AN EVALUATION AND APPLICATION OF THE MINIMUM REQUIREMENTS METHOD OF ECONOMIC BASE ANALYSIS TO THE DELINEATION OF THE FUNCTIONAL STRUCTURE OF NEW ZEALAND URBAN PLACES, 1971

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ABSTRACT

The basic-nonbasic dichotomy of functions performed by urban places, their relative importance in ensuring the existence and continued growth of urban places, and the problems encountered in their identification and measurement have been examined within the conceptual framework of the economic base concept. One of the indirect or macro methods of economic base analysis which has been used in the identification and measurement of the basic and nonbasic functions performed by urban places, namely the minimum requirements method and its variants, has also been examined and evaluated in order to provide a theoretical and methodological framework for the application of the second variant of the method to 82 New Zealand urban places. On the basis of the Department of Labour's April, 1971 half-yearly survey of employment statistics, the second variant of the minimum requirements method as developed by Ullman and Dacey and refined by the use of least-squares linear regression equations and their associated regression lines which systematically correct the results obtained for variations in urban place population size, has been used to identify and measure the basic and nonbasic functions performed by New Zealand urban places. Using the basic functions, which are generally considered predominantly of economic significance, as a quantitative measure of the extent to which each of the industrial categories represented in the employment structure of an urban place constitute an economic specialisation of the urban place; the complex of specialised functions characteristic of each urban place in New Zealand has been used to delineate the functional structure of the urban place. To clarify these results and provide a comparative indicator, reference has been made to several direct

or micro economic base studies which have applied the sales-employment conversion method of economic base analysis to individual New Zealand urban places, and to a number of overseas economic base studies which have applied the minimum requirements method and its variants to various national and regional systems of urban places. Finally, to obtain an overview of the New Zealand urban scene the basic functional structures of New Zealand urban places have been characterised and classified. Each urban place's dominant function, its distinctive functions, and its degree of functional specialisation have been determined to achieve this end in a similar manner to Maxwell's functional classification of Canadian cities. The results of this classification have been presented in tabular and cartographic form, discussed in terms of their spatial patterns and statistical aspects, and compared with several functional classes derived by Pownall in his earlier functional classification of New Zealand towns. The overview gained indicates the predominantly multi-functional basic character of the functional structures of New Zealand urban places.

PREFACE

The extent and complexity of urbanisation in New Zealand provide ample justification for urban research. Interest in such research, however, has only recently begun to gather momentum, and while existing studies of New Zealand's urban geography provide some coverage, this is far from complete. Consideration is therefore given in this present study to the improvement of fundamental knowledge in one area of ignorance which has been identified, namely the economic base aspects of the functional structure of New Zealand urban places.

In preparing the present study I have received much valuable assistance from the following people and organisations. To Mr R. Le Heron, Massey University, I am exceedingly grateful for continued advice, encouragement, and in the later stages of the study, supervision; to Mr R. Wishnowsky I am grateful for technical advice and the preparation of the figures; to Mrs J. Jepson I am indebted for the typing; while thanks go to Miss C. Astle and Mr M. de Malmanche for the duplicating; and to Miss M. Stace and Mr and Mrs J. Willshire for assistance with the proof reading. To the Mathematics Departments of the Palmerston North Teachers' Training College and the Palmerston North Boys' High School I wish to express my thanks for the use of their calculating facilities; to the Massey University Printery for the reproduction of the figures; and to Dudley Rabone and Co. Ltd., for the use of their duplicating machine. And finally, my thanks go to my wife Jill, for many hours of assistance in collating data and proof reading, and for continual encouragement.

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CHAPTER I

INTRODUCTION

The Study of Urbanisation in New Zealand

> "There is an often-noted paradox in the spatial patterns of economic activity and population in New Zealand: although the country's economic well-being clearly depends on the productivity and profitability of its rural, primary industries, the majority of its inhabitants are town-dwellers" (Johnston, 1973b,3).

Indeed, New Zealand is one of the most highly urbanised countries in the world in terms of population distribution, and this is not a recent phenomenon. Its urban places,[1] originally established by a colonial power as administrative centres and transfer points for expediting the export of the colony's resources, have developed into a national urban system inside which four out of every five New Zealanders live. This was clearly illustrated by the 1971 census, which indicated that 81.5 per cent of the nation's population were urban dwellers.

The process of urbanisation however, involves much more than merely population redistribution, and therefore it is appropriate that urban research be directed towards the improvement of fundamental knowledge of each of its three separate dimensions: structural, behavioural and demographic.[2] Such research is necessary, not only to give a better appreciation of past and present patterns and processes or urbanisation in New Zealand, but also to give a basis for the future. This need for research into the process of urbanisation in New Zealand is simply justified by Johnston (1973b,3), who points out,

> "Urbanisation.....is a complex process involving many aspects of life, and is a worthy subject of study in a highly urbanised society such as New Zealand."

Relevant Urban Research

It is apparent from the preceding discussion that the extent and complexity of urbanisation in New Zealand provide ample justification for urban research. Interest in such research however, has only recently begun to gather momentum, and while existing studies of New Zealand's urban geography provide some coverage of each of the three dimensions of urbanisation, this is far from complete.[3] Indeed, it is possible to identify many areas of ignorance with respect to each of these three dimensions which remain unresearched.

Therefore it is appropriate, that consideration be given in this present study to the improvement of fundamental knowledge in one such area of ignorance which has been identified with respect to the structural dimension of urbanisation, namely the economic bases of New Zealand urban places. This gap in the knowledge of New Zealand urban places was initially identified by Mayer (1962,14), and later mentioned by Watters (1965c,208), who suggested that studies were ".....needed on the basic-nonbasic aspects of the functional structure of New Zealand towns."

"Structurally, each urban place performs certain functions, since no one is self-sufficient" (Johnston, 1973c, 175). The functions performed by urban places have been extensively studied by overseas geographers, economists and planners, and as a result of their research, a dichotomy of urban place functions is generally recognised.[4] Those functions which are performed for the population inside the urban place are termed "nonbasic", while those performed

for the population outside the urban place are termed "basic".[5] Since the basic functions are generally considered predominantly of economic significance, economic base studies[6] have been of concern in urban analysis, and a large number of methods have been developed and applied in such research (see Chapter 2). All of these methods involve measures of the extent to which each function in turn constitutes an economic specialisation of the particular urban place; the complex of specialised functions characteristic of each urban place in a set of urban places, such as that of a nation or region, has been used to indicate the essential functional structure of the urban place, as well as to classify urban places by their functions (Mayer, 1969b, 10). It is assumed in these methods of economic base analysis that the local needs of the urban place will be satisfied before export occurs. This, of course, is not strictly true, but if any type of good or service is exported before local needs are met, at least an equal volume of imports of similar goods and services takes place, and an equilibrium is attained. The surplus beyond that level is then indicative of the basic functions, and the extent of such surplus is indicative of the functional structure of the urban place, that is, its economic specialisations. These considerations, which form the essence of economic base analysis, constitute the crux of this present study of New Zealand urban places.

To date, almost all the research undertaken in New Zealand pertaining to urban place functions, has focussed on only the central place functions of urban places.[7] The exceptions to this include the studies by Pownall (1953,332-350), who used simple percentage deviations above the national mean values for seven functional categories, and by Johnston (1973c,175-203), who employed location quotients greater than

unity for seventy-one industrial categories; calculated on the basis of the statistical data collected by the Department of Labour in its half-yearly surveys of employment in each of New Zealand's urban places with a population of 1,000 or more;[8] to identify and measure the complex of specialised, central place and non-central place functions characteristic of each urban place, as a preliminary to classifying New Zealand urban places by their functional specialisations.

The methodologies employed in these two studies of New Zealand urban place functions are somewhat different however, from those of economic base analysis, which do not seem to have found wide acceptance in New Zealand. In fact, the only economic base studies carried out in New Zealand, have been those of Hamilton by Blechynden (1962; 1964, 122-137), Rotorua by Lowe (1966), and Stratford by Laidlaw (1968).[9] Each of these studies applied a direct or micro method of economic base identification and measurement to individual New Zealand urban places. As yet, no research has attempted to apply an indirect or macro method of economic base identification and measurement to the urban places constituting New Zealand's urban system.

Objectives and Organisation

The preceding considerations stimulated this present study, and provided its objectives and its organisation.

Objectives

1. An examination of the functions performed by urban places, their relative importance in ensuring the existence and continued growth of urban places, and the problems encountered in their identification and measurement, within the conceptual framework of the economic base concept.

2. An examination and evaluation of an indirect or macro method of economic base identification and measurement, namely the minimum requirements method and its variants, in order to provide a theoretical and methodological framework for the application of the second variant of the minimum requirements method to New Zealand urban places.

3. An application of the second variant of the minimum requirements method as developed by Ullman and Dacey (1960, 175-194) in their analysis of the economic base of United States cities to the delineation of the functional structure of New Zealand urban places.

Organisation

Chapter Two is concerned with a theoretical examination of the functions performed by urban places within the conceptual framework of the economic base concept. The basic-nonbasic dichotomy inherent in the economic base concept is used to examine the functions performed by urban places. This dichotomy is illustrated by means of a series of simple diagrammatic models which are based on the relationships implied in the economic base concept. The relative importance of the basic and nonbasic functions in ensuring the existence and continued growth of urban places is then considered with respect to the assumption of causation implicit in the economic base concept. Finally, the problems encountered in the identification and measurement of the basic and nonbasic functions in terms of the selection of a spatial unit of reference, a unit of measurement, and an overall method of economic base analysis are outlined.

Chapter Three deals with an examination and evaluation of the minimum requirements methods and its variants in order to provide a

theoretical and methodological framework for the application of the second variant of the method to New Zealand urban places in Chapter Four. The theoretical bases of the minimum requirements method and its variants, the hypothetical, normative models of the urban place economy assumed in each of these methodological concepts, and the dependence of the magnitude of the basic and nonbasic functions on the variant of the method used, together with a number of other variables, especially urban place population size, are examined and evaluated. Finally, the theoretical and practical limitations of the minimum requirements method as well as its advantages are discussed.

Chapter Four involves the application of the second variant of the minimum requirements method as developed by Ullman and Dacey (1960,175-194) in their analysis of the economic base of United States cities to the delineation of the functional structure of 82 New Zealand urban places. This particular method was selected on the basis of the type of comparative research undertaken in this present study and the availability of relevant statistical data, as the most appropriate method of economic base analysis for this purpose. The type of results obtainable from the use of this method in a context other than the United States, in terms of the way it measures the extent to which each of the functions represented in a New Zealand urban place constitute an economic specialisation of the urban place, and identifies the complex of specialised functions characteristic of each New Zealand urban place in order to delineate its functional structure, are outlined. To clarify these results and provide a comparative indicator, reference is then made to those New Zealand economic base studies of Hamilton by Blechynden (1962; 1964,122-137), Rotorua by Lowe (1966), and Stratford by Laidlaw (1968), which have

employed direct or micro methods of economic base analysis, and to a number of overseas economic base studies which have applied the two variants of the minimum requirements method to various regional and national systems of urban places.

Chapter Five classifies the results obtained from the application of the second variant of the minimum requirements method to New Zealand urban places in Chapter Four. These results pertaining to the specialised functions characteristic of each of the 82 New Zealand urban places examined are used to classify each New Zealand urban place by its dominant function, its distinctive functions, and its degree of functional specialisation, in a similar manner to Maxwell's (1965,79-104) functional classification of Canadian cities. The results of this classification are presented in a tabular and cartographic form similar to that adopted by Pownall (1953,332-350), and are discussed both in terms of their statistical aspects and their spatial characteristics. To clarify these results and provide a comparative indicator, reference is also made to the comparable elements of Pownall's (1953,332-350) functional classification of New Zealand urban places.

Chapter Six which is the concluding chapter, briefly presents a number of observations pertaining to the value of the economic base concept, and in particular the second variant of the minimum requirements method of economic base analysis in the study of New Zealand urban places.

Footnotes

1. For the definition of the term "urban places" as applied in this present study, see Appendix B, footnote 1.
2. These three separate dimensions of the process or urbanisation

have been identified by Johnston (1973b,3-14; 1973d,78-81) and Webb (1973a,325-335) in their studies of urbanisation in New Zealand drawing on the initial formulation by Lampard (1965, 519-520).

3. Most of the studies of New Zealand's urban geography published prior to 1969 are indicated on a chronological basis in Johnston's (1969,121-135) discussion of urban geography in New Zealand. While most of those published after 1969 are referred to in "Urbanisation in New Zealand", a collection of review essays edited by Johnston (1973a), which presents a general overview of the present state of knowledge of the patterns and processes of urbanisation in New Zealand.

4. In this present study, "urban functions" are applied as a term describing those economic activities which are characteristically carried out in urban places, the presence of which may be used to indicate the existence of an urban place.

5. For a glossary of equivalent economic base terms see Appendix A.

6. Literature dealing with economic base studies is extensive and well balanced. Following Hoyt's pioneering of the economic base concept in its modern form in the late 1930's and 1940's, numerous empirical and theoretical contributions have been made by geographers, economists and planners, and although these are not always readily accessible, most are discussed in the following reviews of the development of the economic base concept, see Alexander (1953,9-11; 1954,246-261), Alexandersson (1956), Andrews (1953a,161-167), Blumenfeld (1955, in Pfouts, 1960,229-277), Borchert and de Smidt (1967,64), Chapin (1965,

107-157), Dziewonski (1967,139-145), Hoyt (1941,188-195; 1954, 183-184), Isard (1960,189-205), Jerczynski (1971, in Spanish translation by Chaves, 1973), Lane (1966,339-347), Massey (1971), Mayer (1965,84), Mayer and Kohn (1959,85-126), Murphy (1966,98-112), Pfouts (1960), Richardson (1970,11), Thomas (1957,86-92), Tiebout (1956a,95-99; 1962), Ullman, Dacey and Brodsky (1971), Yeates and Garner (1971,118-137). Comprehensive lists of economic base studies may be found in the bibliographies on the economic base concept compiled by de Smidt (1967,70-82) and McNamara (1954,186-191).

7. The central place functions performed by urban places are undoubtedly the most important for the majority of New Zealand urban places. For several studies which have been made to identify and measure the relative importance of each urban place in New Zealand's urban system, see Duncan (1955,119-138), Forrest (1968,61-75; 1973,96-107), King (1962a,50-71), Pownall (1957,332-350), White (1972,36-50). For more detailed studies which have been carried out on the central place functions of urban places in Canterbury, see King (1962b,139-149) and in Waikato, see Whitelaw (1962,72-92).

8. The procedures adopted by the Department of Labour for the collection, processing and presentation of employment statistics for each of New Zealand's urban places with a population of 1,000 or more, are outlined in Appendix C.

9. In this present study, "economic base studies" are applied as a term describing those studies which employ the concept underlying economic base analysis. Although it needs no argument that it is very difficult to delimit the exact field of the economic base concept (see Chapter 2), to avoid confusion

Andrews (1953b,263-268) has drawn a useful distinction between, on the one hand, "economic base studies" and, on the other, "economic surveys". In his article, Andrews indicated that many studies do use the term "economic base study", while in fact the analyses concerned are not more than general economic surveys. Such general economic surveys are much more systematic analyses, Andrews suggested, than studies using the concept underlying economic base analysis.

CHAPTER 2

URBAN PLACE FUNCTIONS AND THE ECONOMIC BASE CONCEPT

Geographers have often posed the questions: What functions do urban places perform? How important are those functions in urban place existence and growth? How can these functions be identified and measured? Each of these questions is examined in this chapter within the conceptual framework of the economic base concept.[1] This concept involves a distinctive way of looking at urban place functions and their relationships, not just those with the contiguous area or "hinterland", as in central place studies, but also those with the rest of the world or "foreland".[2]

The Basic-Nonbasic Dichotomy of Urban Place Functions

Urban places emerge

> "to perform functions which are most efficiently conducted by relatively large numbers of people concentrated in a small area" (Johnston, 1973b,4).

The functions performed by urban places are examined in this section by means of a series of simple diagrammatic models which focus on the basic-nonbasic (export-local) dichotomy inherent in the economic base concept.

In this present study, urban places are assumed to be primarily economic entities, for as Johnston(1973b,4) points out,

> "in most parts of the world today and certainly in New Zealand, economic efficiency is the primary raison d'etre of most urban places."

They emerge largely as a result of economic development, which is associated with increasing functional specialisation, both for people and for places, and the greater the specialisation, the greater the

amount of trade necessary. Urban places develop to expedite this exchange, and so encourage further functional specialisation, the main way in which efficiency and productivity increase. Urban places do this by becoming the loci of specialised functions, and by acting as locales for the articulation of trade. It is the performance of these specialised functions for which, urban places through a combination of chance, situation, resources, and initial advantage, have some comparative advantage over other places (Johnston, 1973b,5), together with the export flow of their goods and services to those areas of demand constituting the urban places' hinterlands and/or forelands, that provided the underlying philosophy of the economic base concept and led to the recognition of the basic-nonbasic dichotomy of functions performed by urban places.

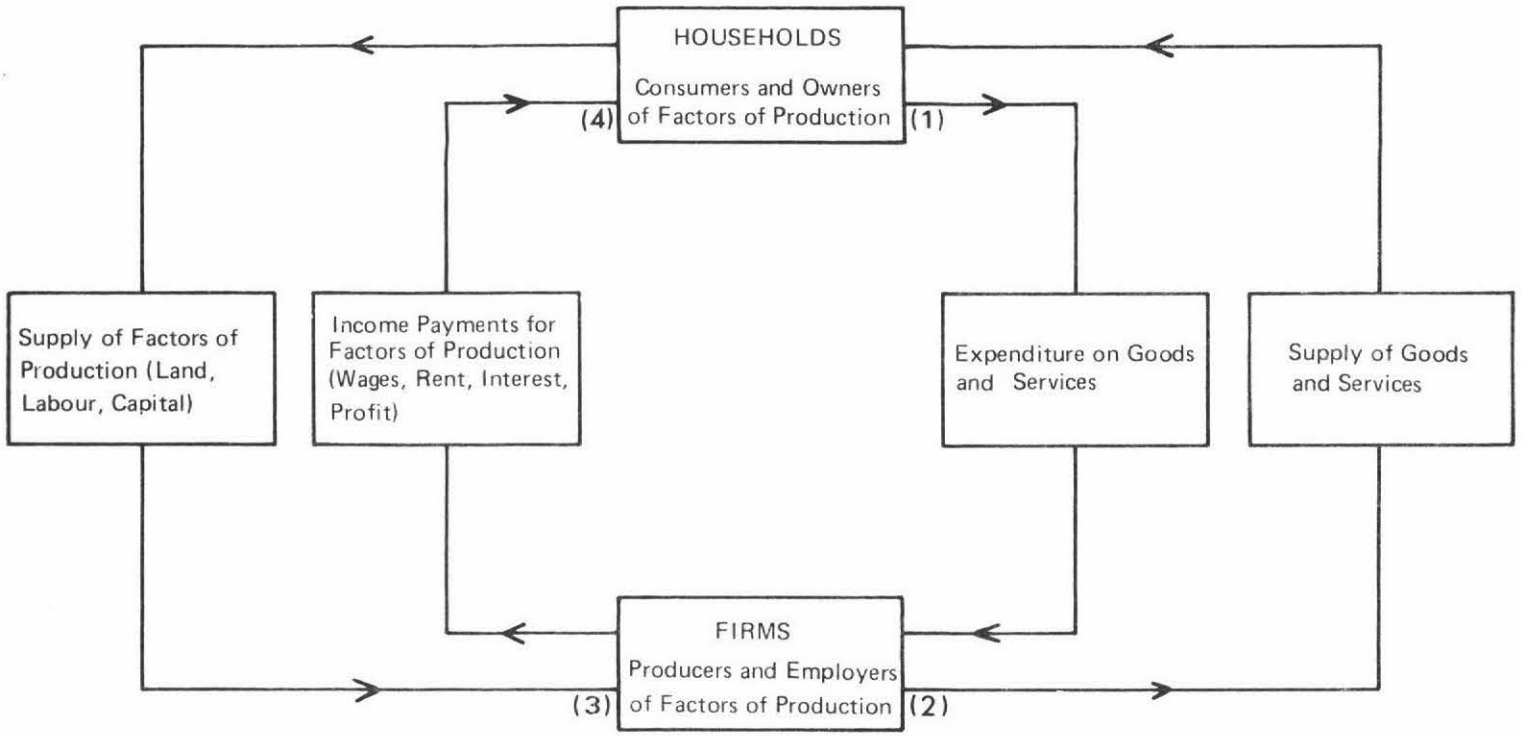
Although it is difficult to find a breakdown of the functions performed by urban places which corresponds to the basic-nonbasic dichotomy inherent in the economic base concept, the following series of simple diagrammatic models has been develcped using the relationships with the sources of demand implied in this concept. These models are based on the functioning of the simplified economy of hypothetical urban place 'A'.

Model One: The Simplified Economy of Hypothetical Urban Place 'A' (Figure 1).[3]

Model One illustrates the working of the very simple two-sector economy of hypothetical urban place 'A'. These two sectors of the economy, the household sector and the firm sector, each have two important economic roles: the household sector as consumer and as owner of the factors of production (land, labour, capital), and the firm sector as producer and as employer of the factors of production.

FIGURE 1

THE SIMPLIFIED ECONOMY OF HYPOTHETICAL URBAN PLACE 'A'



Sources: Adapted Hughes, 1969,216; Lobley, 1972,13; and Roberts, 1974,241.

The flows between these two sectors represent transfers of money, but money flows have a corresponding flow of real economic activity, namely the transfer of goods and the provision of services to the household sector. On the other side, income is generated in the process of production as the household sector supplies the factors of production to the firm sector in exchange for wages, rent, interest, and profit. The elementary flows of economic life within the simplified economy of hypothetical urban place 'A', therefore, are as follows: the consumer role of the household sector decides the pattern of its expenditure for goods and services; the producer role of the firm sector matches this demand with the production and supply of these goods and services, but in doing so creates demands through its employer role for the supply of factors of production; in payment for supplying these factors of production income accrues to the owner role of the household sector, enabling it in its consumer role to renew its demands, and thus generate further "rounds" of economic activity.

This model, which represents a closed system of economic activity, illustrates the division which exists in the economy of an urban place between the expenditure-exchange process and production-income creation, and can be interrupted at a number of points to measure the elementary flows of economic life. For example, household sector expenditure can be measured at point 1, firm sector value of production at point 2, firm sector employment at point 3, and household sector income at point 4. Because it is probably easier to emphasise the "real" flows of economic life, most economic base studies interrupt the system at point 3, and use employment as their unit of measurement in analysing the economy of an urban place. The reasons for the frequent use of employment as the unit of measurement in economic base studies, its limitations and its advantages, are examined in the final

section of this chapter.

No urban place however, exists as a closed system of economic activity as Model One indicates. Each exists as a specialised part of an integrated system of urban places, and because it is not self-sufficient, must not only import goods and services to make up for local deficiencies but must export goods and services into the system in order to pay for its imports.

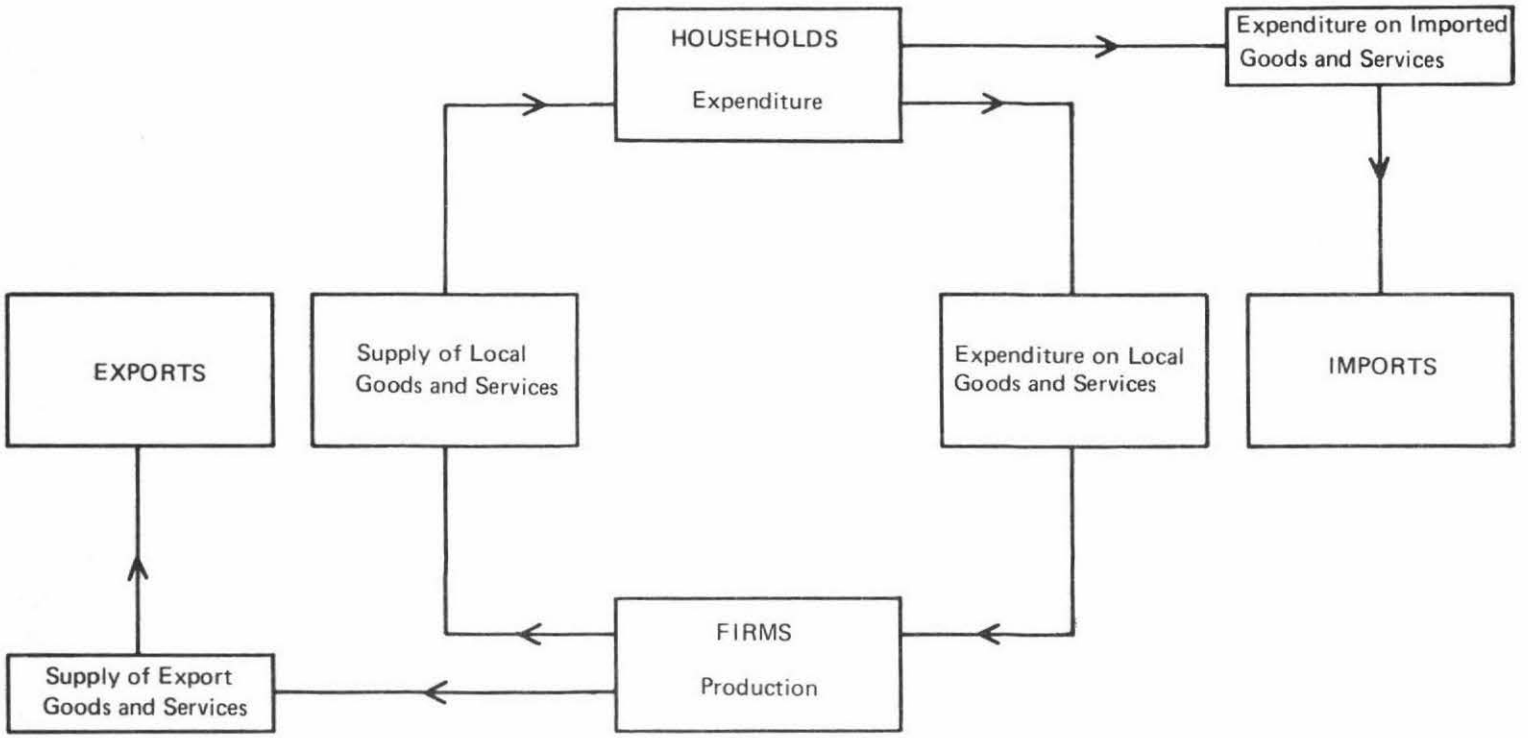
Model Two: The Addition of Trade to the Simplified Economy of Hypothetical Urban Place 'A' (Figure 2).

Model Two represents the expenditure-production flows of Model One, complicated by the addition of a two-way pattern of trade in the form of imports and exports. The consumer role of the household sector in deciding its pattern of expenditure takes into consideration not only locally produced goods and services, but also imported goods and services which make up for local deficiencies; while the producer role of the firm sector matches not only this local demand originating inside the urban place, but also the export demand originating outside the urban place from areas constituting the hinterland and foreland of hypothetical urban place 'A', with its production and supply of goods and services. For these reasons, which indicate that the economy of hypothetical urban place 'A' does not operate in isolation as a closed system, trade in terms of imports and exports was included in Model Two.

It is obvious from the external-internal dualism of production and supply flows illustrated in Model Two that the firm sector of the economy of hypothetical urban place 'A' consists of two components: the "export" or "basic" component which is concerned with the production and supply of goods and services for consumption <u>outside</u> the urban place, and the "local" or "nonbasic" component which is concerned with the production and supply of goods and services for consumption <u>inside</u> the urban place. It is this fundamental distinction which contitutes

FIGURE 2

THE ADDITION OF TRADE TO THE SIMPLIFIED ECONOMY OF HYPOTHETICAL URBAN PLACE 'A'



Source: Adapted Roberts, 1974,242.

the underlying philosophy of the economic base concept.

To elaborate this breakdown of the economy of hypothetical urban place 'A', corresponding to the export-local, basic-nonbasic division, the following two models were developed on the basis of the production-supply response of the firm sector of the economy of hypothetical urban place 'A' to its sources of demand, in order to illustrate the relationships implied in the economic base concept. It is these relationships with the sources of demand originating inside and outside the urban place that the economic base concept is primarily concerned. Models Three and Four, which are merely extensions of Models One and Two, are therefore demand oriented, and consider only the role of demand and its consequent effect on the production-supply flows of the firm sector of the economy of hypothetical urban place 'A'.[4]

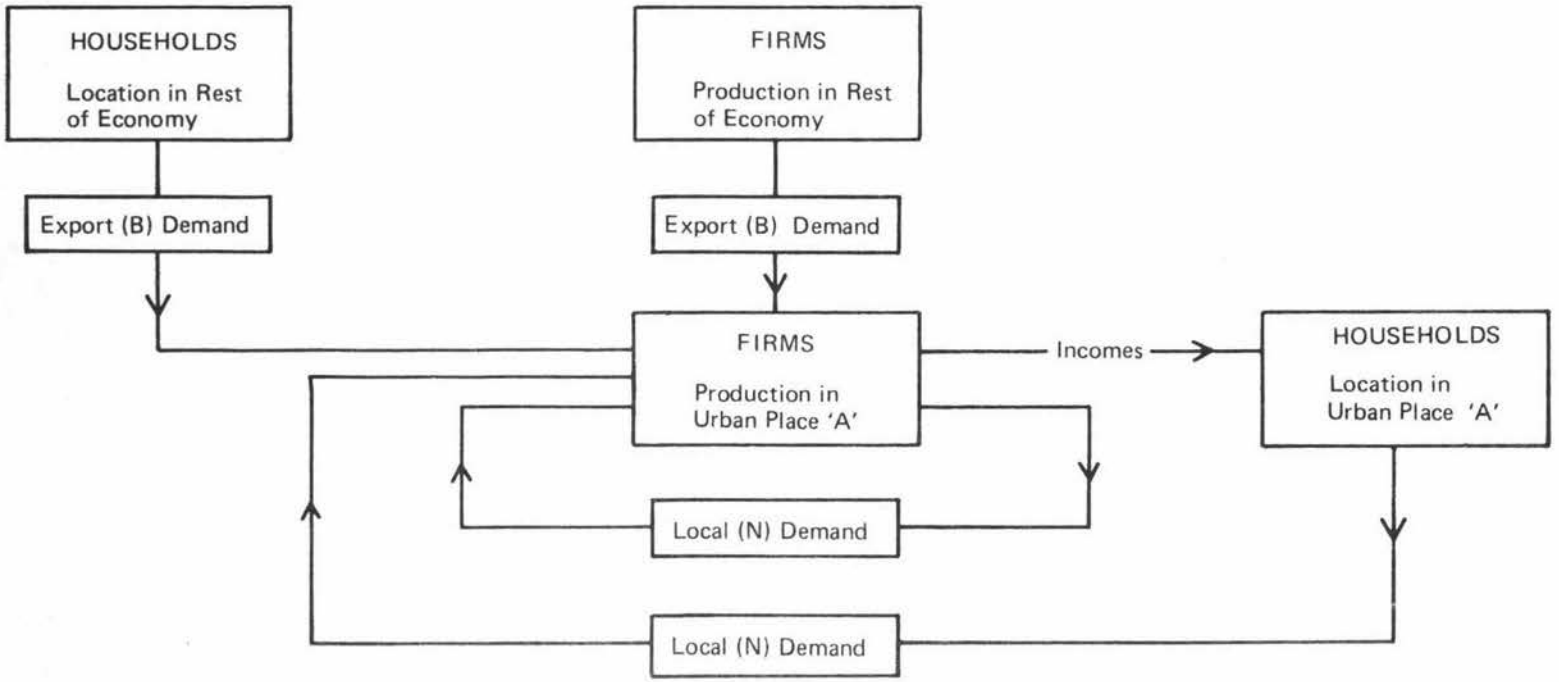
Model Three: The Role of Demand in the Simplified Economy of Hypothetical Urban Place 'A' (Figure 3).[5]

Model Three illustrates the role of external and internal demand in the economy of hypothetical urban place 'A'. The role of demand is represented by four sectors: the household and firm sectors outside the economy of hypthetical urban place 'A', and the household and firm sectors inside the economy of hypothetical urban place 'A'. These four sectors can then be grouped into two main sources of demand, corresponding to the export-local, basic-nonbasic division inherent in the economic base concept. It is upon these two main sources of demand that the working of the economy of hypothetical urban place 'A' depends, for they ultimately determine the economy's level of production and supply. These two main sources of demand include:

1. <u>External or "export" (basic) demand</u>.
   (a) From households located outside hypothetical urban place 'A' in the rest of the economy.

FIGURE 3

THE ROLE OF DEMAND IN THE SIMPLIFIED ECONOMY OF HYPOTHETICAL URBAN PLACE 'A'



Source: Adapted Hughes, 1969,234.

(b) From firms producing outside hypothetical urban place 'A' in the rest of the economy.

2. Internal or "local" (nonbasic) demand.

(a) From households located inside the economy of hypothetical urban place 'A'.

(b) From firms producing inside the economy of hypothetical urban place 'A'.

Any detailed analysis of the economic base of an urban place must go a considerable way towards explaining the relationships illustrated in Model Three, if it is to achieve its fundamental objective.

Model Four: The Production and Supply Response to the Role of Demand in the Simplified Economy of Hypothetical Urban Place 'A' (Figure 4).

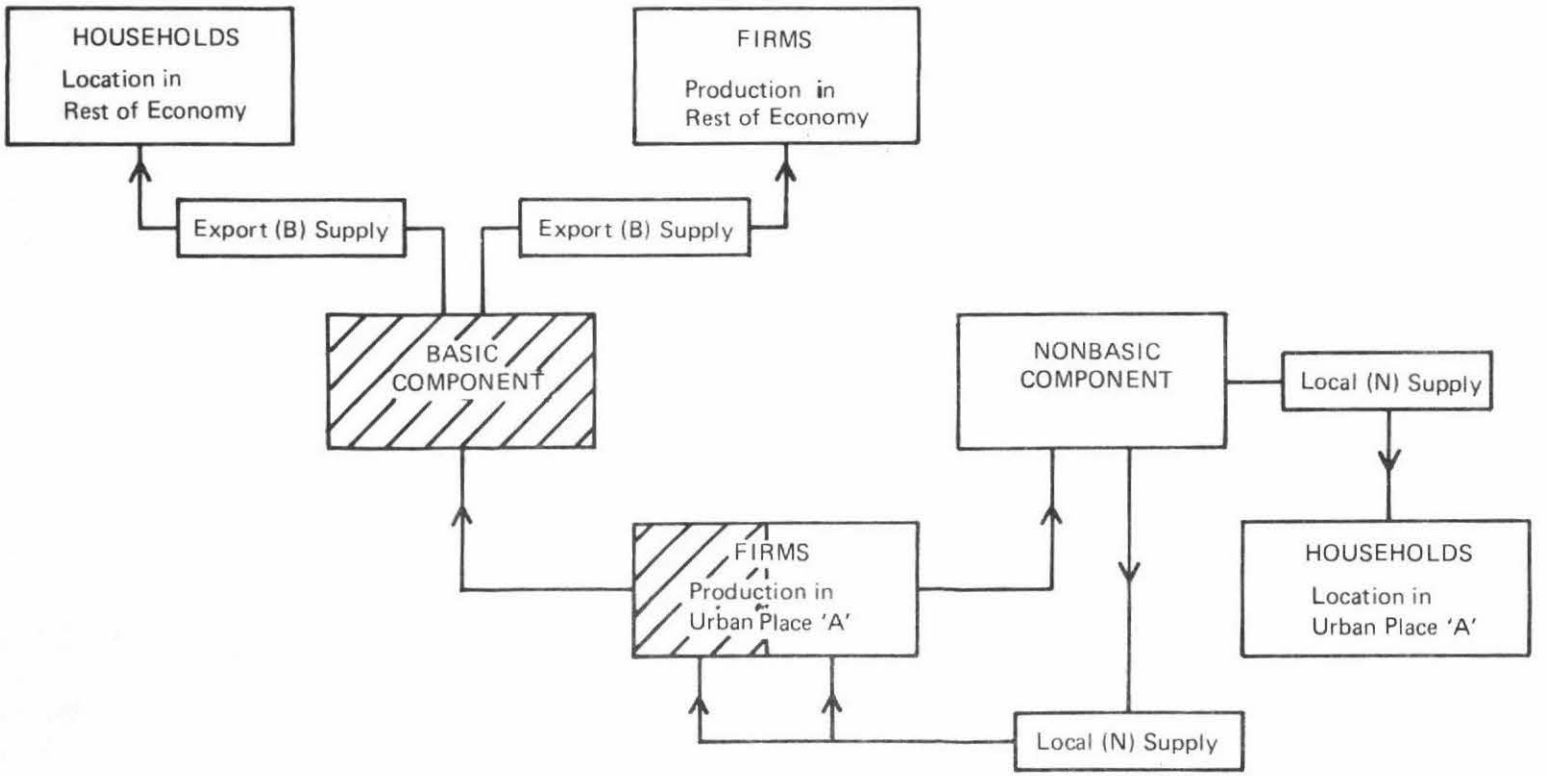
Model Four is simply a corollary of the role of demand presented in Model Three, and illustrates the production and supply response of the firm sector of the economy of hypothetical urban place 'A'. Model Four does this by dividing the production and supply response of the firm sector into the two components recognised in the economic base concept (Smith, 1971,102; Lloyd and Dicken, 1972,169).

1. The Basic Component. This includes all those productive functions performed by the firm sector of the economy of hypothetical urban place 'A' for which the effective demand is external to the urban place itself, chiefly the urban place's export or basic functions.

2. The Nonbasic Component. This includes all those productive functions performed by the firm sector of the economy of hypothetical urban place 'A' for which the effective demand is internal to the urban place itself, chiefly the urban place's local or nonbasic functions, which supply the day-

FIGURE 4

THE PRODUCTION AND SUPPLY RESPONSE TO THE ROLE OF DEMAND
IN THE SIMPLIFIED ECONOMY OF HYPOTHETICAL URBAN PLACE 'A'



to-day needs of the household and firm sectors.

The working of the economy of hypothetical urban place 'A' therefore depends upon the level of production in both the basic and nonbasic components of the firm sector, supplying goods and services to match the two main sources of demand outlined in Model Three, as follows:

1. External or "export" (basic) supply.
   (a) To households located outside hypothetical urban place 'A' in the rest of the economy.
   (b) To firms producing outside hypothetical urban place 'A' in the rest of the economy.
2. Internal or "local" (nonbasic) supply.

(a) (a) To households located inside the economy of hypothetical urban place 'A'.
   (b) To firms producing inside the economy of hypothetical urban place 'A'.

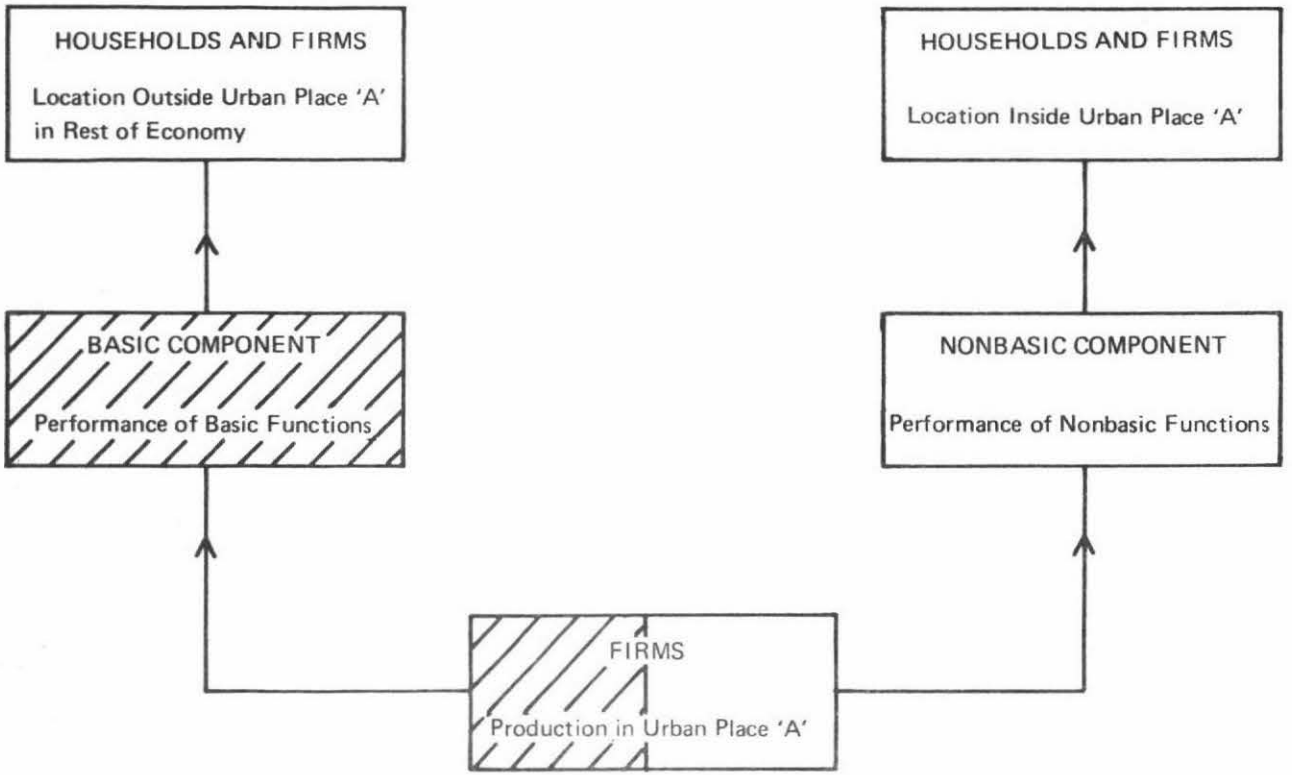
Model Five: The Essence of the Basic-Nonbasic Dichotomy Inherent in the Economic Base Concept (Figure 5).

Model Five represents a simplification of the relationships illustrated in Models Three and Four, and serves to clarify the essence of the basic-nonbasic dichotomy inherent in the economic base concept. The fundamental assumption underpinning this concept is that the productive functions performed by the basic and nonbasic components of the firm sector of the economy of hypothetical urban place 'A' may be divided into two groups - termed basic and nonbasic (Murphy, 1966,98).

1. Basic Functions. These are those productive functions performed by the basic component of the firm sector of the

FIGURE 5

THE ESSENCE OF THE BASIC - NONBASIC DICHOTOMY
INHERENT IN THE ECONOMIC BASE CONCEPT



economy of hypothetical urban place 'A' that sell their goods and services to households and firms located outside hypothetical urban place 'A' in the rest of the economy. These functions are referred to as basic because they bring money into the urban place.

2. Nonbasic Functions. These are those productive functions performed by the nonbasic component of the firm sector of the economy of hypothetical urban place 'A' that sell their goods and services to households and firms located inside hypothetical urban place 'A'. These functions are referred to as nonbasic because they do not bring money into the urban place.

This basic-nonbasic dichotomy of functions performed by the basic and nonbasic components of the firm sector of the economy of hypothetical urban place 'A' can be expressed as a simple equality (Yeates and Garner, 1971,119):

TOTAL ECONOMY OF HYPOTHETICAL URBAN PLACE 'A'	=	TOTAL BASIC FUNCTIONS	+	TOTAL NONBASIC FUNCTIONS

or symbolically as:

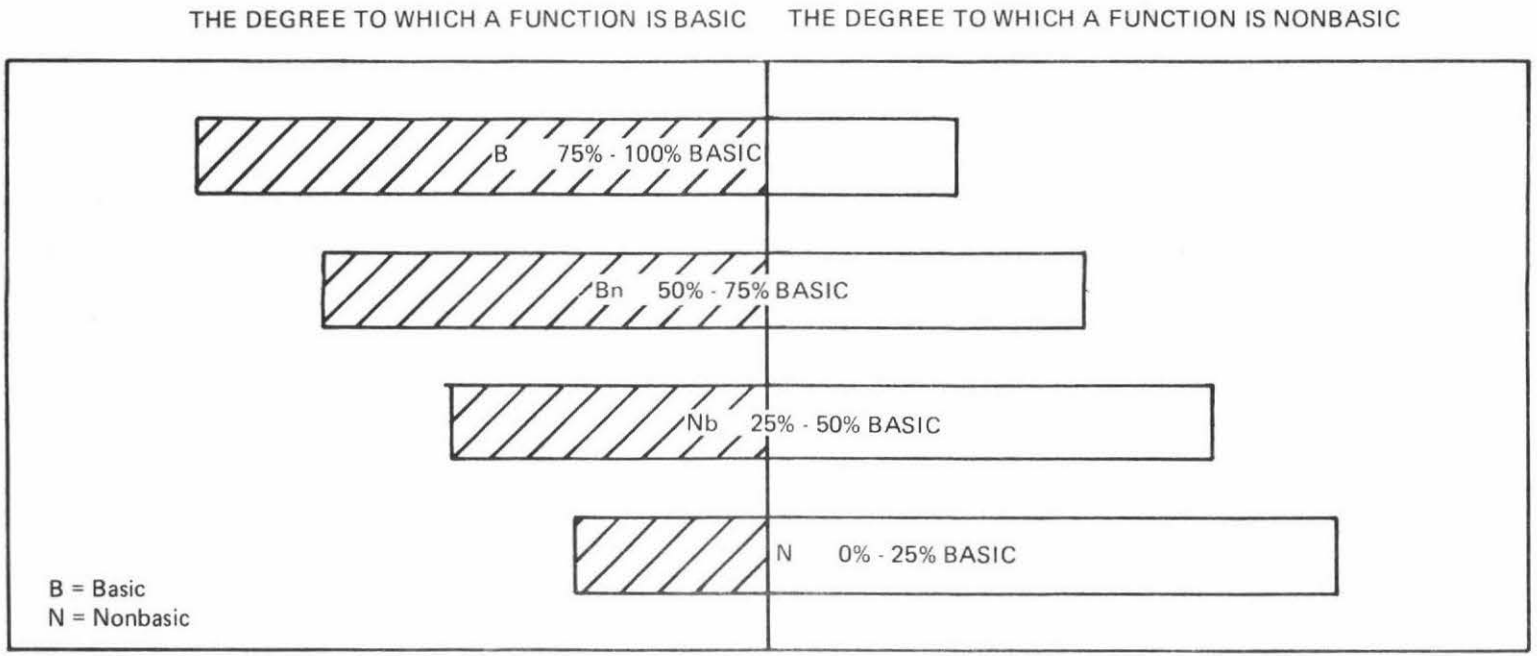
$$E = B + N$$

Model Six: The Degree to which each Function Performed by Hypothetical Urban Place 'A' is either Basic and/or Nonbasic (Figure 6).

It is difficult however, to find a breakdown of these functions performed by the firm sector of the economy of hypothetical urban place 'A' which corresponds to the basic-nonbasic dichotomy, for there are relatively few "pure" functions which can be considered to be either entirely basic or entirely nonbasic.[6] This is indicated in Model Six which illustrates and defines in an oversimplified manner

FIGURE 6

THE DEGREE TO WHICH EACH FUNCTION PERFORMED BY HYPOTHETICAL URBAN PLACE 'A' IS EITHER BASIC AND/OR NONBASIC



Source: Adapted Alexander, 1954,254-255.

the degree to which each function performed by hypothetical urban place 'A' is either basic and/or nonbasic in terms of four arbitrary categories:[7]

1. Functions in category B (mostly basic).
2. Functions in category Bn (mostly basic, but at least 25 per cent nonbasic).
3. Functions in category Nb (mostly nonbasic, but at least 25 per cent basic).
4. Functions in category N (mostly nonbasic).

