620	739.0206	52.0411	65.1026	233.0360
Thunder Bay	108,375	0.645	0.645	815.4325	52.7797	69.8270	125.8593
Oshawa	91,670	0.605	0.660	480.0916	24.6264	49.6073	110.6687
Sudbury	90,525	0.700	0.730	480.0608	50.3176	75.4764	203.6178
Burlington	87,090	0.575	0.625	307.0387	14.3817	54.1394	88.3856
Sault Ste. Marie	80,410	0.690	0.690	363.6364	25.6809	55.9010	136.3636
Niagara Falls	67,025	0.585	0.605	800.5222	37.5233	66.2066	146.2514
Brantford	64,500	0.560	0.615	723.0233	43.2946	35.2326	137.8682
Nepean	64,470	0.580	0.630	293.5862	22.6462	30.4793	92.4461
Oakville	61,465	0.575	0.645	530.7899	20.3775	64.9150	132.9212
Guelph	60,080	0.580	0.630	320.0732	11.9008	31.4997	91.2949
Kingston	58,905	0.530	0.615	1057.2108	59.1206	88.2777	133.0532
Peterborough	58,155	0.575	0.610	724.1424	44.9660	72.8226	160.3473
Sarnia	57,585	0.595	0.600	920.3786	46.8438	62.5597	148.1723
North Bay	49,110	0.645	0.690	600.6923	23.1114	65.5162	196.9558
Cornwall	47,015	0.635	0.680	541.4761	24.7793	33.0746	190.5775
Welland	44,510	0.600	0.640	676.0840	34.5428	73.4105	121.2649
Brampton	41,150	0.600	0.660	535.6622	26.2454	49.2710	129.2831
Galt	38,775	0.595	0.705	398.5816	17.6015	56.9955	115.2160
Gloucester	37,075	0.620	0.765	399.1908	20.4990	46.4599	97.0330
Waterloo	36,780	0.550	0.610	412.4524	14.3420	61.7863	137.5748
Markham	36,555	0.550	0.640	362.3991	36.0416	90.9588	176.1045
Chatham	35,370	0.545	0.595	945.0099	29.2621	68.0662	151.8943
Belleville	35,030	0.555	0.615	712.2466	27.1910	56.0234	135.2412
Richmond Hill	32,535	0.625	0.670	546.1810	44.2600	48.4862	79.6066
Pickering	31,795	0.635	0.700	308.3818	11.9516	39.2357	78.8646
Chinguacousy	30,920	0.625	0.660	258.6514	6.7109	51.0996	139.3111
Timmins	28,475	0.675	0.760	457.6822	33.0992	31.9579	128.2704
Barrie	27,680	0.540	0.600	480.0397	40.3721	75.4155	1[illegible].6871
Woodstock	26,230	0.545	0.595	415.6500	19.4434	60.0457	98.3607
St. Thomas	25,660	0.510	0.580	546.3757	35.3663	51.0522	95.4793
Whitby	25,310	0.620	0.670	326.3532	19.0636	62.3271	141.1497
Stratford	24,660	0.515	0.595	468.1671	17.1330	56.8735	135.0365
Orillia	23,975	0.565	0.620	598.2273	27.4244	54.7445	181.0219
Port Erie	23,255	0.525	0.575	528.5960	18.7057	52.1393	80.1978
Vanier	22,615	0.675	0.700	703.5154	69.0913	33.9377	226.2879
Port Colborne	21,315	0.580	0.620	811.2831	30.0258	63.4530	153.7650
Brockville	19,635	0.520	0.600	557.0410	12.3504	54.4945	182.8368
Saltfleet	19,140	0.665	0.700	445.6635	16.0658	41.1442	55.1202
Owen Sound	18,575	0.525	0.575	338.4926	26.6487	55.1817	154.1050
Dundas	17,280	0.550	0.630	363.4259	17.9398	58.4491	100.8391
Georgetown	17,055	0.610	0.690	343.1545	11.8734	35.9132	119.3198
Preston	16,755	0.575	0.685	392.7186	16.8606	81.9158	143.3900
Pembroke	16,485	0.625	0.650	597.2096	13.8004	47.1641	107.6736
Vaughan	15,940	0.535	0.620	1221.4555	87.0452	150.7215	340.9661
Ancaster	15,270	0.575	0.600	279.6333	7.2037	30.4519	62.3772
Toronto	712,780	0.570	0.600				
North York	504,210	0.565	0.655				
Scarborough	334,475	0.600	0.695		not available		
Etobicoke	282,686	0.560	0.655				
York	147,430	0.605	0.655				
East York	104,870	0.515	0.600				

