

THE UNIVERSITY OF CALGARY

ECONOMIC BASE CHANGES IN THE CANADIAN
URBAN SYSTEM: 1951 TO 1986

by

DANIEL PATRICK DONOGHUE

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF

MASTER OF ARTS

DEPARTMENT OF GEOGRAPHY

CALGARY, ALBERTA

JUNE, 1991

© Daniel Patrick Donoghue 1991

THE UNIVERSITY OF CALGARY

THE FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance the thesis entitled, "Economic Base Changes in the Canadian Urban System: 1951 - 1986," submitted by Daniel Patrick Donoghue in partial fulfillment of the requirements for the degree of Master of Arts.

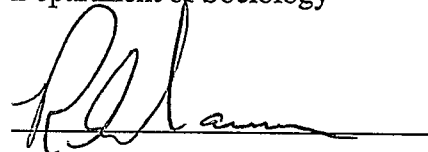
Dr. W.K.D. Davies, Supervisor,
Department of Geography



Dr. M.R.C. Coulson,
Department of Geography



Dr. R.A. Wanner,
Department of Sociology



June 14, 1991

ABSTRACT

This study deals with the changes in the economic bases of Canadian centres with populations greater than 30,000 from 1951 to 1986. A review of the literature pertaining to various related aspects of Urban and Economic Geography provides the background for this study. The main objectives are to examine the relationships between the economic characteristics of places as they increase in size through time, with a bias towards studying the specific changes in the service sector. This is facilitated by the use of such indicators as the Location Quotient and Gini Coefficient of Specialization which portray characteristics of industrial specialization in specific industries as well as summary measures of the diversification levels found in individual Canadian cities. Classifications of Canadian centres in 1951 and 1986 are also carried out, utilizing Cluster Analysis, to provide an indication of the relationships these centres have with one another within the framework of the urban system and how these relationships have altered over 35 years.

ACKNOWLEDGEMENTS

First, I would like to thank my parents for their constant support and for always providing an environment conducive to learning. I would also like to thank Dr. W.K.D. Davies for his guidance, advice, support and most of all, patience as well as financial assistance provided from a S.S.H.R.C. Grant number 410-85-0268 and University Research Grant. In the Geography Department I would particularly like to thank Mrs. Joyce Rowden, just for being there. I would like to acknowledge Dean Hyne who made a Dean's Special Scholarship available to help in the pursuit of data for this study as well as a Thesis Research Grant from the Faculty of Graduate Studies. Most of all I would like to thank all my friends in Calgary who made coming to Canada to do this work so enjoyable, in particular to Jim Warren and Lloyd Visser of the ABC club, who instilled in me a great desire to watch hockey games on CBC; to Roger Wheate and Wayne Blumstengel, to those many office partners I had in my time at the U of C, to those of you who taught me how to ski, Thank You! While I'm at it I would like to thank the people at the GSA, in particular Denise, for making some of my political endeavours worthwhile. To the Grad Lounge staff and in particular Kathy, for providing a nice place to relax, when it was most needed. I suppose I should thank Dr. Bill Goding too, for always being around to talk about sports, and other assorted topics, when there wasn't anyone else who knew anything about them. Finally, I would like to thank the Irish Cultural Society, for making me feel like I was at home every now and again, just in case a little homesickness set in. To any one who deserves mention and I didn't get around to, Thanks!

DEDICATION

I dedicate this thesis to my Grandmother,

Kattie O'Donoghue

1898 - 1988

May She Rest in Peace

TABLE OF CONTENTS

<u>Chapter</u>	<u>page</u>
APPROVAL PAGE.....	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS.....	iv
DEDICATION.....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES	ix
LIST OF FIGURES	xi
 CHAPTER 1.....	 1
INTRODUCTION	1
1.1 Background	1
1.2 City Size, Growth, and Industrial Diversification	4
1.3 Services and Urban Growth.....	7
1.4 Specific Objectives of Study	8
 CHAPTER 2.....	 10
DATA AND TECHNIQUES	10
2.1 Problems of Urban Definition.....	10
2.2 Cities Used in this Study	12
2.3 Division of Economic Activity	14
2.4 Basic/Non-Basic Division	15
2.5 New Subdivisions of the 'Service' Sector.....	16
2.6 Industrial Classification.....	18
2.7 Economic Base Studies	23
2.8 Location Quotients.....	24
2.9 Gini Index	27
 CHAPTER 3.....	 32
URBAN CENTRE TRENDS.....	32
3.1 Introduction	32
3.2 City Diversification as a Function of City Size.....	32
3.3 City Diversification through Time	35
3.4 The Converging Economic Base of Cities.....	37

3.5 Free standing cities	44
3.6 Conclusion	47
CHAPTER 4.....	49
REGIONAL DIFFERENCES IN ECONOMY OF THE CITIES.....	49
4.1 Introduction	49
4.2 Regional Data	50
4.3 Population.....	52
4.4 Population Change	54
4.5 Workforce.....	57
4.6 Changes in the Size of the Workforce.....	58
4.7 Diversification.....	60
4.8 Location Quotient Changes by Region 1951 - 1986.....	64
4.9.Conclusion	67
CHAPTER 5.....	68
CLASSIFICATION OF CANADIAN URBAN CENTRES.....	68
5.1 Introduction	68
5.2 Background	68
5.3 The Generalization of Information.....	72
5.4 Data Used.....	72
5.5 Cluster Analysis	73
5.6 Justification for the use of a 7 Cluster solution	74
5.7 Presentation of the results from 1986.....	75
5.8 1986 Results of Cluster Analysis.....	76
5.8.1 Cluster 1.....	77
5.8.2 Cluster 2.....	78
5.8.3 Cluster 3.....	79
5.8.4 Cluster 4.....	81
5.8.5 Cluster 5.....	83
5.8.6 Cluster 6.....	84
5.8.7 Cluster 7.....	85
5.9 Other Cluster Solutions 1986	87
5.10 Results of Cluster Analysis on 1951 Data.....	88
5.10.1 Cluster 1	90
5.10.2 Cluster 2.....	91

5.10.3 Cluster 3	92
5.10.4 Cluster 4	93
5.10.5 Cluster 5	94
5.10.6 Cluster 6	94
5.11 Other Cluster Solutions.....	95
5.12 Comparison of 1951 and 1986 Results.....	96
5.13 Comparison of Cluster Membership in 1951 and 1986	97
5.14 Comparison to Previous Classifications.....	98
5.15 Changes in the Urban System	98
5.16 Conclusion.....	99
CHAPTER 6.....	101
SUMMARY and CONCLUSIONS.....	101
BIBLIOGRAPHY.....	106
APPENDICES.....	113

LIST OF TABLES

<u>Table</u>	<u>page</u>
Table 1.1 Composition of the Workforce for Centres with Populations greater than 30,000 from 1951 to 1986	2
Table 2.1 Canadian Urban Centres over 30,000 by Type.....	13
Table 2.2 The Industrial Classification Adopted from the SIC	19
Table 2.3 A Comparison of 1981 Gini Index Values using the 1981 and 1986 Classifications	30
Table 3.1 The Relationship between City Size and the Gini Index 1986	34
Table 3.2 T-Test Results based on a Comparison of the Level of Diversification found in Canadian Centres from 1951 to 1986	37
Table 3.3 Mean Gini Index and One Standard Deviation about the Mean 1951 - 1986.....	39
Table 3.4 Mean Location Quotients 1951 - 1986.....	41
Table 3.5 The Change in Gini Index as the Distance between Centres Changes (1986).....	45
Table 4.1a Mean City Size by Region 1951 - 1986	53
Table 4.1b Percentage Change in Mean City Size by Region 1951-1986.....	53
Table 4.2 Mean of Percentage Changes in Urban Centre Populations by Region 1951-1986.....	55
Table 4.3a Mean Workforce Size of Centres by Region 1951 - 1986	57
Table 4.3b Change in Mean Workforce by Region 1951 - 1986	58
Table 4.4 Mean of Percentage Changes in Urban Workforce by Region 1951-1986...	59
Table 4.5a Mean Gini Indices.....	62
Table 4.5b Mean Changes in the Gini Index by Region 1951 - 1986.....	62
Table 4.6 Mean Regional Location Quotients for 1951.....	64
Table 4.7 Mean Regional Location Quotients for 1986 and Direction of Changes from 1951 to 1986	66
Table 5.1a Characteristics of the Clusters in 1986 based on Mean Location Quotients for Industries	76
Table 5.1b Mean Gini Index values and other Urban Indicators 1986.....	77
Table 5.2 Members of Cluster 1.....	77
Table 5.3 Members in Cluster 2	79
Table 5.4 Members of Cluster 3.....	80