It is apparent from the examination of urban place functions in this section, by means of a series of simple diagrammatic models, that the basic-nonbasic dichotomy inherent in the economic base concept provides a meaningful type of analysis of the functions performed by urban places. Such an analysis represents the first spatial breakdown - between internal and external - in the study of urban places (Ullman, Dacey and Brodsky, 1971,5), and permits the functions performed by urban places to be delimited according to their specific spatial relationships (those with their areal sources of demand).

The Relative Importance of the Basic and Nonbasic Urban Place Functions in Urban Place Existence and Growth

In the preliminary section of this chapter the functions performed by urban places were examined with respect to the basic-nonbasic dichotomy inherent in the economic base concept. This section considers the relative importance of the basic and nonbasic functions in ensuring the existence and continued growth of urban places in terms of the assumption of causation implicit in the economic base concept.

The fundamental assumption underlying the economic base

concept, which was indicated in the preceding section, is that the economic activities or functions performed by an urban place may be classified spatially with respect to the location of their sources of demand, into two groups - termed basic and nonbasic. The basic functions are those which produce goods and services for sale outside the urban place boundaries, and the residue, the nonbasic functions, are those which produce goods and services for sale inside the urban place boundaries. It is postulated by the economic base concept that it is on the basic functions that the existence and growth of the urban place depends.

The economic base concept emphasises that the basic or export functions of an urban place, are dependent on demands originating from outside the urban place (Figure 3). According to the concept these basic functions provide the reason for the existence and growth of an urban place. The growth of an urban place is assumed by the concept to be the response of its basic funtions to increased demands for their goods and services from outside the urban place, while its nonbasic functions are assumed to be there simply as a result of whatever level of demand and income the basic functions of the urban place may have achieved. As Goodall (1972, 238) states, the

> "growth rate of an urban area is explained more by export sector (i.e. basic) growth than any other single factor."

These basic functions not only provide the means of payment for goods and services an urban place cannot produce itself, but also support the nonbasic functions. As Isard (1960, 190) has concisely stated from a regional perspective,

> "This premise states that the reason for the existence and growth of a region lies in the goods and services it produces locally but sells beyond its borders.

> These "basic" activities not only provide the means of payment for raw materials, food, and manufactured products which the region cannot produce itself, but also support the "service" activities, which are principally local in productive scope and market areas."

The basic and nonbasic functions performed by an urban place are therefore distinguished spatially in terms of the location of their sources of demand (Figure 3). As has been mentioned, the basic functions supply goods and services for sale outside the urban place, and the nonbasic functions supply goods and services for sale inside the urban place. The level of economic activity within an urban place then is the sum of the levels of activity in these two groups of functions, measurable in terms of some unit of measurement such as employment or income. The level of economic activity in the basic functions depends, at least in the short run, on factors over which the urban place has no control, such as the demand for their exports, and the amount of investment from outside (Goodall, 1972,238). These basic functions cause income to flow into an urban place. The household sector of the economy of an urban place spends part of this income inside the urban place (Figure 2), and the generation of employment that results from the satisfying of intra-urban demand identifies the nonbasic functions. Since the level of activity in the nonbasic functions depends on the level of demand generated via the basic functions, then the latter are the ones which initiate change in the level of an urban place's economic activity (Goodall, 1972, 238). A cause and effect relationship is thus postulated between the basic and nonbasic functions, in which the basic functions are recognised as "prime mover" of an urban place's economy (Tiebout, 1962, 13). For example, if employment in the basic functions of an urban place increases or decreases, employment in the nonbasic

functions, which are regarded as being "dependent" on the level of demand generated by the basic functions, is presumed to move in the same direction.

> "If export jobs are lost service employment would decrease as the level of demand within the urban economy drops, unemployment would increase, and, in time, emigration would lead to a fall in urban population. Should, however, a service firm close down, the theory argues that a replacement would automatically spring up to take its place since there has been no change in the level of demand. An increase in the level of export activity would, therefore, be expected to generate additional service activity because the level of demand will have increased and more people will be attracted to the urban area. Changes in export activities bring sympathetic changes in service activities - an automatic but not necessarily instantaneous response.
>
> Viewed in this way exports are the point of contact between the urban and the national economy. Export activities import national disturbances and transmit them to the urban economy through their production and employment responses. Fluctuations in the level of urban economic activity are, therefore, seen by the theory as reactions to exogenous forces" (Goodall, 1972,239).

According to the economic base concept therefore, an urban place grows as a result of its basic functions, and its key tenet is, in the words of Pfouts (1958,242), "that exporting activity is the source and wellspring of urban economic growth." In other words, the basic functions are regarded as providing the economic base for the growth of an urban place, in the sense that their growth <u>leads and determines</u> the urban place's overall growth, while the nonbasic functions are considered to be simply the <u>consequences</u> of this overall growth of the urban place (Hoover, 1971,222). Apart from

the question of causation this fundamental assumption inherent in the economic base concept seems to be straight forward. Once the two groups of functions have been identified,[8] the ratio of their magnitudes in terms of some unit of measurement such as employment or income can be calculated.[9] This is the well known and used Basic-Nonbasic Ratio, usually abbreviated to the B-N Ratio.[10] From this in turn, keeping in mind the assumption that the basic functions support the remainder, an appropriate urban base multiplier can be calculated, which relates changes in the basic functions to the derivative change in the level of activity of the nonbasic functions.[11] This urban base multiplier can then be used to project the future prospects for growth in the basic functions performed by an urban place, and to evaluate its impact upon both the nonbasic functions performed by the urban place and the overall growth of the urban place.

Reference has been made to the assumption of causation implicit in the economic base concept. For a clear statement of this common point of view of causation Isard (1960,204) may be quoted,

> "In the minds of some analysts, the export sector is the sector that primarily determines the level of income and the economic welfare of a region, much as in Keynesian doctrine the investment sector is the determining sector in closed regions. In contrast, the non-export sector is passive, being dependent on the level of the export sector and local welfare."

The basic-nonbasic dichotomy inherent in the economic base concept then, emphasises the basic functions as being fundamental to an urban place's existence and growth, and relegates the nonbasic functions to dependent status (McCalden, 1969,42). Although this assumption is made in this present study, it is only sometimes presented as such, and is seldom critically examined by its users. In fact, says

McCalden (1969,42),

> "there is implicit acceptance of the postulate of dependence in the very terminology, so that many writers are committed from the start to a one-sided approach." [12]

In particular, many early writers indicated their commitment to this stand point by the very tone of their writings. For example, Harris and Ullman (1945,7) have written,

> "The support of a city depends on the services it performs not for itself but for a tributary area. Many activities serve merely the population of the city itself. Barbers, dry cleaners, shoe repairers, grocery men, bakers, and movie operators serve others who are engaged in the principal activity of the city which may be mining, manufacturing, trade, or some other activity."

Many of the theoretical inadequacies in the economic base concept, particularly with respect to the question of causation implicit in the concept, may be traced to the disregard for each other's work which has been displayed by geographers and planners on the one hand, and economists on the other hand. This point of professional insularity has been developed by Lane (1966,339-347), who also criticises the misconceptions held by many geographers and planners regarding the determinants of urban place growth. Many geographers and planners, Lane (1966,341-342) points out,

> "seem to believe that the base concept implies that an area's exports are its only source of growth. A more formal analysis of the base concept on the other hand, immediately shows that exports represent one of several sources of autonomous spending - a change in any one of which will produce a multiple process of income and employment generation. Given the very large size of the trade sector one would

> expect to find in an urban area, it is not surprising that the export multiplier is a highly significant factor for urban development. However, the usual (non-economist) understanding of the base concept is that it is the only source of development."

It was initially the interest of a small group of dissident economists in the economic base concept, that led to the validity of the assumption of causation implicit in the concept being questioned.[13] These economists, armed with a philosophy that they would substitute for the economic base concept, critically examined the assumption of causation, and on this ground rejected the concept as an explanation of urban place growth. This surrogate philosophy was derived from the modern theory of international and inter-regional trade and made use of economic concepts, such as the multiplier (Tiebout, 1956a,95-99). In other words the economist's suggestions represent an application of accepted economic theories and constructions to the urban place economy. These economists agreed that, with the possible exception of small urban places, the economic base concept with its undue importance attached to the basic functions, and hence its over emphasis of the role of exports, was an inadequate explanation of urban place growth.[14] Their objections to the concept were centred on the internal flow of goods and services inside an urban place; they argued that the magnitudes of such flows were too great to be ignored, as they are in the economic base concept, in any sizeable urban place. To illustrate their argument in an extreme case, it is necessary to consider the meaningfulness of the application of the concept to the economy of a nation. The concept

> "in this application would argue that the national economy could grow only through increasing exports - that domestic trade is only service industry and is not 'nation-building' industry" (Pfouts, 1960,2).

According to these economists then, the larger the economic region under consideration, the less is the applicability of the economic base concept. The greatest and most serious weakness in these economists' case however, is the absence of a large number of actual studies in which their theory is applied to existing urban places (Pfouts, 1960,3).

The most penetrating, individual critical appraisal of the economic base concept by an advocate of the above argument, has come from Blumenfeld (1955, in Pfouts, 1960,229-277), who identified what he considered to be a number of misconceptions and contradictory interpretations of the concept. In particular, the concept's over emphasis of the role of exports caused Blumenfeld to question the relative importance of the basic and nonbasic functions in urban place growth. Blumenfeld noted that while the proportion of nonbasic to basic functions, in other words the degree of self-sufficiency of an urban place, tended to increase with increasing urban place population size, the applicability of the economic base concept however, tended to decline. On this basis he argued that the non-basic functions are the primary determinant of the long run levels of major urban place economic activity, and of the vitality of the basic functions, and as such,

> "In any commonsense use of the term, it is the 'service' industries of the metropolis that are 'basic' and 'primary', while the 'export' industries are 'secondary' and 'ancillary'". (Blumenfeld, 1955, in Pfouts, 1960,277).

Blumenfeld maintained that major urban places exist and grow because of their highly developed and efficient nonbasic functions, which enable them to replace or substitute new basic functions for those that decline. The basic functions, which are competitive in

regional and national markets, are variable, subject to continual change and replacement. The nonbasic functions however, which are not competitive in the same type of market, are the permanent and constant feature of the major urban place economy, the key element in attracting new and/or additional basic functions, and a vital factor in their continuing efficiency and competitiveness. Blumenfeld thus contended that for major urban places the economic base concept should be inverted on its head.

> "A large metropolitan area exists, survives, and grows because its business and consumer services enable it to substitute new 'export' industries for any that decline as a result of the incessant vicissitudes of economic life. These services are the constant and permanent, hence truly 'basic' and 'primary' elements of the metropolitan economy; while the ever changing export industries are the 'ancillary' and 'secondary' elements. The relation assumed by the method is, in fact, reversed' (Blumenfeld, 1955, in Pfouts, 1960,232).

It is apparent from the preceding discussion in this section that there are two opposing points of view with respect to causation, as to the relative importance of the basic and nonbasic functions in ensuring the existence and growth of urban places. The common point of view, which is implicit in all economic base studies, emphasises the importance of the basic functions and the role of exports, while the dissident point of view, conceding that the former may be the main source of growth in small urban places, indicates that in the long run they are not the main source of growth in major urban places, and therefore stresses the importance of the nonbasic functions. Further consideration however, needs to be given to urban place population size, which clearly tends to influence both these points

of view. This indicates that as the population size of an urban place increases, its basic functions are of decreasing relative importance as a source of urban economic activity, and conversely, its nonbasic functions are of increasing relative importance as a source of urban economic activity. The larger the population size of an urban place therefore, the higher the proportion of nonbasic to basic functions, in other words, the more closely the urban place approaches self-sufficiency. No urban place however, is completely self-sufficient; all must have sets of external flows (imports and exports), since an urban place, by its very nature, cannot constitute an entirely closed system as Model Two in the previous section indicated. The numerical value of the B-N ratio thus tends to decrease with increasing urban place population size, being highest in small urban places and lowest in major urban places.

A distinctive feature in comparing small urban places and major urban places therefore, is that the basic functions figure much more prominently as the main source of urban economic activity in the former than in the latter. This does not inevitably mean differences in economic structure since the basic functions which supply goods and services for export in small urban places may be the nonbasic functions which supply goods and services for local consumption in major urban places. However, in most cases it does have repercussions on economic structure (Richardson, 1973,72). The corollary of dependence upon basic functions for small urban places, equivalent to those hypothesised in Thompson's (1965b, 438) stage of export specialisation,[15] is that they cannot be viable on the basis of their local market alone, since this market is too small to sustain most basic functions. Instead their viability which is based on the adage "export or die", derives from basic functions

which, by definition, are not related to the population size of small urban places.

> "These include: provision of low-order services for an agricultural hinterland (the main function of very small agricultural service centres in rural regions); specialised manufacturing serving non-local markets; resort facilities and tourism. In cases such as these, the export activities may dominate the local economy" (Richardson, 1973,72).

Because of this dependence on basic functions, small urban places in the process of growth, not only lack the ability of major urban places to replace or substitute one basic function for another, but also must attain a substantial population size before they can maintain a large number of nonbasic functions. For as urban places increase in population size correlative with not only increasing specialisation within their economies, but also increasing diversification of their economies, there is an increase in the relative importance of their nonbasic functions, "performing economic services and producing goods for other city dwellers ('taking in each other's washing')" (Glynn, 1970,12). This is to be expected, Goodall (1972,242) says,

> "for as an urban area's population increases, so does the size of the urban market, and this stimulates the production of items formerly imported. Thus with increasing size an urban area crosses successive thresholds at which it becomes profitable to establish further service industries within that area."

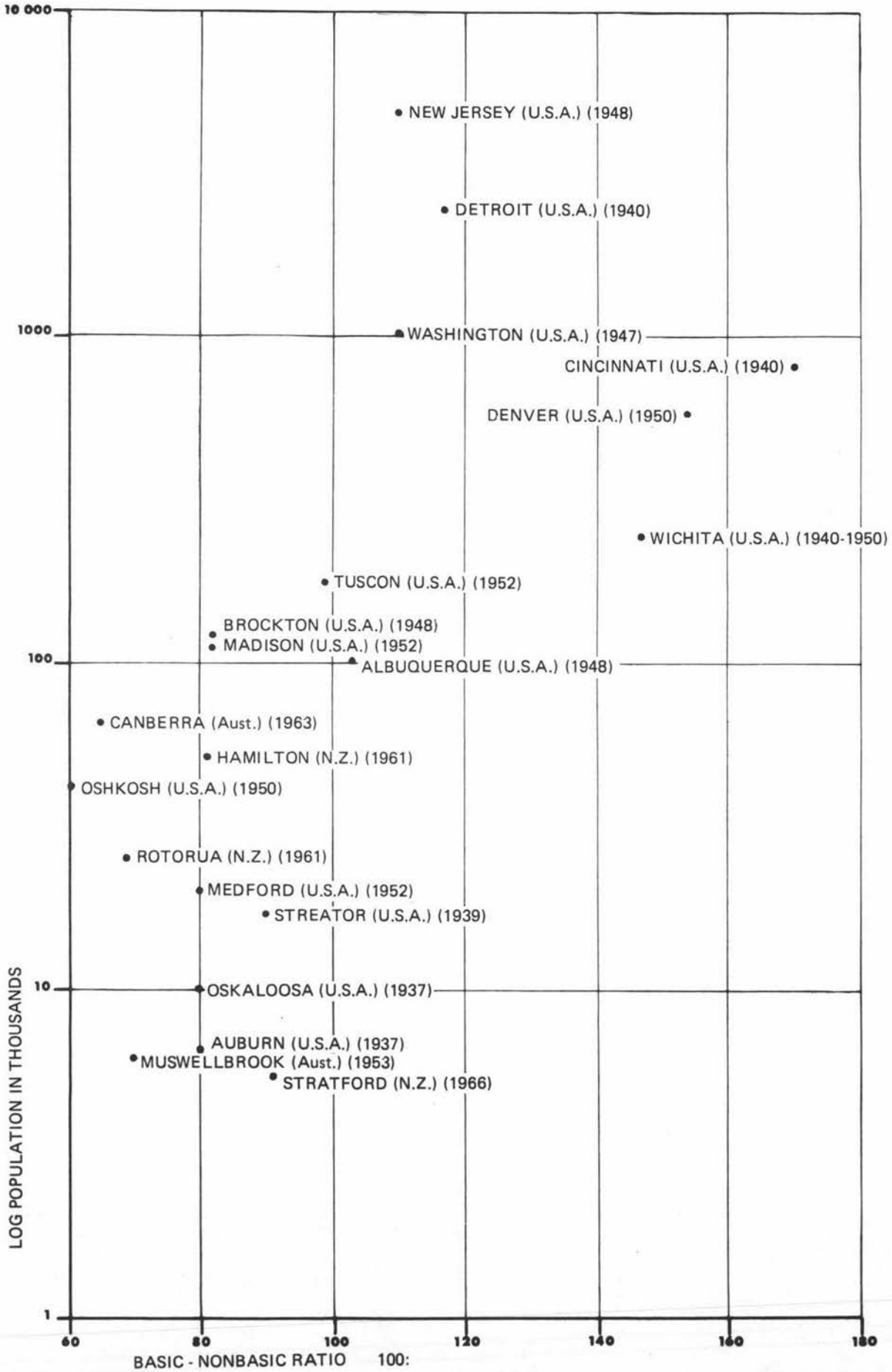
The level of urban economic activity generated by the nonbasic functions therefore, tends to increase with urban place population size, and allows a higher level of self-sufficiency to be reached in major urban places than in small urban places.

These implications of urban place population size with respect to the economic base concept, suggest that the B-N ratio is to some extent a measure of the level of self-sufficiency of an urban place (Massey, 1971,17). It follows, therefore, that the larger the population size of an urban place, the higher will be its level of self-sufficiency in terms of the proportion of nonbasic to basic functions. This has been substantiated by the results of a large number of direct or micro economic base studies of selected individual urban places (Figure 7).[16] It appears from the B-N ratios of the selected urban places represented in Figure 7, that the basic functions tend to be the main source of economic activity in urban places with a population of less than 100,000, but that once the population size of urban places reaches somewhere between 100,000 and 200,000 the nonbasic functions tend to predominate as the main source of economic activity. The B-N ratios in Figure 7 thus varied from 1:0.6 to 1:1.0 for small urban places with a population of less than 100,000, to 1:1.0 to 1:1.7 for major urban places.

A large number of urban analysts have, in fact, explicitly or implicitly, taken the view that urban place population size is the main determinant of urban place growth (Richardson, 1971,87). Although this simple statement has been expressed in many different forms, perhaps the most well known are those which have focussed on the lower end of the urban place size hierarchy, and have stressed the importance of a minimum threshold level (Pred, 1966; Thompson, 1965a; 1965b,431-490; 1968,43-62). Urban place growth is difficult until this threshold has been crossed, but then the growth rate accelerates and becomes self-generating; once across this threshold, an urban place will never contract back over it. Referring to this threshold as the "urban size ratchet", Thompson (1965b,444) posits that,

FIGURE 7

THE RELATIONSHIP BETWEEN THE BASIC - NONBASIC RATIOS OF SELECTED URBAN PLACES AND URBAN PLACE POPULATION SIZE



Sources: Compiled from data derived from Weimer and Hoyt, 1954, reprinted in Pfouts, 1960,30; Murphy, 1966,107; and the economic base studies of individual urban places in Australia and New Zealand by Blechynden, 1962; 1964,122-137; Bunker, 1964; Lowe, 1966; Laidlaw, 1968; and McCalden, 1969.

> "if the growth of an urban area persists long enough to raise the area to some critical size (a quarter of a million population?), structural characteristics, such as industrial diversification, political power, huge fixed investments, a rich local market, and a steady supply of industrial leadership, may almost ensure its continued growth and fully ensure against absolute decline - effect irreversible aggregate growth."

Although the tentative population size suggested by Thompson as the threshold above which urban place growth is self-generating, is higher than the population size range shown in Figure 7 as the level above which the nonbasic functions predominate as the main source of economic activity in urban places; the structural characteristics he mentions as prerequisites for ensuring this self-generating growth, are indicative of the highly developed and efficient nonbasic functions which Blumenfeld (1955, in Pfouts, 1960,276) maintained, "constitute the real and lasting strength of the metropolitan economy." It would appear, therefore, that in major urban places the nonbasic functions are the primary determinant of the long run level of urban economic activity. These nonbasic functions provide a stable framework for an urban place's basic functions which engage in regional and national competition and, thus, a positive locational factor in attracting new and/or additional basic functions and ensuring their continuing efficiency and competitiveness.

It is apparent that the implications of urban place population size tend to influence both points of view with respect to causation, as to the relative importance of the basic and nonbasic functions in ensuring the existence and growth of urban places. To recapitulate, the common point of view which is implicit in the economic base

concept, emphasises the importance of the basic functions, that is external causation; while the dissident point of view stresses the importance of the nonbasic functions, especially in major urban places, that is internal causation. These two, essentially opposite, points of view as to the source of causation tend to be modified by urban place population size however, which indicates that the two are, in fact, closely interrelated. Therefore, although the basic functions are the main source of urban economic activity in small urban places, their relative importance tends to decrease, while the relative importance of the nonbasic functions tends to increase with increasing urban place population size, so that in major urban places the nonbasic functions are the main source of urban economic activity. As Goodall (1972,245) points out,

> "in the long run, lines of causation are reversed and the ability to attract new export activities will depend on an urban area's comparative costs in the performance of those activities. Such costs must reflect the efficiency of the local service sector."

The basic and nonbasic functions are thus complements in urban place growth. One cannot operate without the other. The former tend to be of greater relative importancein the short run, especially in small urban places however, while the latter tend to be of greater relative importance in the long run, especially in major urban places.

With these considerations in mind, it seems that the assumption of causation implicit in the economic base concept is more appropriately made with respect to small urban places than to major urban places (Massey, 1971,18). This assumption is made in this present study, where the majority of urban places analysed are small, with sixty-five per cent having a population of less than 10,000,

and only seven per cent having a population of more than 100,000. Although it is recognised that the basic and nonbasic functions are interrelated in reality, it is assumed in this present study that the nonbasic functions ultimately depend for their economic support on the basic functions, which

> "serve an external market and thus generate an influx of reciprocal goods, services and finance that encourages solvency and expansion within the urban community" (Blechynden, 1964,123).

There is thus justification for focussing on the basic functions, for these provide a quantitative measure of the extent to which each economic activity represented in a given urban place constitutes an economic specialisation of that urban place. Economic specialisation is defined in this present study as the level of employment in each economic activity of an urban place, which is engaged in producing goods and/or services to match demands originating outside the boundaries of the urban place. The complex of specialised functions characteristic of each urban place can then be used to indicate the essential functional structure of the urban place, as well as to classify urban places by their functions.

The Identification and Measurement of the Basic and Nonbasic Urban Place Functions

In the first section of this chapter it was made clear that fundamental to the economic base concept is the recognition of a distinction between the basic and nonbasic functions performed by urban places. The identification and measurement of these two groups of functions however, as a preliminary to indicating the character and degree of economic specialisation of each of the economic activities represented in a given urban place, poses a series of

theoretical and practical problems which have been reduced, for consideration in this section, to three fundamental categories:

1. The selection of a spatial unit of reference.
2. The selection of a unit of measurement.
3. The selection of a method of identification and measurement.

The Selection of a Spatial Unit of Reference [17]

Identification of the basic and nonbasic functions performed by an urban place is essentially simple in theory but rather difficult in application. Identification, in the broad sense, is made as soon as the economic base of an urban place is defined. For example, if the economic base is defined as representing the basic functions of an urban place, then the problem seems to be simply that of identifying and tabulating according to some unit of measurement such basic functions. The residue can then be identified as the urban place's nonbasic functions. The application of this procedure to an urban place however, is complicated by numerous theoretical and practical problems. Delimiting the size of the spatial unit to which the procedure is to be applied "is one of the most important and yet, seemingly, most neglected insofar as rigorous definition is concerned" (Andrews, 1954d, 309).

The crucial importance of precise delimitation lies in the fact that the economic base of an urban place is by definition made up of its basic functions. These basic functions produce goods and services for sale outside the boundaries of the urban place. Similarly, the remainder, the nonbasic functions, produce goods and services for sale inside the boundaries of the urban place. It is evident, therefore, that before a meaningful process of identification,

which labels economic activities as either basic functions or nonbasic functions within an urban place, can begin,

> "a clear conception must exist as to the means of establishing an economic-geographic demarcation between the producing community and the beginnings of its export market" (Andrews, 1954d,309).

The need of delimitation of some kind is encountered in practically all fields of investigation. The process is particularly important in economic base studies because of the fact that "delimitation is, essentially, explicit in the phenomena to be examined" (Andrews, 1954d,309). In other words, the terms "basic" and "nonbasic" assume that limits have been established.

It is obvious then, that the identification of which economic activities are basic functions and which ones are nonbasic functions is dependent upon the location and extent of the boundaires of the spatial unit of reference selected (Chapin, 1965,139-140). For example, the central city of a metropolitan area may have significantly different economic base characteristics than the metropolitan area of which it is a part if the major economic activities are located inside the boundaries of the metropolitan area but outside the boundaries of the central city (Mayer, 1969b,11). The economic base concept is therefore dependent upon the level of areal aggregation of the spatial unit of reference selected (Massey, 1971,12). Generally, the larger the areal extent of the spatial unit of reference selected, the smaller will be the flow of goods and services across the boundaries of the spatial unit, and hence, the higher will be the proportion of nonbasic to basic functions. The numerical value of the B-N ratio can then be simply increased or decreased by respectively, contracting or expanding the boundaries of the spatial

unit of reference. As Richardson (1969a,20) points out, "the size of the export base is an inverse function of the size of the region."

The implications of this sensitivity of the economic base concept to the areal extent of the spatial unit of reference selected were originally indicated by Roterus and Calef (1955,17-20), who illustrated how the definitions of both the basic and nonbasic functions, and hence the B-N ratio changed as the spatial unit of reference was expanded from the one extreme of a crossroad's hamlet to the other of a nation. These implications, Tiebout (1956a,98) maintained were indicative of a fundamental weakness in the economic base concept.

> "The definition of basic activities as exports of goods, services and capital beyond the boundaries of the region can be misleading. If the object of a base study is to show the forces determining the level of income, this concept is too limited in coverage. This follows from the fact that as the boundaries of a region are expanded, exports become less and less. Yet the boundaries are arbitrary, and the wider they are drawn, the less the amount of exports. For the world as a whole there are no exports, but a great deal of income instability exists. This is the danger of equating exports with the source of instability" (Tiebout, 1956a,98).

What spatial unit then, should be used in an economic base study? This complex question has been discussed by Andrews (1954d, 309-319), who examines a number of spatial units used in economic base studies, and evaluates their applicability in terms of their advantages and limitations. The conclusions reached by Andrews indicate that there are at least two general goals to be reached in economic base studies with respect to the selection of a spatial

unit of reference. First, the delimitation of a spatial unit of reference that will best reveal the unit as

> "an economic and social entity whose mechanism of productive and distributive parts if inter-dependent to a very high degree" (Andrews, 1954d, 317).

And second, the standardisation of the spatial unit of reference in order to increase

> "the comparability of base studies and consequently to increase the reliability of generalisations relative to urban economies that may be drawn from such comparisons" (Andrews, 1954d,317-318).

In spite of the theoretical appeal of these two goals, their attainment is unrealistic in most economic base studies, because of the difficulty of obtaining data for spatial units of reference other than the formal statistical and/or administrative units as defined in standard statistical sources. Aware of the difficulties attached to identifying the basic and nonbasic functions and of the fact that any B-N ratio constructed will only be an approximation, most economic base studies trade the advantages of meaningful delimitation as defined by Andrews, for the convenience of selecting standard statistical and/or administrative units of reference for which data are available.

It is apparent then, that no single spatial unit of reference is most appropriate for an economic base study (Tiebout, 1962,21). Indeed, many spatial units of reference have been used in economic base studies, ranging from formal statistical and administrative units as defined in standard statistical sources to less formal units such as labour catchment areas and market areas as defined by the researcher. That there is no single appropriate spatial unit of

reference does not mean there are no standards in selecting a spatial unit of reference. In general, the selection of a spatial unit of reference will depend on the purpose of the study as well as such practical considerations as data availability for and the possibility of meaningfully delimiting the spatial unit. For the method of economic base analysis used, the resulting numerical values of the B-N ratios for the spatial unit as well as its individual economic activities, and the conclusions reached in an economic base study, may be markedly influenced by the boundaries of the spatial unit of reference selected (Isard, 1960,198).

The Selection of a Unit of Measurement

Once an appropriate spatial unit of reference has been selected for an urban place, certain preliminary decisions must be made concerning the way in which its basic and nonbasic functions are to be measured. For this, contended Andrews (1954a,52) "has an important bearing on ultimate interpretations and applications of data collected." Moreover, measurement is an inseparable part of the associated process of identification. In the process of identification there is not only the general problem of separating basic functions from nonbasic functions, but also the associated specific problem of quantifying these phenomena. Therefore, one of the most challenging problems that must be faced in an economic base study is the selection of an appropriate unit or units of measurement, which must be capable of identifying which economic activities and how much each economic activity can be described as basic and/or nonbasic, and of establishing the relative quantitative contribution of the basic and nonbasic functions to the total level of economic activity in an urban place.

Andrews (1954a,52) identified six different units of measure-

ment which have either been used or proposed for use in economic base studies: employment, payrolls, value added, value of production, physical production, and income and expenditure for an entire urban place.[18] The selection of one or more of these units of measurement poses a problem however, for there is no single, commonly accepted or completely satisfactory unit. Indeed, all of the above can be appropriate units of measurement. In general, the selection of any particular unit of measurement will depend on the objectives of the study and the availability of relevant statistical data (Tiebout, 1962,45).

Although there is no universal unit of measurement, it is generally recognised that the best units of measurement are those which express the economic nature of the relationships between an urban place and its hinterland and/or its foreland, that is those units of measurement representing monetary flows. For example, payrolls, value added, value of production, and income and expenditure accounts.[19] However, because of the complexity and difficulty of tracing monetary transactions, together with the lack of data pertaining to such monetary flows, these units of measurement are not widely used. For these reasons, the unit of measurement that is in most general usage is employment (number of employees).

In the absence of detailed data available for the other possible units of measurement, employment is the most commonly used measure. It has several rather obvious advantages. In a general sense, employment is one of the principal factors of production in any economic system whether it be national, regional or urban. Relevant statistical data in this form is usually readily available in standard statistical sources, although detailed breakdowns by

industrial category are frequently difficult to obtain for urban places. Indirect or macro economic base studies use this data as a starting point. The degree of detail with which this aggregate data is available however, tends to influence the methods employed and the conclusions reached in these studies.

It is generally recognised that, while offering the above advantages, employment as a unit of measurement of the basic and nonbasic functions performed by urban places also poses several problems (Andrews, 1954a,53-54; Chapin, 1965,143-144; Isard, 1960, 194; Leven, 1954,369; Massey, 1971,15; Murphy, 1966,101; Richardson, 1969b,167-168; Tiebout, 1962,45).

1. It is difficult to adjust to take account of seasonal, secondary, part-time, and widely fluctuating monthly employment.
2. It ignores differential changes in inter-industry wage rates.
3. It does not reflect differential changes in physical production and total value of production in different industries.
4. It does not take into consideration the export earnings of factors of production other than labour, as is evident in its almost total disrogard of capital exports.

Thus it is evidence, Chapin (1965,144) pointed out, that

> "the use of employment data alone as a measure may obscure a variety of underlying trends of change in the structure of the urban economy."

With or without qualifying assumptions concerning these problems, employment remains the most widely used unit of measurement in applications of the economic base concept. It has been suggested

that in such applications, many of these problems associated with the use of employment as the primary, quantitative unit of measurement could be offset by using other possible units of measurement, such as payrolls, as supplementary, qualitative, and in some cases quantitative, measures (Andrews, 1954a,54; Chapin, 1965,143; Leven, 1954, 369; Miernyk, 1967,34). These would give some indication of the relationship of the basic and nonbasic functions one to the other and the relationship of these two groups of functions to the total level of economic activity in an urban place in economic terms other than those of the primary unit of measurement. Indeed, Andrews (1954a, 58-59) went as far as to recommend that, in order to give a complete and meaningful picture of the economy of an urban place, as many units of measurement as possible be used.

> "In the process of judging an urban economy use all the measuring techniques feasible at the time. The single unit of measure used for identification alone is usually inadequate for general qualitative analysis though it is traditionally so employed. There is a direct proportional relationship between the adequacy of one's perspective on an urban economy and the number of measures of the base used" (Andrews, 1954a,59).[20]

Andrews' recommendation however, Leven (1954,369) contended, was empirically difficult and there still remained the crucial question of which criterion "really" measured the quantitative contribution of the basic and nonbasic functions to the total level of economic activity in an urban place.

To date, employment has been the most popular, and certainly the most practicable unit of measurement used in economic base studies, and it seems likely that this preference will continue

(Murphy, 1966,102). Hence, throughout the remainder of the present study, employment is used as the unit of measurement unless otherwise specified.

The Selection of a Method of Identification and Measurement

There is currently in use a large number of methods of economic base analysis by which the basic and nonbasic functions performed by urban places may be identified and measured. No one method of economic base identification and measurement however, is most appropriate. The selection of a method of economic base identification and measurement depends on the type of study being undertaken and its objectives.

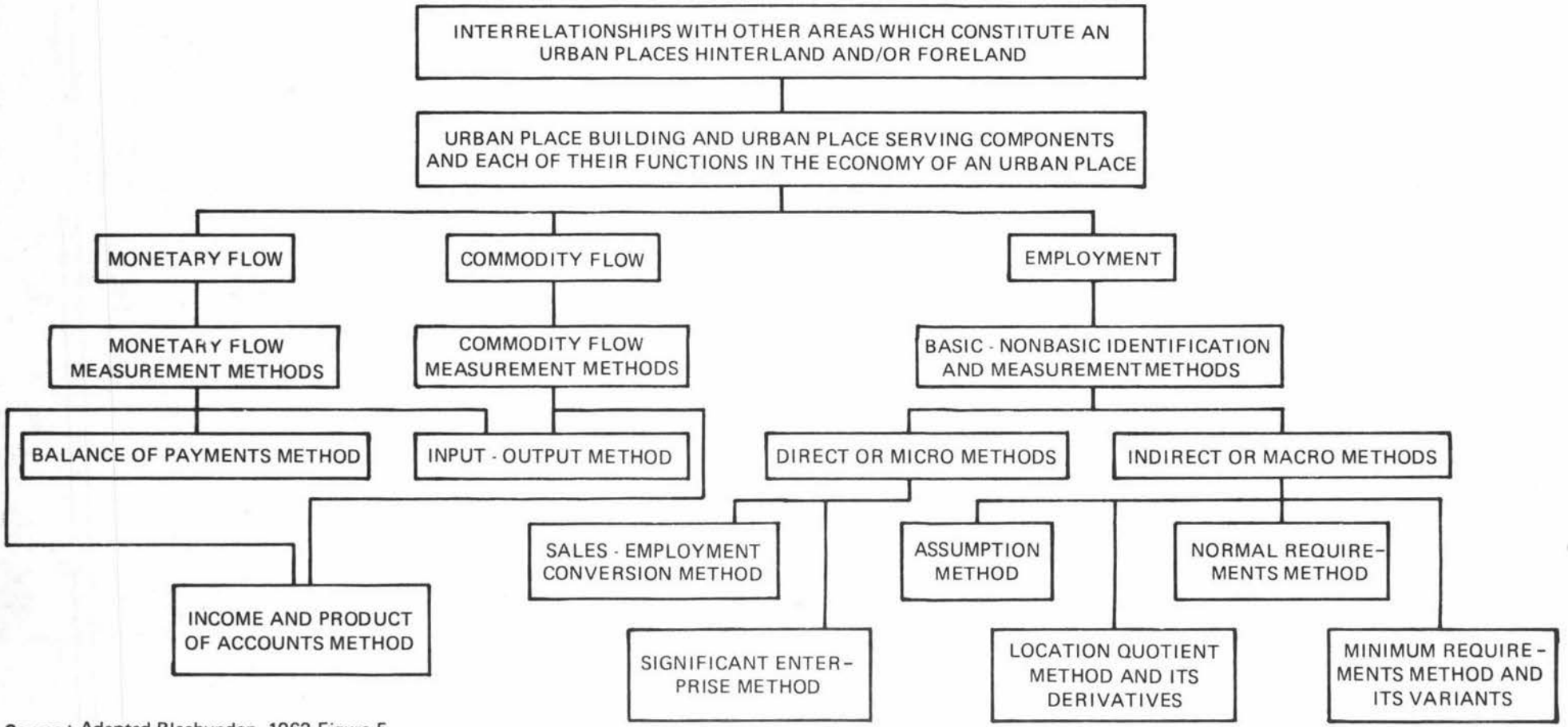
A general diagrammatic model outlining the elements and methods of economic base analysis and their relationships has been developed by Blechynden (1962,7-28).[21] In this model, Blechynden classified the methods of economic base analysis into three broad categories on the basis of each category's most common economic element or unit of measurement, namely monetary flows, commodity flows and employment. This general model, modified by the addition of several more methods to the category based on employment (Figure 8), provides a general overview of the diverse methods of economic base analysis and their relationships.

The main interest in this present study however, is only with the methods of economic base identification and measurement that use employment as their primary unit of measurement. These methods basedon employment as their unit of measurement have been classified in Figure 9 in terms of their dependence on the type of economic base study being undertaken, into two categories:[22]

1. Direct or micro methods which are used in economic base

FIGURE 8

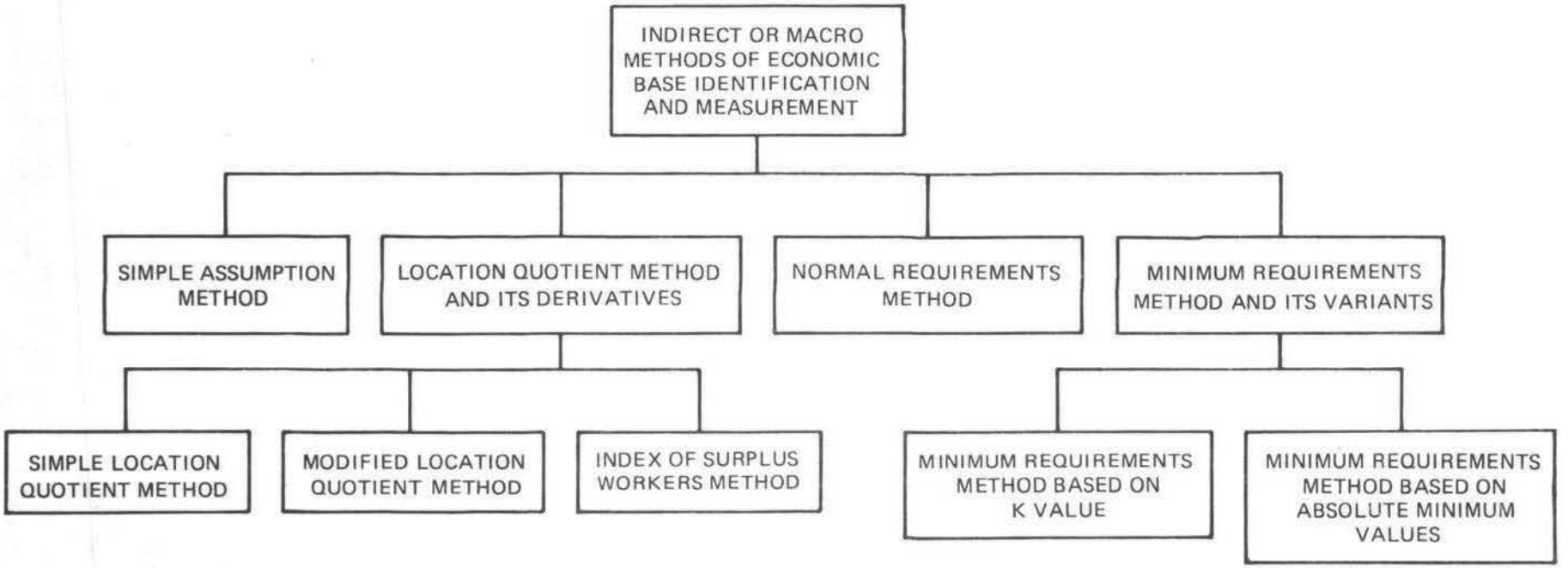
METHODS OF ECONOMIC BASE ANALYSIS



Source: Adapted Blechynden, 1962, Figure 5.

FIGURE 9

INDIRECT OR MACRO METHODS OF ECONOMIC BASE ANALYSIS



studies of individual urban places.

2. Indirect or macro methods which are used in comparative economic base studies of a number of urban places, such as those of a region or a nation.

The direct or micro methods of identification and measurement have been developed in economic base studies of individual urban places. The application of these methods is based on employment data collected for the individual urban place by sampling, questionnaires and personal interviews, and for any spatial unit of reference other than small urban places is very tedious, time consuming and expensive. Such methods make wider generalisations extremely difficult, particularly with respect to comparative analysis (Dziewonski, 1970, 41). The two main direct or micro methods of identification and measurement include the sales-employment conversion method,[23] or as it is commonly termed the "firm-by-firm" approach, and the significant enterprise method.[24]

The indirect or macro methods of identification and measurement have been developed in economic base studies of a number of urban places. These methods have been developed in connection with the need for comparative analyses of regional and national systems of urban places, together with the realisation that in the process of identification and measurement the economic base concept can furnish little more than an approximation (Richardson, 1969b,168). The application of these methods is based on aggregate data obtainable from standard statistical sources, and is less laborious and requires a less formal operational procedure than the application of direct or micro methods. To express the analysed data in a precise manner like the direct or micro methods however, but without the highly formal

operational procedure, requires large scale comparisons. The magnitude of the basic and nonbasic functions performed by an urban place obtained by these indirect or macro methods are only approximations, since the objective of such methods is not to analyse the detail or to explain these magnitudes with respect to individual urban places, but to obtain the bases necessary to analyse the differences between these magnitudes in a system of urban places (Jerczynski, 1971, in Spanish translation by Chaves, 1973,9).

Relying on employment as their unit of measurement, the development of these indirect or macro methods of identification and measurement has chronologically followed a distinct course, with the simple assumption method[25] being supplanted by the location quotient method and its derivatives,[26] and these in turn being superseded by the minimum requirements method and its variants and the less well known normal requirements method.[27] To provide a perspective for the application of the second variant of the minimum requirements method to New Zealand urban places in Chapter 4, the minimum requirements method and its variants are examined and evaluated in Chapter 3. The second variant of the minimum requirements method as developed by Ullman and Dacey (1960, 175-194) in their investigation of the economic base of United States cities was selected for application to New Zealand urban places in this present study on the basis of the availability of relevant statistical data and the type of study being undertaken.

Conclusion

The functions performed by urban places were examined in the first section of this chapter in terms of the basic-nonbasic dichotomy inherent in the economic base concept. Although it is

difficult to find a breakdown of the economy of an urban place which corresponds to this basic-nonbasic division, a series of six simple, diagrammatic models were developed using the relationships with the urban places sources of demand implied in the economic base concept. These models illustrated that the functions performed by an urban place may be divided spatially with respect to the location of their sources of demand into two groups - terms basic and nonbasic. The basic functions are those which produce goods and services for sale outside the boundaries of an urban place, and the residue, the non-basic functions are those which produce goods and services for sale inside the boundaries of the urban place. This basic-nonbasic dichotomy inherent in the economic base concept provides a clear and meaningful type of analysis of the functions performed by urban places.

In the second section of this chapter the relative importance of the basic and nonbasic functions in ensuring the existence and growth of urban places with respect to the assumption of causation implicit in the economic base concept were considered. Two opposing points of view are apparent with respect to causation, as to the relative important of the basic and nonbasic functions in ensuring the existence and growth of urban places. The common point of view which is implicit in the economic base concept, emphasises the importance of the basic functions, that is external causation; while the dissident point of view stresses the importance of the nonbasic functions, especially in major urban places, that is internal causation. These two points of view as to the source of causation are, however, modified by the implications of urban place population size which indicate that the two are, in fact, closely interrelated.

The basic functions therefore, tend to be of greater relative importance in the short run, especially in small urban places, while the nonbasic functions tend to be of greater relative importance in the long run, especially in major urban places. While it is recognised in this present study that both types of function, basic and nonbasic, are closely interrelated in reality, there is justification for focussing attention on the basic functions. These provide a quantitative measure of the extent to which each economic activity represented in an urban place constitutes an economic specialisation of that particular urban place. The complex of specialised functions characteristic of each urban place can then be used to indicate the essential functional structure of the urban place, as well as to classify urban places by their functions.

In the final section of this chapter the problems associated with the identification and measurement of the basic and nonbasic functions performed by an urban place in the selection of a spatial unit of reference, a unit of measurement, and an overall method of identification and measurement were examined. It was apparent that there was no single most appropriate spatial unit of reference, unit of measurement, and method of identification and measurement, and that their selection depends on the purpose of the economic base study being undertaken and the availability of suitable statistical data. The methods of economic base identification and measurement were classified in two diagrammatic models with one providing a general overview of the diverse methods of economic base analysis and their relationships, and the other a more specific summary of the methods of economic base analysis using employment as their primary unit of measurement. These latter methods were classified on

the basis of their dependence on the type of economic base study being undertaken into two categories - terms direct or micro methods, which focus on individual urban places, and indirect or macro methods, which fasten on systems of urban places. These indirect or macro methods have been developed in connection with the need for comparative studies and with the realisation that at best the results obtainable from the use of the economic base concept are only approximations. For these reasons, an indirect or macro method, namely the minimum requirements method and its variarts, was selected for further examination and evaluation in Chapter 3 of this present study, in order to provide a perspective for the application of the second variant of this method in Chapter 4 of this present study to New Zealand urban places.

Footnotes

1. Most of the studies of the means whereby an urban place secures its continued existence have been structured around the economic base concept. It should be noted that while the general term "economic base" is in itself perfectly general, the literature of urban geography has caused it to become associated with a particular body of hypotheses and associated methodologies. It is in this restricted sense that the term is used in this present study.

2. The terms "hinterland" and "foreland" are adapted from Weigend's (1958,192-198) examination of the basic elements of port geography. In this present study, "hinterland" is applied as a term describing the regional area adjacent to an urban place to which it exports goods and services; while "foreland" is applied as a term describing the national and

international areas outside the hinterland of the urban place to which it exports goods and services.

3. The discussion of the elementary flows of economic life in the simplified economy of hypothetical urban place 'A' in Model One (Figure 1) is adapted from Hughes' (1969,216-219) examination of the city as an economic creation, which forms the introductory section of his general study of employment projection with respect to urban development.

4. Most of the accepted theories of urban place growth (economic base, central place and input-output) are demand oriented. Very rarely is the supply side of urban place growth given any emphasis. For an exception see Winger (1969,30-34). The main aspects of the role of demand in the economic base concept are briefly outlined by Hoover (1971,221-234) in his discussion of regional growth, and by Richardson (1971,79-102) in his examination of urban growth. These two authors indicate the need for a broader, more balanced approach to the study of growth, and devote some attention to the role of supply, which though not totally ignored in economic base studies, has been far less thoroughly examined.