Table C-4

SELECTED URBAN INDICATOR OUTPUT VALUES, 37 SELECTED CANADIAN MUNICIPALITIES

City	Population (1971)	Housing (1971)		Public Safety (1971)		Traffic Safety (1971)	
		Persons per Room, Owner-Occupied Dwellings	Persons per Room, Renter-Occupied Dwellings	Total Criminal Offences per 10,000 People	Number of Vehicles Stolen per 10,000 People	Number of Nonfatal Accidents per 10,000 People	Number of Accidents With Damage >$100 per 10,000 People
Montreal	1,214,352	.61	.69	565.092	46.708	71.709	247.218
Edmonton	438,152	.59	.64	1036.079	51.466	50.028	246.695
Vancouver	426,256	.54	.57	1040.220	73.380	87.459	283.069
Calgary	403,319	.58	.60	764.804	46.712	30.869	266.067
Winnipeg (proper)	246,246	.55	.60	1018.778	70.214	137.911	250.156
Laval	228,010	.70	.77	371.080	27.674	56.094	222.753
Quebec	186,088	.69	.70	614.011	69.483	72.278	404.970
Regina	139,469	.61	.61	1243.072	92.709	56.643	185.776
Saskatoon	126,449	.58	.60	632.192	35.192	50.218	186.083
Burnaby	125,660	.57	.64	870.762	53.796	61.038	297.310
Halifax	122,035	.59	.68	619.249	48.347	33.105	206.252
Longueuil	97,590	.73	.76	583.974	41.500	57.895	196.024
St. John	89,089	.60	.77	528.308	58.514	45.598	168.690
St. John's	88,102	.64	.77	828.926	61.633	49.488	215.432
Sherbrooke	80,711	.70	.74	381.608	26.267	12.885	295.994
Saanich	65,040	.55	.63	465.713	11.378	53.352	128.383
Hull	63,580	.68	.78	736.867	82.259	72.035	423.089
Victoria	61,761	.52	.51	1135.506	38.859	85.519	218.423
North Vancouver (dist.)	57,861	.55	.66	630.131	40.615	27.998	105.079
Trois Rivières	55,869	.67	.71	480.052	55.845	66.405	395.210
Delta	45,860	.59	.67	321.849	8.722	43.393	102.268
Lachine	44,423	.58	.73	339.914	22.736	50.649	213.178
Lethbridge	41,217	.56	.59	869.302	40.517	92.438	189.728
West Vancouver	36,440	.47	.51	591.932	22.228	27.717	315.862
Granby	34,385	.72	.75	307.111	44.496	67.471	221.608
Chicoutimi	33,893	.73	.80	370.578	37.176	34.815	344.024
Sydney	33,230	.65	.70	575.083	19.862	32.501	175.143
Prince George	33,101	.65	.71	1410.834	126.884	43.805	255.581
Pierrefonds	33,010	.62	.74	316.874	10.300	28.173	160.557
Cap-de-la-Madeleine	31,463	.75	.77	359.152	22.248	62.295	178.940
Brandon	31,150	.58	.60	638.884	39.165	93.740	151.525
Outremont	28,552	.46	.61	217.498	9.106	46.932	226.254
Red Deer	27,674	.61	.65	110.934	25.656	41.194	202.717
St. Jerome	26,524	.71	.79	427.537	38.833	63.716	293.319
Medicine Hat	26,518	.52	.55	509.465	12.067	35.071	159.514
Kamloops	26,168	.61	.65	149.427	63.818	81.015	284.699
Charlottetown	19,133	.58	.66	636.074	67.945	27.178	238.854

Table C-5

URBAN INDICATOR OUTPUT EQUATIONS, HOUSING
ONTARIO MUNICIPALITIES[1]

Dependent Variables[2] (Log Form)[5]	Independent Variables: Average Personal Income	Percentage of Earners With Incomes Under $4,000	Percentage of Earners With Incomes Over $15,000	Percentage of Population Non-French	Percentage of Families with Children Under 14 Years	Percentage of House-holds With Female Heads	Population / 10,000	Population Density	Social Welfare Expenditures/ 10,000 People[4]	Community Planning Expenditures/ 10,000 People[4]	Total Expenditures on Protective Services per 10,000 People[3][4]	Constant	R^2
Persons per room, owner-occupied dwellings, 1971	.167 (.81)	-.183 (1.16)	-.123 (3.50)	-.250 (6.10)	.272 (1.83)	-.032 (.70)	.020 (2.21)	.002 (.25)	.001 (.36)	.003 (.59)	--	-1.160 (.52)	.67
Persons per room, renter-occupied dwellings, 1971	-.107 (.62)	-.120 (.90)	-.063 (2.10)	-.219 (6.28)	.228 (1.80)	-.074 (1.91)	.018 (2.35)	.013 (1.98)	-.002 (.94)	.004 (.95)	--	.845 (.45)	.68
Persons per room, owner-occupied dwellings, 1971	.254 (1.21)	-.154 (.98)	-.124 (3.56)	-.248 (6.14)	.269 (1.83)	-.023 (.50)	.015 (1.49)	.002 (.22)	.003 (1.03)	.006 (1.20)	-.037 (1.48)	-1.580 (.72)	.68
Persons per room, renter-occupied dwellings, 1971	-.040 (.22)	-.098 (.73)	-.063 (2.13)	-.217 (6.29)	.226 (1.80)	-.067 (1.73)	.014 (1.68)	.012 (1.96)	-.001 (.19)	.006 (1.46)	-.029 (1.32)	.525 (.28)	.70

[1] There are 58 observations for the first two equations and 52 for the last two.

[2] The numbers in parentheses below the coefficients are t-statistics (absolute values).

[3] Includes police, fire, and other protective services.

[4] Observations are a three-year average (1970-72).

[5] The reported coefficients are those pertaining to the log form of the variables. Thus, in its multiplicative form the equation is $Y = AX_1^{a_1}X_2^{a_2} \ldots$ where the a_i's are the coefficients. The reported value of the constant is the estimate of $\log_e A$.

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