Table 5.5 Members of Cluster 4.....	81
Table 5.6 Members of Cluster 6.....	84
Table 5.7 Members of Cluster 7.....	86
Table 5.8 A Comparison of Different Cluster Solutions in 1986.....	87
Table 5.9a Characteristics of the Clusters in 1951 based on Mean Location Quotients for Industries	90
Table 5.9b Mean Gini Index and Workforces 1951.....	90
Table 5.10 Members of Cluster 1	91
Table 5.11 Members of Cluster 2	91
Table 5.12 Members in Cluster 3.....	92
Table 5.13 Members of Cluster 4	93
Table 5.14 A Comparison of Different Cluster Solutions in 1951	95
Table 5.15 A Comparison of the Clusters found in 1951 and 1986.....	96

LIST OF FIGURES

<u>Figure</u>	<u>page</u>
Figure 3.1 Graph of Mean Gini Index +/- 1 Standard Deviation	40
Figure 5.1 Fusion Coefficients for Cluster Solutions 1986.....	74
Figure 5.2 Fusion Coefficients for Cluster Solutions 1951.....	89

CHAPTER 1

INTRODUCTION

1.1 Background

This study analyzes the spatial distribution and concentration of industrial activity in the Canadian Urban System from 1951 to 1986. The population of Canada has grown dramatically from 5,371,315 in 1901 to 14,009,429 in 1951 to 25,354,065 in 1986. Canada, like all the countries of the developed world, has been transformed into an urban and service society during this century. Three important features from this general change to be investigated are the changing composition of the industrial workforce, its variation between places and the changing levels of urbanization. The shifts in Canada's economic structure can be most easily summarized by the typical threefold division into Primary, Secondary and Tertiary industries. Between 1901 and 1986 the Tertiary sector expanded from 26.8% to 70.0% of the total Canadian labour force. This service trend has been noticed in varying degrees in all the countries of the developed world over the same time period (Singelman, 1978) and has also been shown to vary with the stage of economic development of a particular country (Shelp, 1981). But growth in the proportional size of the tertiary sector relative to other industrial categories in general is not the only issue. This increase has been accompanied by greater concentration and specialization in the various branches of the 'tertiary sector'. A more specific breakdown of industrial activities and their respective shares of the Canadian workforce during the period of specific interest, 1951 - 1986, can be observed in Table 1.1. These differential changes within the tertiary sector necessitate the need for a further breakdown of the traditional 'tertiary sector', particularly with regard to the overall effect on the urban system.

The changes in the economic structure of the country are paralleled by changes in the degree of urbanization. From 1931 onwards the majority of the Canadian population has lived in urban centres. Since 1971 there has been a numerical dominance of Metropolitan Centres. The Canadian urban system is quite unique in terms of the location and density of its urban population. Due to the vast size and northerly latitude of the country the large majority of the population is in

Table 1.1 Composition of the Workforce for Centres with Populations greater than 30,000 from 1951 to 1986

Industry	1951	1961	1971	1981	1986	1951-86
Mining & Oil	2.4	2.2	1.9	1.9	0.9	-1.5
Forestry	3.0	1.9	1.0	0.8	0.9	-2.1
Manufacturing	31.3	25.3	23.0	20.0	18.0	-13.3
Construction	8.1	6.3	7.2	6.5	6.2	-1.9
Transportation	8.0	7.2	5.6	5.1	4.6	-3.4
Communications	1.3	2.3	2.2	2.3	3.4*	+0.7
Utilities	1.4	1.3	1.2	1.2		
Wholesaling	4.5	5.2	4.7	5.1	4.8	+0.3
Retailing	11.9	12.6	12.3	12.6	13.2	+1.3
Finance	1.6	2.0	2.5	3.0	3.8	+2.2
Insurance/Real Estate	1.7	2.1	2.3	2.8	1.9	+0.2
Education	3.4	4.8	7.6	7.1	6.9	+3.5
Health	3.6	5.5	6.9	7.9	8.6	+5.0
Business	1.3	1.8	2.8	4.4	4.8	+3.5
Accommodation/Food	3.6	4.3	4.5	5.7	6.6	+3.0
Government	5.3	5.6	6.7	7.0	8.0#	+0.4
Defense	2.3	3.1	1.9	1.1		
Religion	0.9	1.0	0.6	0.6^		
Amuse/Recreation	0.7	0.7	1.0	1.1^		
Personal Services	3.6	3.6	2.4	1.6^		
Miscellaneous	-	1.1	1.6	2.2^		
Other	-	-	-	-	7.3	+2.1

Totals = 100%

* This is total for Communications and Utilities jointly

This is total for Government and Defense jointly

^ All 4 values in 1981 were aggregated to form Other in 1986

In 1986 only 16 categories of industrial activity were produced, there were 21 categories for 1951 to 1981

Source - Statistics Canada, Economic Activity Volumes 1951 -1986

close proximity to Canada's southern border with the United States and the distribution of large centres reflects this trend. Within Canada, urban populations vary enormously in terms of location, size, spacing and internal structures. From the industrial heartland of southern Ontario and Quebec to the vast expanses of the Prairies, from the peninsulas of the Atlantic Provinces to the valleys of British Columbia, Canada exhibits areas as physically varied as anywhere in the world. All of these regions in Canada boast different characteristics, each of which affects the population and its distribution in those areas. The degree of urbanization is just one of the ways in which these regions vary, for all these regions have exhibited disparate growth rates over time for many varied reasons.

It is the objective of this study to *investigate the economic changes in employment characteristics in the evolving Canadian urban system from 1951 to 1986*. Through the use of economic base techniques, based on data from Statistics Canada grouped by the Standard Industrial Classification, the research examines a number of factors linking employment in industry to urban character. Levels of industrial concentration and diversification are presented as a means for relating the economic data to various characteristics of the urban realm, such as city sizes, relative locations and population change. An attempt is made to correlate specific sectors of the economy to the changes that have occurred within the urban system, either as a whole or as individual cases. A number of regional breakdowns are utilized to describe the differences between various areas of the country. To some extent the study replicates the general trend of previous research (Crowley 1978, Marshall 1975, 1981, 1988) but has three important differences. Firstly, it extends these analyses to contemporary data; secondly, it deals with longer time-frames; and thirdly, the study emphasizes service aspects of the economy whereas the earlier studies concentrated on the manufacturing sector, ensuring that few of the specific effects of service employment on a complete urban system were dealt with despite the debate which surrounded basic and non-basic services (Alexander 1954, Blumenfeld 1955). This

service emphasis could be criticized but in light of the shrinking Manufacturing sector (down to 18.1% of the employment for the centres of this study) and the very small size of some of the sectors that would be created by the disaggregation of the Manufacturing division, it seems appropriate that the services sector be disaggregated to serve as an antidote to the past emphasis on internal differences within the Manufacturing sector.

This study uses Statistics Canada data on the industrial labour force from the Standard Industrial Classification between 1951 and 1986. The labour force for all centres over 30,000 population in 1986 is analyzed. This means that there were 63 centres in 1951 and 80 places in 1986 for which data was available. The cutoff of 30,000 as the criteria for inclusion of a centre in the study was chosen because the detailed labour force statistics that were required were not available from the census for smaller centres. A more detailed discussion of this aspect of the study is provided in Chapter 2.

1.2 City Size, Growth, and Industrial Diversification

Studies of the industrial diversification of centres have frequently explored the relationship between specialization and other characteristics. Since the relationships are not entirely clear a review of the literature attempts to clarify the issues. One popular approach has been the search for the relationship between the size and the level of diversification of cities, as in Clemente & Sturgis' work (1971) in the U.S.A. and more recently in a Canadian context by Crowley (1978) and Marshall (1981,1988). Many other studies have investigated the economic relationships with size as well as relative location within the urban system and population growth rates. For example, Keinath (1985), Bahl, Firestone and Phares (1971), Phillips and Vidal (1983) *inter alia*. have examined many of these relationships.

Alexander (1954) alluded to the concept of free standing cities as well as levels of diversification when he contemplated whether a city of 40,000 inhabitants 30 miles away

from a metropolitan centre would display differences when compared to a city of the same size that was located 300 miles from a metropolitan area. He also discussed the possibility that cities which grow vigorously might exhibit different effects on their levels of diversification than cities growing at a slower pace. A possible explanation for this phenomenon is that proposed by Keinath, whose results implied that: "the general economy, in moving toward a more diverse form, creates a positive, probabilistic setting so that a regional economy that is either diverse or diversifying can anticipate a better growth record" (Keinath, 1985, 229).