5. The discussion of the demand sources in the simplified economy of hypothetical urban place 'A' in Model Three (Figure 3) is adapted from Hughes' (1969,234-235) examination of the economic base concept as a technique for predicting the economic development of urban places.

6. The process of identification and measurement of the basic and nonbasic functions performed by urban places is complicated by numerous theoretical and practical problems. One of these

is the problem of there being relatively few "pure" functions which can be simply identified as entirely basic or entirely nonbasic. The separation and quantification of the basic and nonbasic contributions to the so-called typically "mixed" functions poses a difficult problem in the process of identification and measurement. Isard (1960,195) cited the example of the Federal Reserve Bank of Kansas City's (1952) study of the economic base of Wichita, which overcame this problem by initially identifying all the urban functions that were entirely basic, entirely nonbasic, and "mixed". The basic and nonbasic contributions of the "mixed" functions were then measured by using location quotients, in which for each function, per capita employment in Wichita was divided by per capita employment in the United States. The resulting ratios greater than unity were then taken to indicate a basic function, and the amount by which the ratio exceeded unity to indicate the extent to which employment in the function was basic.

7. The discussion on the degree to which each function performed by hypothetical urban place 'A' is either basic and/or nonbasic in Model Six (Figure 6) is adapted from Alexander's (1954, 254-255) examination of the B-N ratio as a new and important method of classifying individual economic activities, which forms part of his general assessment of the geographic qualities of the economic base concept.

8. The methods of economic base analysis used to identify and measure the basis and nonbasic functions performed by urban places are considered in the third section of this chapter.

9. The units of measurement which have been used or proposed for use in economic base studies are outlined in the third section of this chapter.

10. The value of the B-N ratio has been expounded, refined, criticised and debated in a large number of studies. Some studies claim that the B-N ratio has analytical value in the interpretation of the functional structure of urban places, but others have criticised the B-N ratio on the grounds that it is difficult if not impossible to accurately calculate, and that in any case no precise significance can be attached to it because of variations in the ratio when considered in relation to time, areal extent of the spatial unit of reference, method of economic base analysis used, urban place population size, age of urban place, stage in economic cycle, and functional structure of urban place. For further discussion of the advantages and limitations of the B-N ratio and the reasons for these variations, see Alexander (1953,91-93; 1954,250-255), Andrews (1955a,47-53; 1955b,144-155; 1955c,145-156; 1955d,361-371; 1958,37-40), Barkley and Allison (1968,472-473), Blumenfeld (1955, in Pfouts, 1960,262-264), Chapin (1965,144), Ferguson (1960,325-339), Gillies and Grigsby (1956, in Pfouts, 1960,213-228), Greenhut (1959,71-75), Harris (1958,233-237), Heilbrun (1960,291-296), Hoyt (1954,185; 1961a,51-52), Isard (1960,200-204), Massey (1971,17-20), Mayer (1965,84-85), Murphy (1966,99,106-110), Pfouts (1957, 64-69, corrected version in Pfouts, 1960,291-306; 1958, 238-243), Pfouts and Curtis (1958,303-310), Richardson (1971, 84), Roterus and Calef (1955,17-20), Rugg (1972,103-104),

Smith (1971,100), Stewart (1959,327-336), Thomas (1957,89), Tiebout (1956a,97-98; 1958,244-246; 1962,57-58), Yeates and Garner (1971,120-121).

11. The literature dealing with the urban base multiplier is extensive and well balanced. For a full, non-mathematical account of the historical development of the urban base multiplier, see Lane (1966,339-347). For a discussion of the use of the urban base multiplier in conjunction with the economic base concept and of its theoretical underpinnings and problems, see Blumenfeld (1955,265-271), Brazzel and Hicks (1968,503-509), Glasson (1974,63-65), Goodall (1972, 240-242), Hughes (1969,233), Isard (1960,189-205), Meyer (1963, in Needleman, 1968,32-35), Moyerman and Harris (1955, 89), Murphy (1966,99), Richardson (1969a,31-36), Stewart (1959,327-336), Se-Hark Park (1965,382-383), Yeates and Garner (1971,120). For a cross-section of approaches to the problem of measuring urban base multipliers, see Daly (1940, 248-258), Garrison (1972,329-337), Hansen and Tiebout (1963, 409-418), Hildebrand and Mace (1950,241-249), McCalden (1969, 40-41), Moody and Puffer (1970,91-98), Sasaki (1963,293-304), Thompson (1959,61-67), Tiebout (1956b, in Pfouts, 1960,341-358), Weiss and Gooding (1968,235-244).

12. For a glossary of the terminology used in economic base studies see Appendix A.

13. This small group of dissident economists who questioned the validity of the assumption of causation implicit in the economic base concept, included among others, Blumenfeld (1955, in Pfouts, 1960,229-277), Brazzel and Hicks (1968,

503-509), Gillies and Grigsby (1956, in Pfouts, 1960,213-228), Greenhut (1959,71-75), Hultman (1967,148-157), Murdock (1962,66-69), Pfouts (1957,64-69, corrected version in Pfouts, 1960,291-306), Pfouts and Curtis (1958,303-310), Thomas (1957,89), Tiebout (1956a,95-99; 1956c,160-169).

14. One of the first economists to question the economic base concept's over emphasis of the role of exports in regional economic growth and to call for a balanced approach was Tiebout (1956c,160-164). Tiebout's article was prompted by a forceful statement on the primacy of the role of exports in regional economic growth by North (1955,243-258). The whole North-Tiebout debate, including both these articles, North's 1956,165-168) subsequent reply, and Tiebout's (1956d,169) final rejoinder, is reprinted in Friedman and Alonso (1964,240-265). This debate stimulated another between Pfouts (1957, 64-69, a corrected version in Pfouts, 1960,291-306; 1958, 238-243), Harris (1958,233-237), Tiebout (1958,244-246), Andrews (1958,37-40), and later Heilbrun (1960,291-296), over the merits and demerits of the economic base concept.

15. Thompson (1965b,431-490) in his study of urban economic growth and development in a national system of cities outlined a model of the stages of urban economic growth. This has a sequence of five stages:

    1. The Stage of Export Specialisation in which a town is dominated by a single industry and perhaps a single firm.
    2. The Stage of Export Complex in which the town's economic base is extended by the addition of new

plants which are attracted to the original dominant industry either to provide its inputs or to use its outputs.

3. The Stage of Economic Maturity during which the urban economy moves towards self-sufficiency with a much broader range of industries, many of them attracted to the town by its growing market.
4. The Stage of the Regional Metropolis where the town becomes dominant over a group of centres, particularly in the supply of goods and services.
5. The Stage of Professional Virtuosity, in which one centre develops national and even international dominance in a certain function.

Most New Zealand urban places will not proceed beyond stages 1, 2 and 3 of this sequence; few apart from the urban areas attain stage 4, let alone stage 5. Thompson's model has provided the framework for discussion in several New Zealand urban studies, see Forrest (1973,96-107), Johnston (1967,153-157; 1971), Webb (1973b,118-127).

16. The implications of urban place population size with respect to the economic base concept have also been substantiated by the results of indirect or macro economic base studies of regional and national systems of urban places. For example, Ullman and Dacey (1960,175-194) in their study of the economic base of United States cities tested the dependence of the magnitude of the sum of the absolute minimum (nonbasic) percentage values, as derived from their minimum requirements method, on a series of variables. The variable on which the

magnitude of the sum of the minima showed the most dependence was urban place population size. The recognition of this dependence led Ullman and Dacey to analyse the relationship between these two variables. The method and results of this analysis, which indicated a definite relationship between the population size of an urban place and its degree of self-sufficiency, are outlined in Chapter 3. Similarly, the results of the application of Ullman and Dacey's method to New Zealand urban places in Chapter 4 confirm this relationship.

17. For further discussion of the problem of selecting a spatial unit of reference and of the implications of the sensitivity of the economic base concept to the areal extent of the spatial unit of reference selected, see, Andrews (1954d,309-319), Chapin (1965,139-142), Isard (1960,198-199), Massey (1971,12,17-20), Mayer (1969a,137; 1969b,11), Murphy (1966, 105-106), Perloff (1960,61), Richardson (1969a,20; 1969b, 166-167), Roterus and Calef (1955,17-20), Stewart (1959,327-328), Tiebout (1956a,98; 1962,21-23), Yeates and Garner (1971,122).

18. For further discussion of the problem of selecting a unit of measurement and of the advantages and limitations of the main units of measurement in terms of what they do and do not measure, see, Andrews (1954a,52-60), Chapin (1965,142-144), Isard (1960,194), Leven (1954,369-371; 1956,253-254), Massey (1971,15), Mayer (1969a,136), Murphy (1966,101-102), Richardson (1969b,167-168), Tiebout (1962,45).

19. The use of "value added" as a unit of measurement for example,

has been discussed by Leven (1954,370; 1956,253; 1964,64), but while overcoming some of the difficulties of using employment as a unit of measurement, it creates further problems of its own. Tiebout (1956a,98; 1956b, in Pfouts, 1960,348-355) dissatisfied with both these units of measurement, suggested using the more refined unit of "income accruing to residents", that is the value of income received by the residents of an urban place from all sources. Unfortunately, standard statistical data on income is not available in sufficient detail to indicate the precise incomes and their spatial and functional sources for all individuals living within an urban place, and as a result income as a unit of measurement normally presents even greater data collection difficulties.

20. Andrews (1961,219-227) later tried, but only theoretically, to determine the "dominant activities" in a local economy, and to assign a rank or order of importance to each dominant activity by a combination of weight scales measuring economic strength and economic interrelations in terms of a number of units of measurement.

21. For further discussion of the elements and methods of economic base analysis constituting Blechynden's (1962,7-28) general model, modified in Figure 8, see Isard (1960,122-205,309-374).

22. The classification of the diverse methods of economic base identification and measurement into direct or micro methods and indirect or macro methods (Figure 9) in this present study is adapted from similar classifications by Anderson (1968,5), Dziewonski (1970,40-42), Jerczysnki (1971, in Spanish translation by Chaves, 1973,8-9), Massey (1971,27).

23. For a discussion of the methodology of the sales-employment conversion method, its advantages and limitations, see Alexander (1954,259), Andrews (1954b,168-170), Blumenfeld (1955, in Pfouts, 1960,247-249), Chapin (1965,144-145), Garner (1967,333), Isard (1960,196-197), Leven (1956,256-257), Massey (1971,16), Mayer (1965,135-137), Miernyk (1967,34-35), Moyerman and Harris (1955,89), Murphy (1966,103), Richardson (1969a,27-28), Rose (1967,118-123), Rugg (1972,102), Thomas (1957,88; 1960,169), Tiebout (1962,50-55). For a number of applications of the method, see, Alexander (1951; 1953), Blechynden (1962; 1964,122-137), Bunker (1964), Laidlaw (1968), Lowe (1966), McCalden (1969; 1973,91-94).

24. For a discussion of the methodology of the significant enterprise method, its advantages and limitations, see, Andrews (1954c,265-266), Blechynden (1962,20-21), Murphy (1966,104).

25. For a discussion of the methodology of the simple assumption method, its advantages and limitations, see, Andrews (1954b, 165-166), Blechynden (1962,16-23), Blumenfeld (1955, in Pfouts, 1960,244-245), Hoyt (1941,188-195), Leven (1956,254), Richardson (1969a,28-29), Tiebout (1962,46-47).

26. For a discussion of the methodology of the location quotient method and its derivatives, its advantages and limitations, see, Anderson (1968,4-9), Andrews (1954b,166-167), Barkley and Allison (1968,473), Blechynden (1962,13-16), Blumenfeld (1955, in Pfouts, 1960,245-247), Borchert (1970,186-187), Carter (1972,56), Chapin (1954,63; 1965,125-127), Crosson (1960,197-201), Garrison (1972,331-337), Green (1959,42-47,

142-147), Harris (1958,233-237), Hildebrand and Mace (1950, 241-249), Hoover (1971,223), Isard (1960,123-126,195), Jerczynski (1971, in Spanish translation by Chaves, 1973, 27-41; 1972,32-36), Leigh (1970,202-205), Leven (1956, 255-258; 1964, in Needleman, 1968,68-69), Mattila and Thompson (1955,61-67), McGovern (1961,144-150), Moyerman and Harris (1955,89), Murphy (1966,102-103), Pratt (1968,117-124), Richardson (1969a,29-30), Roberts (1974,233-234), Rugg (1972, 103), Thomas (1957,87-88; 1960,167-168), Thompson (1959, 61-67), Tiebout (1962,47-49), Ullman (1968,365-368), Ullman, Dacey and Brodsky (1971,16-21). The location quotient method has been used in several New Zealand urban studies, see, Golledge (1964,28-68), Johnston (1973c,175-203), Linge (1957, 1-18; 1960a,326-343; 1961,195-208; 1963a,23-39).

27. For a discussion of the methodology of the normal requirements method, its advantages and limitations, see, Linge (1960b; 1963b,93-134), Logan and Missen (1971,183-184), Mayer (1965, 86; 1969a,141), Rose (1967,123-124).

CHAPTER 3

AN EXAMINATION AND EVALUATION OF THE MINIMUM REQUIREMENTS METHOD AND ITS VARIANTS

The minimum requirements method and its variants, developed by geographers as short-cut economic base procedures for identifying and measuring the basic and nonbasic functions performed by urban places, are examined and evaluated in this chapter in order to provide a theoretical and methodological framework for the application of the second variant of the method in Chapter 4.

The minimum requirements method is one of the most advanced indirect or macro methods of economic base identification and measurement. This method, which was developed in connection with the need for comparative studies of regional and national systems of urban places, together with the realisation that in the process of identification and measurement the economic base concept can achieve little more than an approximation, has two variants (Jerczynski, 1971, in Spanish translation by Chaves, 1973,11):

1. The minimum requirements method based on the K value.
2. The minimum requirements method based on the absolute minimum values.

Although there are terminological discrepancies associated with this particular indirect or macro method, to avoid confusion, all those methods using the same theoretical-methodological construction base on the division of the basic and nonbasic employment of each of the economic activities represented in any given urban place according to a minimum percentage value of employment or norm for a number of urban places are classified under the general concept of the minimum requirements method. The percentage value of the

point of division in the two variants of the minimum requirements method however, is not identical. The theoretical bases of these two variants, the hypothetical, normative models of the urban place economy assumed in each of these methodological concepts, and the dependence of the magnitude of the basic and nonbasic functions on the variant of the minimum requirements method used together with a number of other variables, especially urban place population size, are examined and discussed in the following two sections of this chapter.

The Minimum Requirements Method Based on the K Value

The first variant of the minimum requirements method was developed by the Swedish geographer Alexandersson (1956) in his comparative analysis of the industrial structure of United States cities. Although this study is well known, the concept of the method and in particular the selection of the point of division require some elaboration. Most of the critics of Alexandersson's methodology have seriously questioned the validity of the arbitrary nature of this selection.

The theoretical basis of the method lies in the question posed by Alexandersson (1956,17),

> "What ratios (of employment) in different industries are a necessary minimum to supply a city's own population with goods and services of the type which are produced in every normal city?"

To answer this question, Alexandersson developed the following procedure in order to identify and measure these significant ratios or percentage values of employment. First, he used the 1950 census of population to obtain the occupations of employed persons by industrial categories for 864 United States cities or urbanised areas

with a population of 10,000 or more. In arriving at these 864 cities, Alexandersson used urbanised areas wherever possible for cities with a population of 50,000 or more, but where urbanised area data were not available, he used standard metropolitan areas, and for smaller cities with a population between 10,000 and 50,000 he used incorporated units or even clusters of incorporated units that seemed to him to approximate urbanised areas as they would have been if these census areas had been developed for cities with a population of less than 50,000. Second, for each city he calculated the percentage of employed persons in that city engaged in each of 36 manufacturing (16) and service (20) industrial categories. Third, for each industrial category, he arrayed the cities by these percentages in an increasing series, that is from the lowest to the highest, on cumulative frequency distribution diagrams (the cumulative frequency in terms of the percentile rank of each city was plotted on the vertical axis (ordinate) against the percentage of employment for each of the 36 industrial categories on the horizontal axis (absicca)). Fourth, for each industrial category he tentatively selected two points (K_1 and K) on the cumulative frequency distribution diagrams, 1 and 5 per cent from the point of origin respectively, which represented cities 9 and 43 in the array of 864 cities. The percentage values for these two tentative points, and not the absolute minimum percentage values, were selected to try and exclude the distorted percentage values which characterised cities with highly atypical employment structures. Fifth, he tested the percentage values for the two tentative points selected against actual city employment structures to find if there were any cities corresponding to the two normative employment structure models. The

sum of the percentage values of employment for each of the 36 industrial categories, obtained on the basis of the first tentative point, the first percentile (1 per cent) from the point of origin, represented by city 9 in the array, reached 28.3 per cent of the employed persons of United States cities with a population of 10,000 or more. This normative employment structure model however, was not considered satisfactory by Alexandersson because it continued to be distorted by cities with atypical employment structures. The ogive curves of the percentage of employment on the cumulative frequency distribution diagrams, however, revealed for the industrial categories of a ubiquitous nature a comparable levelling off at the fifth percentile (5 per cent) from the point of origin, which satisfactorily excluded the low distorting percentage values of cities with atypical employment structures. After some experimentation therefore, Alexandersson selected the percentage value of employment in each of the 36 industrial categories, corresponding to the fifth percentile from the point of origin, as the ratio or point of division of employment into city-serving (nonbasic) and city-forming (basic) employment. This point of division of employment in each of the 36 industrial categories was assumed by Alexandersson to be the critical value, or as he designated it the K value for each of these industrial categories.

To illustrate the procedure used by Alexandersson to determine the K value for an industrial category, the employment array for wholesale trade is considered as an example (Table I) (Alexandersson, 1956,98; Morrissett, 1958,240-241; Yeates and Garner, 1971,123-124). From Table I it can be observed that the city with the highest percentage value of its total employment concerned with wholesale trade is Sanford, Florida, with 18.7 per cent of its employed persons

TABLE I

ALEXANDERSSON'S PERCENTAGE VALUE OF EMPLOYMENT

ARRAY FOR WHOLESALE TRADE, 1950

Percentile	Rank	City	Percentage Value of Employed Persons in Wholesale Trade
100	864	Sanford, Fla.	18.7
	863	Suffolk, Va.	16.9
	862	Mercedes, Tex.	16.7
	•	•	•
	•	•	•
5	43		1.4
	•	•	•
	•	•	•
	4	Kannapolis, N.C.	0.4
	3	Kings Park, N.Y.	0.2
	2	Oaks Ridge, Tenn.	0.2
	1	Richland, Wash.	0.01

Source: Alexandersson (1956, 98); Morrissett (1958,240-241), Yeates and Garner (1971, 124).

engaged in wholesale trade. This city can therefore be ranked number 864 and can be referred to as the 100th percentile city in the ranked array for wholesale trade. The city with the lowest percentage value of its total employment occupied in wholesale trade is Richland, Washington, with 0.01 per cent of its employed persons working in wholesale trade. By calculating from this lowest city for a total of 864 United States cities the fifth percentile city will be the 43rd city in the array (.05 x 864 = 43.2), which in 1950 had 1.4 per cent of its total employment involved in wholesale trade. This is the K value for wholesale trade. Thus only 5 per cent of United States cities with a population of 10,000 or more have 1.4 per cent or less

of their employed persons working in wholesale trade and 95 per cent of the cities have more than 1.4 per cent of their employed persons working in wholesale trade.

Alexandersson considered that these K values, which were representative of the normative employment structure model or ratios of employment expected in most normal cities, indicated the minimum percentage value of total employment expected in each of the 36 industrial categories in any city, and as such answered his original question. The sum of the K values for each of the 36 industrial categories constituting this normative employment structure model, calculated on the basis of the fifth percentile from the point of origin, reached 37.7 per cent of the employed persons in United States cities with a population of 10,000 or more. Alexandersson assumed that this percentage value was the ratio of employment necessary to satisfy the minimum (city-serving or nonbasic) requirements of United States cities with a population of 10,000 or more. The K values however, were quite different for each of the 36 industrial categories, though in each case they represented the percentage value of employment dividing the lowest 43rd or fifth percentile city of the 864 cities from the remainder in a ranked array for each industrial category. A number of industrial categories thus had K values of zero, or close to zero. These industrial categories were termed "sporadic" by Alexandersson, while those industrial categories with K values well above zero were termed "ubiquitous". In general, the manufacturing industrial categories were sporadic and the remaining industrial categories were ubiquitous.[1]

Morrissett (1958,241) however, suggested that Alexandersson's K values were

> "limited by the weight given to small cities. More than three-fourths of the cities are under 50,000 and the K values are dominated by these small cities."

Indeed, Alexandersson gave little consideration in the analysis he carried out to the influence of a city's population size and its geographical location on the magnitude of the relationship between the city-forming (basic) and city-serving (nonbasic) employment. He considered that the magnitude of city-serving employment was an adequate indication of the minimum requirements for small cities with a population between 10,000 and 50,000, which constituted the majority of the 864 cities examined, but that it was too small for larger cities. As Alexandersson (1956,19) mentioned,

> "With increasing size of the town, city-servicing production can be expected to increase in relative importance, not to decrease."

Therefore, he suggested that in larger cities, because of the increasing relative importance of intra-urban exchange of goods and services, the magnitude of city-serving employment could be expected to be higher. This fact led Yeates and Garner (1971,124) in their general review of Alexandersson's method to conclude that,

> "the sum of the K values does not represent the minimum requirements of all cities in the United States, because the towns at the bottom of the array would represent the minimum amount. The fifth percentile town, however, can be interpreted as being the minimum town above the tail end of the abnormal towns in the ranked array. Consequently, this figure can be interpreted as indicating the minimum percentage of employment that is to be expected on the average to serve the requirements of a city's economy in the United States."

Alexandersson, then, only suggested that large cities should have more city-serving or nonbasic employment than smaller cities. This proposition concerning the dependence of the magnitude of the city-serving or nonbasic employment on city population size, however, and another concerning regional variations in the magnitude of the city-serving or nonbasic employment in terms of the geographical location of cities, were empirically examined by Morrissett (1958,239-256) using Alexandersson's concept of the fifth percentile or K value and his data less 124 of the cities in the array. Morrissett reduced the number of cities examined in the array from 864 to 740 by eliminating Washington, D.C. and 123 college towns because of their atypical employment structures. The remaining 740 cities he grouped into two regions, the industrialised Northeast and the less industrialised South and West of the United States, and in each region further divided the cities into discrete city population size categories.[2] For each of the 36 industrial categories he then calculated the fifth percentile or K value for each of the city population size categories in each region.

The results of Morrissett's analysis revealed that the sums of the K values increased with city population size in both the Northeast of the United States and in the South and West. In other words, large cities did tend to have more city-serving or nonbasic employment than small cities. Furthermore, the employment structures of the Southern and Western cities tended to be more closely determined by city population size and geographical location than did the employment structures of Northeastern cities. The city-serving or nonbasic employment was therefore higher in the cities of the South and West, where the sum of the K values increased from 38.9

per cent for cities with a population of 10,000 to 71.0 per cent for cities with a population of 1,000,000, than in those of the Northeast of the United States, where the corresponding figures were 31.5 per cent and 58.7 per cent.

> "Thus, from 30 to 60 per cent of the industrial structure of cities of the Northeast is determined by city size, while in the South and West from 40 to 70 per cent of the economy of cities is dictated by their size" (Morrissett, 1958,246).

This difference in the sum of the K values for each of the city population size categories in the two regions Morrissett explained was the result of the cities in the Northeast of the United States being concerned far more with manufacturing, which was essentially a city-forming or basic function, than were those in the South and West.

Furthermore, the K values for almost all of the 36 industrial categories increased with city population size, although the degree of increase was quite different for each of the industrial categories. In other words, almost all of the industrial categories tended to become more city-serving or nonbasic in larger cities. Morrissett therefore concluded that the employment structure of a city tended to become more city-serving or nonbasic as the population size of the city increased.

Hence, the results of Morrissett's study revealed empirically that not only did the magnitude of the city-serving or nonbasic employment tend to have a simple dependence on city population size, but also that the geographical location of cities tended to cause regional variations in the magnitude of the city-serving or nonbasic employment.

The Minimum Requirements Method Based on the Absolute Minimum Values

Ullman and Dacey (1960,175-194) proposed a modification of the method developed by Alexandersson and later elaborated by Morrissett, which yielded

> "a quantitative statement which closely approximates the minimum percentage of a labour force required in various sectors of its economy to maintain the viability of an urban area. The employment in an urban area which is greater than this minimum requirement is called excess employment. The minimum requirement closely approximates the service or internal needs of a city, and the excess employment approximates the export or basic employment" (Ullman and Dacey, 1960,176).[3]

This modification, although related to the previous methodological concept, differed in its point of division, which was not indicated by the fifth percentile or K value as in the methodology of Alexandersson and later Morrissett, but by the absolute minimum values.

Ullman and Dacey developed this second variant of the minimum requirements method in their analysis of the economic base of United States cities, which was slightly different from their predecessors in that they used a different set of hypotheses. Their analysis was based on United States cities divided into six discrete city population size categories, each containing 38 cities selected at random, except the highest category comprising cities with a population of 1,000,000 or more, which included only 14 cities, the total universe in that category. Ullman and Dacey found that 38 cities in each city population size category produced satisfactory results, for by increasing the number of cities above 38 only lowered the magnitude of minimum or nonbasic employment by one or

two per cent. Only independent cities were used by Ullman and Dacey, and wherever possible for cities with a population of 50,000 or more, they used standard metropolitan areas.

In contrast to the two previous studies which analysed the employment structure of United States cities in terms of 36 industrial categories, Ullman and Dacey used only 14 industrial categories from the 1950 census of population, explaining that for some industrial categories the aggregated data provided more precise absolute minimum requirement values than would the data obtained from a more detailed classification. Indeed, Ullman and Dacey found that the change from 36 to 14 industrial categories only slightly increased the magnitude of the minimum or nonbasic employment. For example, the magnitude of the minimum or nonbasic employment calculated on the basis of 36 industrial categories for 11 urbanised areas with a population of 1,000,000 or more was only 5 per cent lower than that obtained on the basis of 14 industrial categories.

By making use of this 14 industrial category classification obtained from the 1950 census of population and a constant number of United States cities, Ullman and Dacey developed the following procedure to identify and measure the magnitude of the minimum or nonbasic employment in the total employment structure of a city. First, for each city they calculated the percentage of employed persons in that city engaged in each of the 14 industrial categories. Second, for each industrial category, they selected the city in each city population size category that had the lowest or actual absolute minimum percentage of its employment in that particular industrial category. This represented the actual absolute minimum requirement or percentage value of employment for an industrial category in a

city for that particular city population size category. Third, for each city population size category, they summed the actual absolute minimum percentages for each of the 14 industrial categories. Ullman and Dacey assumed that the sum of these minima in each city population size category represented approximately the gross internal or nonbasic employment, and that the remainder represented approximately the gross external or basic employment in all cities in that particular city population size category.

Ullman and Dacey then tested the dependence of the magnitude of the nonbasic employment (sum of the minima) on a series of variables. They tested among others the following variables: time (a comparison of the sum of the minima calculated for 1940 and 1950 indicated that the magnitude of the nonbasic employment in 1950 was slightly higher than in 1940), city type (a comparison of four groups of city types - institutional, industrial, market and balanced - revealed in particular that the magnitude of the nonbasic employment was lower for industrial cities than for market cities, that is 38.2 per cent and 53.3 per cent respectively), city income, city age, and regional variations in the geographical location of cities.[4] The variable on which the magnitude of the nonbasic employment showed the most dependence however, was city population size. Ullman and Dacey found, as had Morrissett, that the larger the city the larger was the magnitude of the nonbasic employment, which ranged from 24.0 per cent for towns with a population between 2,500 and 3,000 to 48.6 per cent for cities with a population between 300,000 and 800,000 or approximate B-N ratios of 1:$\frac{1}{3}$ to 1:1. Ullman and Dacey (1960,180) suggested that this finding was

> "consistent with theory, since the larger the city the larger the number of specialties that

> can be supported and the more self contained the city can be."

This assertion led Ullman and Dacey to carry out a detailed analysis of the relationship between the two variables.

When the sum of the actual, absolute minimum percentage values of employment for each city population size category were plotted on the horizontal axis (absicca), with a normal or arithmetic scale, of a semi-logarithmic graph, against the minimum points for each city population size category on the vertical axis (ordinate), with a constant-ratio or logarithmic scale, Ullman and Dacey found that they closely fitted a straight line, which indicated, on the average, a definite, positive relationship between the two variables.[5] Using this data, they were able to develop a least-squares linear regression equation that allowed the expected minimum requirements or percentage values of employment to be calculated for cities of all population sizes and which thus further refined their method. Furthermore, a linear extrapolation of this regression line downward indicated that

> "it crosses 0 per cent at about four persons, where it should according to logic, since a family unit can sell nothing to itself; when extrapolated upward, a more dubious procedure, it crosses within about 10 per cent of the expected for the United States population, as a whole, if one assumes the United States to be about 90 per cent self-contained" (Ullman, 1962,9).

In addition to calculating the least-squares regression line for cities on the basis of the sum of the actual, absolute minima for each city population size category, Ullman and Dacey applied the same procedure to calculate the least-squares regression line for each of

the 14 industrial categories on the basis of the actual, absolute minimum percentage values of employment in each of the six city population size categories for each industrial category. These regression lines allowed Ullman and Dacey to read off the expected minimum requirements or percentage values of employment for each of the 14 industrial categories for cities of all population sizes. The least-squares linear regression equation by which the above expected minimum requirements or percentage values of employment were determined both for cities of all population sizes and for each of the 14 industrial categories for cities of all population sizes, took the following form:

$$y = a + b \log x$$

where y was the approximate, expected minimum employment requirement value in per cent, x was the logarithm of the population size of the city, and a and b were the calculated regression coefficients.

Ullman and Dacey found that the magnitude of the expected minimum requirements or percentage values of employment for each of the 14 industrial categories varied from retail trade with the largest to mining which was zero with the lowest. Furthermore, they found, with the exception of the industrial category of mining, that the larger the city population size the larger the magnitude of the expected minimum requirements for each of the industrial categories and for the city as a whole, but that the degree of increase in terms of the slopes of the regression lines for each of the industrial categories was quite different. The fit of some of the regression lines for each of the industrial categories, they also noted, was less close than was the case of the regression line for the sum of the minima for cities as a whole. In fact, they indicated that,

> "The minima for many of the individual industries increases fairly erratically with construction and services (except professional) exhibiting the closest fit, and the remaining generally showing greater scatter. This of course is an additional reason for using the regression lines for individual industry calculations rather than the absolute values" (Ullman and Dacey, 1960,184).

The least-squares linear regression equations and their associated regression lines therefore allowed Ullman and Dacey to estimate the magnitude of the minimum requirements of percentage values of employment expected in each of the industrial categories represented in a given city of any population size and in that particular city as a whole. Once the magnitude of a city's expected minimum requirements for each of its industrial categories and for the city as a whole were known, they were then able to calculate the excess percentage values of employment in each of the industrial categories and in the city as a whole. This excess employment was taken to be a good approximation of basic employment. There is no reason however, other than previous empirical findings, why the magnitude of a city's expected minimum (nonbasic) and excess (basic) employment for each of its industrial categories and for the city as a whole should be as predicted, for special local circumstances may make the city deviate considerably from these expected magnitudes (Smith, 1971,101).[6] Indeed, cities do not necessarily require specific percentage values of employment in any industrial category, although observation might suggest that a certain minimum percentage value of employment may be expected. Because of the estimated character of the minimum requirements method therefore, Ullman and Dacey (1960, 177) suggested that this method could "with equal justice be termed

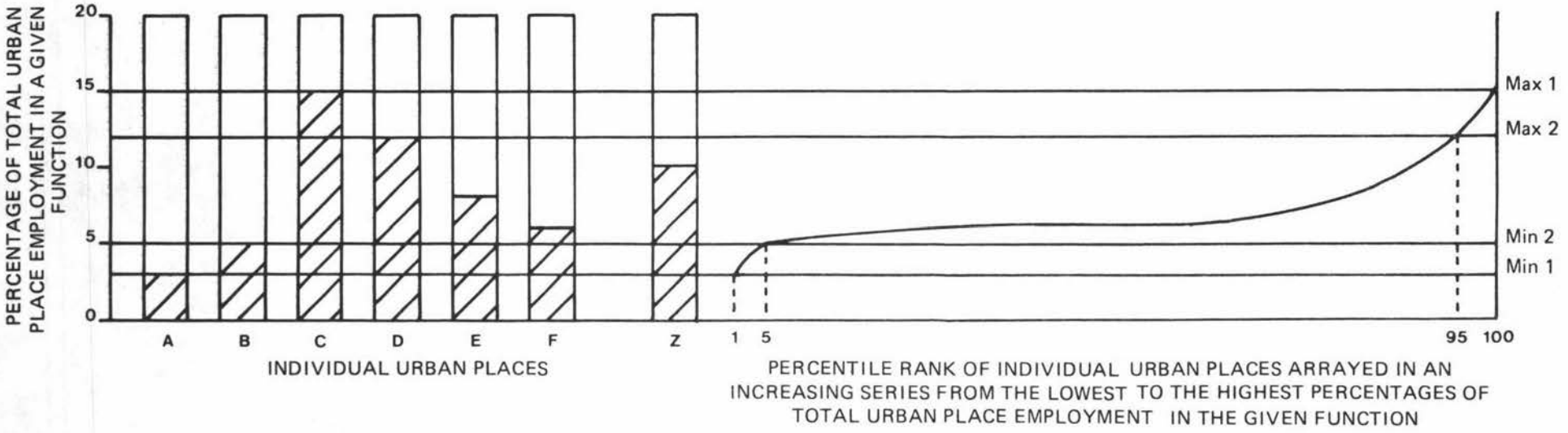
the minimum expectation method."

Economic base studies which have since used the minimum requirements method have done so without any modification of the theoretical assumptions and principles of identification and measurement established in the three previously mentioned analyses by Alexandersson, Morrissett, and Ullman and Dacey, for these are recognised as being fundamental within the context of this indirect or macro method of economic base identification and measurement. This raises the questions, however, of: What are the theoretical assumptions and principles of the minimum requirements method? How are these related to the hypothetical, normative models of the urban place economy assumed in this method? What is the relationship therefore between the basis and nonbasic components of employment identified and measured by the method?

According to the theoretical assumptions of the first variant of the minimum requirements method as developed by Alexardersson, the minimum requirement or percentage value of employment necessary and, at the same time, sufficient to satisfy the internal demand of all cities for goods and services in any given industrial category was the percentage value of employment corresponding to the city of the fifth percentile from the point of origin, or determined in relation to the lowest value. This so-called K value was assumed to be the point of division of employment in that particular industrial category for all cities into basic and nonbasic employment. (In Figure 10, city B indicates this value, corresponding to the line Min_2). At the same time it was assumed that the percentage of employment in all cities in that particular industrial category equal to or lower than the K value corresponded approximately to its

FIGURE 10

A SCHEME ILLUSTRATING THE PRINCIPLE OF THE INDIRECT OR MACRO METHODS OF ECONOMIC BASE IDENTIFICATION AND MEASUREMENT OF URBAN PLACE FUNCTIONS



Notes: The minimum requirement method: Min 1 - the absolute minimum percentage value.
Min 2 - the K value, or the percentage value represented by the 5th percentile of the investigated set of urban places.

The maximum requirements method: Max 1 - the absolute maximum percentage value.
Max 2 - the percentage value represented by the 95th percentile of the investigated set of urban places.

Sources: Adapted Jerczynski, 1971, in Spanish translation by Chaves, 1973,44 and 61; and Jerczynski, 1972,32

nonbasic employment ($N \leq K$), and that the percentage of employment higher than the K value corresponded approximately to its basic employment ($B > K$).

The set of 36 industrial categories, each with a determined K value, were then assumed to represent a normative model of the minimum employment structure of a city with which the actual employment structures of the cities were compared. The consequence of this assumption of the K values as the standard (normative) values, was that the magnitude and structure of the nonbasic employment in the total employment structure of the majority of the cities remained the same, and the B-N ratios remained constant. The magnitude of the basic employment also remained the same, but its structure was differentiated. The only exceptions to this were cities with highly atypical employment structures, in which the percentage of employment in some industrial categories were lower than the K value. The magnitude of the nonbasic employment in the total employment structure of these exceptional cities was lower and that of the basic employment was higher than in the majority of the cities. Although the structure of the basic employment remained differentiated, that of the nonbasic employment and the B-N ratios differed slightly from the majority of the cities. Such percentages of employment that were lower in some industrial categories than the determined K value for those industrial categories occurred in only five per cent of the cities examined.

The theoretical assumptions of the second variant of the minimum requirements method as developed by Ullman and Dacey however, were somewhat different from the assumptions of the first variant of the method. In the second variant of the minimum requirements method the city in each population size category with the lowest or absolute

minimum percentage value of employment in any given industrial category, was assumed to represent the point of division of employment in that particular industrial category, for all cities in that particular city population size category, into basic and nonbasic employment (In Figure 10, city A indicates this value, corresponding to line Min_1). The set of 14 industrial categories, each with a determined absolute minimum percentage value in each of the city population size categories, were then assumed to represent a normative model of the minimum employment structure of a city in each of the city population size categories with which the actual employment structures of the cities in each of the city population size categories were compared. The consequence of this assumption of the absolute minimum percentage values as the standard (normative) values in each city population size category was that there were no percentages of employment in any industrial category lower than the absolute minimum percentage values. The magnitude and structure of the nonbasic employment in the total employment structure of all cities in each city population size category therefore remained the same, and the B-N ratios remained constant. The magnitude of the basic employment also remained the same for all cities in each city population size category, but its structure was differentiated.[7]

In the minimum requirements method the primary consideration is the identification and measurement of the magnitude of the nonbasic employment in a city and only when it is subtracted from the city's total employment is the magnitude of the basic employment in the city obtained. In the first variant of the minimum requirements method this principle produced one minimum requirement for all cities regardless of city population size, while in the second

variant of the method it produced one minimum requirement for all cities within each city population size category. Ullman and Dacey however, refined this second variant of the method by using least-squares linear regression equations and their associated regression lines which allowed the expected minimum requirement for each city of any population size to be calculated.

The Limitations and Advantages of the Minimum Requirements Method

While it is recognised that the minimum requirements method offers certain advantages, which are indicated later in this section, it is also realised that it has a number of limitations, in the sense that it poses several theoretical and practical problems, especially in trying to relate the hypothetical, normative models of the urban place economy assumed in this method to reality.

1. The problem of the selection of the point of division in the minimum requirements method.[8]

The minimum requirements method assumes that the employment necessary and, at the same time, sufficient for satisfying the internal demands of cities for goods and services in any given industrial category is secured by the "minimum" percentage value of employment in that particular industrial category. This "minimum" percentage value is assumed to be the point of division of employment in that particular industrial category for either all cities or for all cities in a given city population size category into basic and nonbasic employment. It is contended however, that by taking the actual, absolute minimum percentage value of employment in any given industrial category as the point of division of employment in that particular industrial category into basic and nonbasic employment as

in the second variant of the minimum requirements method, there is a strong danger that the percentage value for a city with a highly atypical employment structure may be selected as the point of division in that particular industrial category. For example, the actual absolute minimum percentage value of employment for durable manufacturing in the city population size category comprising cities with a population of 1,000,000 or more was 2.3 per cent, which represented the actual percentage value employed in Washington, D.C., the city with the lowest percentage of its employment in durable manufacturing in that particular city population size category (Ullman and Dacey, 1960,176). However Washington, D.C., by its very nature as the capital of the United States, has a highly abnormal employment structure, and as such an anomolous percentage value of employment became the decisive percentage value of employment in durable manufacturing in that particular city population size category. In an attempt to overcome this situation, Ullman and Dacey used the technique of fitting least-squares regression lines to the actual, absolute minimum percentage values of employment from each city population size category for each of the industrial categories in order to average out such abnormalities. As Ullman, Dacey and Brodsky (1971,4) pointed out, the second variant of the minimum requirements method

> "is based on the actual minimum per cent employed in the lowest city among 38 cities of a given size class in each of 14 U.S. census categories ..... for metropolitan areas, smoothed out by regression lines to eliminate freak cases."

In the first variant of the minimum requirements method, Alexandersson and Morrissett, to avoid this situation, did not use

the absolute minimum percentage value of employment as their point of division of employment in any given industrial category, but, after some experimentation, selected the percentage values of employment in each industrial category corresponding to the cities of the fifth percentile determined in relation to the lowest value. By taking these so-called K values as the point of division, they eliminated five per cent of the cities in each industrial category on the basis that these "extreme cities are apt to be characterised by peculiar circumstances" (Morrissett, 1958,241). They offered no theoretical justification however, for selecting the fifth rather than the third, tenth, or some other percentile as their point of division, apart from the fact that it eliminated, supposedly, the cities with highly atypical employment structures. Morrissett (1958, 243) seems to best sum up his and Alexandersson's feelings in the following comment:

> "Alexandersson has described K values as indicative of the minimum outputs necessary to supply a city's own population with goods and services. This definition implies that a city with less than K per cent of its workers employed in an industry must import the deficit. No direct evidence is offered to support this inference; but it does seem reasonable that some figure near the bottom of the array, but not at the bottom, would indicate the 'necessary minimum'."

Tiebout (1962,50), although he had little to offer in the way of a solution to this problem of selecting a suitable point of division, pointed out with reference to this first variant of the minimum requirements method that,

> "the difficulty with this approach is: Where does one place the cutoff point? The higher the cutoff

place, the less each community will have as exports. Thus unless good judgment is used, this approach can be misleading."

2. The problem of the underlying assumption of homogeneity with respect to the production and consumption patterns in the hypothetical, normative models of the urban place economy assumed in the minimum requirements method.[9]

One of the assumptions inherent in the minimum requirements method, as in all comparative methods of this kind, is that the area studied is assumed to form a homogeneous universe with a similar standard of living, a similar pattern of production and consumption, and similar distribution techniques (Illeris, 1964,211). The problem of this assumption of an even and uniform model of production and consumption within the area examined, which has been criticised by Pratt (1968,121), is how can the results of the minimum requirements method, which are based on this assumption, be adjusted to try and account for obvious local variations in production and consumption within the area examined. In the first variant of the minimum requirements method this problem which necessitated the adjustment of the K values to allow for local variations in production and consumption in the area examined, was left unresolved. In the second variant of the method however, Ullman and Dacey partially resolved this problem by the systematic correction of the absolute minimum percentage values for city population size, which is probably the most important local variation. Further systematic correction or adjustment of the absolute minimum requirement values for local variations in city type, city income, city age, city growth rate, and the geographical location of cities on which Ullman and Dacey

originally tested the dependence of the absolute minimum percentage values, Ullman, Dacey and Brodsky (1971,23-24) pointed out could also be made. The distortions caused by the assumption of homogeneity therefore, Ullman, Dacey and Brodsky (1971,23) suggested,

> "can be corrected somewhat systematically by a researcher who is somewhat knowledgeable about the city to which he applies the minimum."

Indeed, as Ullman and Dacey (1960,194-195) concluded in their original study,

> "the justification for the minimum requirements method is that it deals with a relatively homogeneous universe in certain fundamentals, apparently a reasonable assumption for the U.S. economy and, to a certain, but lesser, extent for the urban animal anywhere. Thus we present one minimum requirement for all cities of the same size, when obviously there is some variation, although the range is probably not great. The figure could be adjusted to individual cities somewhat by using the data on minima by city types ....., and other characteristics."

3. <u>The problem of the underlying assumption that all cities export but none import in the minimum requirements method.</u>[10]

Another assumption inherent in the minimum requirements method is that each city satisfies its own requirements for all goods and services. Pratt (1968,119) however, argued that this assumption implied that while the city with the lowest percentage of its employment in any given industrial category satisfied its own local requirements, every other city which had more than this lowest percentage value of its employment in that particular industrial category must be engaged in exporting.[11] Pratt (1968,117) therefore

stated that the minimum requirements method as developed by Ullman and Dacey

> "presents a paradox in that it leads to a group of cities in which each city exports and none imports." [12]

Ullman (1968,368) however, rejected Pratt's statement, by pointing out that Ullman and Dacey in their original study did not make such a presentation and furthermore, that they explicitly stated at the beginning of their study that cities

> "export and import commodities and services and also provide some of their own commodities and services internally" (Ullman and Dacey, 1960,175)

and finally that,

> "Exports and imports virtually balance, as would be expected. Thus there are three items in a city's economy: (1) exports, (2) local (both measured by the minimum method), and (3) imports, which should equal exports" (Ullman and Dacey, 1960,193).

Ullman (1968,368) therefore, found it difficult to understand Pratt's (1968,119) lengthy discussion of imports, especially such statements as, "the theory clearly precludes the importing of any goods and services", and that if one accepts the minimum requirement method "one must also assume that cities consume no imports." For it has always been recognised that economic base studies identify and measure

> "exports and local employment or production values, but this never implied that there were no imports; in fact, just the opposite must follow- the exports must be imports to some other place" (Ullman, 1968, 368).

More constructively, Pratt (1968,123) reached the rather ironical conclusion that,

> "If the minimum requirements technique can be accepted, we should feel equally comfortable embracing its logical alternative, the maximum requirements technique."

Pratt suggested that this maximum requirements method could be based on similar principles to the minimum requirements method, with the only difference being the assumption that each city would satisfy its own local requirements for goods and services in any given industrial category, not with the absolute minimum percentage value of employment in that particular industrial category but with the absolute maximum percentage value. (In Figure 10, city C indicates this value, corresponding to the line Max_1.) All the cities with percentage values of employment below this absolute maximum percentage value in that particular industrial category would, according to the hypothetical, normative model of the urban place economy assumed in this method, have to import goods and services. Furthermore, Pratt (1968,123) suggested that

> "this percentage can be adjusted to the 'correct' level by varying the amount of aggregation in establishing the categories. As the categories become more aggregated, we can expect the percentage difference between the maximum city and others in the group to decline, thus reducing imports. If it is felt that the absolute maxima are inappropriate, then the city that is the fifth percentile below the maximum can be chosen."

The hypothetical, normative model of the urban place economy assumed in this latter situation would imply that most cities do not export, for the critical maximum percentage value of employment in any given

industrial category was assumed to be the percentage value of employment in that particular industrial category corresponding to the city of the 95th percentile (In Figure 10, city D indicates this value, corresponding to the line Max_2). In this situation only five per cent of the cities in that particular industrial category would export. The magnitude and structure of the basic employment in the total employment structure of the majority of cities in this model would therefore remain the same, and the B-N ratios would remain constant. The magnitude of the nonbasic employment would also remain the same, but its structure would be differentiated. This model, Pratt (1968,123-124) concluded,

> "should be a significant addition to the possible approaches to identifying the economic base of a community. The investigator now has a choice between a model in which cities do not import and an alternative model in which no city exports. If we alternate in our use of the two methods, and with the correct adjustment of the parameters, perhaps the imports and exports can be made to balance."