Bahl, Firestone and Phares (1971) in the U.S.A. developed a technique to discover if any one city size category had more diversification than others. It was really an attempt to see if there was an ideal city size. Their results showed that cities displayed the greatest level of diversification/specialization at an approximate size of 4 million inhabitants. This work was carried out using an adjusted minimum requirements technique following the work of Ullman and Dacey (1960). The results were not new, for it has long been known that larger centres contain a greater number of economic functions, commercial or otherwise. This reiterates one of the concepts in Central Place Theory as well as Ullman and Dacey's (1960) conclusion that the larger the city the larger the number of specialities that can be supported and the more self-contained the city can be. This type of statement has also been summarized in the work of Jacobs (1970), this time linked to the mechanism of import substitution.

Clemente and Sturgis (1971) went a step further and hypothesized a direct relationship between the size of a population and the extent of the diversification of the industrial structure. In their work this hypothesized relationship was found to be much weaker than expected. The reason put forward to explain the weakness of the relationship was the presence of an actual division of labour among communities - thus intimating a growing functional dependence of places.

Crowley (1973, 91) reviewed the work of Clemente and Sturgis and suggested that the weak relationship they obtained was caused by a 'nonsense relationship of data'. He developed what was considered a more suitable data set finding that:

- (a) specialization appears to be correlated with size;
- (b) labour force, as the measure of size, yielded higher coefficients of correlation than population.

Crowley believed that the relationship was not stable and that it may actually be decreasing through time. Marshall (1975) also found a weak degree of association between diversification and city size but showed that larger centres did tend to be highly diversified.

Simmons (1976) reviewed the size relationships of growth trends in the Canadian urban system and suggested that once a city reaches a size of about 10,000 and dominates a set of tributary towns it seldom declines. This idea can be directly related to the concept of industrial diversification. When a town reaches a certain size and has certain levels of self-sufficiency it will not be dependent on other centres for its survival. The exception to this generalization is the *resource centre* - of which there are many in Canada. Many such towns have attained this level of population, but many subsequently declined once the resources were depleted, for these centres have no other industries in the local area to fall back on. Mathur (1970), in another growth related review of industrialization and city size, argued that the proportion of employment in growth industries which generate more skilled jobs increases with city size. In other words, the larger the city the greater the number of skilled jobs in growth related industries.

In a study of the Manufacturing sector Beattie and Watts (1983) examined the relationship between city size and manufacturing in terms of four features:

- (a) percentage workforce involved in manufacturing;
- (b) plant size differences;
- (c) levels of specialization;
- (d) the stage in the manufacturing process which was taking place.

They concluded that:

- (i) there were systematic relationships between the size of an urban place and several aspects of its manufacturing activities;
- (ii) manufacturing tends to be more influenced by location than population size.

The results from these types of study are to be taken as an encouragement that similar variations might be observed when the services sector is taken into account. Certainly they are issues worth exploring.

1.3 Services and Urban Growth

The topic of specific relationships between industries and urban places also has to be discussed. The main problems involved with this kind of work are the limitations on what aspects of an industry's impact can be examined. In the past researchers have concentrated on various locational and specialization problems for industries, but early work tended to assume basic or city-forming activity (usually manufacturing) was dominant. Historically, many of these works tended to be purely descriptive. More recent work has been able to deal with the impact of specific sectors on the local economy, through the use of multiplier effects and detailed data describing usership of facilities. For example: Holton-Wilson and Raymond (1973) examined the impact of a University on the local surroundings in Kent, Ohio, based on local multipliers and student spending. The empirical analysis which was conducted proved to be an improvement on previous efforts which seemed to have over estimated the impact students had on the local economy. Moore and Suffrin (1974), carried out similar work at Syracuse University in New York. The main point Moore and Suffrin made was that large non-profit organizations can definitely impact the economic growth and vitality of an area. Erickson, Gavin and Cordes (1986) examined the economic impact of the hospital sector with specific references to the export of hospital services. Moore (1974) likewise showed the effects of this sector on a local community and showed how money could be generated as a form of inter-regional trade.

Beyers and Alvine (1985) illustrated in their study of the Central Puget Sound area of Washington that services sector firms have provided strong empirical evidence for the export of services outside the local economy. Norcliffe (1983a) has also discussed the relationship between the trade flows of services and the economic base. These examples of service sector importance, at other than the local level, tend to shatter the fallacy of the original basic/non-basic view that services were only city-serving. Clearly they have an important city-forming role.

1.4 Specific Objectives of Study

This study will focus on a number of relevant themes :

- (a) the changing level of urbanization and the diversity of employment structures in the individual centres as well as the various regions of Canada for the years 1951 to 1986;
- (b) the varying degree of diversification and the resulting relationships with changing populations of urban centres through time;
- (c) the impact of size and diversification as well as relative location on centres in a dynamic urban system;
- (d) a classification of urban centres into groups based on common economic base characteristics and the changes that have occurred in those centres between 1951 and 1986.

The end result of such a focus will be a better understanding of the economic characteristics in an urban system in general and Canada in particular. Chapter 2 of the study deals with the data set and the techniques which were utilized in the study to outline the economic characteristics of individual places. Chapter 3 consists of an overview of

some of the economic characteristics found in the Canadian urban system and some of the trends that are in evidence on a systems-wide basis. Chapter 4 examines a number of differences in economic characteristics between the regions of Canada as they relate to the trends noticed in Chapter 3. Chapter 5 attempts to classify individual centres into categories that broadly reflect the similarities that existed between places in Canada in both 1951 and 1986 as well as attempting to evaluate the changes that have taken place during that 35 year interval.

CHAPTER 2

DATA AND TECHNIQUES

2.1 Problems of Urban Definition

The definition of what constitutes an urban or metropolitan area has, in the past, been a point of contention in the study of Urban Geography. There are several definitions which can currently be found worldwide. Carter (1975) has noted that it is impossible to identify a dividing line in terms of size, which is conceptually meaningful, to delimit urban populations. Carter has presented some of the various criteria based on 1969 United Nations statistics which have been used globally for this purpose. These criteria include population size and density, predominant economic activities, administrative function or structure and other non-specified urban characteristics. Carter (1975) concluded that it is impossible to identify one simple dividing line in terms of size, which is conceptually meaningful, to delimit urban populations.

Davies (1989) extended these ideas in a conceptual definition which attempted to integrate the criteria which have been utilized previously to define a place as being "urban". This definition suggested that, "urban places are large permanent population agglomerations or settlements possessing nodality for surrounding centres, whose functional complexity and social heterogeneity create a separate identity within the larger society." (Davies, 1989, 6). From these concepts Davies suggested measurements can be applied to each criteria and multivariate analysis can classify the information into a series of types.

Similar problems of definition apply to the concept of Metropolitan Areas. These large urban designations are difficult to define and also vary in size from country to country. The United States uses the Standard Metropolitan Statistical Area (SMSA) which can range in size anywhere upwards from 25,000 people depending on the density of

population in that area. If certain density requirements are not met 50,000 is the minimum size of an SMSA. The contiguous outer areas of the larger centres are included as part of the SMSA if they have less than 25% of their workforce involved in the agricultural sector. To some extent these definitions employ criteria linked to some of the ideas proposed by Davies (1986).

In Canada the largest urban places are known as Census Metropolitan Areas (CMA's). The next largest size of centre is the Census Agglomeration (CA), and lower still is the incorporated city, town or village. The CMA has a minimum population requirement of 100,000. Canada does not use the percentage of agricultural workforce participation as a requirement for contiguous areas on the urban fringe to be included in the CMA's or CA's. This measure was utilized up until 1971 when it was found to have flaws. Instead, commuter flows and continuity of the urban area criteria are used. These delineations of urban areas in Canada are different from those used in some other Western nations but Statistics Canada believes the discrepancies which may arise from these differences are small, the result being the Canadian information is quite comparable to that from other countries.

A Census Metropolitan Area is defined as, "the main labour market of a continuous built-up area having a population of 100,000 or more." and a Census Agglomeration is defined as, "the main labour market of an urbanized core (or continuously built-up area) having between 10,000 and 99,999 population." (Statistics Canada 1986). Census Agglomerations are comprised of either municipalities completely, or partly, inside the urbanized core and/or other municipalities if at least 40% of the employed labour force living in the municipality works in the urbanized core, or if at least 25% of the employed labour force working in the municipality lives in the urbanized core. These definitions were altered slightly in 1986 to allow for new units, namely the consolidated CMA and CA. Some CMA's and CA's which were adjacent to each other were grouped together to

make up consolidated units. This consolidation takes place when there is at least 35% of the labour force living in the smaller of the two adjacent units commuting to the larger centre.

2.2 Cities Used in this Study

Although CMA data is useful Table 2.1 shows that there were only 25 CMA's in Canada in 1986 and 15 in 1951 although it must be noted that the definition changed. If one were to only use CMA's for the analysis contemplated here there would be a very restricted set of cities. Hence it was necessary to revert to a data set which is a combination of CMA's, CA's and Incorporated Cities over 30,000 (that are not included within the existing CMA or CA boundaries). While this is not an ideal situation, once it is recognized that different entities are being used to describe urban centres no real problems should be encountered since the study is looking at the summary of the largest urban aggregates at specific points in time. In 1986 the 80 largest urban and metropolitan areas of Canada with populations over 30,000 are included in the study. The exception is Port Alberni which was added to the list because its 1981 population was over 30,000, despite the fact it declined to 26,130 in 1986. The populations and workforces of the centres in the study for 1951 and 1986 can be found in Appendix A. While detailed workforce statistics were only available for 63 of the places in 1951, population data was available for 78 of the centres.

Table 2.1 shows that employment statistics were only available for 63 of these centres in 1951. The rapid growth in population in Canadian urban areas since 1951 has resulted in the transformation of many small towns into larger urban centres. This temporal change results therefore in a lack of data - especially workforce data - for some of the centres that are included in the study at the earlier stages of the analysis. Some of the larger centres in 1986 were at some time in the recent past too small to have their workforce

statistics detailed, although the population statistics have been included for those centres, therefore these centres were not included in the study until the required data became available. Thus, the data - especially for the earlier stages of the analysis - is not as comprehensive as one would like. Once this workforce information becomes available for the centres

Table 2.1 Canadian Urban Centres over 30,000 by Type

	CMA	CA	Inc. ¹	Total
1951	15#	16*	32	63
1961	17#	19*	35	71
1971	22	34	21	77
1981	24	48	6	78
1986	25	55	-	80

these values represent centres which were considered to be 'major centres' prior to the use of the Census Metropolitan Area terminology.

* these values represent centres which were considered to be 'other major centres' prior to the use of the Census Agglomeration terminology.

¹ incorporated represents any incorporated city, town, village or district municipality. The complete set of places analyzed is shown in Appendix A.

in question (because they had attained a specific size) it is added to the data set. This explains why the set of cities being used in the study for workforce analysis is not consistent throughout. Detailed workforce data was available for 63 centres in 1961, 71 in 1961, 77 in 1971, 78 in 1981 and 80 centres in 1986. All of the centres included in the study in 1951 are included in 1986, a list of the centres included in the study can be found in Appendix A, along with the year they were first included in the study (Appendix B). The actual type of centres and their distribution in the data set can be seen in Table 2.1. It seemed more appropriate to have a population cut-off to establish a consistent set of places. Unfortunately for the comprehensiveness of this study industrial labour force data is not available for the smallest places. The 30,000 size category in 1986 was selected as the lower value for inclusion of an urban place in the research for a number of reasons. First,

a reasonably comprehensive set of employment categories (21 groups) could be obtained from 1951 onwards. Secondly, if the population of 25,000 were used as the lower limit, the changes that have taken place in the Standard Industrial Classification (SIC) for the grouping of industries for the reduced set of categories would have led to inequalities in the workforce values for the various centres resulting in the incompatibility of statistics within the same set of data. Thirdly, the data set that has been created by applying the population threshold of 30,000 in 1986 closely resembles the data sets which Maxwell (1965) and Crowley (1973) used in related research. This allows for some comparison of the results reported here to previous work.

In some cases CMA's or other urban centres were defined differently in the past and other entities were used to describe specific places. An example of this is Port Arthur and Fort William, two separate cities in 1951 which in 1986 constituted Thunder Bay. Other examples are Kitchener-Waterloo, Chicoutimi-Jonquière and Ottawa-Hull. In each of these cases the workforce information reflects the 1986 situation, therefore if Chicoutimi and Jonquière had separate workforce statistics in 1951 they were joined together for the purposes of this study to make them as close to the 1986 definition as possible. Otherwise the definition of the time was used. This allows for a comparison of the results reported in 1951 to those found in 1986. This information can be found in Appendix E.

2.3 Division of Economic Activity

Researchers who have attempted to analyze the changes in the economic character of centres have traditionally divided economic activity into three major sectors; primary, secondary, and tertiary, known as the Fisher-Clark thesis (Singelman, 1978) or classification (Noyelle & STanback, 1983). The primary sector is involved with the extraction and production of raw materials, and includes such activities as agriculture, mining, fishing and forestry. Secondary activities are those industries which process and

manufacture goods using the raw materials produced in the primary sector. The Tertiary, or service sector, is that large and most heterogeneous group of activities that deals with the provision of services, not the production of goods. There are however a number of alternate classification schemes which have been proposed to draw attention to divisions within the Tertiary and to summarize the economic characteristics of places.

2.4 Basic/Non-Basic Division

One of the earliest discussions of the effect of differential employment upon urban growth was the debate on the basic versus the non-basic sector. The basic/non-basic dichotomy was, in reality, a division between the primary and secondary sectors, which were considered as city forming, versus the tertiary (or services) sector, which was considered as city serving. For a time, basic activities were considered to be the most important stimulus to city growth (Alexander, 1954). The view that basic activities were the main stimulus to urban growth was linked to the importance of manufacturing and resources as city building stimulants in the nineteenth and early twentieth centuries. After the Second World War it became apparent that non-basic industries were as important, if not more so, than basic industries. This is evidenced by the view that, "non-basic industries constitute the real and lasting strength of the metropolitan economy," (Blumenfeld, 1955, 131). More recently, the consensus seems to be that this basic/non-basic division is an unsatisfactory way of expressing differences in an urban economy (Wood, 1983) due to a changing world economy and its over-simplicity. In a similar vein to the argument put forward by Wood, neither the simple basic/non-basic dichotomy, nor the threefold division into primary, secondary and tertiary activities provides much detailed knowledge of urban system differentiation or growth. More detailed classifications have been proposed to help the study of urban system change.

2.5 New Subdivisions of the 'Service' Sector

In the last decade there have been many proposed divisions of the Tertiary Sector outlined in the Fisher-Clark classification scheme (Daniels 1982, Gottman 1970, Christian & Harper 1982, Marshall 1981). Three proposed divisions can be identified and these vary in the number and content of the ensuing subdivisions.

(i) Threefold Division of Services

One popular approach is the division of the traditional Tertiary sector into the Tertiary, Quaternary and Quinary sectors - but there is no agreement on the way each of the three entities can be linked to specific industries. This additional three way division has evolved over time. In the early 1970's the Quaternary sector was recognized as being separate from the traditional Tertiary sector (Gottman,1970) and has been known to include such activities as Finance, Business Services and Insurance & Real Estate. The Quinary sector, was then perceived as another grouping of services which could not be classified satisfactorily into either the new Tertiary or Quaternary sectors. The Quinary sector has mainly been limited to including Education, Health and Government Services. This division of the service sector and the groups into which specific activities fall can be found in Appendix F. Although the division of all service activities into these three sectors is accepted by many there are important differences of opinion on the composition of these sectors, whilst alternative methods for differentiating activities of a service nature can be found (Daniels,1982 & Christian & Harper,1982).

(ii) Consumer and Producer Services

The division of service activities into Consumer and Producer services is one of the alternative divisions of service activities and is one of the simplest methods for differentiating amongst them (Daniels 1982, & Wood,1983). The services are called Consumer or Producer according to the destination of the services involved: either to the

population at large (consumers); or to other industries (producers). The great value of this classification is its emphasis on the increasing role of services as opposed to goods in the production process itself (Taylor & Thrift, 1986). This means services can no longer be seen as relating to the traditional consumer or final demand orientation of services - personal or commercial. This emphasis on production varies from other service activity divisions because it is the only classification that is concerned with the end destination of a service and can be a useful aspect of utilizing this approach.

(iii) Sixfold Division of Services

Noyelle & Stanback (1983) have proposed a six way division of service activity. Their proposal included the following subdivisions: Distributive, Retail, Non-profit, Producer, Consumer and Government services. This was based on an earlier four-way division by Singelman (1978), who outlined the trend towards service sector activities in the developed world during this century. Gershuny (1978), in reference to the United Kingdom, has described an Intermediate Service sector, based on his experiences in that country. These additional subdivisions of the Service Sector just serve to illustrate the number and variety of possible ways in which it can be subdivided.

Unfortunately, for the sake of consistency, these key authors have used different criteria in the development of their classification schemes. As a result many of the divisions and sectors that have been created are neither easily applicable for empirical study - since the link to economic classifications is not clear - nor comparable to each other. Due to differences of methodology in establishing these so called 'sectors', none may be adopted without causing controversy and debate over the make-up of the sectors, or the suitability of their applications, for the divisions often seem at best arbitrary and subjective. Their main utility is in grouping somewhat similar data for the ease of data manipulation, in the sense that there is a reduction of the diversity of types to a smaller number of sectors.