4. <u>The problem of the meaningfulness and accuracy of the results obtained by the minimum requirements method, which are dependent on the level of disaggregation used in defining the number of industrial categories to be examined in the urban economy.</u>[13]

> "None of the proponents of the minimum requirements technique offer any theoretical justification for the degree of disaggregation which they adopt. It appears that they disaggregate until they obtain a percentage minimum requirement which meets some preconceived notion of what this magnitude should be or until the minimum approaches the service

> sector determined by other approaches to the problem" (Pratt, 1968,123).

Furthermore, Pratt pointed out that by manipulating the level of disaggregation nearly any level of nonbasic employment desired could be obtained. With this in mind, he questioned why Ullman and Dacey in the second variant of the minimum requirements method had selected 14 industrial categories rather than some other number. In answer to this query, Ullman (1968,365) indicated that not only was a 14 industrial category breakdown a conventional census arrangement, but also that it was the finest Ullman and Dacey could obtain from the published census for small cities. Although this 14 industrial category classification was not the ideal level of disaggregation, Ullman and Dacey (1960,178) suggested on the basis of a comparison with the next level of disaggregation (36 industrial categories), that it was meaningful and satisfactory.

> "Furthermore, for some categories 14 industry types provide a better minimum than would a finer classification. Using 36 industries, for example, breaks transportation into three parts: railroads, trucking, and other transportation. Thus minimum or K values are derived from cities with extremely low employment in either railroads or trucking, to say nothing of other transport, which when combined would give an equally absurdly low figure for all transport; such a city with negligible employment in transportation is hardly viable" (Ullman and Dacey, 1960,179).

It has been suggested in several studies however, that a finer level of disaggregation would be more desirable in the minimum requirements method in order to identify and measure more relevant variations present within the broad industrial categories used,

especially manufacturing (Bahl, Firestine and Phares, 1971,415-416; Stewart, 1967,431). In other words, it would be more desirable to use a finer level of disaggregation which revealed the dominance of one or a few specific industries within a certain broad industrial category, rather than one which emphasied these broad but often less relevant industrial categories. A finer level of disaggregation however, Richardson (1969a,31) maintained

> "actually reduces the reliability of the minimum requirements technique..... This is because with exceedingly fine disaggregation the minimum requirements for most categories would be near zero, suggesting that regions have virtually no internal needs and that most production goes for export."

The level of disaggregation therefore, tends to influence the magnitude of the basic and nonbasic employment in any given industrial category, with disaggregation increasing and aggregation decreasing the magnitude of basic employment in that particular industrial category. For this reason, Ullman and Dacey's calculations in the second variant of the minimum requirements method made on the basis of a 14 industrial category classification and refined by the use of least-squares regression lines, tend to overestimate the magnitude of the nonbasic employment and to underestimate the magnitude of the basic employment in the total employment structures of the cities examined.

The four preceding problems are the main difficulties which have confronted the minimum requirements method. Lesser problems do arise, particularly if the assumptions made in setting the limits of an economic base study in which the method is used are not explicitly stated. Such problems include, among others, the selection of an

appropriate spatial unit of reference (Bahl, Firestine and Phares, 1971,415; Illeris, 1964,212), the inclusion of a reasonable number of cities in each city population size category (Illeris, 1964,212), and the justification for the inclusion or exclusion of specific industrial categories (Jerczynski, 1971, in Spanish translation by Chaves, 1973,21; Zelinsky, 1957,275). If these problems are to be overcome, Jerczynski (1972,42) pointed out that

> "A number of additional empirical studies must be carried out in order to answer the questions as to what degree of aggregation is most adequate for the method, which is the relevant spatial unit, how to solve a number of other problems of a technical nature, and finally, how to interpret the results obtained."

However, among those who have used the minimum requirements method, it is generally recognised that, despite these limitations, this indirect or macro method of economic base analysis offers certain advantages in its ease of application, in its clarification of the objectives of the economic base concept,[14] and in its avoidance and partial solution in a consistent manner of some of the theoretical and practical problems of economic base identification and measurement associated with direct or micro methods, such as the linked industry question (Illeris, 1964,210; Ullman and Dacey, 1960,192; Ullman, Dacey and Brodsky, 1971,16). Furthermore, this short-cut procedure possesses positive virtues with respect to approximating the basic and nonbasic functions of cities, yielding new, generalised information as well as valuable preliminary functional profiles for individual cities, providing a consistent and definable basis for comparing and classifying cities generally and individually, and advancing the general understanding of the urban economy. Indeed, Harris (1962)

suggested in the symposium discussion of Ullman and Dacey's original study, which was also presented as a paper at the International Geographical Union symposium on urban geography held at Lund, Sweden, in 1960, that the second variant of the minimum requirements method in particular made a significant contribution to urban geography in three respects.

> "1. It demonstrates that of the total employment of a city, the proportion engaged in serving the needs of the city itself increases with the size of the city from about one fourth for very small towns to about one half for large metropolitan centres. This important new measurement is consistent with what one would expect if he recalls that an individual family in a city in a commercialised economy would get from outside the family unit all goods and services that would be recorded by a census but that if the entire world were in one gigantic city all goods and services would come from within the city unit itself.
> 2. It develops a practicable method of approximating the economic base of cities on a comparable basis. The great problem of detailed studies of individual cities is that they are not easily comparable with similar studies from other cities.
> 3. It provides a new and improved base for the construction of functional classification of cities by more refined and rational criteria" (Harris, 1962, in symposium discussion edited by Norborg, 1962,165).

Conclusion

In this chapter, the minimum requirements method and its variants, formulated as short-cut techniques of economic base analysis for identifying and measuring the basic (excess) and nonbasic

(minimum) functions performed by urban places were examined and evaluated in order to provide a theoretical and methodological framework for the application of the second variant of the method in Chapter 4.

Developed in connection with the need for comparative urban economic base studies together with the realisation that at best the results obtainable from the application of the economic base concept are approximations, the minimum requirements method is based on the division of the basic and nonbasic employment in each of the industrial categories represented in any given urban place according to a minimum percentage value of employment calculated from a number of urban places. Two variants of the minimum requirements method were recognised: the minimum requirements method based on the K value (Alexandersson, 1956; Morrissett, 1958,239-256), and the minimum requirements method based on the absolute minimum values (Ullman and Dacey, 1960,175-194). The theoretical bases of these two variants, the hypothetical, normative models of the urban place economy assumed in each of these methodological concepts, and the dependence of the magnitude of the basic and nonbasic employment on the variant of the method used together with several other variables, especially urban place population size, were outlined and discussed.

While it was recognised that the minimum requirements method had several limitations, in the sense that it posed a number of theoretical and practical problems with respect to the selection of the point of division, the underlying assumptions of homogeneity and of all cities exporting but none importing, and the meaningfulness and accuracy of the results obtainable from the method, which are dependent on the level of disaggregation employed in delimiting the

number of industrial categories to be examined in the urban economy; it was also realised that the method offered certain advantages. These advantages of the method included, not only its ease of application and its clarification of the objectives of the economic base concept, but also its positive virtues in approximating the basic and nonbasic functions of urban places, in analysing the functional structures of individual urban places, and in providing

> "a consistent and definable basis for comparing cities individually and advancing the understanding of the urban economy generally" (Ullman and Dacey, 1960,194).

For these latter reasons, together with the practical consideration of the availability of relevant statistical data, the second variant of the minimum requirements method, refined by the technique of least-squares regression lines which systematically corrects the absolute minima for variations in urban place population size, is applied to New Zealand urban places in Chapter 4 of this present study. For this variant of the method enables the gross basic and nonbasic functions of urban places to be calculated for individual urban places "in a more reliable way than by any other short cut method" (Ullman and Dacey, 1960,192).

Footnotes

1. Alexandersson (1956) used the fifth percentile or K values to divide the 36 industrial categories investigated into those which were distributed ubiquitously, that is, found in all or nearly all of the 864 United States cities with a population of 10,000 or more examined, and those which were distributed sporadically, that is, found in only a few of the cities.

The 13 industrial categories which had K values of zero, or close to zero, Alexandersson therefore termed "sporadic", while the remaining 23 industrial categories which had K values well above zero, he termed "ubiquitous". In general, the manufacturing industrial categories were sporadic and the remaining industrial categories were ubiquitous. For a tentative breakdown of the 36 industrial categories on this presence-absence of ubiquitous-sporadic basis proposed by Alexandersson with a further subdivision into conventional manufacturing and service divisions, see Haggett (1965,126).

2. Morrissett (1958,243) grouped the 740 United States cities with a population of 10,000 or more examined into two regions, the Northeast of the United States and the South and West, and in each region further divided the cities into discrete city population size categories. Although Morrissett stated that there were six city population size categories, the table in which he illustrated this number of categories, the population size range of each category, and the number of cities in each category, was omitted in the publication of his study. Confusion arises, however, as to the actual number of city population size categories used by Morrissett, because the remaining tables in his study are based on seven city population size categories. Most general reviews of Morrissett's study indicate that he divided the cities in each region into seven city population size categories (Jerczynski, 1971, in Spanish translation by Chaves, 1973,14; Yeates and Garner, 1971,125).

3. It is important to note that the economic base concept's definition of basic and nonbasic employment is not quite the

same as the minimum requirements method's definition of excess and minimum employment. For the former terms are defined according to where urban place functions actually sell their goods and services, while the latter are defined according to what urban place functions are necessary and, at the same time, sufficient to supply goods and services for the urban place.

4. For further discussion of the variables on which the magnitude of the sum of the actual, absolute minimum percentage values were tested, see Ullman and Dacey (1960,178-180); Ullman, Dacey and Brodsky (1971,23-24).

5. Alexander (1956,237-238) outlined a similar procedure in his study of the variation from small cities to large cities in the percentage of employment in each of 23 industrial categories in the total employment structure of a city. On the basis of 302 United States urbanised areas and independent cities with a population of 30,000 or more, arrayed and grouped into 18 categories on the basis of population size, Alexander calculated the percentage of each city's total employment in each of 23 industrial categories. For each of the industrial categories he arrayed the cities in each of the city population size categories in terms of these percentages from the lowest to the highest. Then, for each city population size category he selected three percentage values of employment in each of the industrial categories: the absolute minimum percentage value, the absolute maximum percentage value, and the median percentage value. Finally, for each of the industrial categories he constructed a triple graph depicting the 18 absolute minimum percentage values for

the 18 city population size categories, the 18 absolute maximum percentage values, and the 18 median percentage values. These graphs revealed for the majority of the 23 industrial categories of employment analysed, a strong positive correlation between city population size and the absolute minimum percentage values, a strong negative correlation between city population size and the absolute maximum percentage values, and no very strong correlation between city population size and the median percentage values.

6. The empirical value of the second variant of the minimum requirements method was verified by comparing the results obtained from the method for individual United States cities with those derived from direct or micro economic base studies of the same cities. These comparisons, Ullman and Dacey (1960,189) pointed out, were

> "not conclusive evidence of the correctness of the minimum requirements method, because of limitation in number, different methods of classification and/or different dates, as well as possible error in the other estimates. Nevertheless they do appear to confirm that the main function measured by the minimum method is the local component and its remainder, export activity, and that the measure is reasonably reliable."

7. When the actual absolute minimum percentage values of employment for any given industrial category within each of the city population size categories were refined by the use of least-squares regression lines, which systematically corrected the absolute minima for variations in city

population size, the magnitude and structure of both the basic and nonbasic employment in that particular industrial category, and the B-N ratios in all cities were differentiated.

8. For further discussion of the problem of the selection of the point of division in the minimum requirements method, see Alexandersson (1956,17-19), Morrissett (1958,241-243), Murphy (1966,105), Pratt (1968,118-119), Richardson (1969a,30), Tiebout (1962,50), Ullman and Dacey (1960,176), Ullman, Dacey and Brodsky (1971,4), Yeates and Garner (1971,124,129).

9. For further discussion of the problem of the assumption of homogeneity inherent in the minimum requirements method, see Illeris (1964,211), Pratt (1968,121), Richardson (1969a,31), Ullman (1968,367), Ullman and Dacey (1960,193-194), Ullman, Dacey and Brodsky (1971,13,23), Zelinsky (1957,275).

10. For further discussion of the problem of the assumption that all cities export and none import in the minimum requirements method, see Jerczynski (1971, in Spanish translation by Chaves, 1973,18-19), Marshall (1973,2), Pratt (1968,117, 123-124), Richardson (1969a,31), Ullman (1968,368), Ullman and Dacey (1960,175,193), Ullman, Dacey and Brodsky (1971, 21-23).

11. Marshall (1973,2) accepts Pratt's argument in his efforts to discredit the minimum requirements method as developed by Ullman and Dacey as a measure of industrial diversification.

12. Pratt (1968,119) pointed out that if a percentage value of employment other than the actual, absolute minimum percentage

value of employment in any given industrial category was used, some cities would be allowed to import without violating the method. For example, the fifth percentile or K value used in the first variant of the minimum requirements method by Alexandersson and also by Morrissett would provide for importation by those cities in the lowest five per cent for any given industrial category ($N \leq K$). The remaining 95 per cent of the cities in that particular industrial category would do no importing.

13. For further discussion of the problem of the meaningfulness and accuracy of the results obtained from the minimum requirements method, which are dependent on the level of disaggregation used in defining the number of industrial categories to be examined in the urban economy, see Bahl, Firestine and Phares (1971,415-416), Pratt (1968,121-123), Richardson (1969a,31), Stewart (1967,431-432), Ullman (1968,365), Ullman and Dacey (1960,180,184), Ullman, Dacey and Brodsky (1971,17).

14. The minimum requirements method provides an answer to Blumenfeld's (1955, in Pfouts, 1960,230,249-253) criticism, that it was not clear whether the objective of economic base analysis was to analyse the balance of payments of an urban place, or to study the functions performed by an urban place from the point of view of their criticality, as determined by their potential vulnerability to outside competition and their potential capacity to expand into outside markets. The objective of the minimum requirements method of economic base analysis clearly is to answer the latter question.

CHAPTER 4

AN APPLICATION OF THE SECOND VARIANT OF THE MINIMUM REQUIREMENTS METHOD TO NEW ZEALAND URBAN PLACES

The second variant of the minimum requirements method as developed by Ullman and Dacey (1960,175-194) in their study of the economic base of United States cities, and refined by the technique of least-squares regression lines which systematically correct the results obtained from the method for variations in urban place population size, is applied to New Zealand urban places in this chapter in order to delineate their functional structures. This particular indirect or macro method of economic base analysis was selected on the basis of the advantages it offers for the type of study undertaken in this chapter, which were outlined in the previous chapter, and the availability of relevant statistical data, as the most appropriate method of economic base identification and measurement for attaining the above objective.

The second variant of the method is used in this chapter to identify and measure the excess (basic) employment in any given urban place above the minimum (nonbasic) employment determined as being necessary and, at the same time, sufficient for satisfying the internal demand for goods and services for a set of analogous urban places, in order to indicate the character and degree of economic specialisation of each of the functions represented in that particular urban place. The complex of specialised functions characteristic of each of the 82 New Zealand urban places examined is then used to delineate the functional structure of these urban places. The scope of these results obtained from the method in a

context other than the United States are illustrated using the examples of the Palmerston North urban area and the Levin borough. To clarify these results and provide a comparative indicator, reference is made to the New Zealand economic base studies of Hamilton by Blechynden (1962; 1964,122-137), of Rotorua by Lowe (1966), and of Stratford by Laidlaw (1968), which employ direct or micro methods of economic base analyses, and to several overseas economic base studies which apply the two variants of the minimum requirements method tc various regional and national systems of urban places.

The Methodological Procedure for Delineating the Functional Structure of New Zealand Urban Places

The methodological procedure adopted in this present study is outlined in this section in terms of:

1. The urban places examined.
2. The industrial categories used.
3. The method of analysis applied.

The Urban Places Examined

All of the 106 urban areas and independent boroughs in New Zealand with a population of 1,000 or more according to the 1971, New Zealand Census of Population and Dwellings, Volume 1, Increase and Location of Population, were included in this present study. The total number of urban places examined however, was reduced to eighty-two by excluding those urban places which had highly atypical employment structures, and those urban places for which employment structures were not available. These 82 urban places examined included 24 urban areas and 58 boroughs, each with an employment structure in which

five or more of the seven industrial categories used were represented.[1] The number of urban areas, which are statistical divisions, represented the total universe for this division. The number of boroughs however, which are administrative divisions, was limited by the exclusion of those boroughs incorporated in urban areas and those boroughs with highly atypical employment structures, in the sense that either 70 per cent or more of their total employment was concentrated in only one of the seven industrial categories used, or that less than five of the seven industrial categories used were represented in their employment structures. The distribution of these urban areas and boroughs examined in each island and in New Zealand as a whole is indicated in Table II, and their geographical location is shown in Figure 11.

TABLE II

THE DISTRIBUTION OF THE 82 NEW ZEALAND URBAN PLACES EXAMINED BY URBAN AREAS AND BOROUGHS, 1971

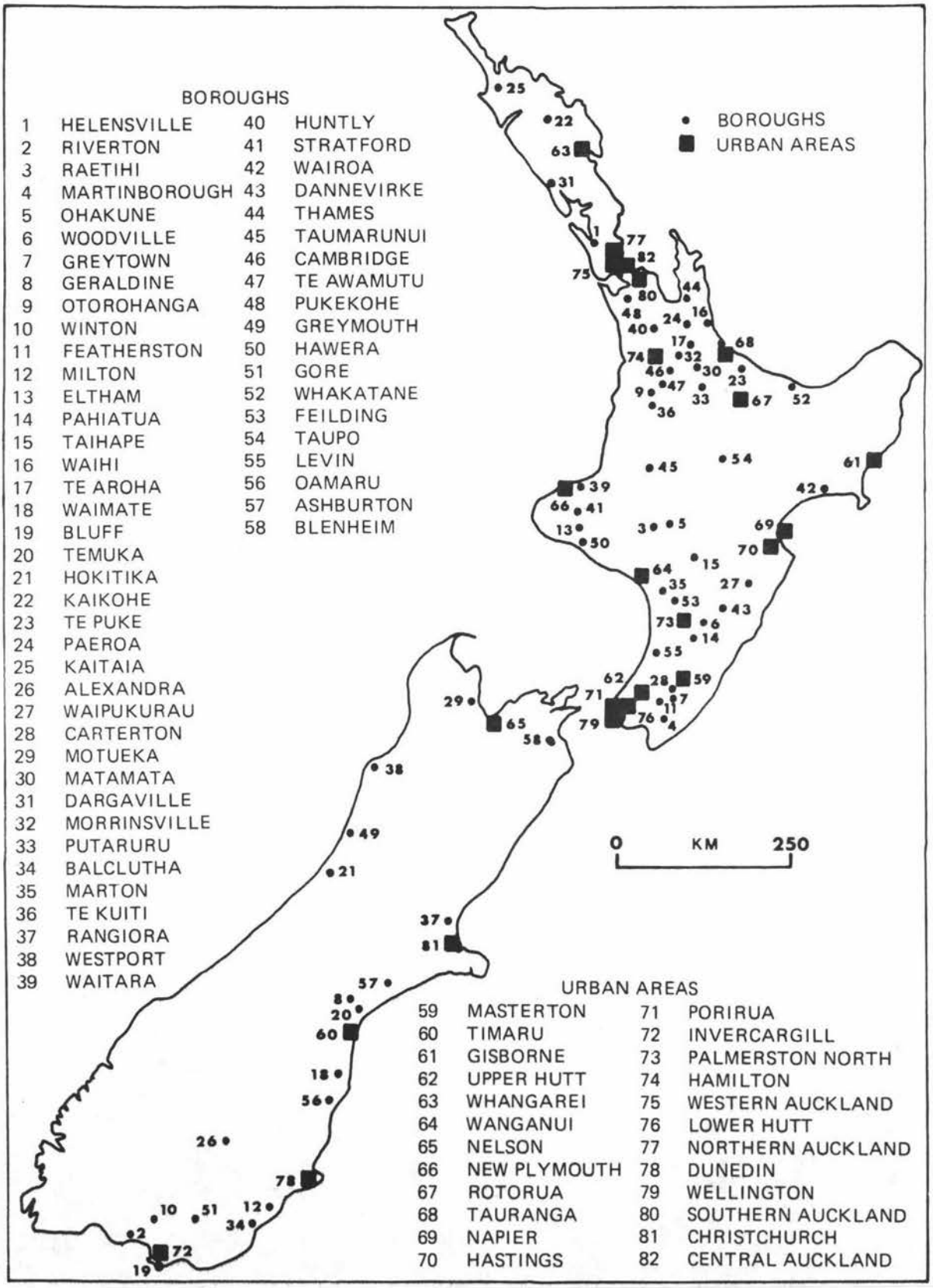
Urban Places	North Island	South Island	New Zealand
Urban Areas	19	5	24
Boroughs	40	18	58
Total Urban Places	59	23	82

The Industrial Categories Used

In this present study "functional structure" is equated to urban place "employment structure" as it is assumed that the economic activities in which an urban place's population are employed provide good indicators of urban place functions. The terms "economic acitivity", "function", "industrial category", and "major division", used in conjunction with the discussion of the functional structure

FIGURE 11

LOCATION OF THE 82 URBAN PLACES EXAMINED, 1971



of New Zealand urban places, are considered to be synonymous. The urban place functions recognised in this present study consist of the industrial categories used by the Department of Labour for collecting, processing, and presenting the employment statistics from its half-yearly surveys of employment in New Zealand urban places with a population of 1,000 or more.[2] The Department of Labour breaks down these employment statistics into 33 intermediary groups, most of which are at the two digit level, for nine major divisions.[3] In this present study employment statistics from the Department of Labour's April, 1971, half-yearly survey are used for seven of the nine major divisions. The two major divisions omitted on the basis of employment in these industrial categories being negligible, were Major Division 1, Agriculture, Hunting, Forestry and Fishing, and Major Division 2, Mining and Quarrying.

These Department of Labour employment statistics used by industrial categories for each New Zealand urban place with a population of 1,000 or more represent broad functional classes in the employment structure of the urban place. Although highly aggregated, these industrial categories are sufficient to distinguish in approximate terms the extent to which each function represented in a given urban place constitutes an economic specialisation of that particular urban place. This complex of specialised functions characteristic of each New Zealand urban place can then be used to delineate the functional structure of the urban place.

It should be noted that the Department of Labour employment statistics used in this present study provide only a crude index of the functions represented in each New Zealand urban place.[4] The crude nature of these employment statistics results from the

limitations imposed by the Department of Labour's definition of "employment statistics" for the purpose of its half-yearly surveys, and from the incomplete coverage of employment in New Zealand urban places with a population of 1,000 or more in these half-yearly surveys.

The Method of Analysis Applied

Basic employment - that part of total urban place employment engaged in economic activities that produce goods and services for sale outside the urban place - is used to delineate the functional structures of New Zealand urban places. It is the basic employment of an urban place that reveals the functional relationships which exist between the urban place and its hinterland and/or its foreland. To calculate each New Zealand urban place's basic employment in the respective functions in this present study, the second variant of the minimum requirements method as developed by Ullman and Dacey (1960,175-194) is used. The analytical framework of this method is static however, in the sense that it concentrates on only one date, 1971. Nevertheless, as Ullman, Dacey and Brodsky (1971,7) pointed out, this method

> "is a surprisingly reliable indicator, although no more than an approximation, and that it is the best short cut method for estimating, especially for aggregate groupings."

The following methodological procedure was adopted to identify and measure the basic employment of New Zealand urban places.

First, because the second variant of the minimum requirements method is based on the principle that the minimum requirement or percentage value of employment varies according to urban place population size, the 82 New Zealand urban places selected for

analysis were arrayed in an increasing series and divided into four arbitrarily determined categories on the basis of population size. The population size range of these categories and the number of urban places in each category, in each island and in New Zealand as a whole, is shown in Table III.

TABLE III

THE DISTRIBUTION OF THE 82 NEW ZEALAND URBAN PLACES EXAMINED BY POPULATION SIZE CATEGORIES, 1971

Population Size Category	Urban Places	Population Size Range	North Island	South Island	New Zealand
1	Boroughs	1,000-4,999	25	13	38
2	Boroughs	5,000-9,999	13	2	15
3	Boroughs and Urban Areas	10,000-49,999	13	5	18
4	Urban Areas	50,000 and over	8	3	11
		Total Urban Places	59	23	82

The distribution of urban places of each of the population size categories between the North and South Islands is fairly representative of the total population distribution. Roughly three-quarters of the population of New Zealand lives in the North Island (71.7 per cent at the 1971 census), the total number of urban places examined and the number of urban places in the third and fourth categories were distributed between the two islands in the same proportions. The number of urban places in the first and second categories however, tended to be under-represented in the former category and over-represented in the latter category with respect to the North Island.

It should be noted that there is only a reasonably small

number of urban places in the second, third and fourth population size categories. The small number of urban places in these categories must be borne in mind throughout this analysis. The results of this present study may have been affected by this factor but there appears to be no satisfactory way of knowing this or making allowances for it.

Second, the number of employed persons in each of the seven industrial categories used (which included practically all employment) was obtained from the Department of Labour's April, 1971 half-yearly survey of employment, for each of the 82 New Zealand urban places with a population of 1,000 or more (Appendix D, Table 2). Then, for each urban place, the percentage of employed persons in that urban place engaged in each of the seven industrial categories was calculated (Appendix D, Table 3).

Third, for each of the seven industrial categories, the figure for the urban place in each population size category with the lowest or actual, absolute minimum percentage of its employment in that particular industrial category was tabulated (Table IV). This represents the actual, absolute minimum requirement or percentage value of employment for an industrial category in an urban place of that particular population size category. Thus in Table IV the actual, absolute minimum requirement or percentage value of employment for manufacturing for urban places with a population of 50,000 or more is 14.9 per cent, which represents the actual percentage employed in Invercargill, the urban place with the lowest percentage of its employment in manufacturing in that particular population size category. Similarly other urban places in each of the population size categories provided the other actual, absolute minimum require-

TABLE IV

THE ACTUAL, ABSOLUTE MINIMUM PERCENTAGES OF EMPLOYMENT IN EACH OF THE 7 INDUSTRIAL CATEGORIES IN NEW ZEALAND URBAN PLACES OF VARYING POPULATION SIZE CATEGORIES, 1971

Industrial Category	Urban Place Population Size Categories			
	1,000-4,999 (38 urban places)	5,000-9,999 (15 urban places)	10,000-49,999 (18 urban places)	50,000 and over (11 urban places)
Manufacturing	5.1	8.2	13.1	14.9
Electricity, Gas and Water	0.3	0.3	0.3	0.6
Construction	0.6	3.1	6.0	6.0
Wholesale and Retail Trade and Restaurants and Hotels	14.0	12.7	13.1	12.3
Transport, Storage and Communication	2.5	3.9	3.0	5.1
Financing, Insurance, Real Estate and Business Services	0.6	2.3	1.7	1.8
Community, Social and Personal Services	11.8	11.3	12.4	17.3
Total	34.9	41.8	49.6	58.0

ments or percentage values of employment for each of the seven industrial categories. These actual, absolute minima for each of the seven industrial categories within each of the population size categories were then summed to produce the total actual, absolute minimum requirement or percentage value of employment for each population size category. The sum of these actual, absolute minima in each population size category are assumed to represent approximately the gross minimum or nonbasic employment, and that the remainder

represent the gross excess or basic employment in all urban places in that particular population size category.

From Table IV it can be observed that the sum of the actual, absolute minimum requirements or percentage values of employment increase with urban place population size. In other words, the larger the urban place the larger the sum of the actual, absolute minima, which ranged from 34.9 per cent for urban places with a population between 1,000 and 4,999 to 58.0 per cent for urban places with a population or 50,000 or more. This is consistent with the findings of earlier investigators (Morrissett, 1958,239-256; Ullman and Dacey, 1960,175-194), who indicated that the actual absolute minima varied with urban place population size. It is therefore suggested that the employment structure of New Zealand urban places becomes more nonbasic as the population size of an urban place increases; in other words, the more closely the urban place approaches self-sufficiency.

Furthermore, reading across Table IV, it can be observed that the actual, absolute minimum requirements or percentage values of employment for most of the individual industrial categories required to keep the urban place viable also increase with urban place population size. The one exception to this general trend is the actual, absolute minima for the industrial category of wholesale and retail trade and restaurants and hotels which decrease with increasing urban place population size. An explanation for this exception is offered later in this section. Although the actual absolute minima for most of the industrial categories increase with urban place population size, the rate of increase however, differs among these industrial categories. In several of the industrial

categories this rate of increase tends to be fairly irregular. No explanation has been found for this irregular tendency. Possibly the explanation may be a higher level of consumption in these industrial categories in large urban places than in small urban places, which would be contrary to the assumption of a homogeneous universe. Or the irregularity may simply be due to the small number of urban places examined in the second, third and fourth population size categories. This irregularity may be an argument in favour of making only one minimum requirement or percentage value of employment in each industrial category for all urban places, irrespective of their population sizes, like Alexandersson.

Fourth, when these actual, absolute minimum requirements or percentage values of employment in each population size category for each of the seven industrial categories were plotted on the horizontal axis (absicca), with a normal or arithmetic scale, of a semi-logarithmic graph, against the minimum population points for each population size category on the vertical axis (ordinate), with a constant-ratio or logarithmic scale, the plotted points for each industrial category closely fitted a straight line. Using this data, least-squares linear regression equations were developed (Table V) and regression lines were derived for each of the industrial categories (Figure 12). These allow the expected minimum requirements or percentage values of employment for each of the industrial categories to be calculated for urban places of all population sizes (Appendix D, Table 4). This procedure is used to eliminate atypical, actual, absolute minimum requirements or percentage values of employment derived from urban places with highly atypical employment structures, by averaging out or systematically correcting the actual, absolute

TABLE V

THE LEAST-SQUARES LINEAR REGRESSION EQUATIONS USED TO DETERMINED THE EXPECTED MINIMUM PERCENTAGE VALUES OF EMPLOYMENT IN EACH OF THE 7 INDUSTRIAL CATEGORIES IN NEW ZEALAND URBAN PLACES OF ANY POPULATION SIZE, 1971

All equations are of the form:

$$\log y = a + bx$$

where log y represents the logarithm of the population size of the urban place, x represents the expected minimum requirement or percentage value of employment, and a and b represent the calculated regression coefficients for each of the seven industrial categories, namely the y-intercept and the slope of the line. The formulae for calculating the y-intercept (a) and the slope of the line (b) are of the form:

$$b = \frac{\Sigma xy - (\Sigma x)(\Sigma y)/N}{\Sigma x^2 - (\Sigma x)^2/N}$$

where N represents the number of pairs of observations

$$a = \bar{y} - b\bar{x}$$

The y-intercept (a) and the slope of the line (b) of the equations for each of the seven industrial categories are:

Industrial Category	y-Intercept (a)	Slope (b)
Manufacturing	2.3026	0.1499
Electricity, Gas and Water	2.4335	3.7762
Construction	2.8805	0.2469
Wholesale and Retail Trade and Restaurants and Hotels	15.2033	-0.8717
Transport, Storage and Communication	1.9265	0.5305
Financing, Insurance, Real Estate and Business Services	2.8843	0.6033
Community, Social and Personal Services	1.0762	0.2101

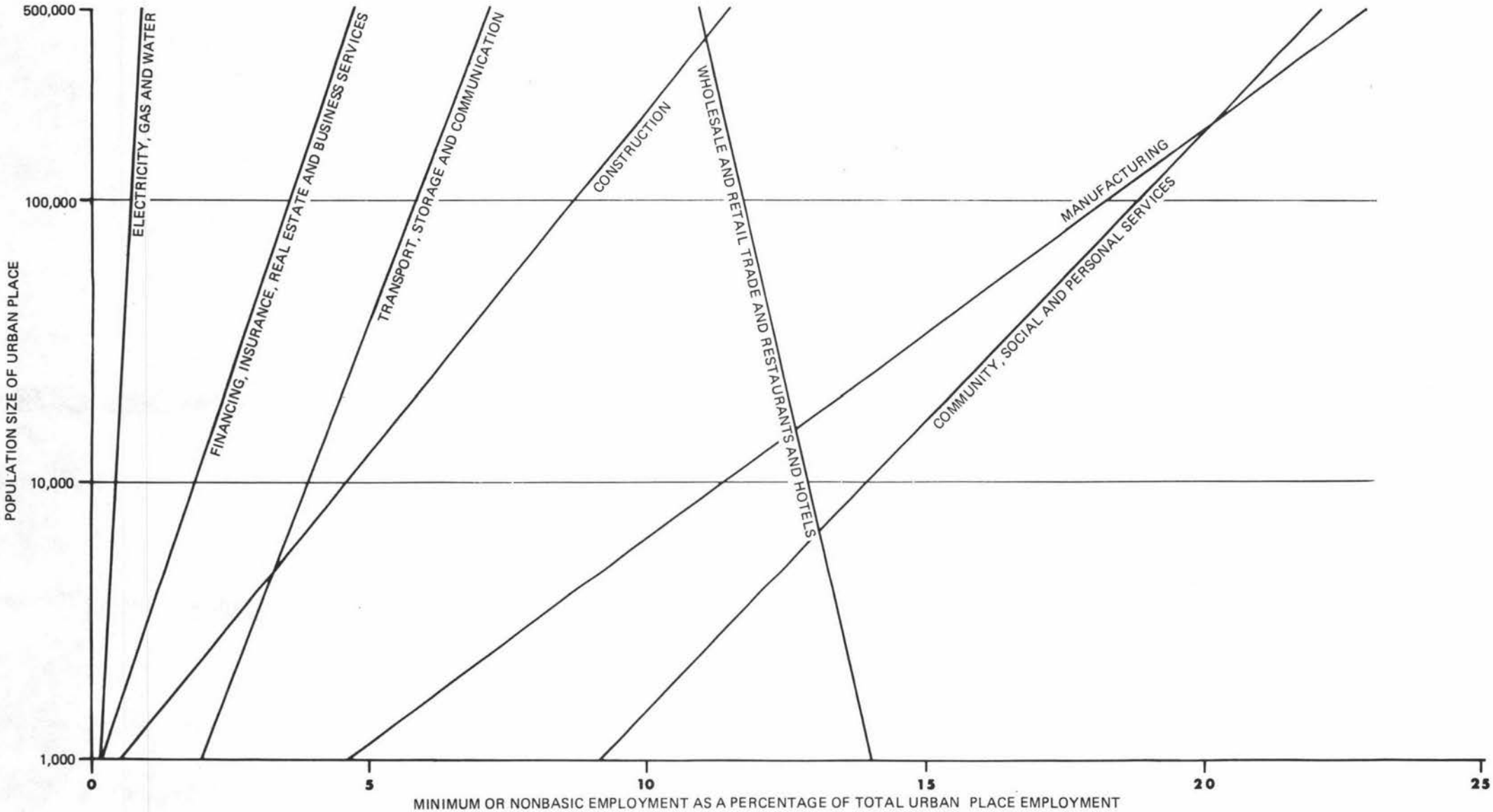
minima in each of the industrial categories for variations in urban place population size.

From Figure 12 it can be observed that the magnitude of the expected minimum requirements or percentage values of employment for each of the seven industrial categories vary with urban place population size from manufacturing with the largest to electricity, gas and water with the lowest. In general the larger the urban place the larger the magnitude of the expected minima in each of the industrial categories. However, the degree of increase or the slopes of the regression lines differed for each of the industrial categories.[5] The one exception to this general trend is the slope of the regression line for the industrial category of wholesale and retail trade and restaurants and hotels which indicates a decrease in the magnitude of the expected minima with increasing urban place population size. A possible explanation for this exception is suggested in the conclusions reached in the detailed studies of this industrial category by King (1962a,50-71) and Forrest (1973,96-107), which indicate that the relative importance of this industrial category of wholesale and retail trade and restaurants and hotels in the employment structure or urban places declines with increasing urban place population size, or the level of urbanisation of New Zealand urban places.

For each New Zealand urban place, the expected minimum requirements or percentage values of employment calculated for each of the industrial categories represented in its employment structure are assumed to approximate the magnitude of the nonbasic employment expected in each of its industrial categories. While the sum of these expected minima is assumed to approximate the magnitude of

FIGURE 12

LEAST-SQUARES REGRESSION LINES* USED TO DETERMINE EXPECTED MINIMUM REQUIREMENTS OR NONBASIC PERCENTAGE VALUES OF EMPLOYMENT FOR SEVEN INDUSTRIAL CATAGORIES



*Least-squares linear regression equations, Table 5; and statistical data, Table 4

the total nonbasic employment expected in the employment structure of the urban place as a whole (Appendix D, Table 4).

Fifth, once the magnitude of the nonbasic employment expected in the industrial categories represented in an urban place, and in the urban place as a whole is known, the magnitude of the basic employment in the urban place as a whole, and in each of its industrial categories can be calculated. For any given urban place, this involved the subtraction of the expected minimum requirements or percentage values of employment for each of the industrial categories represented in its employment structure (Appendix D, Table 4) from the actual total percentage values of employment in each of its industrial categories (Appendix D, Table 3). The difference between these expected minimum and actual, total percentage values of employment in each of the industrial categories is assumed to represent the excess percentage values of employment in the industrial categories of that particular urban place. These excess percentage values of employment in each of the industrial categories represented in each New Zealand urban place are assumed to approximate the magnitude of basic employment expected in each of its industrial categories (Appendix D, Table 5). While the sum of these excess percentage values of employment is assumed to approximate the magnitude of the total basic employment expected in the employment structure of the urban place as a whole (Appendix D, Table 5).

The magnitude of the basic employment in each of the industrial categories represented in any given urban place is used in this present study as a measure of the extent to which each industrial category or function in turn constitutes an economic

specialisation of that particular urban place, while the complex of specialised functions characteristic of each New Zealand urban place is used to delineate the essential functional structure of the urban place.

There are a number of problems associated with this method of analysis however, and these should be pointed out.

1. There is the difficulty that there are only a small number of urban places in the second, third and fourth population size categories, so that the calculation of meaningful actual, absolute minimum requirements or percentage values of employment for each of the seven industrial categories for each of these population size categories is open to question.
2. The least-squares regression lines in Figure 12 have been calculated for each of the seven industrial categories on four points only, and this is not satisfactory. One improvement that could be made is that the number of urban place population size categories could be increased. However, this hardly helps as it would not only mean that all points on the semi-logarithmic graph would be derived from population size categories with a smaller number of urban places, but also would only tend to accentuate the previous difficulty. One is constantly thrown back on the hard fact that there were in 1971 in New Zealand only 106 urban areas and independent boroughs with a population of 1,000 or more.
3. The least-squares regression lines in Figure 12 for

each of the seven industrial categories have been interpolated from the minimum population levels of the first (1,000), second (5,000) and third (10,000) population size categories, and extrapolated from the minimum population level of the fourth (50,000) population size category to a population of 286,787. However, it is possible that the relationship between population and employment in any given industrial category may change. It is possible, for example, that an industrial category may show a tendency to gain an increasing percentage of employment in urban places up to a certain population size, and then it may decrease again.

An Application of the Second Variant of the Minimum Requirements Method of Delineating the Functional Structure of Individual New Zealand Urban Places

The method of analysis outlined in the previous section for identifying and measuring the magnitude of the basic employment in each of the industrial categories or functions represented in any given urban place is applied in this section to indicate the extent to which each of these functions in turn constitutes an economic specialisation of that particular urban place. The complex of specialised functions characteristic of each New Zealand urban place, defined in terms of their basic employment, is then used to delineate the functional structure of individual New Zealand urban places. In this section the application of the method of analysis to delineating the functional structure of individual New Zealand

urban places is illustratei using the examples of the Palmerston North urban area and the Levin borough.

Palmerston North

The application of the method of analysis to delineating the functional structure of individual New Zealand urban places is illustrated in Table VI using the example of the Palmerston North urban area.

In column 1 of Table VI the actual number of employed persons in each of the seven industrial categories represented in the employment structure of Palmerston North is listed; in column 2 the actual percentage values of employed persons in each of the industrial categories is listed; in column 3 the minimum requirements or percentage values of employment expected for an urban place of Palmerston North's population size as derived from the least-squares linear regression equations (Table V) and their associated regression lines for each of the industrial categories (Figure 12) are listed; the excess or basic percentage values of employment for each of the industrial categories listed in column 4 are derived by subtracting column 3, the expected minimum percentage values, from column 2, the actual percentage values of employment in each of the industrial categories for Palmerston North. In column 5 the excess or basic percentage values are converted to a further percentage to indicate the relative contribution of each of the seven industrial categories to the total excess or basic employment. It is the excess or basic values in columns 4 and 5 of Table VI that are fundamental to the delineation of the functional structure of the Palmerston North urban area. Similarly, the function structure of each of the 82 New Zealand urban places examined may be derived

TABLE VI

THE FUNCTIONAL STRUCTURE OF PALMERSTON NORTH, 1971

Industrial Category or Function	Palmerston North Urban Area Total Employment		Minimum Requirements Expected for an Urban Place of Palmerston North Urban Area's Population Size	Excess or Basic Employment	
	Number	Per cent	Per cent	Per cent of Total Employment	Per cent of Total Excess or Basic Employment
	1	2	3	4	5
Manufacturing	4952	24.9	16.4	8.5	22.7
Electricity, Gas and Water	359	1.8	0.6	1.2	3.2
Construction	1517	7.6	7.6	0.0	0.0
Wholesale and Retail Trade and Restaurants and Hotels	4055	20.4	12.0	8.4	22.4
Transport, Storage and Communication	1769	8.9	5.3	3.6	9.6
Financing, Insurance, Real Estate and Business Services	1143	5.7	3.1	2.6	6.9
Community, Social and Personal Services	6105	30.7	17.5	13.2	35.2
Total	19900	100.0	62.5	37.5	100.0

Basic-Nonbasic Ratio 1:1.67 Total Population 57,065 (1971)

by using the data in Appendix D, Tables 2, 3, 4, 5 and 6, which represent the values for each New Zealand urban place that are indicated in Table VI, columns, 1, 2, 3, 4 and 5 for the Palmerston North urban area.

Comparing column 5, the percentage values of the total excess or basic employment in each of the seven industrial categories with column 2, the actual percentage values of the total employment in each of these industrial categories in the Palmerston North urban area, reveals that community, social and personal services, increases absolutely the most from 30.7 per cent of the total employment to 35.2 per cent of the total excess or basic employment, followed by wholesale and retail trade and restaurants and hotels, which increases absolutely from 20.4 per cent of the total employment to 22.4 per cent of the total excess or basic employment. This is to be expected however, for not only is Palmerston North an important regional service and distribution centre for one of New Zealand's richest agricultural areas, but also it is an important educational, research, and health centre serving the southern half of the North Island. The other industrial categories in which the percentage value of the total excess or basic employment in column 5 exceeds the percentage value of the total employment in column 2 are, in decreasing order of absolute increase, electricity, gas and water; financing, insurance, real estate and business services; and transport, storage and communication. These indicate the importance of Palmerston North as a regional administration and commercial centre and as a focal point of a major road and rail transportation network serving the southern half of the North Island with links to all major market areas of New Zealand. It would appear then, that

the main factor which can be attributed to the importance of these particular industrial categories in the functional structure of the Palmerston North urban area is its advantageous location, central not only to the whole of New Zealand market, but also, and perhaps more importantly, to a large regional market.

The industrial category decreasing absolutely the most is manufacturing, from 24.9 per cent of the total employment to 22.7 per cent of the total excess or basic employment. This is a reflection of the importance of the nonbasic employment in manufacturing which has a 65.7 per cent orientation to the internal market and a 34.3 per cent orientation to external markets. This differs however, from Warren's (1969) analysis of the structure of manufacturing in Palmerston North, who indicated, using questionnaire survey information to divide individual factory establishments between markets according to the proportion of product marketed there, that manufacturing in 1967 had only a 42.3 per cent orientation to the internal market but a 57.7 per cent orientation to external markets. These differences may be attributed to one or more of the following factors: the approximate nature of the method of analysis applied in this present study; the level of aggregation used in this present study which analyses manufacturing as one broad industrial category compared to Warren's breakdown of manufacturing into five more specific categories; the different dates of the two studies; the degree of reliability of Warren's questionnaire data; the increasing importance of Palmerston North's internal market between 1966 and 1971 as a result of an increase in population size from 52,393 to 57,065; the tendency of nonbasic employment in any given industrial category to increase in relative importance with increasing urban

place population size; and finally, the decreasing relative importance of manufacturing in Palmerston North's employment structure from 30.0 per cent of the total employment in 1966 to 24.9 per cent in 1971.

It can also be observed in Table VI that construction is an entirely nonbasic function, with employment in this industrial category being just sufficient to match the internal demands of the population of the Palmerston North urban area. This situation is common to all New Zealand urban areas examined.

Levin

The application of the method of analysis to delineating the functional structure of the Levin borough is illustrated in Table VII. Comparing column 5 of Table VII, the percentage values of the total excess or basic employment in Levin in each of the industrial categories represented in its employment structure with column 2, the actual percentage values of the total employment in each of these industrial categories, reveals that manufacturing increases absolutely the most from 40.5 per cent of the total employment to 57.7 per cent of the total excess or basic employment, and with the exception of electricity, gas and water, that all the other industrial categories register an absolute decrease, with wholesale and retail trade and restaurants and hotels decreasing absolutely the most from 13.1 per cent of the total employment to 0.8 per cent of the total excess or basic employment. It can be observed in Table VII that these latter industrial categories are essentially nonbasic functions, with employment in these categories being mainly concerned with meeting the internal demands of the population of the Levin borough. This is to be expected in a small urban place located in close proximity to the urban areas of Palmerston North and Wellington, where the

TABLE VII

THE FUNCTIONAL STRUCTURE OF LEVIN, 1971

Industrial Category or Function	Levin Borough Total Employment		Minimum Requirement Expected for an Urban Place of Levin Borough's Population Size	Excess or Basic Employment	
	Number	Per cent	Per cent	Per cent of Total Employment	Per cent of Total Excess or Basic Employment
	1	2	3	4	5
Manufacturing	1769	40.5	12.1	28.4	57.7
Electricity, Gas and Water	141	3.3	0.4	2.9	5.9
Construction	263	6.0	5.0	1.0	2.0
Wholesale and Retail Trade and Restaurants and Hotels	573	13.1	12.7	0.4	0.8
Transport, Storage and Communication	285	6.6	4.1	2.5	5.1
Financing, Insurance, Real Estate and Business Services	154	3.5	2.0	1.5	3.1
Community, Social and Personal Services	1179	27.0	14.5	12.5	25.4
Total	4364	100.0	50.8	49.2	100.0

Basic-Nonbasic ratio 1:1.03 Total Population 13,051 (1971)

locational advantages for these particular industrial categories are reflected in their importance in the functional structures of these urban areas.

Levin borough's importance as a minor manufacturing centre in New Zealand was initially noted by Carr (1967) in her study of Levin as a market town in transition, and later elaborated by Astle (1970) in an unpublished undergraduate paper on the structure and importance of manufacturing in the economic base of Levin. The development of Levin as a minor manufacturing centre had its origin in the national economic climate of chronic labour shortages in the late 1940's and in the 1950's. Economic pressures on manufacturing industries arising from these labour shortages, which were particularly severe in the Wellington-Hutt area, together with the shortage and high cost of industrial land, influenced many industries to move out of the Wellington-Hutt area. At the same time economic pressures on individuals arising from high and continually increasing housing costs in the Wellington-Hutt area, influenced many people to move out of this area to newly developing urban places still within satisfactory commuting distance of their source of employment in the Wellington-Hutt area. Many of these people however, were often prepared to move even further out provided employment opportunities existed in these newly developing urban places. These two factors of economic pressure on employers on the one hand and on employees on the other were favourable to the growth of manufacturing in the Levin borough. As McQueen (1969,15) pointed out,

> "Levin provides an interesting example of a town which has developed rapidly in recent years as a result of both 'push' and 'pull' factors. It has a strong base in the textile and clothing

> industries, which are relatively labour intensive, and therefore not easily accommodated within Wellington. But an enterprising borough council backed by other local authorities has actively promoted industry in the borough. The result has been the addition to a largely farm-based market town and service centre of a strong industrial base, and subsequent increased local prosperity. It must be added that Levin has a number of particular advantages for ligher industry; good road and rail service to main markets, proximity to the capital as well as Palmerston North, and a pleasant environment."