Clearly there is no real consensus over the division of service activities into two, three, or more general sectors, so this study avoided the issue in the initial stages of the study. Instead, each of the 17 service activities found in the Standard Industrial Classification (S.I.C.) in Canada will be kept separate up until 1981 - only 12 in 1986, so that the detailed effect of as wide a range of service activities as possible upon urban differentiation in Canada may be investigated.

2.6 Industrial Classification

The Standard Industrial Classification (SIC) is used in Canada to categorize all the groups of industrial activities for the purpose of enumeration. This classification is meant to standardize, through an extensive framework of activities, the information on employment by sector from one census to the next. It is important to note that the SIC is used for classifying the workforce by the industrial activity in which they are involved, not the actual occupations in which the workforce engage. SIC data is used in this study in preference to occupational data because it is important to discover what sectors of the economy people are employed in, rather than finding out what their actual occupations may be. People of the same occupation, e.g. a secretary, may be working in totally different sectors of the economy and it is more important in an economic base study of this nature that these sectoral differences are highlighted as opposed to the occupational differences which exist. The SIC has various levels of aggregation within its framework, with Industrial Divisions, Major Groups and Minor Groups. The Major Groups are subsets of the Divisions and the Minor Groups are subsets of the Major Groups.

The Industrial Classification utilizes a three digit code for each Minor Group. The Major group thus consists of a number of Minor Groups and the Divisions may consist of a number of Major Groups. An example of this is Defence. This activity has an SIC three digit code of 902 and it is a subset of the Federal Administration Major Group, as well as

being part of the Public Administration and Defence Division. It is therefore possible to decide what level of aggregation will be useful in a given study. The Industries used herein and their relationship to the SIC are shown in Table 2.2.

Table 2.2 displays the breakdown of the workforce and the level of aggregation that is applied in this study. The main focus, when making the decision as to what industrial classes would be used, was to highlight the differences between urban centres for those activities in which all centres are assumed to have some level of participation. Using this as a guideline Manufacturing was included as a Division and not disaggregated into its component Major Groups because some centres can be very specialized in some sub-sectors of the Manufacturing Division. An example is the Motor Vehicle Manufacturing

Table 2.2 The Industrial Classification Adopted for this Study from the SIC

INDUSTRIAL DIVISION	MAJOR CATEGORIES:	
	(a) 21 - 1951 to 1981	(b) 16 - 1986
1. Forestry	1. Forestry	1. Forestry
2. Mines, Quarries & Oil	2. Mining and Oil	2. Mining and Oil
3. Manufacturing	3. Manufacturing	3. Manufacturing
4. Construction	4. Construction	4. Construction
5. Transportation, Communications & Utilities	5. Transportation & Storage	5. Transportation & Storage
	6. Communications	6. Communications & Utilities
6. Trade	7. Utilities	7. Wholesale
	8. Wholesale	8. Retail
	9. Retail	9. Finance Industries
7. Finance, Insurance and Real Estate	10. Finance	10. Insurance & Real Estate
	11. Insurance & Real Estate	
8. Community, Business and Personal Services	12. Education	11. Education
	13. Health	12. Health
	14. Religious Organizations	
	15. Amusement & Recreation	
	16. Business Services	13. Business Services
	17. Personal Services	
	18. Accommodation & Food & Food	14. Accommodation & Food
	19. Miscellaneous	15. Other Services
9. Public Administration & Defence	20. Public Administration	16. Public Admin & & Defence
	21. Defence	

Minor Group. Obviously cars are not manufactured in every urban centre whereas all the service Major Groups will be found in each urban centre. This is an explicit attempt to lessen the impact of the manufacturing sector on the levels of specialization within the urban centres. Therefore, Manufacturing is only included at the Division level.

Two Industrial Divisions were totally excluded from the study: Divisions 1 and 3 which represent Agriculture and Fishing & Trapping respectively. This decision was taken on the grounds that this study deals with large metropolitan areas and cities. Since these occupations are based in rural areas and small towns they are not included. Statistics Canada has also taken notice of this point by dropping the "less than 25% involved in Agriculture" stipulation for an urban area's inclusion as a CMA because of the extremely low number of people which fell into this category. A case could be made for including the Fishing sector in the analysis because of the urban base of this industry in coastal areas but again the level of participation was extremely low for cities with populations greater than 30,000. The result is that the employment totals used in this study, for the nation as a whole and for individual places, do not include any employment from the Agriculture or Fishing sectors, due to their non-urban characteristics. The populations engaged in these activities could have been included in the 'Other' category but it was decided to keep the 'Other' category as it was used in the census - for Other Services only. This was not seen as a problem due to the miniscule numbers of people employed in the Agriculture and Fishing sectors in centres with populations over 30,000. Therefore, the base for national employment used in this study to derive the Location Quotients and Gini Coefficients excludes the population involved in the Agriculture and Fishing & Trapping sectors.

In contrast to the exclusion of the two previously mentioned primary industries, the Forestry and Mining, Quarrying & Oil Industries were included in this study. The reason for this is the widespread nature of the logging industry in Canada and the large numbers employed in urban places, especially relative to other sectors in some urban areas. The

Mining, Quarrying and Oil sector was included because of the associations which are often found between this sector and urban centres, either through the workforce's involvement in the actual mines, e.g. Sudbury, Ontario, or through the large numbers of office workers in related services that are a part of this sector, e.g., Calgary, Alberta.

The only other Division of the SIC which was used without being subdivided into its component Major Groups was the Construction Industry. This classification is very useful because of its close association with urban growth. The Construction sector employment level reflects the vibrancy of the building industry in an area and consequently the rate of growth of an urban area. The rest of the sectors used in the study are from the Services sector. It can be seen that the Primary and Secondary industries were not broken into subsets, where as the Tertiary (or Services) sector is disaggregated into component Major and even Minor Groups. This reflects the focus of the study in concentrating on differences within the service sector of the economy as a source of variation in the overall diversification of urban centres.

In this study there are a number of small changes from the aggregation level used in the Standard Industrial Classification. Some Major Groups band together to make one group while others have subdivisions. Each decision has to be explained.

(a) The Transportation and Storage Major Groups were combined to form one sector. This combination is due to the perceived similarities of these two sectors, especially locational similarities, as compared to the other two Major Groups within this Industrial Division - Communications and Utilities. This grouping has been used previously for classification schemes by Coffey & Polese (1988).

(b) In the Finance, Insurance and Real Estate Division the Major Group Insurance Carriers is combined with the Insurance and Real Estate Agencies Major Group for reasons similar to those used in deciding to combine the Transportation and Storage sectors

together. The result is that Finance Industries is a single Major Group which is included as a sector for the purposes of this study.

(c) The final case where a major group was altered was in the Public Administration and Defence Division. The Minor group which is Defence Services (902) was separated out, except 1986 where it was not possible, from the Federal Administration Major Group due to marked differences in their locational and job related requirements.

The classifications and sectors that are used in this research were constant from 1951 to 1981 so the results are readily comparable. Unfortunately, the data for 1986 had to be altered from that used in previous years. The level of aggregation changed from 1981 to 1986 resulting in some inconsistencies in the data set. The level of aggregation in 1986 permits the use of only 16 sectors compared to the 21 that were utilized up until 1981 producing 3 changes.

(a) The first divergence in the classification that was available for 1986 is the combination of the Communications and Utilities Major Groups from two separate groups in 1981 to one sector in 1986.

(b) Unfortunately Defence could not be extracted from the Public Administration Division, so those people involved in the Defence sector have to be included in the Public Administration (or Government) category.

(c) The absence of a few types of service industries in 1986 which were Major Groups in 1981 must also be noted. The Religious Organizations, Amusement and Recreation, Personal Services and Miscellaneous Services Major Groups were omitted in 1986 and replaced by a category known as Other Services which includes all these services.

The effects of using a different level of aggregation are not immediately clear. The changes between 1981 and 1986 mean that the data set up until 1981 is not totally compatible with that for 1986. To understand how these changes affect the data set as a whole involved an investigation of the possible implications of such a change in aggregation level. The 1981 results were analyzed twice, using the 1981 and the 1986 classifications. The results of this comparison can be found in Table 2.3 and are unlikely to cause any sizeable differences because the sectors that were affected by the change in classification are those sectors which employ the smallest numbers of the workforce. On the overall level it is important to discover the effects of this change in aggregation on the diversification levels of the urban areas in the study.

2.7 Economic Base Studies

The cities of Canada are, by their nature, individual entities owing their existence to many varied economic and historical reasons. The differences between places are thus an explicit statement of their past and a reason for their unique internal structure of economic activities. All places are centres of production and centres of consumption but the balance between the two will vary from place to place. The economic base of an urban centre is a measure of the activities in which the workforce are involved. The economic base is not one number or value, rather it is an overall set of comparative workforce statistics which give an insight into the composition of the labour force of an area in the context of all the other centres. Although most cities have some employment in most of the 21 categories (except for place specific industries, e.g. coal mining, etc.) they vary in relative amounts. So cities are often characterized by those concentrations - administration, manufacturing, etc..

Economic base ideas have been used in Geography and Economics as a tool for describing the differentiation between cities, although not always in a manner similar to that

which is currently used. In the late 1950's quantitative classifications of cities began to replace descriptive classifications of cities and Carter (1975) has reviewed these techniques.

Most of these techniques are based on the basic/non-basic ratio of employment. One method being the Minimum Requirement Approaches (Ullman & Dacey 1960). The initial basis for this measurement technique was the assumption that the "minimum requirement (the lowest possible number of people employed in a sector in a city) closely approximates the service or internal needs of a city (non-basic), and the excess employment approximates the export (basic) employment". An additional problem of this technique is the inherent assumption that the minimum requirement closely approximates the service or internal needs of the city, which in post-industrial society may not be applicable due to the functional specialization of industries within a system. This new specialization implies that a city need not have any employment in some sectors even though there may be an internal need for specific services or goods. These problems led to the decision not to use this procedure.

Older and more popular techniques which can be utilized in the study of the economic base of an urban area are the Gini Coefficient and the Location Quotient or Index of Specialization (Isserman 1977, Norcliffe 1983a). Since these techniques are used in this study they are discussed below.

2.8 Location Quotients

Location Quotients are a measure of the relative level of specialization in each of the individual activities used in the study, measured by the share of employment in that industrial category. The location quotient expresses the share of employment in a selected industry in a specific urban centre as a proportion of the share of employment in the same industry within the total Canadian economy. For every case in this study the Location

Quotients were derived from the national employment totals (not the sum of the city totals) in the applicable year.

The value of the Location Quotient for industry i in city c is represented by the equation

$$LQ_{ic} = e_{ic}/e_{tc} / E_{in}/E_{tn}$$

where:

e_{ic}	represents employment in industry i in the city c ;
e_{tc}	represents total number of those employed in city c ;
E_{in}	represents employment in industry i in the nation n ;
E_{tn}	represents total number of those employed in nation n ;
LQ_{ic}	represents the Location Quotient for industry i in city c .

The value of the quotient will be 1.0 if the industry in question has the same proportional share in that centre as for the nation as a whole. Values greater than 1.0 signify specialization in that industry and values less than 1.0 show a deficiency of employment in that industry in a given place based on the national profile. Noyelle & Stanback (1983) point out that this measure has traditionally been used to distinguish export activity in a centre, with the surplus to which the value exceeds 1.0 representing the degree to which the product or service is presumed to be exported. This indicator will thus be extremely useful in the study of specialization in industrial classes based on the numbers of workers employed in those categories, assuming that the purpose of specialization in an industry is the creation of goods and services for export. It will be possible to have an insight into the distribution of industrial concentration in the Canadian urban system. Using this information, along with other data on city size, growth rates and location it becomes possible to form a sort of overview of the conditions which are found in centres which show evidence of specialization in specific industries. This type of information may also provide clues about the historical development of certain industries and how some locational requirements have changed through time. The added advantage of using national totals to derive the Location Quotients, and therefore the Gini Indices, is that if other centres are added to the study and investigated the Location Quotients and Gini Indices will

remain the same for the places already examined. If city totals were used the Location Quotients and Gini Indices would change for existing places with the addition of each new case. Certainly this is not a desirable situation.

It is important to be aware of some of the problems isolated by Isserman regarding the utility and accuracy of this technique, specifically, the change in the quotient when more detailed industrial classifications are used (Isserman, 1977). This problem of disaggregation which is utilized to separate out an industry into sub-sectors will have a great effect on the Location Quotient or the overall portrayal of the importance of an industry to an urban centre. Isserman used a good example from Philadelphia in 1972 to explain this point. For the Meat Products industry (SIC 201) there was a location quotient of less than one. If the industry was disaggregated to the four-digit SIC code level to examine Sausage and Other Meats (SIC 2013) the location quotient would have been greater than one. One level of the SIC implies there is no surplus labour in this meat products industry, but another level of the SIC implies that a surplus of labour and presumably export activity existed in a sector of the meat industry in Philadelphia. This example shows how great care must be taken in interpreting results of the location quotient and how one must be able to recognize that an industry as a whole may display high or low levels of concentrations while sub-sectors of that industry may show totally different trends. This demonstrates clearly how the level of disaggregation of the data will affect the results. So the decision on the level of aggregation to be used is always a difficult decision. The decisions already discussed above reflect the desire to highlight, if not exaggerate, the major differences in the economic system - particularly in the services sector - while downplaying the importance of minor ones, e.g. within the manufacturing sector, which could be extracted from the data.

2.9 Gini Index

The location quotient provides a measure of the degree of specialization *in each industry*. What is also needed is a *summary* measure of the economic specialization of a *place* taking into account all of these industries. The Gini Index achieves this. This summary measure is named after Gini who, following the work of Lorenz in the early part of this century, used this indicator in the study and measurement of the inequalities of incomes. It is an empirical measure that is widely utilized in the study of diversification of employment types in an area (Marshall, 1981 & Crowley, 1978). The Gini Index uses the Lorenz Curve as its basis, whereby the cumulative deviation or dissimilarity of ranked industry values can be measured from the diagonal which shows complete diversification. This graphical solution can be represented mathematically by the following equation, which was used by Marshall (1981).

$$G_j = \frac{\sum_{i=1}^{n-1} |C_i D_{i+1} - D_i C_{i+1}|}{10,000}$$

where:

- C_i = the cumulative percentage of the labour force in industry i for the city being studied;
- D_i = the cumulative percentage of the labour force in industry i for the nation;
- n = the number of industries ranked in the order of their specialization as measured by their location quotients;
- G_j = the Gini Index for town j .

This coefficient is employed in this study to highlight the summary differences in the degree of specialization in urban areas in Canada. By using this index it will be possible to see how various centres over 30,000 have differing employment profiles. In essence, the Gini Index is a measure of the degree of specificity of a place's employment profile,

based on a national profile of employment in the various industrial classes. It is calculated by comparing the economic base of a particular centre to that of the national economic base. The Gini Index has a theoretical range of values from 0 to 1, where 0 represents total diversification of a centre's employment profile, i.e. equal to the national employment profile, and 1 being the total concentration of one employment type in a given place. The computer programme used to calculate the Gini Indices for this study was a Fortran programme written by Dr. W.K.D. Davies for the University of Calgary mainframe computer.

This index has been utilized in the past (Marshall, 1981 & 1988) to explain the differences of employment types in Canadian cities larger than 10,000 in population. In his studies Marshall used 29 different employment types, 15 of which were manufacturing classes, and 14 which are not. Marshall then proceeded to collapse these variables into an economic dualism: manufacturing and services. This means he ignored the internal differentiation within the service sector in the various towns. In this study only the Manufacturing Industrial Division will be used, rather than the Manufacturing Major Groups which made up Marshall's 15 classes. This ensures that the Gini Index in this study will be more reflective of the differences in the 'service sector' of the economy - given the emphasis on services not manufacturing. The Index will therefore be very useful in measuring levels of diversification in the economic bases of centres through both time and city growth and will allow us a method with which we can analyze the stated hypotheses of the study. Keinath (1985) has outlined two problems with the use of the Gini Index.

(a) The first problem is the fact that in the calculation of the Gini Index, it is assumed that the national profile of employment is a true reflection of diversification. This implies that a city reflecting the national profile in its own economic base will be totally diversified. The alternative to this is that each industry should have equal weight in this

type of analysis. This latter option was discredited as being unrealistic by Marshall (1975). Measuring the differences from the national profile is considered to be a much more effective method and is therefore the method employed in this study. Not only is it realistic to use the national employment profile but it highlights the relative differences between places as they vary from the national economic structure and each other. This study definitely prefers this national employment profile method, compared to a more arbitrary measure of diversification which would not have any relativity to the existing economic structures within the Canadian Urban System.

(b) The second problem in the use of the Gini Index is its sensitivity to the sizes of sectors according to the category of economic activity. The main concern here is that the Gini Index is not a measure of variation in the degree of a place's specialization but is rather a statement of the difference in the economic sector in which two centres may be equally specialized. An example of this would be two centres which have very similar proportions of their workforce in an industry accompanied by a huge difference in the absolute numbers of employees in each centre in that sector. The result is that two very different scenarios will present a similar picture. This difference between proportional and absolute values is a difficulty but it is not a realistic argument to apply to a study where the desired outcome is a statement of the relative differences between places based on their employment profile with respect to the overall national profile of employment.