The study of the importance and structure of manufacturing in the Levin borough undertaken by Astle (1970), involved a questionnaire survey of the main individual factories within the borough, and an application of the direct or micro sales-employment conversion method of economic base analysis to the questionnaire survey data. In all, 30 factories were surveyed, of which 20 factories had 20 or more employed persons and accounted for 95.0 per cent of the total manufacturing employment surveyed. The questionnaire survey was carried out to obtain the number of employed persons in each of the 30 factories and an estimate of the proportion of sales made by each factory in each of the following five market areas: local and regional, Wellington-Hutt, rest of the North Island, South Island and overseas. Using this questionnaire survey data the number of employed persons in each factory were divided between these five market areas according to the proportion of sales made in each market area (Table VIII).

It can be observed in Table VIII that manufacturing in the Levin borough in 1970 had only a 10.1 per cent orientation to local

TABLE VIII

THE MARKET ORIENTATION OF MANUFACTURING IN LEVIN, 1970

The percentage of sales in each market area has been converted to employment figures for each factory and the total in the industrial category of manufacturing re-processed as percentages.

Market Area / Manufacturing	Local and Regional	Wellington Hutt	Rest of North Island	South Island	Overseas	Total
Employment	151	442	572	263	79	1507
Per cent	10.1	29.4	38.0	17.2	5.3	100.0

Source: Astle, 1970,6.

and regional markets but an 83.6 per cent orientation to the rest of New Zealand and a further 5.3 per cent to overseas markets. Furthermore, it was revealed that manufacturing had much stronger connections with North Island markets (67.4 per cent) than with those in the South Island (17.2 per cent), which reflected in part the smaller South Island domestic market and the associated recent northward shift of markets and in part difficulty of access.

Although the results of this 1970 study generally support the results obtained on the basis of the method of analysis applied in this present study, they are not directly comparable because those of the former study were derived essentially from the main factories located within the Levin borough, which obviously had a strong export market orientation and a high proportion of basic employment. However, this former study surveyed only 1,507 employed persons engaged in manufacturing in the Levin borough compared to the Department of Labour's April, 1970 half-yearly survey of total employment in Levin which recorded a total of 1,807 employed persons engaged in this industrial category. Assuming that the difference of 300 employed persons between the two surveys were engaged in manufacturing in

small factories having a strong local market orientation and a high proportion of nonbasic employment, the results of the 1970 study could be modified to reveal that manufacturing in the Levin borough in 1970 had a 25.0 per cent local (nonbasic) market orientation and a 75.0 per cent export (basic) market orientation. These modified results may then be used with caution, to substantiate the results obtained in this present study which indicate that manufacturing in the Levin borough in 1971 has a 29.9 per cent local (nonbasic) market orientation and a 70.1 per cent export (basic) market orientation.

On the basis of the application of the method of analysis adopted in this present study to delineating the functional structure of the Palmerston North urban area and the Levin borough in this section, it would appear that the results obtainable from this method may be used to provide an approximate delineation of the functional structure of New Zealand urban places.

A Comparison of the Results derived from the Second Variant of the Minimum Requirements Method with those obtained from Direct or Micro Economic Base Studies of Individual New Zealand Urban Places

In this section the results of the method of analysis applied in this present study to delineating the functional structure of individual New Zealand urban places are compared with those obtained in the direct or micro economic base studies of Hamilton by Blechynden (1962; 1964,122-137), Rotorua by Lowe (1966), and Stratford by Laidlaw (1968).

The same procedure for delineating the functional structures of Hamilton, Rotorua and Stratford is followed in columns 1 - 5 of Tables IX, X and XI, as in the examples of Palmerston North and Levin in the previous section. Thus it can be observed in Table

TABLE IX

THE FUNCTIONAL STRUCTURE OF HAMILTON, 1971

Industrial Category or Function	Hamilton Urban Area Total Employment		Minimum Requirement Expected for an Urban Place of Hamilton Urban Area's Population Size	Excess or Basic Employment	
	Number	Per cent	Per cent	Per cent of Total Employment	Per cent of Total Excess or Basic Employment
	1	2	3	4	5
Manufacturing	6004	22.4	17.4	5.0	14.4
Electricity, Gas and Water	421	1.4	0.7	0.7	2.0
Construction	2944	10.0	8.2	1.8	5.2
Wholesale and Retail Trade and Restaurants and Hotels	5993	20.4	11.8	8.6	24.8
Transport, Storage and Communication	2517	8.6	5.6	3.0	8.7
Financing, Insurance, Real Estate and Business Services	2145	7.3	3.4	3.9	11.2
Community, Social and Personal Services	8790	29.9	18.2	11.7	33.7
Total	29414	100.0	65.3	34.7	100.0

Basic-Nonbasic Ratio 1:1.88 Total Population 80,812 (1971)

TABLE X

THE FUNCTIONAL STRUCTURE OF ROTORUA, 1971

Industrial Category or Function	Rotorua Urban Area Total Employment		Minimum Requirement Expected for an Urban Place of Rotorua Urban Area's Population Size	Excess or Basic Employment	
	Number	Per Cent	Per cent	Per cent of Total Employment	Per cent of Total Excess or Basic Employment
	1	2	3	4	5
Manufacturing	2187	18.8	15.3	3.5	8.7
Electricity, Gas and Water	108	0.9	0.6	0.3	0.8
Construction	1208	10.4	7.0	3.4	8.4
Wholesale and Retail Trade and Restaurants and Hotels	2876	24.7	12.2	12.5	31.0
Transport, Storage and Communication	1134	9.7	5.0	4.7	11.7
Financing, Insurance, Real Estate and Business Services	550	4.7	2.8	1.9	4.7
Community, Social and Personal Services	3582	30.8	16.8	14.0	34.7
Total	11645	100.0	59.7	40.3	100.0

Basic-Nonbasic Ratio 1:1.48 Total Population 39,752 (1971)

IX that in Hamilton the industrial category of wholesale and retail trade and restaurants and hotels increases absolutely the most, from 20.4 per cent of the total employment in column 2 to 24.8 per cent of the total excess or basic employment in column 5, followed closely by the industrial categories of financing, insurance, real estate and business services and community, social and personal services. While the industrial categories of construction and manufacturing register absolute decreases, with the latter decreasing absolutely the most from 22.4 per cent of the total employment to 14.4 per cent of the total excess or basic employment.

Comparing column 5, the percentage of the total excess or basic employment with column 2, the percentage of the total employment in Table X for Rotorua, reveals that wholesale and retail trade and restaurants and hotels, increases absolutely the most, from 24.7 per cent of the total employment to 31.0 per cent of the total excess or basic employment, followed by the industrial categories of community, social and personal services and transport, storage and communication. With the exception of financing, insurance, real estate and business services, which shows no variation between columns 2 and 5, all the other industrial categories record an absolute decrease, with manufacturing decreasing absolutely the most from 18.8 per cent of the total employment to 8.7 per cent of the total excess or basic employment.

In Table XI for Stratford, the industrial categories in which the percentage value of the total excess or basic employment in column 5 exceeds the percentage value of the total employment in column 2 are transport, storage and communication; financing, insurance, real estate and business services; and manufacturing. All the other

TABLE XI

THE FUNCTIONAL STRUCTURE OF STRATFORD, 1971

Industrial Category or Function	Stratford Borough Total Employment		Minimum Requirement Expected for an Urban Place of Stratford Borough's Population Size	Excess or Basic Employment	
	Number	Per cent	Per cent	Per cent of Total Employment	Per cent of Total Excess or Basic Employment
	1	2	3	4	5
Manufacturing	398	22.1	9.5	12.6	22.4
Electricity, Gas and Water	5	0.3	0.3	0.0	0.0
Construction	100	5.5	3.4	2.1	3.7
Wholesale and Retail Trade and Restaurants and Hotels	520	28.8	13.2	15.6	27.8
Transport, Storage and Communication	236	13.1	3.4	9.7	17.2
Financing, Insurance, Real Estate and Business Services	102	5.6	1.4	4.2	7.5
Community, Social and Personal Services	443	24.6	12.6	12.0	21.4
Total	1804	100.0	43.8	56.2	100.0

Basic-Nonbasic Ratio 1:0.78 Total Population 5,398 (1971)

industrial categories register an absolute decrease, with community, social and personal services decreasing absolutely the most, from 24.6 per cent of the total employment to 21.4 per cent of the total excess or basic employment. The percentage values of the total excess or basic employment in column 5 of Tables IX, X and XI, as derived from the method of analysis applied in this present study, provide an approximate delineation of the functional structure of Hamilton, Rotorua and Stratford respectively.

The results of the direct or micro economic base studies of these three urban places were obtained on the basis of the application of the sales-employment conversion method to data collection by questionnaire surveys. The questionnaire surveys were carried out to ascertain the number of employed persons in 60 per cent of the firms in 19 industrial categories in Hamilton for 1961, in 47 per cent of the firms in 18 industrial categories in Rotorua for 1965, and in 80 per cent of the firms in 16 industrial categories in Stratford for 1966, and to estimate the proportion of sales made by the firms in each industrial category in the local market area and a number of export market areas. Using this questionnaire survey data in each study, the total number of employed persons surveyed in each industrial category were divided between the market areas according to the proportion of sales made in each market area, and then scaled up proportionately to the total number of employed persons recorded in that particular industrial category by the Department of Labour in its appropriate half-yearly surveys of employment.

To compare the results obtained in these direct or micro economic base studies with those derived from the application of the indirect or macro second variant of the minimum requirements method

adopted in this present study, the industrial categories used in these studies had to be made comparable. This was attained by aggregating the industrial categories used in the direct or micro economic base studies into six major divisions as outlined by the Department of Labour's former Standard Industrial Classification, and by aggregating the seven industrial categories used in this present study into six comparable major divisions, which only involved the combining of the industrial categories of wholesale and retail trade and restaurants and hotels, and financing, insurance, real estate and business services, into the one major division of commerce.

Tables XII, XIII and XIV illustrate the comparison of the results presented in Tables IX, X and XI with the results obtained in the direct or micro economic base studies of Hamilton, Rotorua and Stratford respectively. In columns 1 and 2 of Tables XII, XIII and XIV the actual percentage values of employment in each of the six major divisions used to represent the functional structure of the three urban places analysed are listed, in column 1 according to the date in which each direct or micro economic base study was carried out, and in column 2 for 1971, which was the date concentrated on in this present study. In columns 3 and 4 the excess or basic percentage values of employment for each of the major divisions are listed for the same dates as columns 1 and 2. While columns 5 and 6 are derived by dividing columns 3 and 4, the excess or basic percentage values of employment for each of the major divisions by columns 1 and 2, the actual percentage values of employment, to represent the percentage values of each major division that are excess or basic.

TABLE XII

A COMPARISON OF THE FUNCTIONAL STRUCTURE OF HAMILTON AS DELINEATED BY BLECHYNDEN FOR 1961 AND BY ASTLE FOR 1971

Major Division or Function	Hamilton Urban Area Total Employment		Excess or Basic Employment			
	Percent		Percent of Total Employment		Percent of Each Major Division Excess or Basic	
	1961	1971	1961	1971	1961	1971
	1	2	3	4	5	6
Manufacturing	22.6	22.4	13.5	5.0	60.2	22.3
Electricity, Gas, Water and Sanitary Services	2.6	1.4	1.2	0.7	46.2	50.0
Construction	11.0	10.0	5.2	1.8	47.3	18.0
Commerce	24.3	27.7	13.0	12.5	53.5	45.1
Transport, Storage and Communication	11.8	8.6	7.6	3.0	64.4	34.9
Services	27.7	29.9	14.6	11.7	52.8	39.1
Total	100.0	100.0	55.1	34.7	55.1	34.7

Comparing the results of the method of analysis applied in this present study in terms of the percentage value of each major division that is excess or basic in column 6, with the findings of Blechynden for Hamilton in column 5 of Table XII, of Lowe for Rotorua in column 5 of Table XIII, and of Laidlaw for Stratford in column 5 of Table XIV, reveals a fairly close correspondence for most of the major divisions, if the tolerable limits of about 2 to 25 per cent set by Ullman, Dacey and Brodsky (1971,49) are accepted.

TABLE XIII

A COMPARISON OF THE FUNCTIONAL STRUCTURE OF ROTORUA AS DELINEATED BY LOWE FOR 1965 AND BY ASTLE FOR 1971

Major Division or Function	Rotorua Urban Area Total Employment		Excess or Basic Employment			
	Percent		Percent of Total Employment		Percent of Each Major Division Excess or Basic	
	1965	1971	1965	1971	1965	1971
	1	2	3	4	5	6
Manufacturing	22.5	18.8	17.7	3.5	78.7	18.6
Electricity, Gas, Water and Sanitary Services	1.3	0.9	0.7	0.3	51.1	33.3
Construction	12.3	10.4	6.7	3.4	54.7	32.7
Commerce	20.5	29.4	9.8	14.4	48.0	51.0
Transport, Storage and Communication	10.7	9.7	7.6	4.7	71.2	48.5
Services	32.7	30.8	14.4	14.0	44.0	45.5
Total	100.0	100.0	56.9	59.7	56.9	59.7

Using these tolerable limits it can be observed in Tables XII, XIII and XIV that there is a reasonably close correlation between the results of the two methods, in the totals, and for most of the major divisions, with only one major division in Rotorua and in Stratford but three in Hamilton being outside the tolerable limits. The major division in most disagreement in all three comparisons is manufacturing, while the major division in most agreement is commerce. Furthermore, it can be observed in Tables XII, XIII and XIV that the results derived from the indirect or macro method of economic base

TABLE XIV

A COMPARISON OF THE FUNCTIONAL STRUCTURE OF STRATFORD AS DELINEATED BY LAIDLAW FOR 1966 AND BY ASTLE FOR 1971

Major Division or Function	Stratford Urban Area Total Employment		Excess or Basic Employment			
	Percent		Percent of Total Employment		Percent of Each Major Division Excess or Basic	
	1966	1971	1966	1971	1966	1971
	1	2	3	4	5	6
Manufacturing	21.3	22.1	16.1	12.6	75.8	57.0
Electricity, Gas, Water and Sanitary Services	1.9	0.3	0.9	0.0	42.9	0.0
Construction	7.1	5.5	3.5	2.1	49.3	38.2
Commerce	20.4	34.4	12.2	19.8	60.0	57.6
Transport, Storage and Communication	11.4	13.1	6.0	9.7	52.3	74.0
Services	37.8	24.6	13.8	12.0	36.5	48.8
Total	100.0	100.0	52.5	56.2	52.5	56.2

analysis applied in this present study, in terms of the percentage value of each of the major divisions that is excess or basic in column 6, are consistently lower than those obtained from the direct or micro method of economic base analysis applied in the other three studies in column 5.

The second variant of the minimum requirements method applied in this present study, thus, provides a close approximation of the results obtained on the basis of the direct or micro sales-employment conversion method applied in the economic base studies of Hamilton by

Blechynden, of Rotorua by Lowe and of Stratford by Laidlaw. The reason for the discrepancies in those major divisions exceeding the tolerable limits is difficult to explain, other than that they may be a consequence of one or more of the following factors: the approximate nature of the method of analysis applied in this present study; the different industrial classifications and different dates used in the studies; the possibility of error in the questionnaire survey data collected in the three direct or micro economic base studies as well as in the proportional scaling up of the basic and nonbasic employment surveyed in each industrial category in these studies to the total employment registered for that particular industrial category by the Department of Labour in its appropriate half-yearly survey of employment; and finally, the dependence of results derived from the second variant of the minimum requirements method on the level of disaggregation used, the greater the degree of disaggregation, the lower the minimum requirements or percentage values of employment and the higher the excess or basic percentage values (Pratt, 1968,123). Illeris (1964,215) noted the same trend observing, "the minimum percentages are heavily dependent on ..... the detail of ..... the statistical breakdown of the employment." The high level of aggregation used in this present study therefore, tends to underestimate the magnitude of the excess or basic percentage values of employment in each of the industrial categories. This is clearly illustrated in the comparisons in Tables XII, XIII and XIV which indicate that in 14 out of the total 18 major divisions, the percentage values derived from the second variant of the minimum requirements method in column 6 are lower than those obtained from the application of the sales-employment conversion method in the

three direct or micro economic base studies.

Even as now calculated, however,

> "the minimum method can provide a useful check on other calculations. The essence of the method is comparative - comparing one city with another, in general, in terms of minima, but also specifically from city to city ..... Such comparisons turn up errors as well as providing bases for findings ..... Minimum findings appear to provide a fairly reasonable approximation to reality in the majority, but by no means all of the aggregated cases. Like explosives, they should be handled with care, although they are generally more reliable than earlier crude blasting measures" (Ullman, Dacey and Brodksy, 1971,55).

A Comparison of Several Indirect or Macro Economic Base Studies which have applied the Minimum Requirements Method to Various National and Regional Systems of Urban Places

To clarify the results derived from the application of the second variant of the minimum requirements method to New Zealand urban places in this present study and to provide a comparative indicator, reference is made in this section to several overseas indirect or macro economic base studies which have successfully applied the minimum requirements method to various national and regional systems of urban places. Although the number of overseas economic base studies with which this present study is compared is limited, the information pertaining to the unit of measurement, the spatial unit of reference, and the variant of the minimum requirements method used is sufficiently detailed to provide an adequate base for the appreciation of the final results obtained. These overseas indirect or macro economic base studies together with the

present study are presented in a comparative form in Table XV, and refer to national and regional systems of urban places in the United States, France, Denmark, India, Poland and New Zealand.

It can be observed in Table XV that in almost all the economic base studies the first variant of the minimum requirements method based on the fifth percentile or K value, which was developed by Alexandersson (1956) and later elaborated by Morrissett (1958,239-256), has been preferred. The second variant of the method based on the absolute minimum values, which was developed by Ullman and Dacey (1960,175-194) and later updated by Ullman, Dacey and Brodsky (1971), has only been applied by Carriere and Pinchemel (1963) in their analysis of urban communities and agglomerations in France, and in this present study of New Zealand urban places.[6] Carriere and Pinchemel however, did not use the technique of least-squares linear regression equations and their associated regression lines to calculate the expected minimum requirements or percentage values of employment in each of the industrial categories used, but based their analysis on the actual, absolute minima. Jerczynski (1971, in Spanish translation by Chaves, 1973,22-23) maintained that this lack of interest in applying the second variant of the method to national and regional systems of urban places was related, partly to the limited number of urban places, especially large urban places in many countries which could be divided into adequate population size categories, and partly to the paucity of data in the standard statistical publications of many countries for small urban places.

The unit of measurement used in all the indirect or macro economic base studies represented in Table XV is employment, as it appears in standard statistical publications, and which in most cases

A COMPARISON OF ECONOMIC BASE STUDIES WHICH HAVE APPLIED THE MINIMUM

Study Number in Chronological Order	Author of Study (Date of Publication)	Area Studied (Country, Region)	Date of Study	UNIT OF MEASUREMENT	
				Employment Structure for Place of Residence or Place of Work	Level of Disaggregation of Industrial Categories in Study Classification
1	G. Alexandersson (1956)	United States of America	1950	Place of Residence	36 Including 15 Manufacturing categories, Construction, and 20 Service categories
2	I. Morrissett (1958)	United States of America	1950	Place of Residence	36 Including 15 Manufacturing categories, Construction, and 20 Service catergories.
3	G. Le Guen (1960)	France	1954	Place of Residence	8 Including Fishing, 2 Manufacturing catergories, Construction, and 4 Service categories
4	E.L. Ullman and M.F. Dacey (1960)	United States of America	1950	Place of Residence	14 Including Agriculture, Mining, 2 Manufacturing catergories, Construction, and 9 Service categories
5	G. Le Guen (1961)	France (Province of Brittany)	1954	Place of Residence	8 Including Fishing, 2 Manufacturing categories, Construction, and 4 Service categories.
6	F. Carriere and P. Pinchemel (1963)	France	1954	Place of Residence	10 Including 6 Manufacturing categories, Construction, and 3 Service categories
7	S. Illeris (1964)	Denmark	1958 1960	Place of Residence and Place of Work	35(6) Including Market Gardening, Fishing, Quarrying, 14 Manufacturing categories, Construction, and 17 Service categories.
8	G. E. Stoner (1968)	India	1951 1961	Place of Residence	4 Including Manufacturing, and 3 Service categories.
9	E.L. Ullman, M.F. Dacey and H. Brodsky (1969)	United States of America	1960	Place of Residence	14 Including Agriculture, Mining, 2 Manufacturing categories, Construction, and 9 Service categories
10	K. Dziewonski and M. Jerczynski (1971)	Poland	1960	Place of Work	33 Including Agriculture, 22 Manufacturing categories, Construction, and 9 Service categories
11	A. M. Astle (1975)	New Zealand	1971	Place of Work	7 Including Manufacturing, Construction, and 5 Service categories

Source: Adapted from Jerczynski, 1971, in Spanish translation by Chaves, 1973.

TABLE XV

REQUIREMENTS METHOD TO VARIOUS NATIONAL AND REGIONAL SYSTEMS OF URBAN PLACES

SPATIAL UNIT OF REFERENCE			METHOD	COMPONENT		RATIO
Number of Urban Places Examined	Urban Place Population Size Categories Used	Boundaries of Urban Places Examined	Minimum Requirements Method Based on: a) K value b) Absolute minimum values	Nonbasic	Basic	B-N Ratio (B=1)
				Percentage of Total Urban Place Employment		
864	Urban places with a population of 10,000 or more without division into population size categories	Urbanised Areas and Standard Metropolitan Areas	K value	37.7%	62.3%	1:0.61
740	7 10,000-25,000, 25,000-50,000, 50,000-100,000, 100,000-250,000, 250,000-500,000, 500,000-1,000,000, 1,000,000 and over.	Urbanised Areas and standard Metropolitan Areas	K value	Dependent on urban place population size and its geographical location (For urban places of 25,000-50,000) Northeast Region 34.1% | 65.9% South and West Region 41.2% | 58.8%		1:0.52 1:0.70
147	Urban places with a population of 20,000 or more without division into population size categories	Urban Communities and Agglomerations	K value	40.4%	59.6%	1:0.68
204	6 2,500-3,000, 10,000-12,500, 25,000-40,000, 100,000-150,000, 300,000-800,000, 1,000,000 and over	Independent Cities and Standard Metropolitan Areas	Absolute minimum values	Dependent on urban place population size (For urban places of 25,000-40,000) 39.8% | 60.2%		1:0.66
82	Urban places with a population of 2,000 or more without division into population size categories	Urban Communities and Agglomerations	K value	42.3%	57.7%	1:0.73
159	5 Less than 20,000, 20,000-30,000, 30,000-50,000, 50,000-100,000, 100,000 and over	Urban Communities and Agglomerations	K value Absolute minimum values	35.3% | 64.7% Dependent on urban place population size (For urban places of 20,000-30,000) 35.0% | 65.0%		1:0.55 1:0.54
275	2 700-3,000, 3,000-60,000	Urban Places based on administrative boundaries	Value of the 6 2/3th percentile	Dependent on the number of employed persons in retail trade and personal services. (For urban places with 1,500-4000 employed persons in retail trade and personal services) 35.3% | 64.7%		1:0.55
183 246	6 50,000-60,000, 60,000-75,000, 75,000-100,000, 100,000-150,000, 150,000-300,000, 300,000 and over	Urban Places based on administrative boundaries	K value	46.3% 43.4%	53.7% 56.6%	1:0.86 1:0.77
214	6 2,500-3000, 10,000-12,500, 25,000-40,000, 100,000-150,000, 300,000-800,000, 1,000,000 and over	Independent Cities and Standard Metropolitan Areas	Absolute minimum values	Dependent on urban place population size (For urban places of 25,000-40,000) 41.4% | 58.6%		1:0.71
38	1 25,000-75,000	Federal Capital Cities based on administrative boundaries	K value	29.2%	70.8%	1:0.41
82	4 1,000-4,999, 5,000-9,999, 10,000-49,999, 50,000 and over	Urban Areas based on statistical boundaries and Boroughs based on administrative boundaries	Absolute minimum values	Dependent on urban place population size (For urban places of 10,000-49,999) 49.6% | 50.4%		1:0.98

is related to place of residence. This present study and Dziewonski and Jerczynski's (1971) study of Polish cities constitute an exception in the sense that they use employment statistics related to place of work.

The minimum requirements method is very sensitive to the level of disaggregation used as was indicated earlier in this present study. In the economic base studies compared in Table XV the level of disaggregation employed varies from 36 industrial categories in the studies of United States cities by Alexandersson (1956) and Morrissett (1958,239-256) to four industrial categories in Stoner's (1968,71-82) study of Indian urban places. Different levels of disaggregation however, tend to influence the magnitude of the basic and nonbasic employment in each of the industrial categories represented in any given urban place, and in the urban place as a whole. As Pratt (1968,123) pointed out, "Disaggregation will increase basic workers; aggregation will decrease basic workers."

Although the same variant of the minimum requirements method and the same unit of measurement have been applied in almost all the studies represented in Table XV, it appears that most studies have been unaware of the implications of the level of disaggregation in the industrial classification used, and of the affiliation of the urban places examined to different socio-economic groupings. For example, comparing the final results in terms of the magnitude of the nonbasic employment and the B-N ratio obtained in each of these studies using employment statistics collected between 1950 and 1961, and applying the first variant of the minimum requirements method based on the K value, reveals that for urban places with a population of 10,000 or more the K value reached: 29.2 per cent in Poland,

between 34.1 per cent and 42.3 per cent for Western countries (United States, France and Denmark), and 46.3 per cent for India. While the B-N ratios reached respectively: 1:0.41, 1:0.52 to 1:0.73, 1:0.86. These economic base studies, however, make no allowance for differences in the level of disaggregation in the industrial classification used and for the association of the urban places examined in the various countries to different soci-economic formations. Therefore, the comparison in Table XV of the economic base studies which have applied the minimum requirements method must be viewed cautiously.

Stoner (1968,71-82) in his analysis of the economic structure of Indian cities, however, did attempt to adapt the first variant of the minimum requirements method based on the K value to the characteristics of Indian cities, which he indicated were markedly different from those of United States cities. For example, the functional zones of Indian cities did not radiate gradually outwards from the centre of the city to the periphery, the mobility of the hinterland population of Indian cities was very small, and their zones of influence were insignificant. This closed nature of the economies of Indian cities indicated that theoretically the magnitude of their nonbasic employment should be high. Indeed, the magnitude of the nonbasic employment obtained for Indian cities reached 46.3 per cent in 1951 and 43.4 per cent in 1961, which was higher than the magnitude derived for United States cities in Morrissett's (1958,239-256) study with which Stoner made comparisons. The main objection to Stoner's study emerges from these comparisons, because of the largely different standard industrial classifications adopted in each country, as Stoner used a highly aggregated classification in which

he included only four broad industrial categories. For example, the magnitude of the K value in manufacturing for Indian cities in 1951 was 10.8 per cent and in 1961 was 14.65 per cent compared to the 1.9 per cent for United States cities in 1950. The classificatory criteria used to aggregate the employment statistics into manufacturing for Indian cities (manufacturing equated to one general industrial category termed "production other than cultivation"), and United States cities (manufacturing equated to 15 specific industrial categories), were significantly different. Furthermore, the magnitude of the K value for manufacturing was calculated for Indian cities with a population of 50,000 or more and for United States cities with a population of 10,000 or more.

Besides the difficulties of the methodological differences in the definition and breakdown of the industrial categories used and the urban places examined, other difficulties arise in making a comparison of economic base studies on an international scale in terms of the interpretation of their final results. In particular, there is the difficulty of comparing the magnitudes of the basic and nonbasic employment and the B-N ratios obtained for urban places in various countries which differ in their level of socio-economic development. This raises the question of: Is it possible to accept that the same magnitude of the basic and nonbasic employment and the same B-N ratio in a country with a high level of economic development and in a country with a low level of economic development correspond, in a qualitative sense, to the same hypothetical, normative model of the urban place economy? (Jerczysnki, 1971, in Spanish translation by Chaves, 1973,25).

The dynamics of the structural changes in the primary,

secondary and tertiary employment sectors of national economies, provides the basis for the hypothesis that a relationship exists between the magnitude of the basic and nonbasic employment and the B-N ratio in urban places in any given country and the level of socio-economic development in that particular country. This relationship, Jerczynski (1971, in Spanish translation by Chaves, 1973,25-26) suggested, on the basis of the assumption that the area studied is an isolated system, could be presented, in the long term, in the form of the following three sector scheme:

Sector One: In those countries with a low level of economic development, where the primary sector (agriculture) dominates the economy and the transportation and communication system has yet to be developed, urban places are relatively isolated and tend to be characterised by a high proportion of local or nonbasic employment.

Sector Two: In those countries with a high level of economic development, where the secondary sector (manufacturing) dominates the economy and the transportation and communication system is highly developed, and in which there is a high mobility of industrial goods and a fairly high degree of functional specialisation, urban places are relatively open and tend to be characterised by a high proportion of export or basic employment.

Sector Three: In those countries with a very high level of economic development changes of a qualitative nature begin to play a more important role. Automation of the production process is introduced, productivity increases with the same as earlier or even smaller proportion of employment, and at

the same time the proportion of employment in the tertiary sector (services) of the economy is increasing. Urban places have a high degree of openess, higher than in the two preceding sectors, and tend to be characterised once again by a high proportion of local or nonbasic employment. The urban places in this sector form specialised parts of an integrated national system of urban places.

Jerczynski (1971, in Spanish translation by Chaves, 1973, 26-27) illustrated this relationship between the magnitude of the basic and nonbasic employment and the B-N ratio in urban places in any given country and the level of socio-economic development in that particular country for each of the three sectors. He pointed out that from 1952 to 1962, of the 33 million new jobs created in the socialist European countries and the Soviet Union that were not in agriculture, more than half were in manufacturing (41 per cent) and construction (11 per cent). This constituted an adequate base to assert, he maintained, that in socialist countries the main force in the dynamics of the structural changes in the employment sectors of their economies in the decade 1950 to 1960, was represented by industrialisation. This placed the socialist countries in Sector Two.

It can be observed in Table XV, which is adapted from Jerczynski's analysis, that in the case of the United States the magnitude of the nonbasic employment in urban places reached its highest value in 1960, which placed it in Sector Three. While in the case of India, which was classified in Sector One, the decade 1950 to 1960 was characterised by the growth of the basic employment in urban places.

A complete explanation of this hypothesis of a relationship

between the basic and nonbasic employment and the B-N ratio in urban places in any given country and the level of socio-economic development in that particular country however, requires many empirical, comparative studies on a macro or international scale.

The results obtained from the application of the second variant of the minimum requirements method to New Zealand urban places in this present study, indicate that urban places in New Zealand tend to be characterised by a high proportion of nonbasic employment. This appears to be the result of the high level of aggregation of the industrial categories used to represent the urban place economy in this present study, together with the fact that the dynamics of the structural changes in the employment structure of New Zealand have been slightly different from the normal primary-secondary-tertiary transition. This transition is usually associated with Clark (1940), who suggested that the employment structure of a country changed as the proportion of its labour force employed in the primary, secondary and tertiary sectors varied with its level of economic development. However,

> "Among the countries of the 'developed' world, employment structures in several ex-colonies such as New Zealand have progressed in a slightly different way from that outlined above. These areas were largely established to provide primary products - from farming and mining - for their 'mother countries'. Thus in New Zealand there has been a decline in the proportion employed in primary industries as the farming industry has developed into one of the most capital-intensive, labour efficient in the world. But there has never been a large manufacturing sector, though it has grown rapidly in recent decades. Throughout the present

> century, the tertiary sector has been the largest, which reflects the nature of the colonial economy. As a primary producer for Britain, the main labour requirements were for people to work in agriculture and associated industries, plus a tertiary sector to organise the production and the exchange of its output for the imported manufactured goods" (Cant and Johnston, 1973,15-16).

The effect of this asymmetrical, national employment structure is reflected in the employment structures of almost all the New Zealand urban places examined in this present study, which tend to be dominated by industrial categories of a tertiary nature. Although this fact is not conclusive evidence of the correctness of the method of analysis applied in this present study, it does appear to confirm the results derived from this method, which indicate in Table XV that New Zealand urban places in comparison with those of other countries tend to be characterised by a high proportion of nonbasic employment. Furthermore, the importance of the tertiary sector, together with the high degree of urbanisation and the very high level of socio-economic development in New Zealand, would probably place it in Sector Three of Jerczynski's formulation.

Conclusion

The second variation of the minimum requirements method as developed by Ullman and Dacey, and refined by the use of least-squares linear regression equations and their associated regression lines, which systematically correct the actual, absolute minima derived from the method for variations in urban place population size, has been applied to New Zealand urban places in this chapter in order to delineate their functional structures. The excess or

basic percentage values of employment obtained by this method for each of the industrial categories represented in any given urban place, were assumed to be indicative of the character and degree of economic specialisation of each of the industrial categories or functions in that particular urban place. The complex of specialised functions characteristic of each New Zealand urban place examined was then used to delineate the functional structure of the urban place. To illustrate the possibilities of the results obtained from the method, with respect to delineating the functional structure of individual New Zealand urban places, examples of the Palmerston North urban area and the Levin borough were used. Finally, to clarify the results derived from the method and to provide a comparative indicator, reference was made firstly, to three direct or micro economic base studies of Hamilton, Rotorua and Stratford, and secondly, to several oversease indirect or macro economic base studies which have applied the minimum requirements method to various national and regional systems of urban places. The first comparison revealed that the results derived from the method of analysis adopted in this present study corresponded fairly closely to those obtained in the direct or micro economic base studies, although they tended to underestimate the magnitude of the basic employment in most industrial categories because of the high level of aggregation used. The second comparison, however, indicated that these results were reasonably comparable with those obtained in overseas indirect or macro economic base studies, and that the underestimation of the magnitude of the basic employment in most industrial categories, and its converse, the overestimation of the nonbasic employment, could be partially explained in terms of Jerczynski's formulation, as a

consequence of the importance of the tertiary sector in New Zealand's employment structure.

The second variant of the minimum requirements method applied in this present study, however, is only a short-cut procedure, and it must be remembered that its analytical framework is static and the results obtained from its use are merely useful approximations. Undoubtedly possible refinements could be introduced, but whether the increased effort is worthwhile in terms of the incremental benefits is questionable. To date, few other methods have been developed that cover so much ground as readily as the second variant of the minimum requirements method. The positive virtues of the method, whether one accepts all its possible economic base implications or not, are that it provides a meaningful measure for delineating the functional structure of individual urban places, a consistent and definable basis for comparing the functional structures of individual urban places, and as will be indicated in Chapter 5, an effective measure for classifying urban places according to the characteristics of their functional structures, namely their dominant and distinctive functions, and their degree of functional specialisation.

Footnotes

1. For the definition of the terms "urban areas" and "boroughs" as applied in this present study, and a list of those urban areas and boroughs examined, see Appendix B.
2. The procedures adopted by the Department of Labour for the collection, processing, and presentation of employment statistics for each of New Zealand's urban places with a population of 1,000 or more, are outlined in Appendix C.

3. For a complete list of the nine major divisions used by the Department of Labour in its half-yearly surveys of employment, see Appendix C.

4. For the Department of Labour's definition of the term "employment statistics" as used in this present study, and the degree of coverage reached in its half-yearly surveys of employment in each of New Zealand's urban places with a population of 1,000 or more, see Appendix C.

5. For further discussion of the influence of population size on the economic structure of urban places and their constituent industrial categories, see Richardson (1973,71-83).

6. The second variant of the minimum requirements method as developed by Ullman and Dacey (1960,175-194), has also been applied by Boyce (1964b,9-45), to provide specific information on the employment structure of the Wabash Basin as a preliminary for a more general discussion on regional development and change.

CHAPTER 5

THE FUNCTIONAL STRUCTURE OF NEW ZEALAND URBAN PLACES: A CLASSIFICATION OF URBAN PLACES

In this chapter the results derived from the application of the second variant of the minimum requirements method to New Zealand urban places in Chapter 4 pertaining to the complex of specialised functions characteristic of the functional structures of the 82 New Zealand urban places examined, are classified in order to obtain an overview of the New Zealand urban scene. The dominant function, the distinctive functions, and the degree of functional specialisation in each urban place's functional structure, defined in terms of basic employment, have been determined to achieve this objective in a similar manner to Maxwell's (1965,79-104) functional classification of Canadian cities. The results of this classification are presented in a tabular and cartographic form similar to that adopted by Pownall (1953,332-350), and are discussed both in terms of the statistical aspects of the data and their spatial characteristics. To clarify these results and provide a comparative indicator, reference is made to the comparable elements of Pownall's (1953, 332-350) functional classification of New Zealand towns.

Urban places

> "perform those functions for which, through a combination of chance, situation, resources and initial advantage, they have some comparative advantage over other places" (Johnston, 1973b,5).

It is obvious then, that one of the principal differences among urban places is the differences in the functions which they perform. Various classifications of urban place functions have been devised

by geographers, who have long been interested in developing methods for classifying and comparing urban places by function and specialisation. All of these methods developed for the measurement of this urban place characteristic, involve measures of the extent to which each function in turn constitutes an economic specialisation of a particular urban places; the complex of specialised functions characteristic of each urban place in a system of urban places, such as those of a nation or region, has then been used to classify urban places by their functions.

The Purpose and Methods of the Functional Classification of Urban Places

> "Within urban geography, an important field of study comprises the explanation of the distribution and structure of urban functions" (Smith, 1965,539).

The purpose of classifying urban places therefore, on the basis of, for example, their functional specialisation is to identify spatial patterns in the distribution and structure of urban place functions. After a thorough review of a large number of attempts at classifying urban places, Smith (1965,539-540) concluded however, that the

> "specific geographic objectives - or, for that matter, objectives in general - usually are difficult to discern in the statements of purpose appearing in functional classifications of towns ..... Too often it appears that a major purpose of these studies (if not the major purpose) has been the development and presentation of a different methodology as an end in itself."

Of the various ways in which urban places have been classified, those based on the identification of a dominant economic function or

functional specialisation have been by far the most numerous and important in the literature. As the population size of urban places increases, so their functional structure becomes increasingly more complex; and the urban place economy is based on a diversity of economic activities. Consequently they become more difficult to differentiate one from another on the basis of the functions they perform. This multi-functional nature of urban places notwithstanding, it is common, however, to find the urban place economy dominated by one, perhaps two, main economic activities. Classification based on functional specialisation attempts to identify these dominant economic activities and to group together those urban places that are most similar to each other with respect to their functional specialisation (Yeates and Garner, 1971,61).

As the review by Smith (1965,540-545) indicated, the many methodologies that have been adopted in this context may be initially differentiated into those which are qualitative and those which are quantitative in nature. In the former, urban place types are identified intuitively on the basis of logical deduction and general observation. The classifications proposed by Aurousseau (1921,563-592) and Harris and Ullman (1945,7-17) are perhaps the most representative of the qualitative schemes. In the latter, urban place types are identified from an analysis of precise statistical data about the functions urban places perform. The classifications undertaken by Harris (1943,86-99), Pownall (1953,332-350) and Nelson (1955, 189-210) are perhaps the best known of the quantitative schemes.[1]

Studies in which functional specialisation is identified from the analysis of precise statistical data are far more numerous in the literature. The common assumption in these studies is that the

urban place's labour force is the best indicator of the nature of the urban place economy. Categories of urban places with similar functional specialisation have therefore been most frequently identified from the analysis of employment statistics.

> "Specialisation is said to exist when employment in a given type of activity exceeds some critical level specified by the researcher. For it is only when an abnormally large proportion of the city's labour force is employed in a particular activity that it becomes a distinguishing feature in functionally differentiating that place from all others" (Yeates and Garner, 1971,63).

The major difficulty in such studies however, is that of deciding at what specific point an economic activity becomes important enough in an urban place's functional structure to be of such special significance as to require separate classification. According to Yeates and Garner (1971,63),

> "the fundamental problem is to meaningfully define the critical level of employment necessary for specialisation to exist. There is no single or even best solution to this problem, and in the literature on the functional classification of cities there is little agreement on either the magnitudes of these threshold values or on the ways by which they should be selected. In the last resort, definitions of specialisation depend very much on the methods used in classification and the purpose for which it is undertaken."

For example, in the classifications carried out by Harris, Pownall and Nelson, the critical levels or threshold values of employment needed for specialisation in each of the functions examined, were selected on the basis of 1) an intuitive analysis of the

occupational structure of well defined types of urban places (Harris); 2) the national arithmetic mean or average values (Pownall); and 3) one standard deviation above the national arithmetic mean or average values (Nelson).

In these classifications undertaken by Harris, Pownall, and Nelson, figures for total employment in each of the functions examined were used in differentiating between urban places on the basis of their functional specialisation. However, as mentioned in Chapter 2 of this present study, the total employment of an urban place can be separated into two parts, 1) the basic component that is concerned with the production of goods and services for sale outside the boundaries of the urban place, and 2) the nonbasic component that is concerned with the production of goods and services for sale inside the boundaries of the urban place. It is generally recognised that the economic welfare of urban places depends to a large degree on the magnitude of their basic employment, for it is this which ultimately makes possible the growth of an urban place as a result of trade with other places in its hinterland and/or its foreland.

Because of this, it has been suggested that it is more appropriate to identify the functional specialisation of urban places from an analysis of basic rather than total employment. This problem was implicitly recognised by Harris (1943,86-99) who assigned higher threshold percentages to some functions than to others in defining specialisation. In this way he attempted to

> "rule out local service employment in activities that exist merely to serve workers employed in the primary activities of the city" (Harris, 1943,87).

Explicit recognition of this problem is found in the classifications of United States cities by Alexandersson (1956)[2] and Duncan and Reiss (1956), of Canadian cities by Maxwell (1965,79-104) (see Appendix E), and in the index of functional specialisation proposed by Ullman and Dacey (1960,175-194). For example, Alexandersson (1956,22) recognised this problem in his observation that early studies on functional classification based "their classifications on the total industrial structure without making any distinction between city forming and city serving ratios," consequently in his analysis of United States cities "city serving structure was subtracted from total structure before the classification was made." Similarly Duncan and Reiss (1956,216) suggested

> "the problem of functional classification is best undertaken by considering functional specialisation in terms of the kinds of export activity of a community which creates an in-flow of money to the community."

It is apparent then, that there is much in common between the economic base concept and the general rationale for functional classification: both attempt to identify what is distinctive in the economic structure of an urban place in comparison to other urban places. Thus Leven (1956,253), in discussing the importance of the basic functions, writes,

> "Exports are the distinctive feature of an area's economic structure. They differ markedly from place to place, reflecting the adjustment of an area's production to the natural and acquired advantages of its situation."

Similarly, functional classifications have been largely undertaken to identify what is "distinctive" about an urban place economy;

either without first determining what is basic, or using some arbitrary criteria for this determination. Indeed, Duncan (1960,36) reached several tentative conclusions regarding the economic base concept and functional specialisation.

1. The economic base concept lacks a sufficiently definite statement to permit its use in extensive comparative studies. Nevertheless, in thinking about urban places, the economic base idea is a valuable concept.
2. The investigation of the ways in which urban places differ from one another, as regards to their economic or industrial structure, will be emphasising the basic functions to some degree.
3. The classification of urban places according to their functional specialisation should be instrumental to some theoretically relevant problem, for there is little need for just another functional classification of urban places, however ingenious its methodology.

Although the use of the economic base concept in classifying urban places on the basis of the proportion of the total urban place employment engaged in basic functions is still far from satisfactory, Alexander (1954,246-261) contends it nonetheless has several qualities which recommend it to geographers.

> "This concept has merit for urban geography because it classifies economic functions fundamentally on the basis of space-relationships, it reveals one group of economic ties which bind a city to other areas, (and) it permits a classification of and comparative analysis of settlements" (Alexander, 1954,261).

The main virtue of a functional classification based on the economic

base concept, whether one accepts all its economic base implications or not, is that it provides a consistent and meaningful basis for classifying and comparing urban places and for identifying spatial patterns in the distribution and structure of urban place functions.

The Functional Classification of New Zealand Urban Places

On the basis of the urban places examined, the industrial categories used, the method of analysis applied, and the results obtained in Chapter 4, the purpose of this section and the following section is to develop an overview of the New Zealand urban scene by classifying the functional structure of the urban places in New Zealand. Basic employment is used to characterise and classify urban place functional structures. It is the basic employment that identifies the raison d'etre of an urban place and reveals the functional relationships that exist between the urban place and its hinterland and/or its foreland. Each urban place's basic employment in the seven industrial categories or functions used, was obtained from the results derived from the application of the second variant of the minimum requirements method as development by Ullman and Dacey (1960,175-194) to New Zealand urban places in Chapter 4 (see Appendix D, Tables 5 and 6).

The Characterisation of Urban Place Functional Structures

Following Maxwell's (1965,85) example, three characteristics were used to delineate urban place functional structures: the urban place's dominant function, its distinctive functions, and its degree of functional specialisation (see Appendix E). The dominant function of an urban place is defined as the industrial category in its employment structure having the largest percentage value of the

urban place's total basic employment. A distinctive function is defined as an industrial category in the employment structure of an urban place whose percentage value of the total basic employment in that particular urban place greatly exceeds the percentage value it usually has in most urban places. Finally, urban place specialisation is indicated by the index of specialisation as developed by Ullman and Dacey (1960,189-190). This index is based on the relationship of an urban place's distribution of total basic employment among its industrial categories to its distribution of expected minimum requirement or percentage value of employment. As the value of the index increases, specialisation is considered to increase.

The Dominant and Distinctive Functions

> "By recognising two types of functions - dominant and distinctive functions - two kinds of functional importance are considered" (Maxwell, 1965,85).

Industrial categories are rated in terms of their importance in an urban place's functional structure relative to the importance of the other industrial categories in the urban place's structure when determining the dominant function of an urban place. When identifying an urban place's distinctive functions, industrial categories are rated in terms of their importance in an urban place's functional structure relative to their importance in the functional structures of all the urban places examined.

When identifying the dominant functions in urban places, two classes of manufacturing dominance were recognised: "manufacturing I" and "manufacturing II". This was considered necessary because this industrial category had the largest range of percentage values of basic employment in New Zealand urban places. Manufacturing I is

defined as where 50 per cent or more of an urban place's basic employment is accounted for by manufacturing. While manufacturing II is defined as where manufacturing is dominant, but represents less than 50 per cent of the urban place's basic employment.

When determining the distinctive functions of urban places, four classes of "distinctiveness" were recognised. These classes are defined in terms of standard deviation percentage value of basic employment above the arithmetic mean or average percentage value of basic employment for each industrial category. For each industrial category, Class 1 includes all urban places whose percentage value of basic employment for that particular industrial category is equal to the mean percentage value of basic employment for the industrial category, plus a percentage value of at least two standard deviations above the mean. Class 2 includes all urban places whose percentage values of basic employment for the industrial category exceed the mean by between the mean and two standard deviations. Class 3 includes all urban places whose basic employment percentage value is between the mean and one standard deviation above the mean. Class 4 includes all urban places whose basic employment percentage values for the industrial category are below the mean. Table XVI indicates the percentage values determining the four classes of functional importance for each of the seven industrial categories used.

Urban places were rated in each of the seven industrial categories in terms of these four classes of distinctiveness. An industrial category was considered distinctive in the functional structure of an urban place when the urban place qualified for one of the first three classes. Urban places have as many distinctive functions or industrial categories as they have basic employment

TABLE XVI

PERCENTAGE VALUES OF BASIC EMPLOYMENT FOR DETERMINING CLASSES OF DISTINCTIVE FUNCTIONAL IMPORTANCE

Industrial Category or Function	Mean percentage value of basic employment	Standard deviation of basic employment	Class 4 (Below mean percentage value of basic employment	Class 3 (Between mean percentage value and one standard deviation above the mean)	Class 2 (Between one and two standard deviations above the mean	Class 1 (Above two standard deviations above the mean
Manufacturing	26.9	24.4	< 26.9	27.0-51.3	51.4-75.7	75.8 +
Electricity, Gas and Water	4.7	6.5	< 4.7	4.8-11.2	11.3-17.7	17.8 +
Construction	9.1	9.0	< 9.1	9.2-18.1	18.2-27.1	27.2 +
Wholesale and etail Trade and Restaurants and Hotels	18.5	11.8	< 18.5	18.6-30.3	30.4-42.1	42.2 +
Transport, Storage and Communication	15.8	12.4	< 15.8	15.9-28.2	28.3-40.6	40.7 +
Financing, Insurance, Real Estate and Business Services	6.0	4.4	< 6.0	6.1-10.4	10.5-14.8	14.9 +
Community, Social and Personal Services	19.0	10.8	< 19.0	19.1-29.8	29.9-40.6	40.7 +

percentage values qualifying them as being of Class 1, 2, or 3 in distinctiveness. A function was not considered distinctive in an urban place when the urban place qualified only for a Class 4 rating.

Urban Place Functional Specialisation

A procedure frequently used in determining the degree of functional specialisation of urban places is to compare the functional structure of individual urban places with an idealised functional structure representing what is thought to be a balanced structure or situation of minimum specialisation. The urban place's degree of specialisation is then given by the deviation of its functional structure from the model. The problem has been to develop meaningful models representative of a balanced structure.

In this present study the index of specialisation developed by Ullman and Dacey (1960,189) as a by-product used of the expected minimum requirements or percentage values of employment for industrial categories or functions was adopted. Ullman and Dacey used the distribution of an urban place's total expected minimum requirement or percentage value of employment among its functions as a model of a balanced structure, that is, the case of minimum specialisation. If the urban place's excess or basic employment is distributed among its functions in the same proportions as is the expected minimum requirement or percentage value of employment, the case of least specialisation is considered to exist. Urban place specialisation is thought to increase with increasing deviation of the urban place's excess or basic employment distribution from the distribution of the urban place's expected minimum requirement or percentage value of employment among its functions.

Ullman and Dacey designed their index so that large deviations

of the excess or basic employment distribution from the distribution of the expected minimum requirement or percentage value of employment are accentuated. Their formula for calculating their index of specialisation is as follows:

$$S = \Sigma i \quad \frac{(Pi - Mi)^2}{Mi} + \frac{(\Sigma iPi - \Sigma iMi)^2}{\Sigma iMi}$$

where: S is the index of specialisation, i refers to each of the industrial categories or functions, Pi to the percentage value of an urban place's total employment engaged in each of the functions, Mi the expected minimum requirement or percentage value of employment for each function, and Σi the sum of all the functions.

An index value of unity indicates that the excess or basic employment of the urban place is distributed among its functions in the same proportions as is the urban place's expected minimum requirement or percentage value of employment. This is the case of minimum specialisation. As the value of the index increases, specialisation is considered to increase.[3]

The Dominant Functions and Functional Specialisation of New Zealand Urban Places

The dominant and distinctive functions and functional specialisation of each of the 82 New Zealand urban places examined are presented in Appendix D, Tables 7 and 8. While of interest in themselves, the spatial patterns in their structure and distribution that can be derived from this data are of greater geographical significance. Maps and further tables illustrating the distribution of the industrial categories used as dominant and distinctive functions in New Zealand urban places and of urban place functional specialisation

were constructed. In this section the dominant functions and functional specialisation of New Zealand urban places are discussed, while in the following section their distinctive functions are examined.

The spatial patterns of functional dominance and specialisation of New Zealand urban places are shown in Figure 13, while the statistical aspects of these patterns in terms of the inter-island distribution of each of the dominant functions and the relationship between these dominant functions and the functional specialisation of New Zealand urban places are presented in Tables XVII and XVIII. It can be observed in Table XVII that the industrial categories of manufacturing; community, social and personal services; and wholesale and retail trade and restaurants and hotels, dominate the functional structures of New Zealand urban places. These three industrial categories account for 84.2 per cent of the dominant functions and are dominant in 69 of the 82 urban places examined. Three other industrial categories register as dominant functions. Transport, storage and communication is dominant in nine urban places, construction in three, and electricity, gas and water in one. Only financing, insurance, real estate and business services did not register as a dominant function in any New Zealand urban place.

Manufacturing which accounts for 37.8 per cent of the dominant functions and is dominant in 31 primarily non-central urban places was divided into manufacturing I, which is dominant in 14 urban places, and manufacturing II, which is dominant in 17 urban places. Manufacturing I achieves an especially important position in the major urban areas (for example: Central Auckland, Lower Hutt, Christchurch) and in small boroughs engaged in primary processing

TABLE XVII

THE DISTRIBUTION OF DOMINANT FUNCTIONS IN NEW ZEALAND URBAN PLACES, 1971

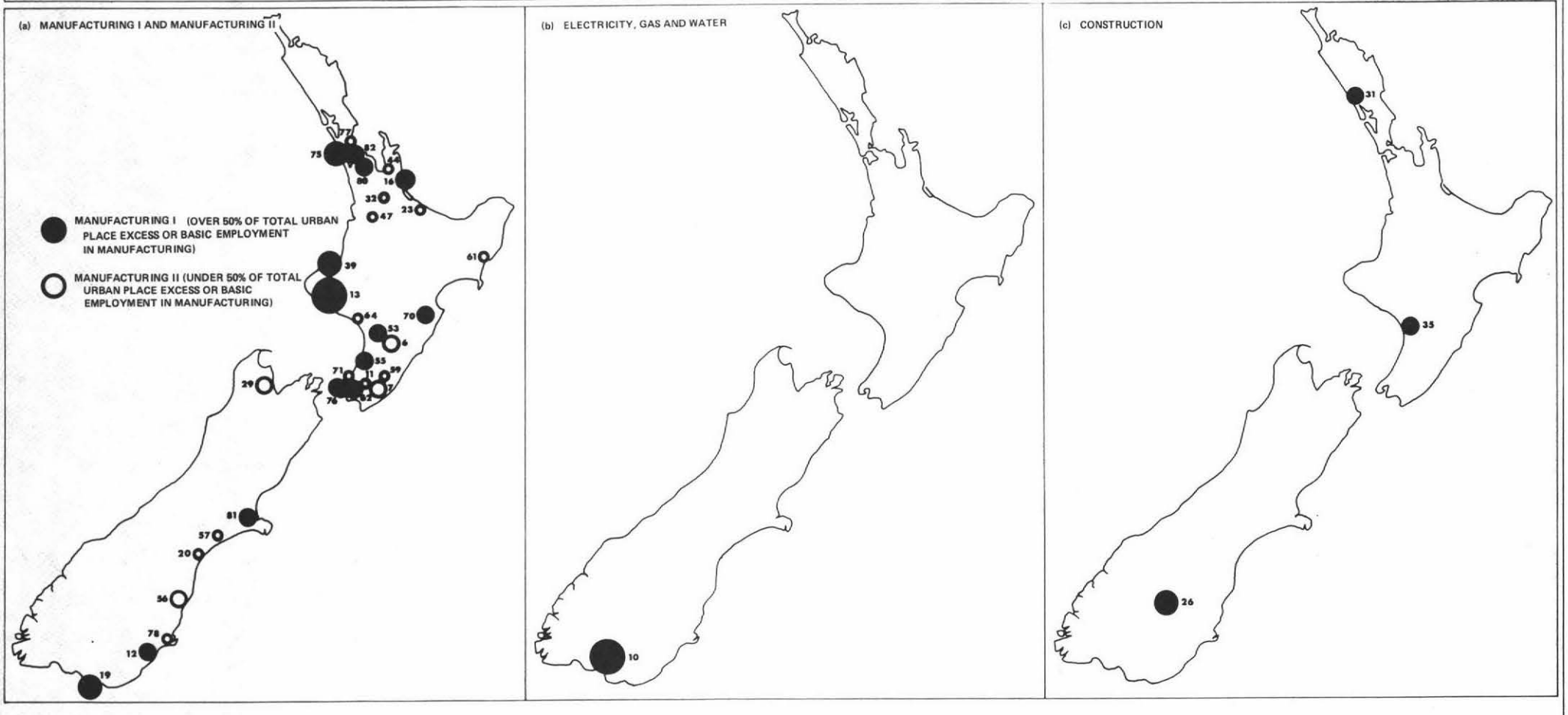
Dominant Industrial Category or Function	North Island		South Island		New Zealand	
	Number	Per cent	Number	Per cent	Number	Per cent
Manufacturing I	11	13.4	3	3.7	14	17.1
Manufacturing II	12	14.6	5	6.1	17	20.7
Electricity, Gas and Water	0	0.0	1	1.2	1	1.2
Construction	2	2.4	1	1.2	3	3.6
Wholesale and Retail Trade and Restaurants and Hotels	11	13.4	6	7.3	17	20.7
Transport, Storage and Communication	7	8.6	2	2.4	9	11.0
Community, Social and Personal Services	16	19.6	5	6.1	21	25.7
Total	59	72.0	23	28.0	82	100.0

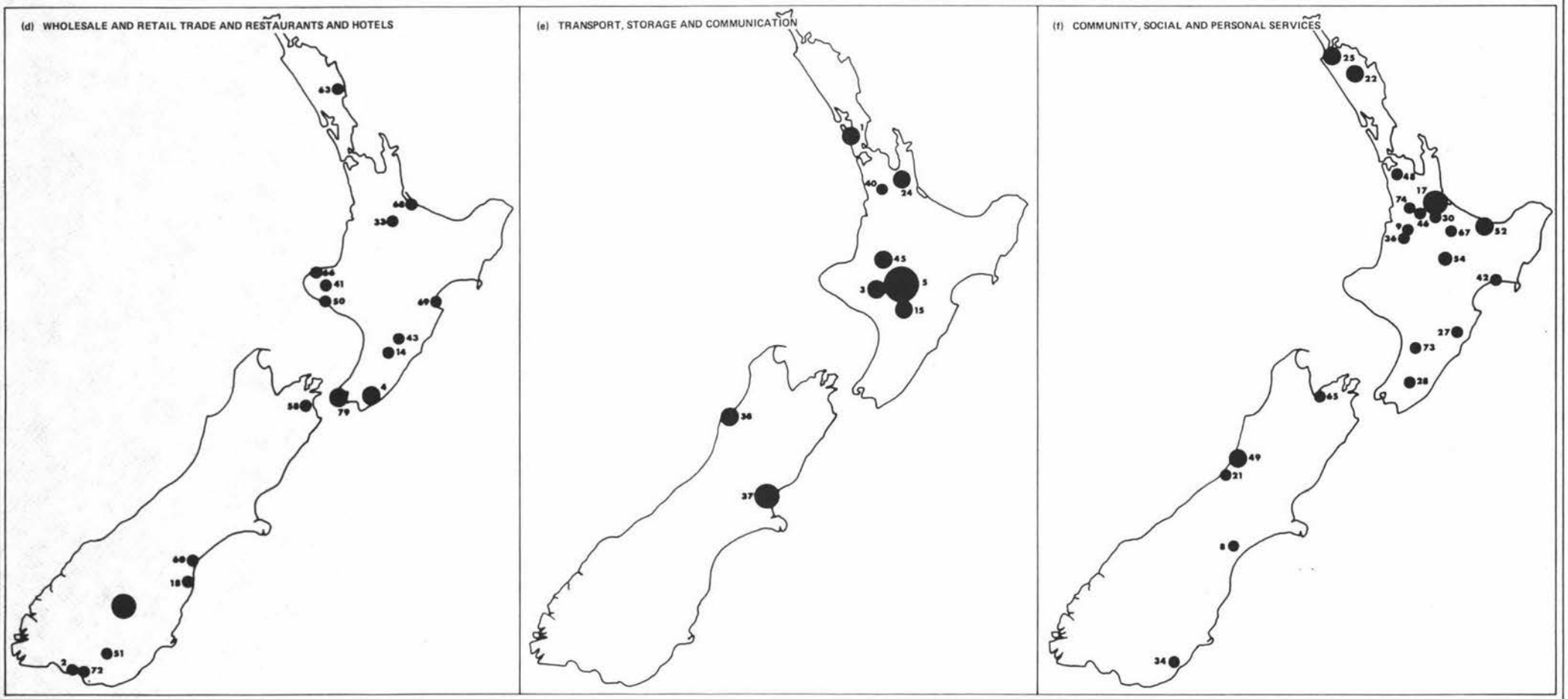
for overseas markets (for example: Waitara, Eltham, Milton). From Table XVIII it can be observed, that these urban places in which manufacturing I is the dominant function, have the highest values of functional specialisation, followed by the three dominant functions of transport, storage and communication; construction; and electricity, gas and water, which tend to characterise the functional structures of small non-central place boroughs.

Many of the urban places with manufacturing II ratings and low values of functional specialisation have also important wholesale and retail trade and restaurants and hotels, and community, social and personal service functions, despite the high rating enjoyed in them

FIGURE 13

THE DOMINANT FUNCTIONS AND FUNCTIONAL SPECIALISATION OF NEW ZEALAND URBAN PLACES, 1971





URBAN PLACE SPECIALISATION INDEXES

SPECIALISATION INDEX VALUES FOR URBAN PLACES RANGE FROM 1.04 TO 47.88

- 8 AND ABOVE
- 4 - 7.99
- 2 - 3.99
- BELOW 2

DOMINANT FUNCTIONS

THE FUNCTION OR INDUSTRIAL CATEGORY WITH THE LARGEST PERCENTAGE VALUE OF TOTAL URBAN PLACE EXCESS OR BASIC EMPLOYMENT IS CONSIDERED THE DOMINANT FUNCTION OF THE URBAN PLACE

SCALE

0 KILOMETRES 500

NOTE: IDENTIFICATION NUMBERS REFER TO INDIVIDUAL NEW ZEALAND URBAN PLACES, SEE FIGURE 11

TABLE XVIII

THE RELATIONSHIP BETWEEN FUNCTIONAL SPECIALISATION AND THE DOMINANT FUNCTIONS OF NEW ZEALAND URBAN PLACES, 1971

Urban Place Functional Specialisation Index Values / Dominant Industrial Category or Function	Below 2	2.00-3.99	4.00-7.99	Above 8
Manufacturing I	0	10	3	1
Manufacturing II	13	4	0	0
Electricity, Gas and Water	0	0	0	1
Construction	0	2	1	0
Wholesale and Retail Trade and Restaurants and Hotels	15	2	0	0
Transport, Storage and Communication	1	6	2	0
Community, Social and Personal Services	16	4	0	1
Total	45	28	6	3

by manufacturing as the dominant function. The fact that many of these urban places, which include the minor urban areas (for example: Gisborne, Wanganui, Masterton) and small boroughs (for example: Te Puke, Woodville, Temuka), have important central place functions suggests that the kind of manufacturing found in them will differ considerably from that of the more specialised manufacturing I urban places. Indeed, Cant and Johnston (1973,30-32) have suggested that these urban places with a manufacturing II rating are mainly concerned with manufacturing from local materials for local markets and with import replacement manufacturing. This kind of manufacturing

reinforces the central place functions of the urban place.

Functional diversification is greatest among the 38 urban places whose functional structures are characterised by the dominant functions of community, social and personal services, and wholesale and retail trade and restaurants and hotels. These dominant functions exist mainly to articulate the flow of goods and services to the hinterlands of such central place urban places. Community, social and personal services accounts for 25.7 per cent of the dominant functions and is dominant in 21 urban places, the majority of which are boroughs (for example, Kaikohe, Te Aroha, Hokitika). Only four urban areas have a dominance of community, social and personal services (Hamilton, Rotorua, Palmerston North, Nelson). Wholesale and retail trade and restaurants and hotels which is dominant in 17 urban places, accounted for 20.7 per cent of the dominant functions and characterised the functional structures of mainly urban areas (for example: Whangarei, Wellington, Invercargill).

Because the industrial categories of manufacturing; community, social and personal services; and wholesale and retail trade and restaurants and hotels, enjoy a position of such overwhelming importance as dominant functions, they tend to blanket many of the distinct and unique features in urban place functional structures. This results in a colourless impression of urban place functional structures. For this reason the distribution patterns of industrial categories as distinctive functions need to be examined to determine the significant or specific functional roles of many urban places.

The Distinctive Functions of New Zealand Urban Places

In this section the main spatial patterns and statistical aspects of the distribution of the distinctive functions for each

New Zealand urban place are identified at a descriptive level of analysis. Tables XIX to XXVII indicate the statistical aspects of the distribution, while Figures 14 to 20 depict the spatial pattern of the urban places ranked in each of the distinctive functions at the Class 1, 2, and 3 levels of functional importance in basic employment. The spatial patterns of the distribution of several of the individual distinctive functions are compared to the comparable distribution patterns derived for New Zealand urban places by Pownall (1953,332-350) (see Appendix F), who said simple percentage deviations from the national arithmetic means or average values as the criteria expressing the relative importance of the seven functions he analysed.

There is a notable tendency in the literature pertaining to functional classification to refer to single function urban places. An analysis of the basic employment structure of New Zealand urban places, however, reveals that this characteristic appears to be more the exception than the rule. In Table XIX it can be observed that all New Zealand urban places have at least one distinctive function of national significance, with only four per cent or the urban places actually specialising in one distinctive industrial category of functional importance. Although the remaining 96 per cent of New Zealand urban places (compared to Pownall's 85 per cent) have more than one distinctive function it is more convenient to systematically classify each urban place by individual distinctive functions, so that an urban place with several distinctive functions will be classified in several different sections. For presenting the results of this classification therefore, individual distinctive functions are mapped, tabulated, and discussed, but only in certain

TABLE XIX

THE DISTRIBUTION OF NEW ZEALAND URBAN PLACES ACCORDING TO THE NUMBER AND PER CENT OF DISTINCTIVE FUNCTIONS BY DISTINCTIVE INDUSTRIAL CATEGORIES OF FUNCTIONAL IMPORTANCE , 1971

Distinctive Industrial Category of Functional Importance	Urban Places in Distinctive Industrial Categories of Functional Importance		Urban Places with one distinctive function		Urban Places with two distinctive functions		Urban Places with three or more distinctive functions	
	Number in Urban Places examined	Per cent of Urban Places examined	Number in Urban Places examined	Per cent of Urban Places examined	Number in Urban Places examined	Per cent of Urban Places examined	Number in Urban Places examined	Per cent of Urban Places examined
Manufacturing	31	38	7	23	8	26	16	51
Electricity, Gas and Water	24	29	0	0	1	4	23	96
Construction	40	49	0	0	5	13	35	77
Wholesale and Retail Trade and Restaurants and Hotels	40	49	1	2	5	13	34	85
Transport, Stoage and Communication	33	40	1	2	3	9	29	89
Financing, Insurance, Real Estate and Business Services	43	52	0	0	0	0	43	100
Community, Social and Personal Services	43	52	0	0	4	9	39	91
Total Distinctive Industrial Categories of Functional Importance in 82 Urban Places examined	254	100	9	4	26	10	219	86

instances will they refer to clear-cut cases of single function urban places. The statistical aspects of the functional structure of each urban place as a whole, however, are presented in Appendix D, Table 8.

Manufacturing as a Distinctive Function

Manufacturing ranks sixth in New Zealand urban places as a distinctive function with 38 per cent of the urban places coming within this classification (Table XIX). It can be observed from Table XX that 80.7 per cent of the urban places with manufacturing as a distinctive function are located in the North Island, confirming its importance with respect to this particular function. Nearly 55 per cent of these urban places were small boroughs.

Figure 14 indicates that urban places with manufacturing as a distinctive function are concentrated in two main areas and dispersed in four minor areas. The two largest and most important groupings are in the North Island, centred on the urban areas of Auckland and on the urban areas of Wellington-Hutt, with an extension of the latter incorporating the urban places in the Wairarapa. The four minor groupings of urban places in which manufacturing is a distinctive function are located in South Auckland, Taranaki, Wanganui-Manawatu, and along the east coast of the South Island from Christchurch to Bluff. Powmall (1953,340) noted a similar spatial pattern in the distribution of the urban places which have manufacturing as a dinstinctive function, with the exceptions of the Auckland area which he did not consider significant in terms of manufacturing, and the Taranaki area which he identified as being the largest and most striking grouping. These differences between the two classifications are indicative of two trends which have

FIGURE 14

THE DISTRIBUTION OF MANUFACTURING AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

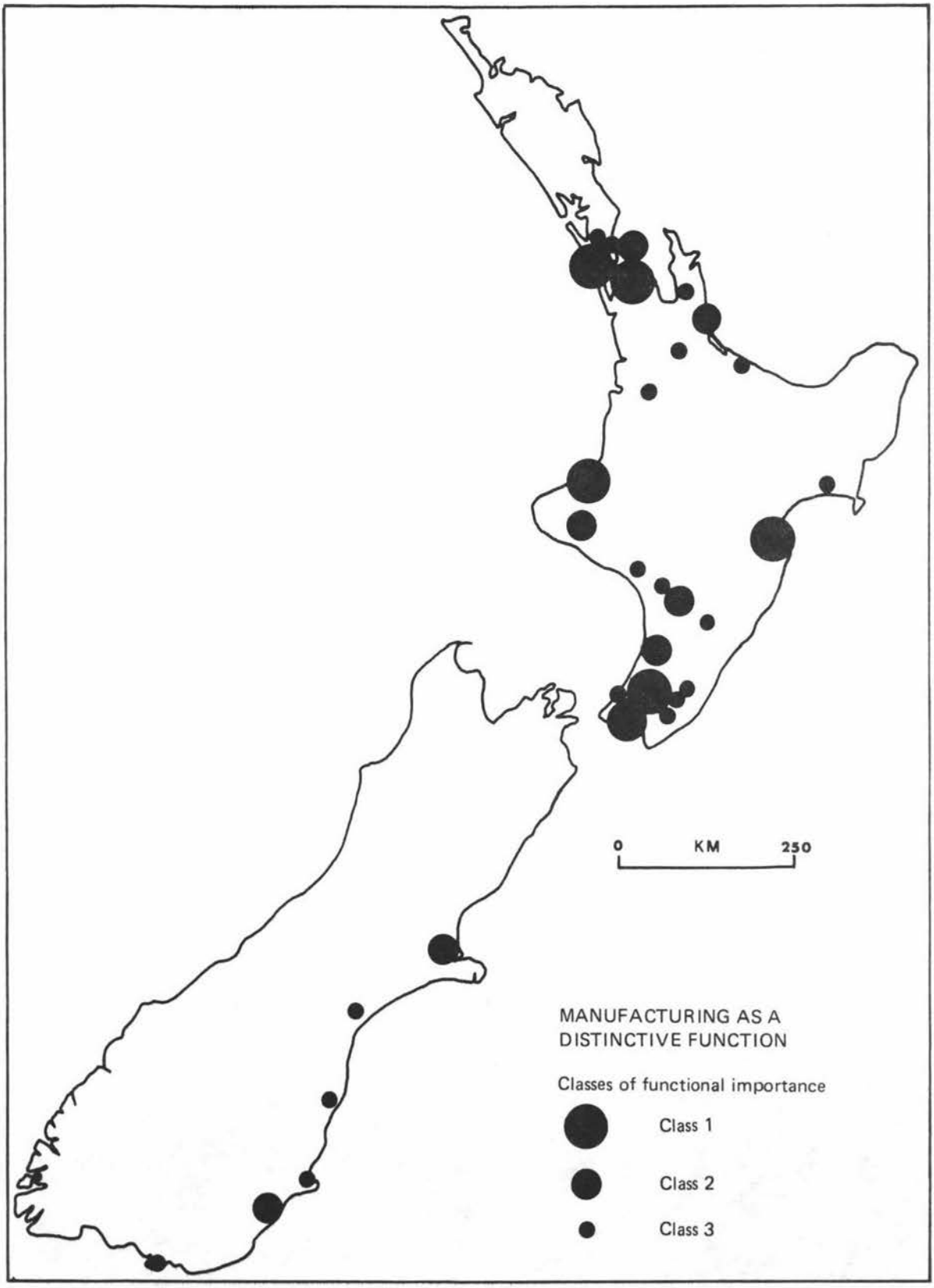


TABLE XX

THE DISTRIBUTION OF MANUFACTURING AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

Dinstinctive Classes of Functional Importance	North Island		South Island		New Zealand	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
1	6	19.4	0	0.0	6	19.4
2	5	16.1	2	6.5	7	22.6
3	14	45.2	4	12.8	18	58.0
Total	25	80.7	6	19.3	31	100.0

have influenced manufacturing in the period 1953 to 1975. First, the emergence of manufacturing as an important element in the New Zealand employment structure in recent decades (Cant and Johnston, 1973,16), and its associated concentration of growth in Auckland, which has given this area control over the whole country (Hampton, 1968,41-55). Second, the adoption of bulk collection by milk tankers and the economic rationalisation of the structure and organisation of the dairy industry in New Zealand (Rowlands, 1971,158-163), which has resulted in a tendency towards fewer larger factories; this has been to the economic benefit of a few urban places in the Taranaki area, but to the detriment of many others.

Powmall (1953,340) noted in his study

> "the complete absence of manufacturing towns on the West Coast of the South Island and the relative lack of importance of similar towns on the North Island's east coast."

Figure 14 shows a similar relative lack of importance of manufacturing as a distinctive function in the urban places of Eastland, with the

one exception of Hastings, and its complete absence in the urban places of not only Westland, but also Nelson-Marlborough, the Volcanic Plateau and Northland.

By comparison with the other distinctive functions, the urban places with manufacturing as a distinctive function tend to be more specialised. For not only do they have the largest proportion performing only one distinctive function (Table XIX), but also the highest percentage of ratings in Class 1 of functional importance (Table XX). The number of distinctive funtions performed by urban places with manufacturing as a distinctive function, and the class of functional importance in which manufacturing is rated in these urban places, is related to the type of urban places into which they may be further classified. Four different categories of urban places with manufacturing as a distinctive function might be suggested tentatively:

1. Urban areas with a diversity of industries but highly specialised in manufacturing as a distinctive function (for example: Central Auckland, Hastings, Lower Hutt, Christchurch).
2. Urban areas with a diversity of industries but not highly specialised in manufacturing as a distinctive function (for example: Northern Auckland, Masterton, Porirua, Dunedin).
3. Boroughs with a diversity of industries but not highly specialised in manufacturing as a distinctive function (for example: Te Awamutu, Te Puke, Featherston, Ashburton).
4. Boroughs often with only a single major industry which

are highly specialised in manufacturing, especially the processing of primary produce (for example: Waitara, Eltham, Milton, Bluff).

Electricity, Gas and Water as a Distinctive Function

Twenty-nine per cent of New Zealand urban places have electricity, gas and water as a distinctive function (Table XIX). This industrial category is, thus, the smallest distinctive functional category. It can be observed in Table XXI that the urban places with this particular distinctive function are reasonably evenly distributed between the North and South Islands, although there is a slight North Island predominance. However, the 41.7 per cent of the urban places with this distinctive function in the South Island represented the largest proportion of all the categories of distinctive functions performed by South Island urban places.

The urban places in this distinctive functional category tend to be predominantly multi-functional, with 79.2 per cent having a Class 3 rating of functional importance (Table XXI) and 96 per cent performing three or more distinctive functions. Nearly 90 per cent of these urban places were boroughs, four of which have a Class 1 rating of functional importance (Winton, Eltham, Alexandra, Te Aroha).

Furthermore, the urban places with electricity, gas and water as a distinctive function are less concentrated than the urban places with any other distinctive function (Figure 15). The only minor grouping of significance being in the Otago-Southland region and in the Wairarapa-Southern Hawkes Bay area. Although most of the other urban places in this distinctive function category are dis-

FIGURE 15

THE DISTRIBUTION OF ELECTRICITY, GAS AND WATER AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

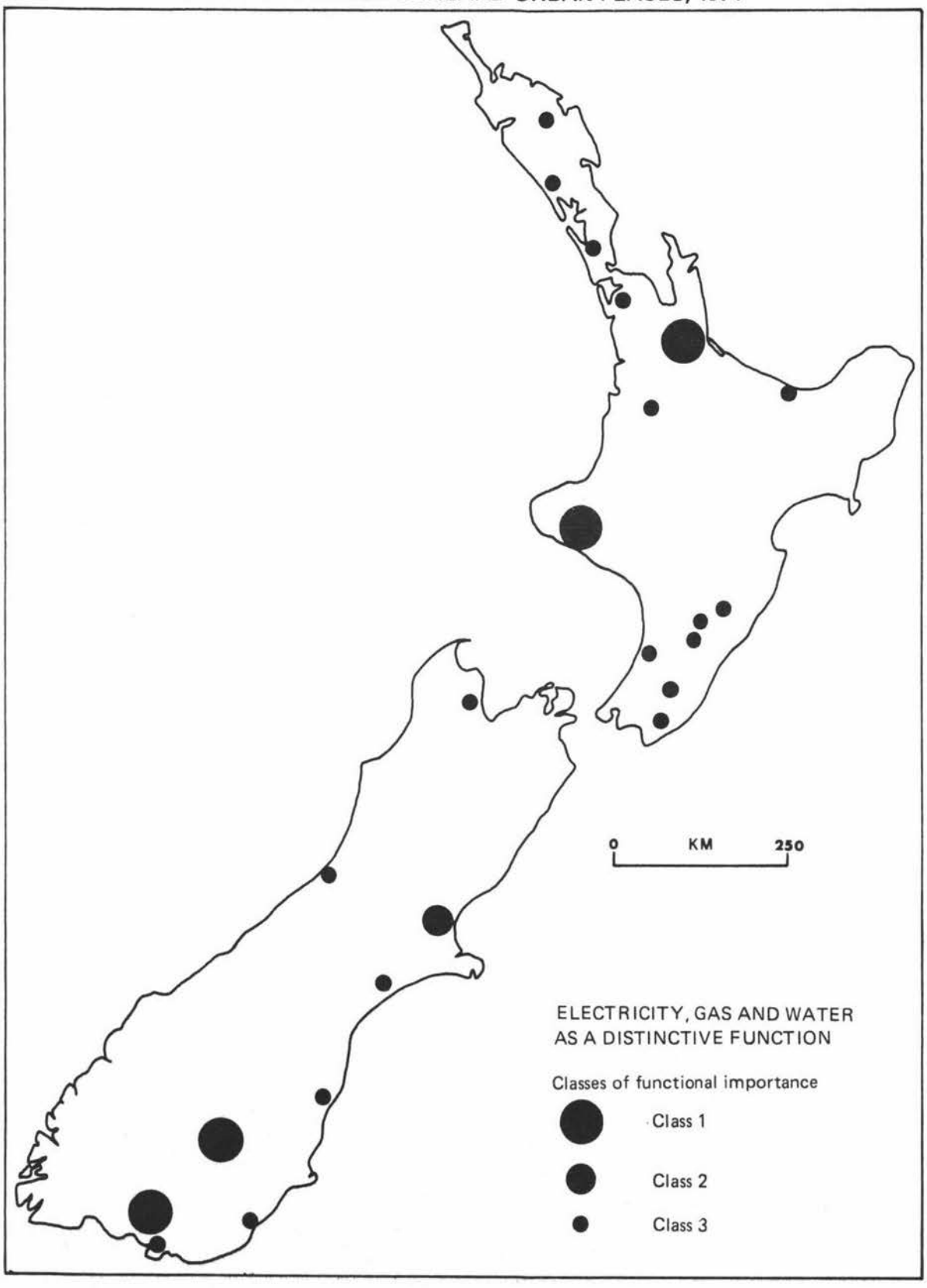


TABLE XXI

THE DISTRIBUTION OF ELECTRICITY, GAS AND WATER AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

Distinctive classes of functional importance	North Island		South Island		New Zealand	
	Number	Per cent	Number	Per cent	Number	Per cent
1	2	8.3	2	8.3	4	16.6
2	0	0.0	1	4.2	1	4.2
3	12	50.0	7	29.2	19	79.2
Total	14	58.3	10	41.7	24	100.0

persed, there is a complete absence of such urban places in Eastland, Hawkes Bay, the Volcanic Plateau, and Marlborough.

Construction as a Distinctive Function

Forty-nine percent of New Zealand urban places have construction as a distinctive function (Table XIX). Table XXII shows that 70 per cent of the urban places in this distinctive functional caregory are located in the North Island, which is to be expected from the relative distribution of urban places studied in each island. Eighty-five per cent of these urban places were boroughs. Indeed, it is noticeable in Figure 16 that construction as a distinctive function is not associated with any of the major urban areas.

The urban places with construction as a distinctive function tend to be multi-functional, with 70 per cent having a Class 3 rating of functional importance (Table XXII) and 77 per cent performing three of more distinctive functions (Table XIX).

FIGURE 16

THE DISTRIBUTION OF CONSTRUCTION AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

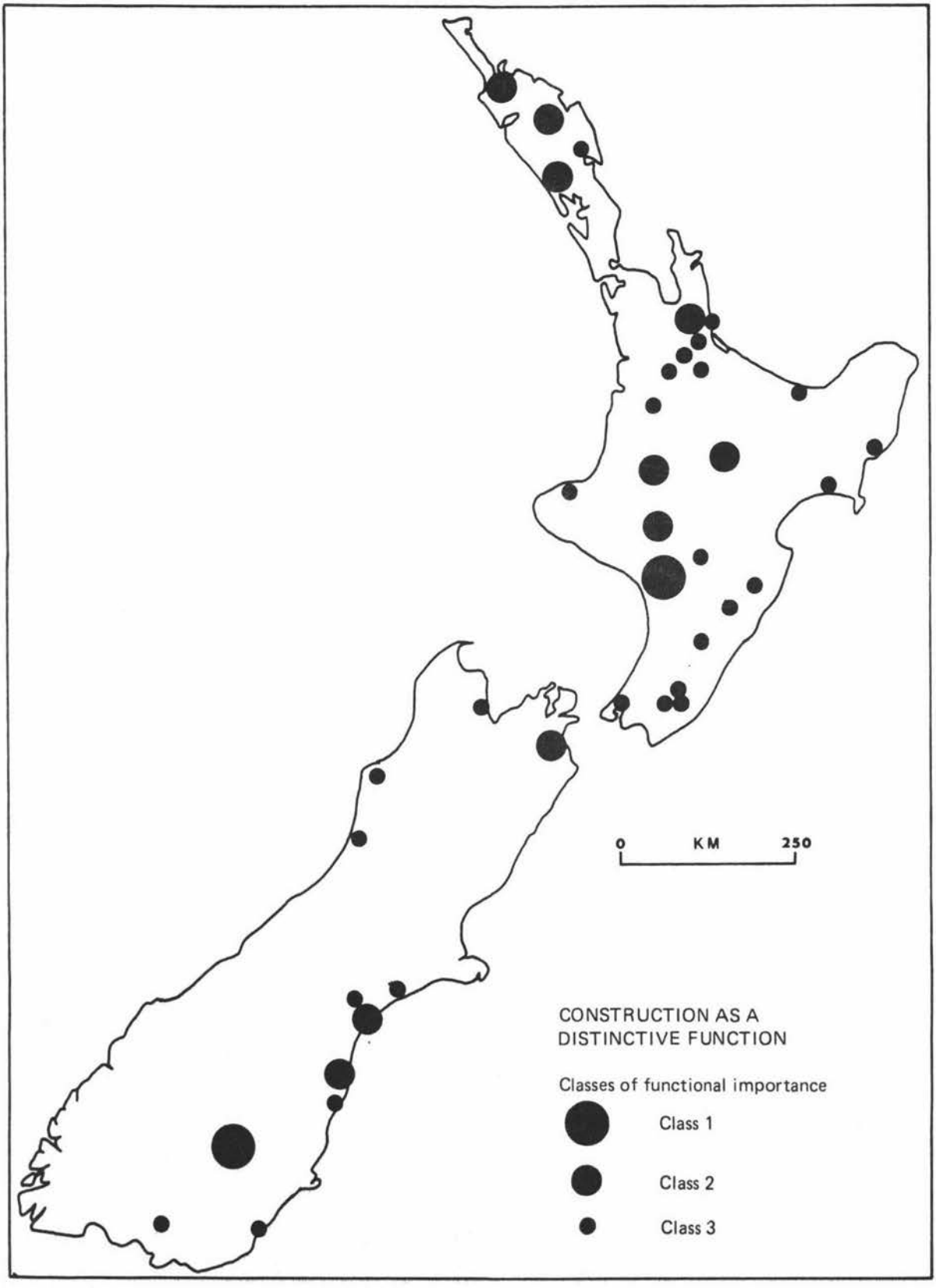


TABLE XXII

THE DISTRIBUTION OF CONSTRUCTION AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

Distinctive classes of functional importance	North Island		South Island		New Zealand	
	Number	Per cent	Number	Per cent	Number	Per cent
1	1	2.5	1	2.5	2	5.0
2	7	17.5	3	7.5	10	25.0
3	20	50.0	8	20.0	28	70.0
Total	28	70.0	12	30.0	40	100.0

Figure 16 shows that the urban places in this distinctive functional category are located in five major and three minor groupings. The largest and most striking groupings are in Northland, the Hauraki Plains, along the North Island Main Trunk Railway route from Marton to Te Kuiti, the Wairarapa-Southern Hawkes Bay area, and South Canterbury. Smaller groupings are apparent in Eastland, Westland and Otago-Southland.

Wholesale and Retail Trade and Restaurants and Hotels as a Distinctive Function

The statistical aspects of the distribution of urban places with wholesale and retail trade and restaurants and hotels as a distinctive function are almost identical to those of construction. Forty-nine per cent of New Zealand urban places are included in this distinctive functional category (Table XIX), of which 70 per cent are located in the North Island (Table XXIII). Although 60 per cent of these urban places are boroughs, many urban areas have wholesale and retail trade and restaurants and hotels as a distinctive function.

FIGURE 17

THE DISTRIBUTION OF WHOLESALE AND RETAIL TRADE AND RESTAURANTS AND HOTELS AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

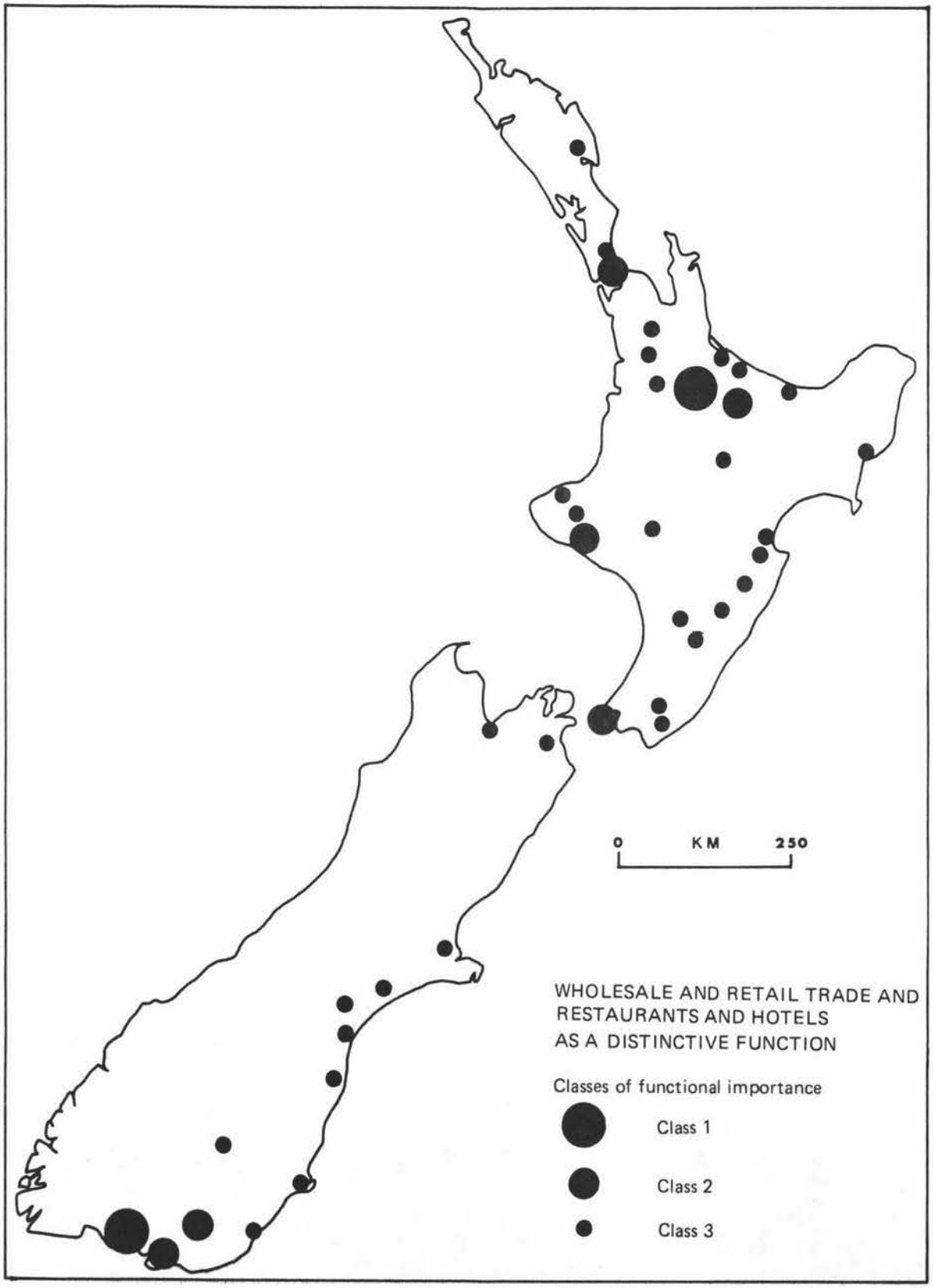


TABLE XXIII

THE DISTRIBUTION OF WHOLESALE AND RETAIL TRADE AND RESTAURANTS AND HOTELS AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

Distinctive classes of functional importance	North Island		South Island		New Zealand	
	Number	Per cent	Number	Per cent	Number	Per cent
1	1	2.5	1	2.5	2	5.0
2	4	10.0	2	5.0	6	15.0
3	23	57.5	9	22.5	32	80.0
Total	28	70.0	12	30.0	40	100.0

The urban places in this distinctive functional category tend to be multi-functional, with 80 per cent having a Class 3 rating of functional importance (Table XXIII) and 85 per cent performing three or more distinctive functions.

The spatial pattern of the distribution of urban places in this distinctive functional category reveals four major and three minor groupings (Figure 17). The largest groupings are in South Auckland-Bay of Plenty, Hawkes Bay, South Canterbury, and Southland-Otago, which are important agricultural areas. One of the primary economic roles of urban places in this distinctive functional category therefore, is to act as central place locales for the articulation of goods and services to their hinterlands. The three minor groupings include Taranaki, Wellington and Auckland. The complete absence of wholesale and retail trade and restaurants and hotels as a distinctive function in the urban places of Westland and its lack of relative importance in the urban places of Manawatu-Wanganui, Eastland and Northland are as pronounced as the distributions which have already

been noted.

Transport, Storage and Communication as a Distinctive Function

Forty per cent of New Zealand urban places have transport, storage and communication as a distinctive function, of which 69.7 per cent are located in the North Island. These urban places vary in population size from Wellington, the third largest urban area, to Helensville, the smallest borough examined. The most important urban places in this distinctive functional category however, are the boroughs with a population of less than 10,000, which constitute 73 per cent of the urban places in this category.

The urban places with transport, storage and communication as a distinctive function are multi-functional, with 72.7 per cent having a Class 3 rating of functional importance (Table XXIV) and 89 per cent performing three or more functions (Table XIX).

The two main concentrations of urban places with transport, storage and communication as a distinctive function, do not correspond with the general distribution of population, but are located on the Hauraki Plains and as Pownall (1953,342) noted,

> "near the centre of the North Island along the Main Trunk Railway where towns are small and rural population is sparse."

Two minor groupings are also apparent in Figure 18 in Northland and Westland, together with several important isolated or paired urban places having this particular distinctive function, namely Helensville, Napier, Wellington, Blenheim, Rangiora, and Timaru and Geraldine, and Invercargill and Bluff. The almost complete absence of transport, storage and communication as a distinctive function in urban areas generally, and in the urban places on the North Island's east coast

FIGURE 18

THE DISTRIBUTION OF TRANSPORT, STORAGE AND COMMUNICATION AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

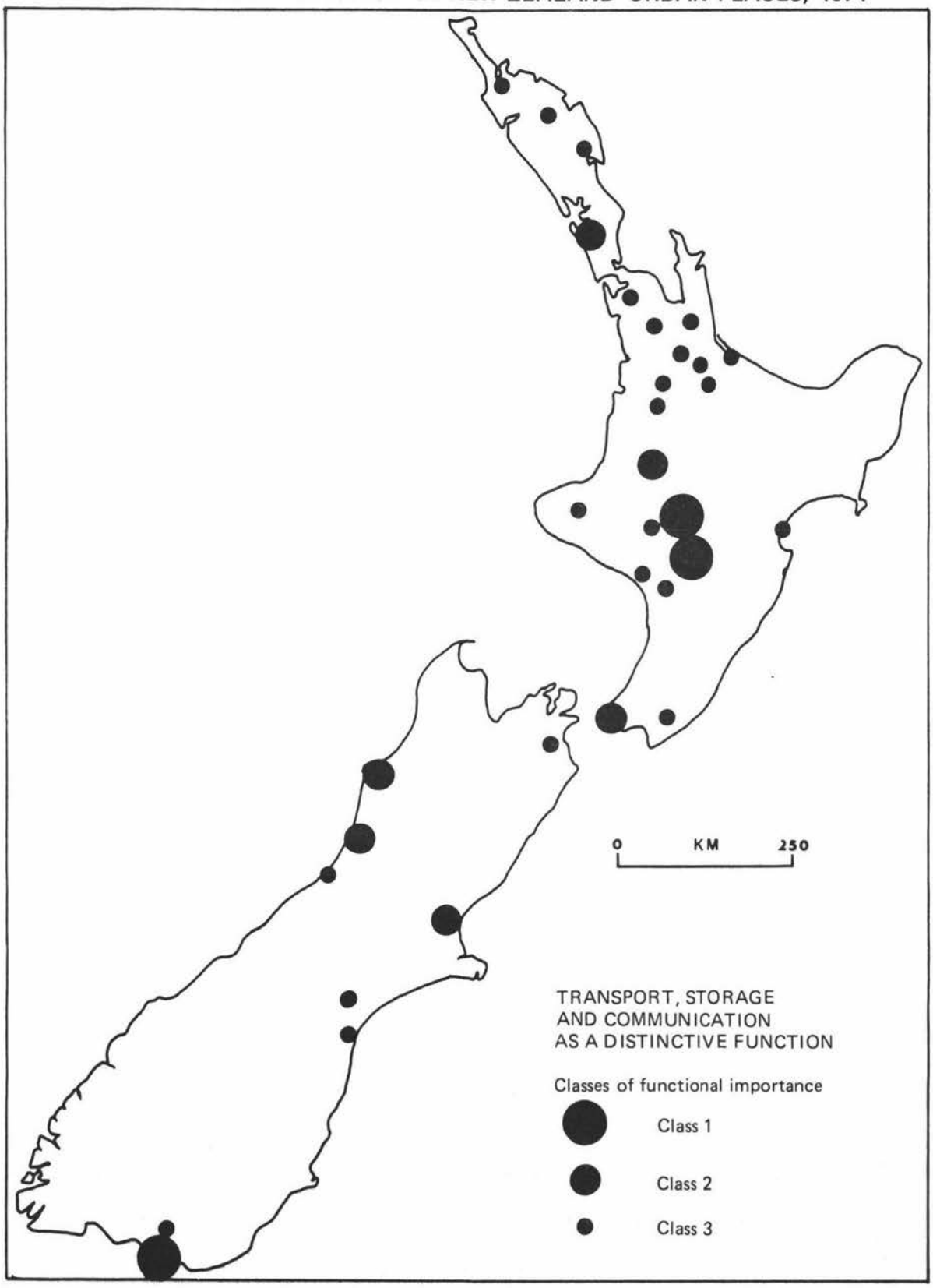


TABLE XXIV

THE DISTRIBUTION OF TRANSPORT, STORAGE AND COMMUNICATION AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

Distinctive classes of functional importance	North Island		South Island		New Zealand	
	Number	Per cent	Number	Per cent	Number	Per cent
1	2	6.1	1	3.0	3	9.1
2	3	9.1	3	9.1	6	18.2
3	18	54.5	6	18.2	24	72.7
Total	23	69.7	10	30.3	33	100.0

are equally as striking as the distributions which have been mentioned.