The two problems are inherently associated with each other and are both based on a concept of specialization which is a more pure form of that concept. These problems are not perceived as causing difficulties in the application of the Gini Index in the context of this type of study, but any interpretation of the Gini Index values must keep these issues in mind.

The Gini Index measures the levels of diversification of an urban area and will be affected by a change in aggregation of the industrial data classes between 1981 and 1986. Due to the decreased number of sectors in 1986 there would be less room for variation within the data set. This assumption would imply that there would be lower levels of specialization in industries and thus greater degrees of diversification throughout the urban system. The effect of a change in the level of aggregation was tested using the 1981 employment data in the 1986 industrial classification. The result is a direct comparison between the Gini Index for 1981 based on the 1981 classification and the Gini Index for 1981 based on the 1986 classification which can be observed for 10 selected centres in Table 2.3.

Table 2.3 A Comparison of 1981 Gini Index Values using the 1981 and 1986 Classifications

CITY	1981 Classification ¹ (21 sectors)	1986 Classification ² (16 sectors)	Difference
Brandon	.2523	.2381	.0142
Calgary	.2801	.2759	.0042
London	.1338	.1313	.0025
Montreal	.1183	.1154	.0029
Oshawa	.2178	.2104	.0074
Ottawa / Hull	.3649	.3565	.0084
Victoria	.2832	.2797	.0035
Halifax	.2586	.2484	.0102
Bathurst	.2786	.2723	.0063
Shawinigan	.3110	.2764	.0346
Mean Difference for complete data set			.0079

1. Uses the 1981 Industrial Classification(21 sectors) applied to 1981 statistics

2. Uses the 1986 Industrial Classification(16 sectors) applied to 1981 statistics

The cities identified in Table 2.3 are intended to provide a cross section of centres in the data set by providing a mixture of varying populations, locations and diversification values. As expected the result of the change in classification from 21 to 16 sectors between 1981 and 1986 produced a general lowering of the Gini Index. However the effect is marginal, with a mean decrease of .0079 for the data set as a whole with the greatest

decline being only .0346. Every centre in the data set displayed a decrease in their Gini Index when the 1986 classification was used. The mean Gini Index for the complete data set in 1981 (using 21 sectors) is .2408 compared to .2329 when the 1986 (16 sectors) level of aggregation is applied to the 1981 data set. This represents a decline of 3.3% in the mean value of the Gini Index based on the difference in the level of aggregation. The small differences mean that it is feasible to directly compare the diversification levels up to 1986, despite the change in the level of aggregation in the industrial classification.

CHAPTER 3

URBAN CENTRE TRENDS

3.1 Introduction

The purpose of this chapter is to focus the discussion of economic base change upon the relationship between the results and four expectations derived from the literature outlining a number of significant trends found in the set of cities used in this study. A number of theoretical concepts that are related to urban geography will be examined detailing the dynamic structure of cities and the factors which may explain variations from place to place within the system. The ideas to be discussed and tested are:

- (a) city economies become more diversified through time;
- (b) cities become more diversified as they increase in size (which is related to the aforementioned belief in most cases);
- (c) the economic bases of cities are converging through time;
- (d) relative location of city will play a role in the diversification level present in that centre.

While each individual city is different in its economic structure, there are general trends that can be observed when the system of cities is looked at as whole.

3.2 City Diversification as a Function of City Size

In a system of urban centres it is apparent that all centres will have different populations and economic compositions. Cities each have their own identity and history which account for their size and economic makeup. There has been some discussion on the role city size plays in determining the level of industrial concentration or diversification. Intuitively, we know larger centres will have more economic activity because the size of a centre is a direct reflection of the workforce present at any time. This alone would imply that a larger centre should be more diversified than a smaller centre. Another aspect to

examine is the role of import substitution (Jacobs, 1970) and how it effects diversification levels of cities. It is believed that as a city increases in size, goods or services which that centre once imported, will be produced locally with the effect that there will be greater diversity of industries present in that centre. This effect of import substitution in creating greater differentiation is backed up by Central Place Theory which has as one of its main tenets the idea that larger centres tend to have more service functions present than smaller centres in the hierarchy of places. However the fact that a larger centre has more economic activities taking place therein does not imply that larger centres are immediately more diversified than smaller centres. The reason for this should be clear, the greater activity might be explained by an increase in employment in only specific sectors of the economy. Therefore a centre that increases in size will not necessarily become more diversified, but the probability is that as a centre increasingly expands its economic activity - even in one sector of the economy - it is likely that other associated industries and support industries for the increased population will at some time lead to an increase in the level of diversification. Clemente & Sturgis (1971) noted that there was a direct relationship between the size of a population and the extent of the diversification of its industrial structure. This work was followed by the findings of Crowley (1973) who noticed that measures of internal specialization appear to be significantly correlated with size. Marshall (1975) tested the concept when he illustrated that diversification is significantly but weakly associated with city size.

Using the Gini Index as the measure of diversification will enable anomalies to be discovered due to the concentration of some industries in individual places. To get a more focused image of what is actually occurring, a systems-wide approach is necessary. The Gini Indices for each centre in the study for each year can be found in Appendix B. There are a number of ways of actually doing this. One can simply correlate city size with the Gini Index for those centres and find out the amount of variation in the Gini Index that is

explained by city size. This approach yielded an r-squared value of .042 when the population and Gini Index were correlated and even when logarithmic values were used for the population data the highest r-squared value was .057, clearly indicating a lack of correlation between population and the level of diversification. Another approach is to divide the data set into groups of places based on their population to establish mean Gini Index values for cities in specific size ranges. Both of these techniques are utilized to establish if there is a relationship between city size and the Gini Index for those centres. The main problem with these techniques, particularly the former, is that there is a skewing of the data in that there is a large number of smaller places in the data set compared to the larger centres. This is the type of 'nonsense data' which can cause problems which was discussed by Crowley (1973). This could be perceived as a problem if statistical testing is to be done, but for the purpose of displaying differences in the levels of diversification between centres it is not a problem. Table 3.1 shows the relationship between city size and the Gini Index in 1986.

Table 3.1 The Relationship between City Size and the Gini Index 1986

Population	No. of Centres	Mean Value	Median Value
> 1,000,000	3	.1408	.1485
500,000 - 999,999	6	.1973	.1978
200,000 - 499,999	8	.2066	.2106
100,000 - 199,999	11	.1814	.2030
50,000 - 99,999	24	.1895	.1812
30,000 - 49,999	28	.2214	.1990

The results found in Table 3.1 indicate that there was a difference in the level of diversification found in different sized places. Using the mean values, the largest centres were the most diversified and the smallest places displayed the highest levels of concentration. While this is the case, there is not a continuous decrease in diversification with diminished city size. This was slightly different for the median values because of the distortion caused to the mean values by one or two extreme values. In both cases centres

were found to become less diversified until they were in the 200,000 - 499,999 size range and then it was found that centres of the 100,000 - 199,999 were more diversified with increasing levels of concentration observed down to the smallest size range studied. The explanation for this is that many of the cities in the 200,000 - 499,999 range were specialized centres of Manufacturing or Government. The greater level of diversification observed in the 100,000 - 199,999 range is a result of the smaller centres acting as regional service centres e.g., Regina, St. John's and Saint John. It is noted elsewhere (Chapter 5) that these types of centres tend to have lower levels of concentration than some of the larger centres. The subsequent decrease in diversification in the two smallest size ranges reflects the increasing concentration in smaller centres that do not serve as regional service centres, or that do so at a lesser scale and thus have lower levels of diversification. While Table 3.1 shows that there is a limited relationship between city size and the level of diversification the results are dominated by the overwhelming gap in diversification levels between the centres with populations of one million and the rest of the centres indicating the very diversified nature of the largest centres.

An alternate way of searching for this evidence of the relationship between city size and diversification is to examine the changing level of diversification within a centre as that centre increases in population through time, because in almost every case in this study cities are growing, therefore if they become more diversified increased size can be interpreted as being responsible, at least in part, for the greater levels of diversification.

3.3 City Diversification through Time

The previous effort to relate city size and diversification levels was based on a static measure looking at the differences between places at a given time period, this approach allows for the dynamic nature of an urban system. It has been shown that, with only two exceptions, every centre in this study became more diversified between 1951 (21

industries) and 1986 (16 industries) - Quebec and Chatham were the exceptions (see Appendix B). This lends credence to the belief that larger centres are more diversified than smaller ones because throughout the period of this study every centre in the data set increased in population. This is contrary to the view held by Keinath (1985) who asserts that there is no direct cause and effect relationship between growth and diversification. Keinath has tried to explain this by implying that the general economy, in moving towards a more diverse form, creates a positive, probabilistic setting, so that a regional economy that is either diverse or diversifying can anticipate a better growth record, with the qualification added that highly specialized economies can generate growth too, however the prognosis is poor. This leads one to wonder whether diversification is a result of growth or vice versa. However, the fact remains that every place, except the two already mentioned, became more diversified through time and the two places that do show an increase in their Gini Index increased by only .0156 and .0060. This decline in the Gini Index in most places in itself may not be significant if the changes are small, therefore a number of statistical tests were carried out to evaluate if these changes in levels of diversification were significant. The method employed to establish this was rather straightforward. By taking the mean values of the Gini Index for all centres for each year of the study it is possible to get a view of what is happening in the system of cities as a whole.