Financing, Insurance, Real Estate and Business Services as a Distinctive Function

The spatial pattern and statistical aspects of the distribution of urban places having financing, insurance, real estate and business services as a distinctive function correspond very closely to those obtained by Pownall (1953,343-345) for his functional class of distribution and financial towns. In both studies this distinctive functional category is one of the two largest distinctive functional categories numerically, and includes 52 per cent of New Zealand urban places (Table XIX).

The urban placesin this distinctive functional category tend to be exclusively multi-functional, with 88.4 per cent having a Class 3 rating of functional importance (Table XXV) and all the urban places performing three or more distinctive functions. This

TABLE XXV

THE DISTRIBUTION OF FINANCING, INSURANCE, REAL ESTATE AND BUSINESS SERVICES AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

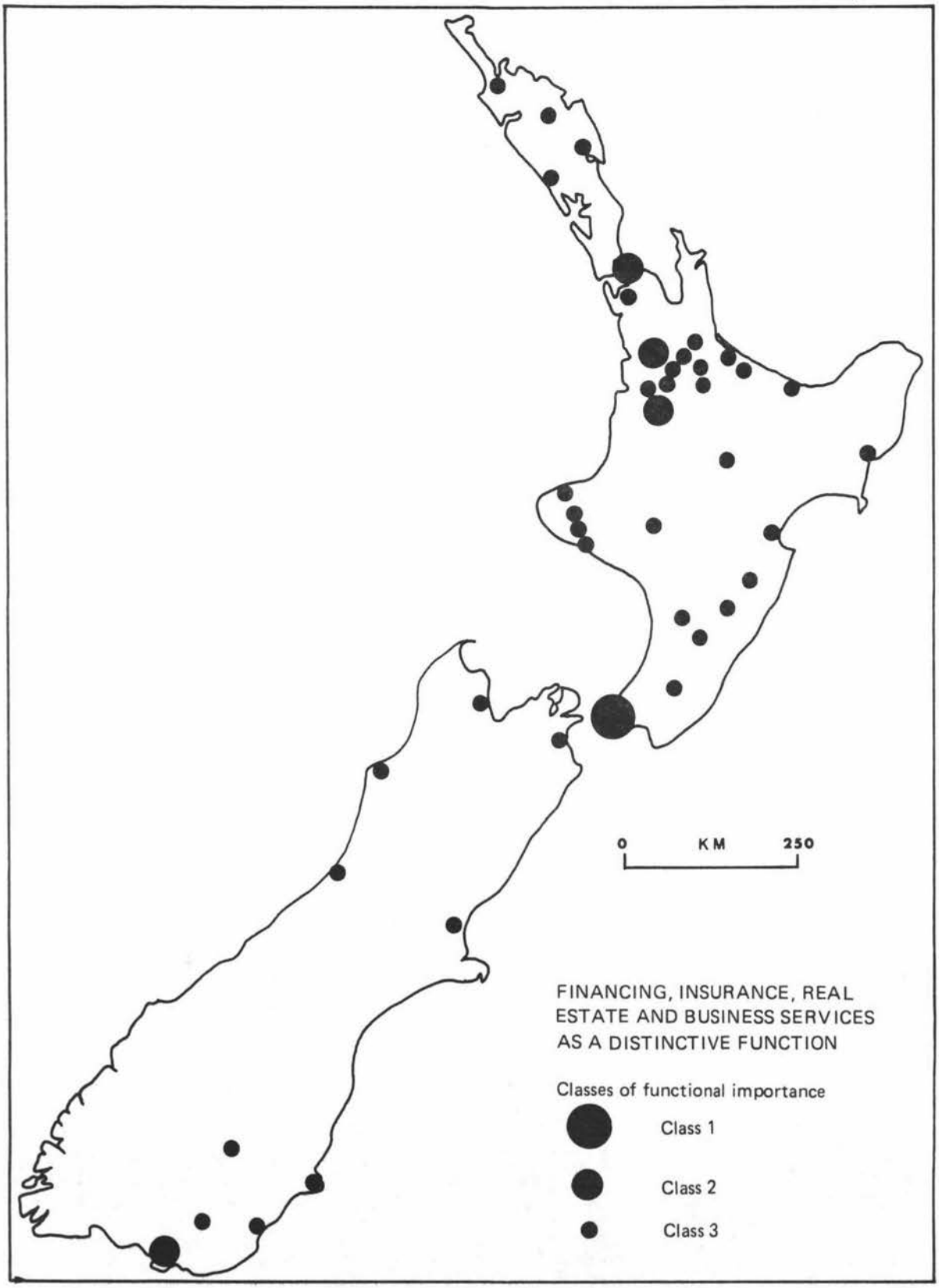
Distinctive classes of functional importance	North Island		South Island		New Zealand	
	Number	Per cent	Number	Per cent	Number	Per cent
1	1	2.3	0	0.0	1	2.3
2	3	7.0	1	2.3	4	9.3
3	29	67.4	9	21.0	38	88.4
Total	33	76.7	10	23.3	43	100.0

corresponds closely with Pownall's figures of 96 per cent of the urban places having small positive deviations from the national arithmetic mean values for the functional class of distribution and financial, and 94 per cent performing three or more functions of importance.

The spatial pattern of distribution of urban places in this distinctive functional category is also clearly comparable with Pownall's findings in two respects: first, 76.7 per cent of the urban places in this category are located in the North Island compared to the 79 per cent derived by Pownall (1953,344), and, second, the three major groupings of urban places in this category identified by Pownall (1953,344-345) are included in the five groupings identified in Figure 19. These five groupings of urban places having financing, insurance, real estate and business services as a distinctive function are located in Northland, Waikato-Bay of Plenty, Taranaki, Hawkes Bay-Wairarapa, and Southland. Most of the remaining regions of New Zealand have regional centres of some

FIGURE 19

THE DISTRIBUTION OF FINANCING, INSURANCE, REAL ESTATE AND BUSINESS SERVICES AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971



importance, such as Palmerston North in the Manawatu-Wanganui area and Gisborne in Eastland. Auckland and Wellington are also represented in this distinctive functional category, with Wellington having a Class 1 rating of functional importance. This is to be expected for almost all the major companies and banks have offices in Wellington because of its central location and its importance as the seat of government.

Community, Social and Personal Services as a Distinctive Function

One of the two largest distinctive functional categories numerically is community, social and personal services, which include 52 per cent of New Zealand urban places (Table XIX). Eighty-four per cent of these urban places are located in the North Island (Table XXVI). Figure 20 reveals that the urban places in this distinctive functional category are dispersed fairly evenly throughout the North Island with no easily discernible groupings. The South Island is noticeable by the relative lack of importance of this distinctive function in its urban places.

The urban places with community, social and personal services as a distinctive function tend to be highly multi-functional, with 62.8 per cent having a Class 3 rating and the remaining 30.2 per cent having a Class 2 rating of functional importance (Table XXVI) and 91 per cent performing three or more distinctive functions. Nearly 80 per cent of these urban places are boroughs, which are the most important centres in this distinctive functional category, along with the regional urban areas such as Hamilton, Rotorua, Palmerston North, and Nelson.

FIGURE 20

THE DISTRIBUTION OF COMMUNITY, SOCIAL AND PERSONAL SERVICES AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

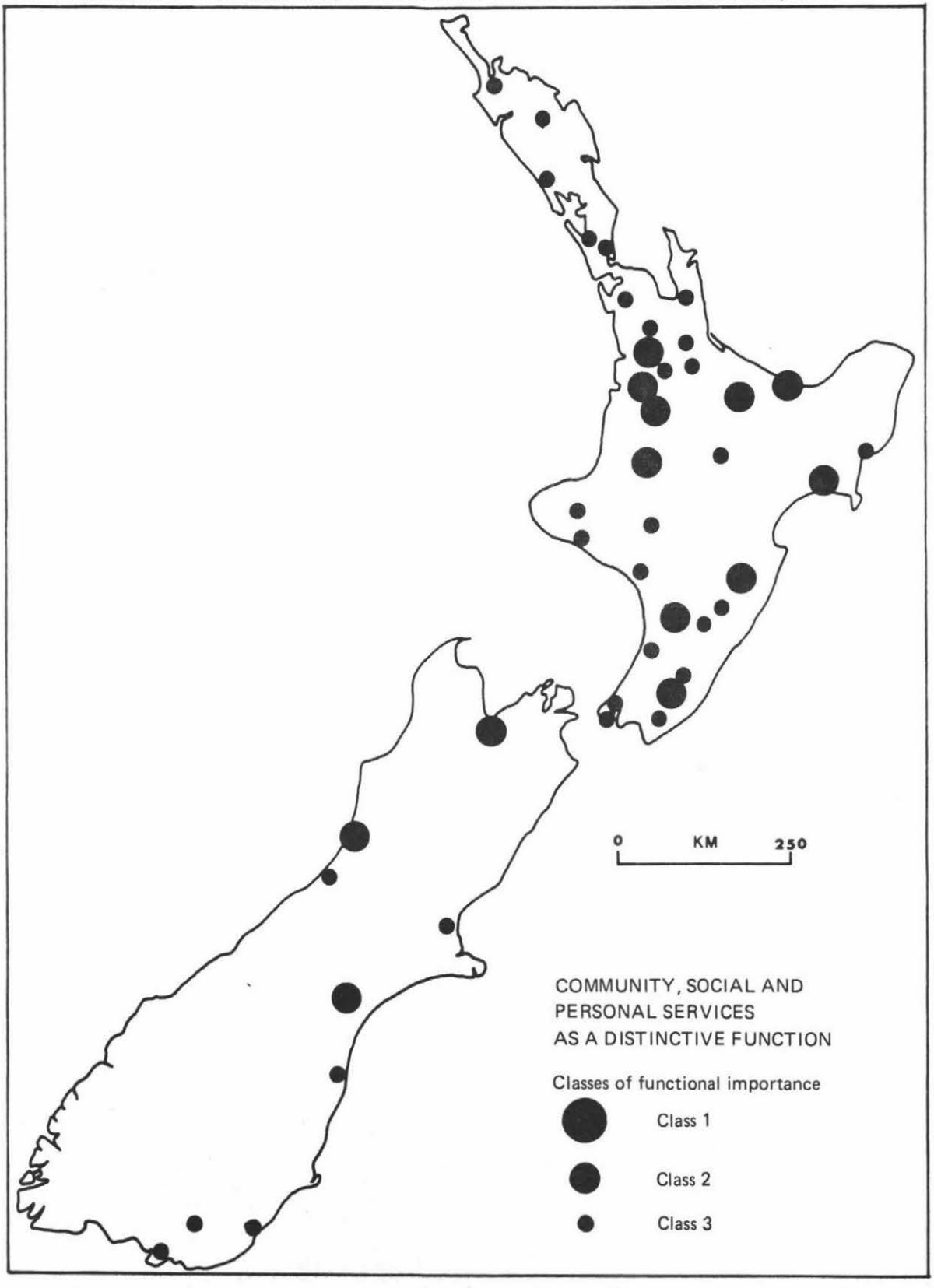


TABLE XXVI

THE DISTRIBUTION OF COMMUNITY, SOCIAL AND PERSONAL SERVICES AS A DISTINCTIVE FUNCTION IN NEW ZEALAND URBAN PLACES, 1971

Distinctive classes of functional importance	North Island		South Island		New Zealand	
	Number	Per cent	Number	Per cent	Number	Per cent
1	0	0.0	0	0.0	0	0.0
2	11	25.6	2	4.6	13	30.2
3	25	58.1	5	11.7	30	69.8
Total	36	83.7	7	16.3	43	100.0

Conclusion

In this section the functional structures of New Zealand urban places, defined in terms of basic employment and delineated on the basis of the second variant of the minimum requirements method, have been characterised and classified in order to obtain an overview of the New Zealand urban scene. Each urban place's dominant function, its distinctive functions, and its degree of functional specialisation have been determined to achieve this end in a similar manner to Maxwell's (1965,79-104) functional classification of Canadian cities. The results of this functional classification have been presented in tabular and cartographic form, discussed in terms of their spatial patterns and statistical aspects, and compared with several of the functional classes derived by Pownall (1953,332-350) in his earlier functional classification of New Zealand towns. The overview gained from these results indicates the multi-functional basic character of the functional structure of New Zealand urban places.

Although the urban places of both islands are predominantly

multi-functional, urban places in the North Island have a higher proportion with three or more distinctive functions (North Island 72 per cent, South Island 65 per cent) and of single function urban places (North Island 12 per cent, South Island 9 per cent), while the South Island has a greater percentage of dual function urban places (South Island 26 per cent, North Island 16 per cent).

The distinctive functions represented in the functional structures of New Zealand urban places, which are rated in terms of their importance in an urban place's functional structure relative to their importance in the functional structures of all the urban places examined, are mainly in Class 3 of functional importance, which accounted for 74 per cent of the distinctive functions. The distribution of distinctive functions in the urban places of both islands indicates that the urban places of the North Island have a slightly higher proportion of distinctive functions with a Class 3 rating of functional importance (North Island 75 per cent, South Island 72 per cent), that those of the South Island have a slightly higher percentage with a Class 2 rating of functional importance (South Island 21 per cent, North Island 18 per cent), and that the urban places of both islands have seven per cent of their distinctive functions with a Class 1 rating of functional importance.

Finally, it can be observed in Table XXVII that there is a disproportionate distribution between the two islands of urban places in the same distinctive functional category. Although the North Island has 72 per cent of the urban places examined, it has a disproportionately large percentage of urban places having community, social and personal services; manufacturing; and financing, insurance, real estate and business services as distinctive functions.

TABLE XXVII

THE DISTRIBUTION OF NEW ZEALAND URBAN PLACES ACCORDING TO THE NUMBER AND PER CENT OF URBAN PLACES BY DISTINCTIVE INDUSTRIAL CATEGORIES OF FUNCTIONAL IMPORTANCE, 1971

Distinctive Industrial Category of Functional Importance	North Island		South Island	
	Number	Per cent	Number	Per cent
Manufacturing	25	80.7	6	19.3
Electricity, Gas and Water	14	58.3	10	41.7
Construction	28	70.0	12	30.0
Wholesale and Retail Trade and Restaurants and Hotels	28	70.0	12	30.0
Transport, Storage and Communication	23	69.7	10	30.3
Financing, Insurance, Real Estate and Business Services	33	76.7	10	23.3
Community, Social and Personal Services	36	83.7	7	16.3
Total Distinctive Industrial Categories of Functional Importance in 82 Urban Places examined	187	74.0	67	26.0

The urban places of the South Island have a disproportionately large percentage only of electricity, gas and water as a distinctive function, while the other three distinctive functions and the total distinctive functions are divided between the two islands in approximately normal ratios.

Footnotes

1. For a detailed review and discussion of these classifications, see Berry and Horton (1970,106-149), Murphy (1966,113-129),

Smith (1965,539-548), Yeates and Garner (1971,59-87).

2. Alexandersson (1956) in his analysis of the industrial structure of United States cities used the fifth percentile or K value to classify these cities in terms of their functional specialisation. The determined K value for a particular industrial category was subtracted from the actual total employment in that industrial category in each of the cities analysed. If the remainder or surplus was 5.0-9.9 per cent of the actual total employment in the industrial category in a city, that city qualified as a C-town in the industrial category, 10.0-19.9 per cent made it a B-town, and more than 20 per cent placed it in the category of an A-town for the industrial category. The same technique was applied for each of the 36 manufacturing and service industrial categories that Alexandersson analysed. Naturally, the K value was different for each of the industrial categories, though in each industrial category it was the percentage value of employment dividing the lowest 43 (or 5 per cent) of the 864 cities examined from the remainder in a ranked array for the given industrial category.

According to Alexandersson's classification, many cities could achieve A, B, or C status in several industrial categories, while some do not attain sufficiently high employment in any industrial category to merit classification as economically specialised cities. Thus Hartford, Connecticut, ranks as a B-town in finance and in machinery production and as a C-town in the manufacture of transportation equipment. Los Angeles, on the other hand, does not attain sufficiently high employment

in any industrial category to merit classification as an economically specialised city. Zelinsky (1957,275), in a review of Alexandersson's study, pointed out that Alexandersson would have been better to follow Harris' (1943,86-99) lead and classify such cities as diversified.

Though he did not cartographically illustrate the distribution and structure of all the 36 industrial categories, Alexandersson present maps of city functional specialisation in a number of different industrial categories. As Nash (1958,47) in his review of Alexandersson's study indicated, the study

> "is basically a cartographic interpretation of statistics..... the point of view is geographic throughout, with strong emphasis on patterns of distribution."

Davies and Young (1969,19-37) have applied Alexandersson's method of functional classification together with Nelson's (1955,189-210) method to the functional classification of South African cities.

3. For further discussion of Ullman and Dacey's index of specialisation, see Bahl, Firestine and Phares (1971,414-425), Marshall (1973), Parr (1965,21-25), Ullman and Dacey (1960,189-191).

CHAPTER 6

CONCLUSION

Because each chapter contains a conclusion of the points made in it, it is felt necessary to include only a brief summation of a number of observations made throughout this present study, pertaining to the value of the economic base concept and the second variant of the minimum requirements method in the study of New Zealand urban places.

The basic-nonbasic dichotomy inherent in the economic base concept provides a meaningful type of analysis of the functions performed by urban places. Such an analysis represents the first spatial breakdown - between internal and external - in the study of urban places, and permits the functions performed by urban places to be classified according to their specific spatial relationships (those with their areal sources of demand). As Borchert and de Smidt (1967,65) pointed out, this type of analysis provides

> "an insight into the functional structure of a town or region, and it is in this respect of greater importance than the official industrial classifications which are mainly of a technical-economic nature, or, in other words, which role does a certain activity play in the economic structure and which contribution does it make to the economic growth?"

Although the basic and nonbasic functions are closely interrelated in reality, there is justification for focussing attention on the basic functions. It is these functions that identify the raison d'etre of an urban place and reveal the functional relationships that exist between the urban place and its hinterland

and/or its foreland. By reference to these basic functions the functional structure of an urban place can be better identified in terms of their economic specialisation. The basic functions therefore provide a quantitative measure of the extent to which each economic activity represented in an urban place constitutes an economic specialisation of that particular urban place. The complex of specialised functions characteristic of each urban place can then be used to indicate the essential functional structure of the urban place, as well as to classify urban places by their functions. These qualities of the economic base concept as an analytical tool are of positive value in the study of urban places and are of more interest to geographers than simple analysis of an urban place as a whole.

The identification and measurement of these basic functions performed by urban places in a national system of urban places necessitates the use of an indirect or macro method of economic base analysis. These methods have been developed in connection with the need for comparative analysis of national systems of urban places, together with the realisation that the economic base concept can furnish little more than an approximation. The application of these methods is based on aggregate data obtainable from standard statistical sources, and is less laborious and requires a less formal procedure than the application of direct or micro methods. The most recent indirect or macro method developed for identifying and measuring the basic functions is the second variant of the minimum requirements method devised by Ullman and Dacey. Short of a time-consuming direct or macro method, Ullman, Dacey and Brodsky (1971,1) suggested that the second variant of the method "is probably the best general method, at least for dealing with aggregates."

This second variant of the minimum requirements method of economic base analysis offers certain advantages in the study of urban places, in its ease of application, in its clarification of the objectives of the economic base concept, and in its avoidance and partial solution in a consistent manner of some of the theoretical and practical problems of economic base identification and measurement. Furthermore, this short-cut procedure possesses certain qualities which are of undoubted value in the context of comparative studies of the functional structures of urban places.

1. It develops a practicable method of approximating the basic and nonbasic functions performed by individual urban places in a more reliable way than any other short-cut method.
2. It provides a useful and easily applied tool for delineating the functional structures of urban places generally, as well as yielding valuable preliminary functional structures for individual urban places.
3. It provides a consistent and definable basis for comparing urban places generally and individually in new and meaningful ways.
4. It provides a new and improved base for the construction of a functional classification of urban places.
5. It advances the understanding of the urban place economy generally.

For these reasons, together with the practical consideration of the availability of relevant statistical data, the second variant of the minimum requirements method was applied to New Zealand urban places in this present study in order to delineate their functional structures. The functional structure of each urban place was then

further characterised and classified in terms of its dominant function, its distinctive functions, and its degree of functional specialisation.

Although this present study is static, in covering but one year, it affords an insight into the applicability of the economic base concept in general, and of the second variant of the minimum requirements method in particular, to the study of New Zealand urban places. Furthermore, as well as illustrating their obvious value in urban research in New Zealand, this present study goes some way to filling at least one gap in the knowledge of New Zealand urban places, namely the economic base aspects of their functional structures.

APPENDIX A

GLOSSARY OF EQUIVALENT ECONOMIC BASE TERMS

The dichotomy of functions performed by an urban place has long been recognised. Geographers, planners and economists have identified and measured it in economic base studies using a diversity of terms. The extent of this diversity of terms has been indicated by Ullman, Dacey and Brodsky (1971,3). For more complete clarity in this present study, a modification of the glossary of equivalent economic base terms outlined by Ullman, Dacey and Brodsky (1971,3), is presented in the table below. All terms in each column are synonymous with the others in that column; that is, all in Column 1 are synonymous with the others in Column 1 only, and all in Column 2 with the others in Column 2 only.

Column 1	Column 2
Basic	Nonbasic
Nonservice	Service
External	Internal
Export	Import
Non-localised	Localised
Independent	Dependent
Primary	Secondary
Exogenous	Endogenous
Surplus	Ancillary
Excess	Minimum
Active	Passive
City Forming	City Filling
City Building	City Serving
Exchange Production	Self Production

APPENDIX B

URBAN AREAS AND BOROUGHS

In this present study 82 New Zealand urban places with a population of 1,000 or more were selected for analysis from the 1971 New Zealand Census of Population and Distribution, Volume 1, Increase and Location of Population. These urban places were either urban areas or boroughs,[1] and their location is shown in Figure 11, with each urban place identified by number, arranged in an increasing series according to population size. In this appendix the terms 'urban area' and 'borough' as used in this present study, are defined on the basis of the criteria adopted by the Department of Statistics for the 1971 Census, and those urban areas and boroughs analysed in this present study are listed.

URBAN AREAS (U.A.). These are non-administrative, statistical units. Their purpose is to provide definite, stable and comparable boundaries for the larger urban concentrations of population where the growth of population and of the continuously built-up area has overstepped the boundaries of contiguous administrative, statistical units (cities and boroughs) and where suburban development has spilled over into the surrounding counties. The criteria on which urban areas are defined include a central city or borough, together with neighbouring boroughs, town districts, and parts of counties which are regarded as suburban and belonging to that centre of urban population irrespective of their being under different local administration. These criteria were introduced in

1917. The boundaries of the Department of Statistic's urban areas, last defined in 1951, were revised prior to the 1971 Census with the number of urban areas being increased from 18 to 24 by the division of Auckland into four urban areas, the addition of one urban area each from Wellington and the Hutt, and the inclusion of Masterton as an urban area.

BOROUGHS (B). These are administrative, statistical units based largely on local government status. The criteria on which boroughs are defined include a maximum area of 9 square miles, a maximum distance between two points of 6 miles, an average population density of one person per acre and a population of at least 1,500. These criteria were introduced in 1954, but all existing boroughs at that time, some of which had populations of less than 200 were allowed to retain their status. A borough may apply for city status on reaching a population of 20,000.

All the 106 urban areas and independent boroughs in New Zealand that had 1971 Census populations of 1,000 or more were included in this present study. The total number of urban places studied however, was reduced to eighty-two by excluding those urban places which had highly atypical employment structures, and those urban places for which employment statistics were not available. These 82 urban places studied, included 24 urban areas and 58 boroughs, which are listed below.

URBAN AREAS (24)

Whangarei, Northern Auckland, Western Auckland, Central Auckland,

Southern Auckland, Hamilton, Tauranga, Rotorua, Gisborne, Napier, Hastings, New Plymouth, Wanganui, Palmerston North, Masterton, Upper Hutt Valley, Lower Hutt Valley, Porirua Basin, Wellington, Nelson, Christchurch, Timaru, Dunedin, Invercargill.

BOROUGHS (58)

Kaitaia, Kaikohe, Dargaville, Helensville, Pukekohe, Huntly, Cambridge, Te Awamutu, Te Kuiti, Taumarunui, Thames, Paeroa, Waihi, Te Aroha, Morrinsville, Matamata, Putaruru, Te Puke, Taupo, Whakatane, Wairoa, Otorohanga, Waipukurau, Dannevirke, Woodville, Waitara, Stratford, Eltham, Hawera, Ohakune, Raetihi, Taihape, Marton, Feilding, Levin, Pahiatua, Carterton, Greytown, Featherston, Martinborough, Blenheim, Motueka, Westport, Greymouth, Hokitika, Rangiora, Ashburton, Geraldine, Temuka, Waimate, Oamaru, Milton, Balclutha, Alexandra, Gore, Winton, Bluff, Riverton.

Footnotes

1. In this present study New Zealand urban places are defined as including all the urban areas and a large proportion of the boroughs, each with a population of 1,000 or more, the criterion used by the Department of Statistics to define "urban population".

APPENDIX C

EMPLOYMENT STATISTICS

This appendix outlines the procedures adopted by the Department of Labour for the collection, processing and presentation of employment statistics relating to individual New Zealand urban places with a population of 1,000 or more.

Employment statistics as used in this present study refer to the Department of Labour's surveyed labour force statistics, and include full-time employees and working proprietors, but exclude one-person businesses, part-time employees and farming, fishing, hunting, waterfront and seagoing work, domestic service in private households and armed forces. These employment statistics are collected for individual New Zealand urban places with a population of 1,000 or more,[1] by the Department of Labour in its April and October half-yearly surveys of employment in all business establishments in each urban place in which at least two persons are employed. Taking New Zealand as a whole, these employment statistics collected in the biannual surveys to the level of two employees, account for about 75 per cent of employment, but for most urban places, it represents a much higher figure, about 90 per cent.

These employment statistics collected by the Department of Labour are processed on the basis of the New Zealand Department of Labour Standard Industrial Classification. The official standard classification of industries in New Zealand is the New Zealand Standard Industrial Classification (N.Z.S.I.C.) of the Department of Statistics. This is a five digit breakdown of the revised Internationl Standard Industrial Classification (I.S.I.C.), which was first issued in 1968 and is at a four digit level. The Department of

Statistics changed from its previous standard industrial classification based on an earlier I.S.I.C., to this five digit classification based on the revised I.S.I.C. in 1971. The Department of Labour uses a four digit (Major Division,Division, Major Group, Group) form of this revised I.S.I.C. modified for New Zealand conditions, but kept fully compatible with the N.Z.S.I.C. The Department of Labour changed to this present standard industrial classification with its April 1971 half-yearly survey. This new standard industrial classification and the Department of Labour's former three digit classification are only approximately comparable.[2] Since the adoption of this new standard industrial classification by the Department of Labour for its half-yearly surveys, employment statistics have been collected and processed at a four-digit level from all employing units in 154 out of a total of 160 codes.[3] This compares with 71 survey codes under the Department of Labour's former classification.

The employment statistics used in this present study were from the Department of Labour's April 1971 half-yearly survey of employment in each of New Zealand's urban places with a population of 1,000 or more by industrial category. Although these employment statistics have been published since November 1968, in the "Industrial Information Bulletin" or statistical section of the Department of Labour's official journal, the Labour and Employment Gazette, the journal's coverage of the results of the April 1971 half-yearly survey of employment was incomplete. The employment statistics used in this present study were therefore, obtained directly from the Department of Labour in Wellington.

Since the Department of Labour adopted its new standard industrial classification in 1971, the employment statistics for

individual New Zealand urban places with a population of 1,000 or more have been presented for publication in the Labour and Employment Gazette at a two digit level, unless an activity is significant within the context of New Zealand's economic structure, in which case a three digit or four digit level has been taken. The resulting classification presents employment statistics for each New Zealand urban place for 33 intermediary industrial categories, most of which are at a two digit level, for 9 major divisions.

The Department of Labour's presentation of employment statistics in the Labour and Employment Gazette excludes employment in Major Division 0 - Activities not Adequately Defined. In this present study employment in three major divisions was excluded: Major Division 1 - Agriculture, Hunting, Forestry and fishing; Major Division 2 - Mining and Quarrying; and Major Division 0 - Activities not Adequately Defined. A complete list of the major divisions included in the New Zealand Department of Labour Standard Industrial Classification 1971, is as follows:

Major Division 1	Agriculture, Hunting, Forestry and Fishing.
Major Division 2	Mining and Quarrying.
Major Division 3	Manufacturing.
Major Division 4	Electricity, Gas and Water.
Major Division 5	Construction.
Major Division 6	Wholesale and Retail Trade and Restaurants and Hotels.
Major Division 7	Transport, Storage and Communication.
Major Division 8	Financing, Insurance, Real Estate and Business Services.

Major Division 9 Community, Social and Personal Services.

Major Division 0 Activities not Adequately Defined.

Footnotes

1. Employment statistics relating to individual New Zealand urban places refer only to workers employed within the statistical boundaries of an urban place. In some instances this can be misleading as major industries such as freezing works are frequently located outside the urban place boundary and as such these employment statistics may understate the size of the labour force resident in the urban place.

2. The most significant changes brought about by the Department of Labour's adoption of the new standard industrial classification are outlined in the Department of Labour's, 1971, Labour and Employment Gazette, 21 (3), 57.

3. The Department of Labour does not survey in codes related to agricultural pursuits.

APPENDIX D

CHARACTERISTICS OF 82 NEW ZEALAND URBAN PLACES, 1971 [1]

This appendix is divided into eight tables. The location of the 82 New Zealand urban places analysed in these tables is shown in Figure 11, with the urban places identified by number, arranged in an increasing series according to population size. The same identification numbers for each urban place are used in the tables which follow.

TABLE 1. GENERAL CHARACTERISTICS OF NEW ZEALAND URBAN PLACES

This table lists all the urban places alphabetically but with the same identification number, which refers to the rank of the urban place by population size in New Zealand, to the left of each urban place to facilitate finding it in the other tables. The table is divided into three columns, which give for each urban place: in Column 1 total population; in Column 2 percent total minimum or nonbasic employment; and in Column 3 percent total excess or basic employment.

TABLE 2. TOTAL EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION

In this table, urban places are listed according to population size as the identification number to the left of each urban place indicates. The table is divided into eight columns, which indicate for each urban place: in Columns 1 to 7 actual numbers employed in each of the seven major divisions used in this present study; and in Column 8 total employment. The column headings for each of the seven major divisions are abbreviated as follows:

Column Number	Abbreviated Column Heading	Full Title of Major Division
1.	MAN.	Manufacturing.
2.	ELE.	Electricity, Gas and Water.
3.	CON.	Construction.
4.	WHO.	Wholesale and Retail Trade and Restaurants and Hotels.
5.	TRA.	Transport, Storage and Communication.
6.	FIN.	Financing, Insurance, Real Estate and Business Services.
7.	COM.	Community, Social and Personal Services.

TABLE 3. TOTAL EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION AS A PERCENT OF TOTAL URBAN PLACE EMPLOYMENT

The urban places in this table are again arranged according to population size, as in Table 2. The table is divided into seven columns, which give for each urban place: in Columns 1 to 7 actual percentages employed in each of the seven major divisions. The two urban places with the highest and the lowest percentages of total employment in each major division are listed below to give an indication of the wide percentage range of employment that exists in each major division.

It is interesting to note that most of the highs and lows are represented by small urban places with populations of less than 5,000. This representative frequency of small urban places, particularly with respect to the highs, can perhaps be explained in terms of the initial stage of export specialisation in Thompson's (1965,438-439) model of the stages of economic growth of urban places. According to this first stage of export specialisation, the economic bases of small urban places tend to be dominated by a single industry, and often a single firm. Forrest (1973,97) in an

adaptation of Thompson's model distinguishes between two types of small urban place in this first stage:

1. Small urban places whose economic bases are dominated by a central place function, and which exist primarily by providing goods and services for its hinterland.
2. Small urban places whose economic bases are dominated by a non-central place function, and which exist primarily by providing goods and services for its foreland.

On the basis of Forrest's distinction, these small urban places which represent highs in this present study, include in the first group such small urban places as Carterton, Riverton, and Te

HIGHEST AND LOWEST PERCENTAGES OF TOTAL EMPLOYMENT FOR NEW ZEALAND URBAN PLACES BY MAJOR DIVISION

MAJOR DIVISION	HIGHEST URBAN PLACES		LOWEST URBAN PLACES	
Abbreviation	Name	Per Cent	Name	Per cent
MAN	Waitara	66.4	Ohakune	5.1
	Western Auckland	53.3	Geraldine	5.1
ELE	Winton	32.8	Several urban	
	Eltham	12.3	places	0.3
CON	Alexandra	23.4	Bluff	0.6
	Marton	19.3	Eltham	2.3
WHO	Riverton	57.7	Western Auckland	12.3
	Putaruru	39.7	Waitara	12.7
TRA	Ohakune	56.5	Riverton	2.5
	Taihape	32.3	Upper Hutt	3.0
FIN	Wellington	13.4	Bluff	0.6
	Invercargill	8.4	Ohakune	1.4
COM	Te Kuiti	32.4	Waitara	11.3
	Carterton	32.3	Bluff	11.8

Kuiti, and in the second group such small urban places as Eltham, Ohakune and Waitara. Johnston (1967,153) suggests, that most of these small urban places in New Zealand will not proceed beyond this first stage of export specialisation, and hence will always have relatively narrow, specialised economic bases.

TABLE 4. TOTAL EXPECTED MINIMUM EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION AS A PERCENT OF TOTAL URBAN PLACE EMPLOYMENT

The urban places are again arranged according to population size in this table. The table is divided into eight columns, which indicate for each urban place: in Columns 1 to 7 expected minimum percentages employed in each of the seven major divisions; and in Column 8 total expected minimum employment. The overall consistent increase in the magnitude of the total expected minimum or nonbasic employment, and in the magnitude of the expected minimum percentages of employment in each of six of the seven major divisions as the population size of the urban place increases can be readily seen. This increase represents a systematic corrective therefore, but only for variations in urban place population size.

TABLE 5. TOTAL EXCESS EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION AS A PERCENT OF TOTAL URBAN PLACE EMPLOYMENT

In this table, urban places are listed according to population size. The table is divided into eight columns, which give for each urban place: in Columns 1 to 7 excess percentages employed in each of the seven major divisions, and in Column 8 total excess employment. This is perhaps the most significant table, since excess employment indicates essentially export or basic employment. The excess percentages employed in each of the seven major divisions is derived

by subtracting the expected minimum percentages employed in each of the seven major divisions in Table 4, from the actual percentages in Table 3. The negative signs before some excess percentage figures, Ullman, Dacey and Brodsky (1971,60) point out, have no special significance. They are the result of the systematic correction for variations in urban place population size, which causes the expected minimum percentages employed in several of the seven major divisions to be slightly high, and are registered by these urban places which have actual percentages employed in one or more of the seven major divisions that are lower than the expected minimum percentages employed in such major divisions for equivalent urban place population sizes. From this table, the distinctive economic characteristics which typify each of New Zealand's urban places emerge, namely those of the seven major divisions that constitute the economic specialisations of an urban place, and therefore are indicative of its functional structure.

TABLE 6. TOTAL EXCESS EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION AS A PERCENT OF TOTAL URBAN PLACE EXCESS EMPLOYMENT

In this table, urban places are again ranked on the basis of population size. The table is divided into seven columns, which give for each urban place: in Columns 1 to 7 excess percentages employed in each of the seven major divisions as a percent of total excess employment. These were derived by converting the excess percentages employed in each of the seven major divisions in Table 5 to percentages of the total excess employment in Table 5. From this table, each of the major divisions can be rated in terms of its importance in an urban place's functional structure relative to the

importance of the other major divisions in the urban place's functional structure. This provides a meaningful and defineable basis for comparing the functional structures of urban places individually and for classifying urban places generally.

TABLE 7. DOMINANT FUNCTIONS AND SPECIALISATION INDEXES OF NEW ZEALAND URBAN PLACES

In this table, urban places are arranged in an increasing series according to specialisation, that is from the least specialised to the most specialised. The identification number to the left of each urban place refers to the rank of the urban place by population size in New Zealand. The derivation of the index is explained in Chapter 5. The table is divided into two columns, which indicate for each urban place: in Column 1 its specialisation index: and in Column 2 its dominant function, that is, the major division having the largest proportion of an urban place's total excess employment.

TABLE 8. DOMINANT AND DISTINCTIVE FUNCTIONS AND SPECIALISATION INDEXES FOR NEW ZEALAND URBAN PLACES

The urban places are again listed according to population size in this table. The table is divided into nine columns, which give for each urban place: in Column 1 its specialisation index; in Column 2 its dominant function; and in Columns 3 to 9 its distinctive functions, that is, those major divisions whose proportion of total excess employment in an urban place greatly exceeds the proportion it usually has in most urban places. Urban places were rated in each major division or function in terms of four classes of 'distinctiveness'. The derivation of these four classes of distinctive functions is explained in Chapter 5. In

this table, a major division or function was considered 'distinctive' in the functional structure of an urban place when the urban place qualified for one of the first three classes. Urban places have as many distinctive functions as they have excess employment values qualifying them as being of Class 1, 2 or 3 in 'distinctiveness'. A major division was not considered significantly 'distinctive' in an urban place and was not listed in this table, when the urban place qualified only for a Class 4 rating.

Footnotes

1. The statistical data in these tables relating to population, are derived from the Department of Statistics, New Zealand Census of Population and Dwellings, 1971, Volume 1, Increase and Location of Population, and to employment, are derived from the Department of Labour, April 1971 half-yearly survey of employment in New Zealand urban places with a population of 1,000 or more by industrial category.

TABLE 1

GENERAL CHARACTERISTICS OF NEW ZEALAND URBAN PLACES

(1) Total Population, 1971; (2) Percent Total Minimum Employment; (3) Percent Total Excess Employment.

ID	NAME	(1)	(2)	(3)
26	Alexandra	3551	40.7	59.3
57	Ashburton	13312	51.0	49.0
34	Balclutha	4601	42.7	57.3
58	Blenheim	14859	51.9	48.1
19	Bluff	3241	40.0	60.0
46	Cambridge	6435	45.3	54.7
28	Carterton	3734	41.0	59.0
82	Central Auckland	286787	75.3	24.7
81	Christchurch	275968	74.9	25.1
43	Dannevirke	5610	44.0	56.0
31	Dargaville	4101	41.8	58.2
78	Dunedin	111059	67.9	32.1
13	Eltham	2321	37.3	62.7
11	Featherston	2090	36.4	63.6
53	Feilding	9780	48.7	51.3
8	Geraldine	1937	35.9	64.1
61	Gisborne	30161	57.4	42.6
49	Greymouth	7936	47.0	53.0
7	Greytown	1725	34.9	65.1
51	Gore	8648	47.6	52.4
74	Hamilton	80812	65.3	34.7
70	Hastings	45512	60.6	39.4
50	Hawera	8134	47.2	52.8
1	Helensville	1290	32.7	67.3
21	Hokitika	3332	40.1	59.9
40	Huntly	5310	43.8	56.2
72	Invercargill	50681	61.5	38.5
22	Kaikohe	3340	40.1	59.9
25	Kaitaia	3501	40.5	59.5
55	Levin	13051	50.8	49.2
76	Lower Hutt	92003	66.2	33.8
4	Martinborough	1390	33.2	66.8

ID	NAME	(1)	(2)	(3)
35	Marton	4700	42.8	57.2
59	Masterton	20147	54.5	45.5
30	Matamata	4057	41.7	58.3
12	Milton	2164	36.7	63.3
32	Morrinsville	4452	42.4	57.6
29	Motueka	3874	41.4	58.6
69	Napier	43601	60.4	39.6
65	Nelson	37994	59.4	40.6
66	New Plymouth	38780	59.5	40.5
77	Northern Auckland	107965	67.6	32.4
56	Oamaru	13078	50.8	49.2
5	Ohakune	1418	33.4	66.6
9	Otorohanga	1964	36.1	63.9
24	Paeroa	3431	40.4	59.6
14	Pahiatua	2610	38.2	61.8
73	Palmerston North	57065	62.5	37.5
71	Porirua	47858	61.3	38.7
48	Pukekohe	7590	46.6	53.4
33	Putaruru	4585	42.7	57.3
3	Raetihi	1359	33.0	67.0
37	Rangiora	4854	43.0	57.0
2	Riverton	1311	32.8	67.2
67	Rotorua	39752	59.7	40.3
80	Southern Auckland	165048	70.9	29.1
41	Stratford	5398	43.8	56.2
15	Taihape	2793	38.8	61.2
45	Taumarunui	5841	44.7	55.3
54	Taupo	10563	49.2	50.8
68	Tauranga	40349	60.0	40.0
17	Te Aroha	3200	39.8	60.2
47	Te Awamutu	6929	46.0	54.0
36	Te Kuiti	4842	43.0	57.0
20	Temuka	3316	40.1	59.9
23	Te Puke	3406	40.3	59.7
44	Thames	5780	44.6	55.4
60	Timaru	28959	57.1	42.9

ID	NAME	(1)	(2)	(3)
62	Upper Hutt	30986	57.7	42.3
16	Waihi	3071	39.5	60.5
18	Waimate	3228	39.8	60.2
27	Waipukurau	3598	40.8	59.2
42	Wairoa	5418	43.9	56.1
39	Waitara	5125	43.6	56.4
64	Wanganui	37982	59.4	40.6
79	Wellington	136782	69.2	30.8
75	Western Auckland	89946	66.2	33.8
38	Westport	4985	43.2	56.8
52	Whakatane	9748	48.6	51.4
63	Whangarei	34029	58.4	41.6
10	Winton	2055	36.2	63.8
6	Woodville	1517	34.0	66.0

TABLE 2

TOTAL EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
1	Helensville	127	28	21	76	129	15	119	515
2	Riverton	33	2	19	164	7	7	52	284
3	Raetihi	19	6	44	79	51	13	66	278
4	Martinborough	31	15	12	97	56	11	74	296
5	Ohakune	18	9	12	50	201	5	61	356
6	Woodville	78	14	20	49	34	7	76	278
7	Greytown	148	2	43	60	38	15	83	389
8	Geraldine	25	2	39	157	100	20	151	494
9	Otorohanga	216	19	48	163	98	41	273	858
10	Winton	69	185	49	116	27	16	102	564
11	Featherston	83	8	36	106	41	15	56	345
12	Milton	381	16	42	112	56	28	140	778
13	Eltham	356	90	17	104	34	42	91	734
14	Pahiatua	129	29	59	172	63	39	136	627
15	Taihape	70	20	84	229	305	43	195	946
16	Waihi	471	18	86	180	61	37	175	1028
17	Te Aroha	119	117	106	222	101	63	252	980
18	Waimate	132	3	131	282	88	40	259	935
19	Bluff	214	14	3	87	164	3	65	550
20	Temuka	224	2	94	120	60	18	113	631
21	Hokitika	183	38	64	175	121	53	252	886
22	Kaikohe	93	70	148	250	146	52	262	1021
23	Te Puke	291	19	61	269	118	68	243	1069
24	Paeroa	289	17	206	252	249	58	248	1319
25	Kaitaia	160	24	241	306	194	81	367	1373
26	Alexandra	67	110	230	297	77	47	157	985
27	Waipukurau	126	33	126	427	170	77	450	1409
28	Carterton	135	22	57	139	62	35	215	665
29	Motueka	245	53	108	234	119	51	240	1050
30	Matamata	207	22	178	325	172	96	390	1390
31	Dargaville	266	75	271	339	121	78	353	1503
32	Morrinsville	354	19	121	285	233	96	309	1417
33	Putaruru	148	15	63	539	227	68	298	1358

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
34	Balclutha	326	69	146	408	189	88	442	1668
35	Marton	340	17	267	252	185	56	263	1380
36	Te Kuiti	149	46	137	308	214	104	460	1418
37	Rangiora	213	93	51	204	289	63	292	1205
38	Westport	206	41	205	281	369	76	337	1515
39	Waitara	1070	4	50	205	63	37	183	1612
40	Huntly	266	16	104	314	199	46	303	1248
41	Stratford	398	5	100	520	236	102	443	1804
42	Wairoa	483	28	183	352	181	68	546	1841
43	Dannevirke	190	56	150	462	171	100	410	1539
44	Thames	717	8	125	363	164	76	553	2006
45	Taumarunui	161	47	320	358	410	80	581	1957
46	Cambridge	252	28	171	307	143	88	373	1362
47	Te Awamutu	572	43	179	611	325	168	554	2452
48	Pukekohe	517	105	204	545	338	142	635	2486
49	Greymouth	409	58	335	572	635	139	994	3142
50	Hawera	443	72	180	881	206	153	623	2558
51	Gore	263	36	189	738	251	149	633	2259
52	Whakatane	223	141	361	688	260	133	820	2626
53	Feilding	1372	64	219	535	242	89	390	2911
54	Taupo	277	36	305	526	249	118	598	2109
55	Levin	1769	141	263	573	285	154	1179	4364
56	Oamaru	1389	260	675	963	588	157	988	5020
57	Ashburton	963	160	471	979	469	165	988	4195
58	Blenheim	821	123	776	1148	608	289	1080	4845
59	Masterton	2034	114	514	1266	501	310	1620	6359
60	Timaru	2171	162	755	2128	1237	448	2153	9054
61	Gisborne	2250	126	921	1882	773	465	2317	8734
62	Upper Hutt	3187	21	542	948	194	163	1521	6576
63	Whangarei	2089	134	1365	2592	1469	703	2546	10898
64	Wanganui	3485	175	1094	2157	1584	643	3605	12743
65	Nelson	2516	232	1119	2113	1068	548	3092	10688
66	New Plymouth	3027	252	1636	2930	1204	676	2412	12137
67	Rotorua	2187	108	1208	2876	1134	550	3582	11645
68	Tauranga	2219	194	1098	2350	1471	672	2584	10588
69	Napier	2845	263	1254	2884	1795	807	2661	12509

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
70	Hastings	6646	223	971	3169	730	544	1743	14026
71	Porirua	1884	20	726	914	346	94	1490	5474
72	Invercargill	2198	420	1388	3615	1677	1204	3922	14424
73	Palmerston North	4952	359	1517	4055	1769	1143	6105	19900
74	Hamilton	6604	421	2944	5993	2517	2145	8790	29414
75	Western Auckland	7231	163	1082	1666	701	248	2487	13578
76	Lower Hutt	14502	534	2700	4973	1660	948	5295	30612
77	Northern Auckland	4826	298	1163	2919	1079	578	4091	14954
78	Dunedin	11073	859	3457	7934	4011	2190	9474	38998
79	Wellington	11942	1045	4945	18174	11782	10811	21647	80346
80	Southern Auckland	13228	171	2352	4704	2136	766	6798	30155
81	Christchurch	35939	1225	5496	16567	8138	4790	18989	91144
82	Central Auckland	63142	1476	10024	33054	14999	11475	29880	164050

TABLE 3

TOTAL EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION

AS A PERCENT OF TOTAL URBAN PLACE EMPLOYMENT

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM
1	Helensville	24.7	5.4	4.1	14.8	25.0	2.9	23.1
2	Riverton	11.6	0.7	6.7	57.7	2.5	2.5	18.3
3	Raetihi	6.8	2.2	15.8	28.4	18.4	4.7	23.7
4	Martinborough	10.5	5.1	4.0	32.8	18.9	3.7	25.0
5	Ohakune	5.1	2.5	3.4	14.0	56.5	1.4	17.1
6	Woodville	28.1	5.0	7.2	17.6	12.2	2.5	27.4
7	Greytown	38.0	0.5	11.1	15.4	9.8	3.9	21.3
8	Geraldine	5.1	0.4	7.9	31.8	20.2	4.0	30.6
9	Otorohanga	25.2	2.2	5.6	19.0	11.4	4.8	31.8
10	Winton	12.2	32.8	8.7	20.6	4.8	2.8	18.1
11	Featherston	24.1	2.3	10.4	30.7	11.9	4.4	16.2
12	Milton	49.4	2.0	5.4	14.4	7.2	3.6	18.0
13	Eltham	48.5	12.3	2.3	14.2	4.6	5.7	12.4
14	Pahiatua	20.6	4.6	9.4	27.4	10.1	6.2	21.7
15	Taihape	7.4	2.1	8.9	24.2	32.3	4.5	20.6
16	Waihi	45.8	1.8	8.4	17.5	5.9	3.6	17.0
17	Te Aroha	12.2	11.9	10.8	22.7	10.3	6.4	25.7
18	Waimate	14.1	0.3	14.0	30.2	9.4	4.3	27.7
19	Bluff	38.9	2.5	0.6	15.8	29.8	0.6	11.8
20	Temuka	35.5	0.3	14.9	19.0	9.5	2.9	17.9
21	Hokitika	20.7	4.3	7.2	19.8	13.6	6.0	28.4
22	Kaikohe	9.1	6.8	14.5	24.5	14.3	5.1	25.7
23	Te Puke	27.2	1.8	5.7	25.2	11.0	6.4	22.7
24	Paeroa	21.9	1.3	15.6	19.1	18.9	4.4	18.8
25	Kaitaia	11.7	1.7	17.6	22.3	14.1	5.9	26.7
26	Alexandra	6.8	11.2	23.4	30.1	7.8	4.8	15.9
27	Waipukurau	8.9	2.4	8.9	30.3	12.1	5.5	31.9
28	Carterton	20.3	3.3	8.6	20.9	9.3	5.3	32.3
29	Motueka	23.3	5.0	10.3	22.3	11.3	4.9	22.9
30	Matamata	14.9	1.6	12.8	23.4	12.4	6.9	28.0
31	Dargaville	17.7	5.0	18.0	22.6	8.0	5.2	23.5
32	Morrinsville	25.0	1.3	8.5	20.1	16.4	6.9	21.8

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM
33	Putaruru	10.9	1.1	4.7	39.7	16.7	5.0	21.9
34	Balclutha	19.5	4.1	8.8	24.5	11.3	5.3	26.5
35	Marton	24.6	1.2	19.3	18.3	13.4	4.1	19.1
36	Te Kuiti	10.5	3.3	9.7	21.7	15.1	7.3	32.4
37	Rangiora	17.7	7.7	4.3	16.9	24.0	5.2	24.2
38	Westport	13.6	2.7	13.5	18.5	24.4	5.0	22.3
39	Waitara	66.4	0.3	3.1	12.7	3.9	2.3	11.3
40	Huntly	21.3	1.3	8.3	25.2	15.9	3.7	24.3
41	Stratford	22.1	0.3	5.5	28.8	13.1	5.6	24.6
42	Wairoa	26.2	1.5	10.0	19.1	9.8	3.7	29.7
43	Dannevirke	12.4	2.6	9.7	30.0	11.1	6.5	26.7
44	Thames	35.7	0.4	6.2	18.1	8.2	3.8	27.6
45	Taumarunui	8.2	2.4	16.3	18.3	21.0	4.1	29.7
46	Cambridge	18.5	2.1	12.5	22.5	10.5	6.5	27.4
47	Te Awamutu	23.3	1.7	7.3	24.9	13.3	6.9	22.6
48	Pukekohe	20.8	4.2	8.2	21.9	13.6	5.7	25.6
49	Greymouth	13.0	1.9	10.7	18.2	20.2	4.4	31.6
50	Hawera	17.3	2.8	7.0	34.4	8.1	6.0	24.4
51	Gore	11.6	1.6	8.4	32.7	11.1	6.6	28.0
52	Whakatane	8.5	5.4	13.7	26.2	9.9	5.1	31.2
53	Feilding	47.1	2.2	7.5	18.4	8.3	3.1	13.4
54	Taupo	13.1	1.7	14.5	24.9	11.8	5.6	28.4
55	Levin	40.5	3.3	6.0	13.1	6.6	3.5	27.0
56	Oamaru	27.7	5.2	13.4	19.2	11.7	3.1	19.7
57	Ashburton	23.0	3.8	11.2	23.3	11.2	3.9	23.6
58	Blenheim	16.9	2.5	16.0	23.7	12.6	6.0	22.3
59	Masterton	32.0	1.8	8.1	19.9	7.9	4.9	25.4
60	Timaru	24.0	1.8	8.3	23.5	13.7	4.9	23.8
61	Gisborne	25.8	1.5	10.5	21.5	8.9	5.3	26.5
62	Upper Hutt	48.5	0.3	8.2	14.4	3.0	2.5	23.1
63	Whangarei	19.2	1.2	12.5	23.8	13.5	6.4	23.4
64	Wanganui	27.3	1.4	8.6	16.9	12.4	5.1	28.3
65	Nelson	23.5	2.2	10.5	19.8	10.0	5.1	28.9
66	New Plymouth	24.9	2.1	13.5	24.1	9.9	5.6	19.9
67	Rotorua	18.8	0.9	10.4	24.7	9.7	4.7	30.8
68	Tauranga	21.0	1.8	10.4	22.2	13.9	6.3	24.4

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM
69	Napier	22.7	2.1	10.0	23.1	14.3	6.5	21.3
70	Hastings	47.4	1.6	6.9	22.6	5.2	3.9	12.4
71	Porirua	34.4	0.4	13.3	16.7	6.3	1.7	27.2
72	Invercargill	15.2	2.9	9.6	25.1	11.6	8.4	27.2
73	Palmerston North	24.9	1.8	7.6	20.4	8.9	5.7	30.7
74	Hamilton	22.4	1.4	10.0	20.4	8.6	7.3	29.9
75	Western Auckland	53.3	1.2	8.0	12.3	5.1	1.8	18.3
76	Lower Hutt	47.4	1.8	8.8	16.2	5.4	3.1	17.3
77	Northern Auckland	32.3	2.0	7.8	19.5	7.2	3.9	27.3
78	Dunedin	28.4	2.2	8.9	20.3	10.3	5.6	24.3
79	Wellington	14.9	1.3	6.2	22.6	14.7	13.4	26.9
80	Southern Auckland	43.9	0.6	7.8	15.6	7.1	2.5	22.5
81	Christchurch	39.4	1.4	6.0	18.2	8.9	5.3	20.8
82	Central Auckland	38.5	0.9	6.1	20.1	9.2	7.0	18.2

TABLE 4

TOTAL EXPECTED MINIMUM EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION AS A PER CENT OF TOTAL URBAN PLACE EMPLOYMENT

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
1	Helensville	5.4	0.2	0.9	13.9	2.2	0.4	9.7	32.7
2	Riverton	5.4	0.2	1.0	13.9	2.2	0.4	9.7	32.8
3	Raetihi	5.5	0.2	1.0	13.8	2.3	0.4	9.8	33.0
4	Martinborough	5.6	0.2	1.1	13.8	2.3	0.4	9.8	33.2
5	Ohakune	5.7	0.2	1.1	13.8	2.3	0.4	9.9	33.4
6	Woodville	5.9	0.2	1.2	13.8	2.4	0.5	10.0	34.0
7	Greytown	6.2	0.2	1.4	13.7	2.5	0.6	10.3	34.9
8	Geraldine	6.6	0.2	1.6	13.7	2.6	0.7	10.5	35.9
9	Otorohanga	6.6	0.2	1.7	13.7	2.6	0.7	10.6	36.1
10	Winton	6.7	0.2	1.8	13.6	2.6	0.7	10.6	36.2
11	Featherston	6.8	0.2	1.8	13.6	2.6	0.7	10.7	36.4
12	Milton	6.9	0.2	1.8	13.6	2.7	0.7	10.8	36.7
13	Eltham	7.1	0.2	2.0	13.6	2.7	0.8	10.9	37.3
14	Pahiatua	7.4	0.3	2.2	13.5	2.8	0.9	11.1	38.2
15	Taihape	7.6	0.3	2.3	13.5	2.9	0.9	11.3	38.8
16	Waihi	7.9	0.3	2.5	13.4	2.9	1.0	11.5	39.5
17	Te Aroha	8.0	0.3	2.5	13.4	3.0	1.0	11.6	39.8
18	Waimate	8.0	0.3	2.5	13.4	3.0	1.0	11.6	39.8
19	Bluff	8.1	0.3	2.6	13.4	3.0	1.0	11.6	40.0
20	Temuka	8.1	0.3	2.6	13.4	3.0	1.1	11.6	40.1
21	Hokitika	8.1	0.3	2.6	13.4	3.0	1.1	11.6	40.1
22	Kaikohe	8.1	0.3	2.6	13.4	3.0	1.1	11.6	40.1
23	Te Puke	8.2	0.3	2.6	13.4	3.0	1.1	11.7	40.3
24	Paeroa	8.2	0.3	2.7	13.4	3.0	1.1	11.7	40.4
25	Kaitaia	8.3	0.3	2.7	13.4	3.0	1.1	11.7	40.5
26	Alexandra	8.3	0.3	2.7	13.4	3.1	1.1	11.8	40.7
27	Waipukurau	8.4	0.3	2.7	13.4	3.1	1.1	11.8	40.8
28	Carterton	8.5	0.3	2.8	13.3	3.1	1.1	11.9	41.0
29	Motueka	8.6	0.3	2.9	13.3	3.1	1.2	12.0	41.4
30	Matamata	8.7	0.3	2.9	13.3	3.2	1.2	12.1	41.7
31	Dargaville	8.7	0.3	3.0	13.3	3.2	1.2	12.1	41.8

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
32	Morrinsville	9.0	0.3	3.1	13.3	3.2	1.3	12.2	42.4
33	Putaruru	9.1	0.3	3.2	13.2	3.3	1.3	12.3	42.7
34	Balclutha	9.1	0.3	3.2	13.2	3.3	1.3	12.3	42.7
35	Marton	9.1	0.3	3.2	13.2	3.3	1.3	12.4	42.8
36	Te Kuiti	9.2	0.3	3.3	13.2	3.3	1.3	12.4	43.0
37	Rangiora	9.2	0.3	3.3	13.2	3.3	1.3	12.4	43.0
38	Westport	9.3	0.3	3.3	13.2	3.3	1.3	12.5	43.2
39	Waitara	9.4	0.3	3.4	13.2	3.4	1.4	12.5	43.6
40	Huntly	9.5	0.3	3.4	13.2	3.4	1.4	12.6	43.8
41	Stratford	9.5	0.3	3.4	13.2	3.4	1.4	12.6	43.8
42	Wairoa	9.5	0.3	3.5	13.2	3.4	1.4	12.6	43.9
43	Dannevirke	9.6	0.3	3.5	13.1	3.4	1.4	12.7	44.0
44	Thames	9.7	0.4	3.6	13.1	3.5	1.5	12.8	44.6
45	Taumarunui	9.8	0.4	3.6	13.1	3.5	1.5	12.8	44.7
46	Cambridge	10.0	0.4	3.8	13.1	3.5	1.5	13.0	45.3
47	Te Awamutu	10.3	0.4	3.9	13.0	3.6	1.6	13.2	46.0
48	Pukekohe	10.5	0.4	4.0	13.0	3.7	1.7	13.3	46.6
49	Greymouth	10.7	0.4	4.1	13.0	3.7	1.7	13.4	47.0
50	Hawera	10.7	0.4	4.2	13.0	3.7	1.7	13.5	47.2
51	Gore	10.9	0.4	4.3	12.9	3.8	1.7	13.6	47.6
52	Whakatane	11.2	0.4	4.5	12.9	3.9	1.8	13.9	48.6
53	Feilding	11.3	0.4	4.5	12.9	3.9	1.8	13.9	48.7
54	Taupo	11.5	0.4	4.6	12.8	4.0	1.9	14.0	49.2
55	Levin	12.1	0.4	5.0	12.7	4.1	2.0	14.5	50.8
56	Oamaru	12.1	0.4	5.0	12.7	4.1	2.0	14.5	50.8
57	Ashburton	12.2	0.4	5.0	12.7	4.1	2.1	14.5	51.0
58	Blenheim	12.5	0.5	5.2	12.7	4.2	2.1	14.7	51.9
59	Masterton	13.4	0.5	5.8	12.5	4.5	2.4	15.4	54.5
60	Timaru	14.4	0.5	6.4	12.3	4.8	2.6	16.1	57.1
61	Gisborne	14.5	0.5	6.5	12.3	4.8	2.6	16.2	57.4
62	Upper Hutt	14.6	0.5	6.5	12.3	4.8	2.7	16.3	57.7
63	Whangarei	14.9	0.6	6.7	12.2	4.9	2.7	16.4	58.4
64	Wanganui	15.2	0.6	6.9	12.2	5.0	2.8	16.7	59.4
65	Nelson	15.2	0.6	6.9	12.2	5.0	2.8	16.7	59.4
66	New Plymouth	15.3	0.6	6.9	12.2	5.0	2.8	16.7	59.5
67	Rotorua	15.3	0.6	7.0	12.2	5.0	2.8	16.8	59.7

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
68	Tauranga	15.4	0.6	7.0	12.2	5.1	2.9	16.8	60.0
69	Napier	15.6	0.6	7.1	12.1	5.1	2.9	17.0	60.4
70	Hastings	15.7	0.6	7.2	12.1	5.1	2.9	17.0	60.6
71	Porirua	15.9	0.6	7.3	12.1	5.2	3.0	17.2	61.3
72	Invercargill	16.0	0.6	7.4	12.0	5.2	3.0	17.3	61.5
73	Palmerston North	16.4	0.6	7.6	12.0	5.3	3.1	17.5	62.5
74	Hamilton	17.4	0.7	8.2	11.8	5.6	3.4	18.2	65.3
75	Western Auckland	17.7	0.7	8.4	11.8	5.7	3.4	18.5	66.2
76	Lower Hutt	17.8	0.7	8.4	11.7	5.7	3.4	18.5	66.2
77	Northern Auckland	18.2	0.7	8.7	11.7	5.9	3.6	18.8	67.6
78	Dunedin	18.3	0.7	8.8	11.7	5.9	3.6	18.9	67.9
79	Wellington	18.9	0.7	9.1	11.5	6.0	3.7	19.3	69.2
80	Southern Auckland	19.4	0.7	9.5	11.5	6.2	3.9	19.7	70.9
81	Christchurch	20.9	0.8	10.4	11.2	6.6	4.2	20.8	74.9
82	Central Auckland	21.0	0.8	10.4	11.2	6.7	4.3	20.9	75.3

TABLE 5

TOTAL EXCESS EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION AS A PER CENT OF TOTAL URBAN PLACE EMPLOYMENT

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
1	Helensville	19.3	5.2	3.2	0.9	22.8	2.5	13.4	67.3
2	Riverton	6.2	0.5	5.7	43.8	0.3	2.1	8.6	67.2
3	Raetihi	1.3	2.0	14.8	14.6	16.1	4.3	13.9	67.0
4	Martinborough	4.9	4.9	2.9	19.0	16.6	3.3	15.2	66.8
5	Ohakune	-0.6	2.3	2.3	0.2	54.2	1.0	7.2	66.6
6	Woodville	22.2	4.8	6.0	3.8	9.8	2.0	17.4	66.0
7	Greytown	31.8	0.3	9.7	1.7	7.3	3.3	11.0	65.1
8	Geraldine	-1.5	0.2	6.3	18.1	17.6	3.3	20.1	64.1
9	Otorohanga	18.6	2.0	3.9	5.3	8.8	4.1	21.2	63.9
10	Winton	5.5	32.6	6.9	7.0	2.2	2.1	7.5	63.8
11	Featherston	17.3	2.1	8.6	17.1	9.3	3.7	5.5	63.6
12	Milton	42.5	1.8	3.6	0.8	4.5	2.9	7.2	63.3
13	Eltham	41.4	12.1	0.3	0.6	1.9	4.9	1.5	62.7
14	Pahiatua	13.2	4.3	7.2	13.9	7.3	5.3	10.6	61.8
15	Taihape	-0.2	1.8	6.6	10.7	29.4	3.6	9.3	61.2
16	Waihi	37.9	1.5	5.9	4.1	3.0	2.6	5.5	60.5
17	Te Aroha	4.2	11.6	8.3	9.3	7.3	5.4	14.1	60.2
18	Waimate	6.1	0.0	11.5	16.8	6.4	3.3	16.1	60.2
19	Bluff	30.8	2.2	-2.0	2.4	26.8	-0.4	0.2	60.0
20	Temuka	27.4	0.0	12.3	5.6	6.5	1.8	6.3	59.9
21	Hokitika	12.6	4.0	4.6	6.4	10.6	4.9	16.8	59.9
22	Kaikohe	1.0	6.5	11.9	11.1	11.3	4.0	14.1	59.9
23	Te Puke	19.0	1.5	3.1	11.8	8.0	5.3	11.0	59.7
24	Paeroa	13.7	1.0	12.9	5.7	15.9	3.3	7.1	59.6
25	Kaitaia	3.4	1.4	14.9	8.9	11.1	4.8	15.0	59.5
26	Alexandra	-1.5	10.9	20.7	16.7	4.7	3.7	4.1	59.3
27	Waipukurau	0.5	2.1	6.2	16.9	9.0	4.4	20.1	59.2
28	Carterton	11.8	3.0	5.8	7.6	6.2	4.2	20.4	59.0
29	Motueka	14.7	4.7	7.4	9.0	8.2	3.7	10.9	58.6
30	Matamata	6.2	1.3	9.9	10.1	9.2	5.7	15.9	58.3
31	Dargaville	9.0	4.7	15.0	9.3	4.8	4.0	11.4	58.2

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
32	Morrinsville	16.0	1.0	5.4	6.8	13.2	5.6	9.6	57.6
33	Putaruru	1.8	0.8	1.5	26.5	13.4	3.7	9.6	57.3
34	Balclutha	10.4	3.8	5.6	11.3	8.0	4.0	14.2	57.3
35	Marton	15.5	0.9	16.1	5.1	10.1	2.8	6.7	57.2
36	Te Kuiti	1.3	3.0	6.4	8.5	11.8	6.0	20.0	57.0
37	Rangiora	8.5	7.4	1.0	3.7	20.7	3.9	11.8	57.0
38	Westport	4.3	2.4	10.2	5.3	21.1	3.7	9.8	56.8
39	Waitara	57.0	0.0	-0.3	-0.5	0.5	0.9	-1.2	56.4
40	Huntly	11.8	1.0	4.9	12.0	12.5	2.3	11.7	56.2
41	Stratford	12.6	0.0	2.1	15.6	9.7	4.2	12.0	56.2
42	Wairoa	16.7	1.2	6.5	5.9	6.4	2.3	17.1	56.1
43	Dannevirke	2.8	3.3	6.2	16.9	7.7	5.1	14.0	56.0
44	Thames	26.0	0.0	2.6	5.0	4.7	2.3	14.8	55.4
45	Taumarunui	-1.6	2.0	12.7	5.2	17.5	2.6	16.9	55.3
46	Cambridge	8.5	1.7	8.7	9.4	7.0	5.0	14.4	54.7
47	Te Awamutu	13.0	1.3	3.4	11.9	9.7	5.3	9.4	54.0
48	Pukekohe	10.3	3.8	4.2	8.9	9.9	4.0	12.3	53.4
49	Greymouth	2.3	1.5	6.6	5.2	16.5	2.7	18.2	53.0
50	Hawera	6.6	2.4	2.8	21.4	4.4	4.3	10.9	52.8
51	Gore	0.7	1.2	4.1	19.8	7.3	4.9	14.4	52.4
52	Whakatane	-2.7	5.0	9.2	13.3	6.0	3.3	17.3	51.4
53	Feilding	35.8	1.8	3.0	5.5	4.4	1.3	-0.5	51.3
54	Taupo	1.6	1.3	9.9	12.1	7.8	3.7	14.4	50.8
55	Levin	28.4	2.9	1.0	0.4	2.5	1.5	12.5	49.2
56	Oamaru	15.6	4.8	8.4	6.5	7.6	1.1	5.2	49.2
57	Ashburton	10.8	3.4	6.2	10.6	7.1	1.8	9.1	49.0
58	Blenheim	4.4	2.0	10.8	11.0	8.4	3.9	7.6	48.1
59	Masterton	18.6	1.3	2.3	7.4	3.4	2.5	10.0	45.5
60	Timaru	9.6	1.3	1.9	11.2	8.9	2.3	7.7	42.9
61	Gisborne	11.3	1.0	4.0	9.2	4.1	2.7	10.3	42.6
62	Upper Hutt	33.9	-0.2	1.7	2.1	-1.8	-0.2	6.8	42.3
63	Whangarei	4.3	0.6	5.8	11.6	8.6	3.7	7.0	41.6
64	Wanganui	12.1	0.8	1.7	4.7	7.4	2.3	11.6	40.6
65	Nelson	8.3	1.6	3.6	7.6	5.0	2.3	12.2	40.6
66	New Plymouth	9.6	1.5	6.6	11.9	4.9	2.8	3.2	40.5
67	Rotorua	3.5	0.3	3.4	12.5	4.7	1.9	14.0	40.3

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM	TOTAL
68	Tauranga	5.6	1.2	3.4	10.0	8.8	3.4	7.6	40.0
69	Napier	7.1	1.5	2.9	11.0	9.2	3.6	4.3	39.6
70	Hastinga	31.7	1.0	-0.3	10.5	0.1	1.0	-4.6	39.4
71	Porirua	18.5	-0.2	6.0	4.6	1.1	-1.3	10.0	38.7
72	Invercargill	-0.8	2.3	2.2	13.1	6.4	5.4	9.9	38.5
73	Palmerston North	8.5	1.2	0.0	8.4	3.6	2.6	13.2	37.5
74	Hamilton	5.0	0.7	1.8	8.6	3.0	3.9	11.7	34.7
75	Western Auckland	35.6	0.5	-0.4	0.5	-0.6	-1.6	-0.2	33.8
76	Lower Hutt	29.6	1.1	0.4	4.5	-0.3	-0.3	-1.2	33.8
77	Northern Auckland	14.1	1.3	-0.9	7.8	1.3	0.3	8.5	32.4
78	Dunedin	10.1	1.5	0.1	8.6	4.4	2.0	5.4	32.1
79	Wellington	-4.0	0.6	-2.9	11.1	8.7	9.7	7.6	30.8
80	Southern Auckland	24.5	-0.1	-1.7	4.1	0.9	-1.4	2.8	29.1
81	Christchurch	18.5	0.6	-4.4	7.0	2.3	1.1	0.0	25.1
82	Central Auckland	17.5	0.1	-4.3	8.9	2.5	2.7	-2.7	24.7

TABLE 6

TOTAL EXCESS EMPLOYMENT IN NEW ZEALAND URBAN PLACES BY MAJOR DIVISION AS A PER CENT OF TOTAL URBAN PLACE EXCESS EMPLOYMENT

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM
1	Helensville	28.7	7.7	4.8	1.3	33.9	3.7	19.9
2	Riverton	9.2	0.8	8.5	65.2	0.4	3.1	12.8
3	Raetihi	1.9	3.0	22.1	21.8	24.0	6.4	20.8
4	Martinborough	7.3	7.3	4.3	28.5	24.9	4.9	22.8
5	Ohakune	-0.9	3.4	3.5	0.3	81.4	1.5	10.8
6	Woodville	33.6	7.3	9.1	5.8	14.8	3.0	26.4
7	Greytown	48.8	0.5	14.9	2.6	11.2	5.1	16.9
8	Geraldine	-2.3	0.3	9.8	28.2	27.5	5.1	31.4
9	Otorohanga	29.1	3.1	6.1	8.3	13.8	6.4	33.2
10	Winton	8.6	51.1	10.8	11.0	3.4	3.3	11.8
11	Featherston	27.2	3.3	13.5	26.9	14.6	5.8	8.7
12	Milton	67.1	2.8	5.7	1.3	7.1	4.6	11.4
13	Eltham	66.0	19.3	0.5	1.0	3.0	7.8	2.4
14	Pahiatua	21.4	7.9	11.6	22.5	11.8	8.6	17.2
15	Taihape	-0.3	2.9	10.8	17.5	48.0	5.9	15.2
16	Waihi	62.6	2.5	9.7	6.8	5.0	4.3	9.1
17	Te Aroha	7.0	19.3	13.8	15.4	12.1	9.0	23.4
18	Waimate	10.1	0.0	19.1	27.9	10.6	5.5	26.8
19	Bluff	51.3	3.7	-3.3	4.0	44.7	-0.7	0.3
20	Temuka	45.7	0.0	20.5	9.4	10.9	3.0	10.5
21	Hokitika	21.0	6.7	7.7	10.7	17.7	8.2	28.0
22	Kaikohe	1.6	10.9	19.9	18.5	18.9	6.7	23.5
23	Te Puke	31.8	2.5	5.2	19.8	13.4	8.9	18.4
24	Paeroa	23.0	1.7	21.6	9.6	26.7	5.5	11.9
25	Kaitaia	5.7	2.3	25.0	15.0	18.7	8.1	25.2
26	Alexandra	-2.5	18.4	34.9	28.2	7.9	6.2	6.9
27	Waipukurau	0.8	3.5	10.5	28.5	15.2	7.5	34.0
28	Carterton	20.0	5.1	9.8	12.9	10.5	7.1	34.6
29	Motueka	25.1	8.0	12.6	15.4	14.0	6.3	18.6
30	Matamata	10.6	2.2	17.0	17.3	15.8	9.8	27.3

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM
31	Dargaville	15.4	8.1	25.8	16.0	8.2	6.9	19.6
32	Morrinsville	27.8	1.7	9.4	11.8	22.9	9.7	16.7
33	Putaruru	3.1	1.4	2.6	46.2	23.4	6.5	16.8
34	Balclutha	18.1	6.6	9.8	19.7	14.0	7.0	24.8
35	Marton	27.1	1.6	28.1	0.9	17.7	4.9	11.7
36	Te Kuiti	2.3	5.3	11.2	14.9	20.7	10.5	35.1
37	Rangiora	14.9	13.0	1.8	6.5	36.3	6.8	20.7
38	Westport	7.6	4.2	18.0	9.3	37.1	6.5	17.3
39	Waitara	101.0	0.0	-0.5	-0.9	0.9	1.6	-2.1
40	Huntly	21.0	1.8	8.7	21.4	22.2	4.1	20.8
41	Stratford	22.4	0.0	3.7	27.8	17.2	7.5	21.4
42	Wairoa	29.8	2.1	11.6	10.5	11.4	4.1	30.5
43	Dannevirke	5.0	5.9	11.1	30.2	13.7	9.1	25.0
44	Thames	46.9	0.0	4.7	9.0	8.5	4.2	26.7
45	Taumarunui	-2.9	3.6	23.0	9.4	31.6	4.7	30.6
46	Cambridge	15.5	3.1	15.9	17.2	12.8	9.2	26.3
47	Te Awamutu	24.1	2.4	6.3	22.0	18.0	9.8	17.4
48	Pukekohe	19.3	7.1	7.9	16.7	18.5	7.5	23.0
49	Greymouth	4.3	2.8	12.5	9.8	31.1	5.1	34.4
50	Hawera	12.5	4.5	5.3	40.5	8.3	8.2	20.7
51	Gore	1.3	2.3	7.8	37.8	13.9	9.4	27.5
52	Whakatane	-5.3	9.7	17.9	25.9	11.7	6.4	33.7
53	Feilding	69.8	3.5	5.8	10.7	8.6	2.5	-0.9
54	Taupo	3.1	2.6	19.5	23.8	15.4	7.3	28.3
55	Levin	57.7	5.9	2.0	0.8	5.1	3.1	25.4
56	Oamaru	31.7	9.8	17.1	13.2	15.4	2.2	10.6
57	Ashburton	22.0	6.9	12.7	21.6	14.5	3.7	18.6
58	Blenheim	9.1	4.1	22.5	22.9	17.5	8.1	15.8
59	Masterton	40.9	2.8	5.0	16.3	7.5	5.5	22.0
60	Timaru	22.4	3.0	4.4	26.1	20.8	5.4	17.9
61	Gisborne	26.5	2.4	9.4	21.6	9.6	6.3	24.2
62	Upper Hutt	80.1	-0.5	4.0	5.0	-4.2	-0.5	16.1
63	Whangarei	10.3	1.5	13.9	27.9	20.7	8.9	16.8
64	Wanganui	29.8	2.0	4.2	11.6	18.2	5.7	28.5
65	Nelson	20.5	3.9	8.9	18.7	12.3	5.7	30.0
66	New Plymouth	23.7	3.7	16.3	29.4	12.1	6.9	7.9

ID	NAME	MAN	ELE	CON	WHO	TRA	FIN	COM
67	Rotorua	8.7	0.8	8.4	31.0	11.7	4.7	34.7
68	Tauranga	14.0	3.0	8.5	25.0	22.0	8.5	19.0
69	Napier	17.9	3.8	7.3	27.8	23.2	9.1	10.9
70	Hastings	80.5	2.5	-0.8	26.7	0.3	2.5	-11.7
71	Porirua	47.8	-0.5	15.5	11.9	2.9	-3.4	25.8
72	Invercargill	-2.0	6.0	5.7	34.0	16.6	14.0	25.7
73	Palmerston North	22.7	3.2	0.0	22.4	9.6	6.9	35.2
74	Hamilton	14.4	2.0	5.2	24.8	8.7	11.2	33.7
75	Western Auckland	105.3	1.5	-1.2	1.5	-1.8	-4.7	-0.6
76	Lower Hutt	87.6	3.3	1.2	13.3	-0.9	-0.9	-3.6
77	Northern Auckland	43.5	4.0	-2.7	24.1	4.0	0.9	26.2
78	Dunedin	31.5	4.7	0.3	26.8	13.7	6.2	16.8
79	Wellington	-13.0	1.9	-9.4	36.0	28.3	31.5	24.7
80	Southern Auckland	84.2	-0.4	-5.8	14.1	3.1	-4.8	9.6
81	Christchurch	73.7	2.4	-17.5	27.9	9.1	4.4	0.0
82	Central Auckland	70.9	0.4	-17.4	36.0	10.1	10.9	-10.9

TABLE 7

DOMINANT FUNCTIONS AND SPECIALISATION INDEXES

OF NEW ZEALAND URBAN PLACES

(1) Specialisation Index; (2) Dominant Function

ID	NAME	(1)	(2)
61	Gisborne	1.04	MAN II
65	Nelson	1.12	COM
67	Rotorua	1.21	COM
73	Palmerston North	1.21	COM
74	Hamilton	1.21	COM
64	Wanganui	1.22	MAN II
41	Stratford	1.22	WHO
59	Masterton	1.22	MAN II
42	Wairoa	1.23	COM
66	New Plymouth	1.30	WHO
60	Timaru	1.33	WHO
46	Cambridge	1.33	COM
47	Te Awamutu	1.34	MAN II
40	Huntly	1.34	TRA
50	Hawera	1.36	WHO
68	Tauranga	1.37	WHO
18	Waimate	1.38	WHO
63	Whangarei	1.39	WHO
23	Te Puke	1.39	MAN II
78	Dunedin	1.39	MAN II
51	Gore	1.41	WHO
54	Taupo	1.42	COM
71	Porirua	1.43	MAN II
2	Riverton	1.44	WHO
30	Matamata	1.45	COM
77	Northern Auckland	1.47	MAN II
27	Waipukurau	1.49	COM
28	Carterton	1.49	COM
44	Thames	1.51	MAN II
69	Napier	1.55	WHO
58	Blenheim	1.56	WHO

ID	NAME	(1)	(2)
57	Ashburton	1.58	MAN II
9	Otorohanga	1.59	COM
11	Featherston	1.66	MAN II
34	Balclutha	1.66	COM
32	Morrinsville	1.67	MAN II
33	Putaruru	1.68	WHO
48	Pukekohe	1.70	COM
43	Dannevirke	1.70	WHO
14	Pahiatua	1.83	WHO
21	Hokitika	1.87	COM
20	Temuka	1.94	MAN II
8	Geraldine	1.94	COM
72	Invercargill	1.95	WHO
36	Te Kuiti	1.99	COM
35	Marton	2.00	CON
29	Motueka	2.01	MAN II
49	Greymouth	2.01	COM
25	Kaitaia	2.03	COM
55	Levin	2.13	MAN I
24	Paeroa	2.15	TRA
7	Greytown	2.32	MAN II
16	Waihi	2.34	MAN I
56	Oamaru	2.34	MAN II
6	Woodville	2.40	MAN II
31	Dargaville	2.42	CON
52	Whakatane	2.44	COM
53	Feilding	2.44	MAN I
4	Martinborough	2.45	WHO
45	Taumarunui	2.51	TRA
62	Upper Hutt	2.68	MAN I
38	Westport	2.78	TRA
80	Southern Auckland	2.83	MAN I
12	Milton	2.84	MAN I
81	Christchurch	2.87	MAN I
70	Hastings	2.98	MAN I
76	Lower Hutt	3.07	MAN I

ID	NAME	(1)	(2)
22	Kaikohe	3.12	COM
3	Raetihi	3.19	TRA
82	Central Auckland	3.26	MAN I
1	Helensville	3.51	TRA
15	Taihape	3.71	TRA
79	Wellington	3.94	WHO
19	Bluff	4.16	MAN I
75	Western Auckland	4.22	MAN I
37	Rangiora	4.56	TRA
39	Waitara	4.75	MAN I
17	Te Aroha	6.03	CCM
26	Alexandra	6.91	CON
13	Eltham	9.54	MAN I
5	Ohakune	9.91	TRA
10	Winton	47.88	ELE

TABLE 8

DOMINANT AND DISTINCTIVE FUNCTIONS, AND SPECIALISATION INDEXES FOR NEW ZEALAND URBAN PLACES

(1) Specialisation Indexes; (2) Dominant Function

ID	NAME	(1)	(2)	DISTINCTIVE FUNCTIONS						
				MAN	ELE	CON	WHO	TRA	FIN	COM
1	Helensville	3.51	TRA	3	3			2		3
2	Riverton	1.44	WHO				1			
3	Raetihi	3.19	TRA			2	3	3	3	3
4	Martinborough	2.45	WHO		3		3	3		3
5	Ohakune	9.91	TRA					1		
6	Woodville	2.40	MAN II	3	3					3
7	Greytown	2.32	MAN II	3		3				
8	Geraldine	1.94	COM			3	3	3		2
9	Otorohanga	1.59	COM	3					3	2
10	Winton	47.88	ELE		1	3				
11	Featherston	1.66	MAN II	3		3	3			
12	Milton	2.84	MAN I	2						
13	Eltham	9.54	MAN I	2	1				3	
14	Pahiatua	1.83	WHO		3	3	3		3	
15	Taihape	3.71	TRA			3		1		
16	Waihi	2.34	MAN I	2		3				
17	Te Aroha	6.03	COM		1	3			3	3
18	Waimate	1.38	WHO			2	3			3
19	Bluff	4.16	MAN I	3				1		
20	Temuka	1.94	MAN II	3		2				
21	Hokitika	1.87	COM		3			3	3	3
22	Kaikohe	3.12	COM		3	2		3	3	3
23	Te Puke	1.39	MAN II	3			3		3	
24	Paeroa	2.15	TRA			2		3		
25	Kaitaia	2.03	COM			2		3	3	3
26	Alexandra	6.91	CON		1	1	3		3	
27	Waipukurau	1.49	COM			3	3		3	2
28	Carterton	1.49	COM		3	3			3	2
29	Motueka	2.01	MAN II		3	3			3	
30	Matamata	1.45	COM			3		3	3	3

ID	NAME	(1)	(2)	DISTINCTIVE FUNCTIONS MAN	ELE	CON	WHO	TRA	FIN	COM
31	Dargaville	2.42	CON		3	2			3	3
32	Morrinsville	1.67	MAN II	3		3		3	3	
33	Putaruru	1.68	WHO				1	3	3	
34	Balclutha	1.66	COM		3	3	3		3	3
35	Marton	2.00	CON	3		1		3		
36	Te Kuiti	1.99	COM		3	3		3	2	2
37	Rangiora	4.56	TRA		2			2	3	3
38	Westport	2.78	TRA			3		2	3	
39	Waitara	4.75	MAN I	1						
40	Huntly	1.34	TRA				3	3		3
41	Stratford	1.22	WHO				3	3	3	3
42	Wairoa	1.23	COM	3		3				2
43	Dannevirke	1.70	WHO		3	3	3		3	3
44	Thames	1.51	MAN II	3						3
45	Taurmarunui	2.51	TRA			2		2		2
46	Cambridge	1.33	COM			3			3	3
47	Te Awamutu	1.34	MAN II				3	3	3	
48	Pukekohe	1.70	COM		3			3	3	3
49	Greymouth	2.01	COM			3		2		2
50	Hawera	1.36	WHO				2		3	3
51	Gore	1.41	WHO				2		3	3
52	Whakatane	2.44	COM		3	3	3		3	2
53	Feilding	2.44	MAN I	2						
54	Taupo	1.42	COM			2	3		3	3
55	Levin	2.13	MAN I	2	3					3
56	Oamaru	2.34	MAN II	3	3	3				
57	Ashburton	1.58	MAN II		3	3	3			
58	Blenheim	1.56	WHO			2	3	3	3	
59	Masterton	1.22	MAN II	3						3
60	Timaru	1.33	WHO				3	3		
61	Gisborne	1.04	MAN II			3	3		3	3
62	Upper Hutt	2.68	MAN I	1						
63	Whangarei	1.39	WHO			3	3	3	3	
64	Wanganui	1.22	MAN II	3				3		3
65	Nelson	1.12	COM				3			2
66	New Plymouth	1.30	WHO			3	3		3	

ID	NAME	(1)	(2)	DISTINCTIVE FUNCTIONS MAN	ELE	CON	WHO	TRA	FIN	COM
67	Rotorua	1.21	COM				2			2
68	Tauranga	1.37	WHO				3	3	3	
69	Napier	1.55	WHO				3	3	3	
70	Hastings	2.98	MAN I	1			3			
71	Porirua	1.43	MAN II	3		3				3
72	Invercargill	1.95	WHO		3		2	3	2	3
73	Palmerston North	1.21	COM				3		3	2
74	Hamilton	1.21	COM				3		2	2
75	Western Auckland	4.22	MAN I	1						
76	Lower Hutt	3.07	MAN I	1						
77	Northern Auckland	1.47	MAN II	3			3			3
78	Dunedin	1.39	MAN II	3			3		3	
79	Wellington	3.94	WHO				2	2	1	3
80	Southern Auckland	2.83	MAN I	1						
81	Christchurch	2.87	MAN I	2			3			
82	Central Auckland	3.26	MAN I	2			2		2	

APPENDIX E

MAXWELL'S CLASSIFICATION OF CANADIAN CITIES

Maxwell's (1965,79-104) study of the functional structure of Canadian cities was undertaken in order to obtain an overview of the Canadian urban scene. All of the 106 incorporated urban centres in Canada that had 1951 populations of 10,000 or more were considered by Maxwell, but by recognising some census metropolitan areas as individual cities and grouping other adjoining urban municipalities to form single units, the total number of cities studies was reduced to eighty. Canadian census labour force statistics for place of residence classified by industry for 1951 furnished the source material.

City "functional structure" was equated with city "employment structure" since it was thought that the activities in which a city's people earned their living provided good indicators of city functions. The terms "city activity" and "city function" were taken to be synonymous, and the city functions recognised consisted of groupings of 1951 Census of Canada industrial categories.

Maxwell used basic employment - that part of a city's total employment engaged in activities that produce goods and services for markets outside the city - to characterise city functional structures. To calculate each city's basic employment in the respective functions, the second variant of the minimum requirements method as developed by Ullman and Dacey (1960,175-194) was used. The actual, absolute minimum requirements or percentage values of employment for selected functions were determined empirically by Maxwell for Canadian cities grouped into four arbitrarily determined population size categories. Following the method of Ullman and Dacey, Maxwell used this Canadian

data to develop least-squares linear regression equations for each of the functions. Although, where applicable, Maxwell preferred to use Ullman and Dacey's least-squares linear regression equations based on United States data.[1] These least-squares linear regression equations allowed the expected minimum requirements or percentage values of employment for each of the functions to be calculated for cities of all sizes. Once a ctiy's expected minima for functions were known, the excess employment was calculated. The excess employment so determined was considered to be a good approximation of basic employment.

Three characteristics were used by Maxwell to typify city functional structures: the city's dominant function, its distinctive functions, and its degree of functional specialisation. The dominant function of a city was defined as the activity having the largest share of the city's total excess or basic employment. A distinctive function was defined as an activity whose share of total excess or basic employment in a city greatly exceeds the share it usually has in most cities. While city specialisation was given by an index based on the relationship of a city's distribution of total excess or basic employment among functions to its distribution of minimum requirement employment among the functions.

Seven dominant functional classes were derived for Canadian cities: retail trade, community service, manufacturing I, manufacturing II, transportation, government service, and extraction. Four classes of distinctive functions were recognised for Canadian cities. These classes were defined in terms of standard deviation values of excess or basic employment above the arithmetic mean value of excess or basic employment for an activity. A functional

specialisation index utilising the expected minimum requirements or percentage values of employment for functions, as developed by Ullman and Dacey (1960,189), was also calculated for each Canadian city. Finally, to achieve an overview of the Canadian urban scene, Maxwell plotted the percentage values of each city's excess or basic employment in manufacturing and in wholesale trade on an isometric graph, together with the values of city population size and functional specialisation in order to classify Canadian cities. Five groups of city-type classes were identified: major metropolitan centres; regional capitals with manufacturing, relatively important; regional capitals with manufacturing, relatively unimportant; specialised manufacturing centres; and special cities.

Forward (1972,137-176) in his study of the cities of the Atlantic Provinces of Canada suggested that Maxwell's approach was most useful for the purpose of achieving a general measure of urban functions on a comparative basis. However, he considered that a limitation of Maxwell's study was that it was based on 1951 employment statistics. To overcome this limitation, Forward updated Maxwell's findings for Canadian cities using 1961 data.

Footnotes

1. Where applicable, Maxwell gave priority to the least-squares linear regression equations derived by Ullman and Dacey from United States data over the Canadian based ones because the United States with its large number of cities, provided a more favourable area from which to draw percentage values of employment representative of the actual, absolute minimum requirements.

APPENDIX F

POWNALL'S CLASSIFICATION OF NEW ZEALAND TOWNS

Pownall's (1953,332-350) study of the functions of New Zealand towns is basically a classification as an end in itself. This is supported by Pownall (1953,332) in his introduction, where he pointed out that in the relatively short period of European settlement the towns of New Zealand have

> "acquired a uniform and individually characterless appearance..... Because of this apparent uniformity among New Zealand towns an analysis of the functions which they perform becomes of particular importance as a means of differentiating clearly among them..... It is therefore of interest to distinguish the kinds of New Zealand towns on the basis of their functions and to classify the urban areas of this small country."

Pownall's study was based on employment statistics collected by the Department of Labour in its April, 1950 half-yearly survey of employment in 69 industrial categories in all towns with a population of 1,000 or more. Defining "towns" in terms of the statistical and administrative units used by the Department of Statistics for census purposes (that is, "urban areas", "boroughs", "town districts"), Pownall divided all New Zealand towns with a population of 1,000 or more into groups of approximately the same population size, resulting in 100 towns divided into seven groups - Group I containing four towns with a population between 91,000 and 308,000, to Group VII containing thirty-six towns with a population between 1,000 and 2,000. He then calculated the national arithmetic means or average values for each group of towns for six different employment functions: manufacturing, building and construction;

primary industrial; transport and communications; distribution and financial; hotel and personal service; and administration and professional service (which combined the majority of the 69 different industrial categories surveyed and covered practically all the actively employed population). The seventh class, that of the residential function, was based on the national arithmetic means or average values calculated for the percentage of the total population actively employed in the towns in each group. Finally, Pownall measured for each individual town, the simple positive deviations in each of the functions represented in its employment structure from the national means for that particular group, and thus derived the relative importance of the town's function, or functions. The location of the 100 towns and their functions as derived above were shown diagrammatically on a base map of New Zealand, and on a series of seven maps, towns of different functions were illustrated.

Although Pownall pays some attention to the distribution of New Zealand towns in the different functional classes, his discussion is largely superficial and involves either the identification of specific towns, reference to regional groupings, or noting the inter-island distribution of towns (Smith, 1965,545-546). This is understandable however, considering the pioneering nature of Pownall's study of New Zealand's urban geography. As Jones (1955,87) in his review of Pownall's study pointed out,

> "Pownall's study has broken new ground in studies or urban geographyin New Zealand, and provides the most comprehensive examination of our towns ever undertaken..... It provides a broad and sound basis for further work on the geography of New Zealand towns."

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