Assuming that these mean Gini Index values reflect the level of diversification of the whole system of places studied, these mean values can be compared for each time period using the Student's T - test. It must be noted that the Gini Indices to be tested do not represent a sample therefore the T-test is merely a guide, rather than a conclusive test. The resulting tests showed a difference in the level of diversification between centres in 1951 and 1986, exhibiting a t-value of 8.448 which is statistically significant at the 99.9% level. This shows that the differences in the level of diversification in 1951 and 1986 were

too large to have occurred by chance and seems to prove the belief that larger cities are, in general, more diversified than smaller centres. Not only is this the case but there are also significant differences between the levels of diversification for the periods 1951-1961 and 1981-1986. These differences can be observed in Table 3.2. The purpose was to determine if there was a difference between two sets of numbers therefore a two-tailed test was applied (Norcliffe, 1977). The means and standard deviations used for the calculation of the t- values can be found in Table 3.3.

Table 3.2 T-Test Results based on a Comparison of the Level of Diversification found in Canadian Centres from 1951 to 1986

Years Tested	Degrees of Freedom	t-Value	significance level
1951-1961	131	2.565	.02
1961-1971	145	1.636	not significant
1971-1981	153	0.883	not significant
1981-1986	156	3.858	.001
1951-1986	141	8.448	.001

note - Significance tests can only be guides because a complete population is used

This does not necessarily mean that all larger centres are more diversified than smaller ones, because anomalies still exist, but it certainly allows one to say that in general cities become more diversified as they increase in size. Bahl *et al* (1971) extended this concept and examined service industries and found that population size is associated with absolute and relative increases in tertiary employment. This growth in services has in a large part explained the increasing levels of diversification found in centres in the Canadian urban system and the findings by Bahl *et al* tend to back up the idea that cities become more diversified as they grow.

3.4 The Converging Economic Base of Cities

The convergence of the economic base of cities can be measured in three ways which are directly linked to our expectations. The first approach is to study the system of places as a whole which can give an overview of a national economic structure. One would

expect the variation in the system to be decreasing through time if convergence were in evidence. The Gini index can be used to examine this belief. A second approach is the study of each industry in each year being examined because one would expect these values to show less variability through time if convergence was taking place. This could be tested using mean location quotients for each industry. Based on the expectation that individual places are becoming less concentrated individual centres could be examined to discover if individual location quotient values are approaching unity and moving away from high values which display concentration.

The concept of convergence of large city economies is not totally new. The concept of import substitution, if followed through, would have convergence as its end result if all centres satisfy their own internal needs. Also, Marshall (1981) observed that urban employment structures are converging toward the national average profile over time. This concept is derived from the belief that as cities approach a specific size their internal economies become more similar in structure to each other. Simmons (1985) has found examples of convergence in the retailing and wholesaling sectors as well as distribution activities in general in a case study of small Ontario centres. Marshall (1981) also points out the ubiquitous nature of growth sectors and how this may lead to convergence to the point where any deviations between places in the future might just be random fluctuations. Despite the references made to this idea no clear cut evidence has been presented to back up the concept of economic base convergence on a system wide basis.

One way of approaching the convergence issue is by studying the Mean Gini Index values for the urban system as a whole, rather than studying individual industries throughout the the system. The decline of the Gini Index for individual centres from 1951 to 1986 indicates a tendency towards diversification. For the sixty-three urban places used in this study for which data was available in 1951, fifty-five of those centres were more diversified in 1981 (at the 21 industry level of aggregation). All the Gini Indices for the

individual places can be found in Appendix B. The implication is that cities are becoming more diversified as they grow through time but are their economic bases converging? The Gini Index can be used, somewhat limitedly, to study this by examining the level of differentiation throughout the whole system at a selected time by utilizing the Standard Deviation from the Mean Gini Index of all the cities in the study through time.

By establishing the Mean Gini Index for the system of cities at a given time period a series of values can be put into a table representing this mean value and the amount of variation about that mean. For the purposes of this study the variation about the Mean Gini Index will be represented by taking one standard deviation (plus and minus) about the mean. Table 3.3 has values for the Gini Index, the Gini Index +1 standard deviation from the mean Gini Index, the Gini Index -1 standard deviation from the mean Gini Index and the value of the standard deviation that was found for each mean Gini Index in each year. If in fact convergence is taking place the standard deviation values from the Mean should be decreasing through time as this would indicate a lessening of the variation of the levels of diversification between places. These values can be seen in Table 3.3.

Table 3.3 Mean Gini Index and One Standard Deviation about the Mean 1951 - 1986

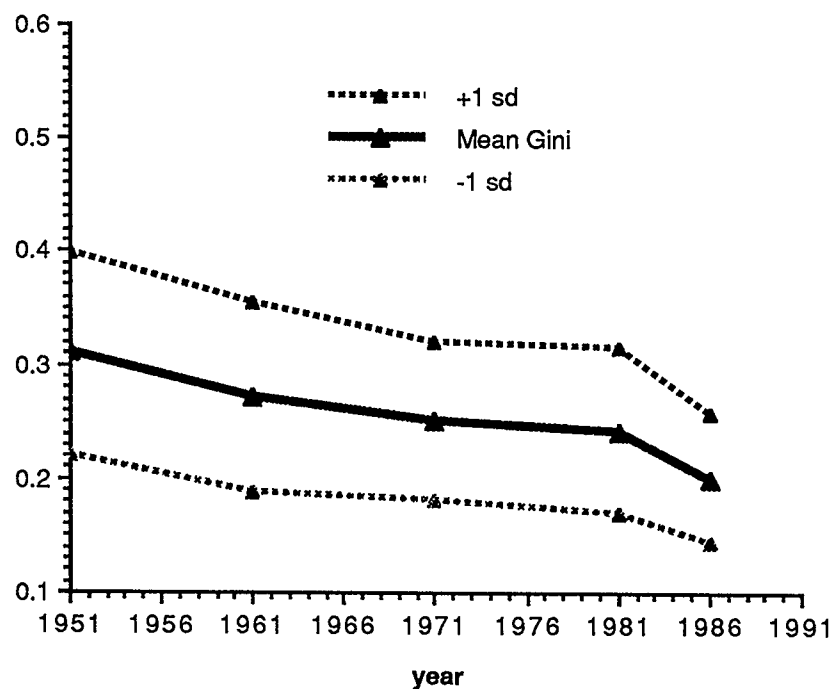
year	+1 deviation	Mean Gini	-1 deviation	Standard Deviation
1951 (63)	.3990	.3097	.2204	.0893
1961 (71)	.3548	.2711	.1875	.0836
1971 (77)	.3200	.2502	.1804	.0698
1981 (78)	.3115	.2402	.1689	.0713
1986 (80)	.2567	.2006	.1433	.0567

(number of centres included in the study)

As can be seen from Table 3.3 there is a decline in the standard deviation about the Mean Gini Index during the duration of this study. A consistent decline in the value of the Gini Index over the same period is also noticed. These two facts combined are certainly proof that city economies are converging through time and with increased growth. This

data may be seen better in graph form in Figure 3.1 where a good visual picture can be seen of what has already been presented in table form. The decline in the Mean Gini Index can be observed with the associated decline in the standard deviation being represented by the two dotted lines getting closer to the Mean Gini Index line through time. This evidence seems to show that city economies are converging through time with increased growth. In fact if one follows the changing levels of diversification through time for the original 63 centres in 1951 the convergence is even more marked with 1986 values of .1940 and .0480 respectively for the Gini Index and standard deviation for these 63 centres.

Figure 3.1 Graph of Mean Gini Index +/- 1 Standard Deviation



Between 1951 and 1986 the standard deviations from the Mean Gini Index for the centres in this study have decreased substantially from .0893 to .0567. This would indicate that the range of Gini Indices for the urban system is becoming smaller as those values decrease. The inference is that, with a smaller range of Gini Index values being

found, the urban centres are - to a degree - becoming more similar to each other. It appears that in the Canadian case urban area economic bases are converging while at the same time these centres continue to become more diversified.

Location quotients can be used to study individual industrial classes, so that the fluctuations of these values may be examined to provide insight into the convergence idea. If indeed there is any type of convergence actually taking place the location quotient values should be approaching unity for all the centres in the system. The reasoning for this is that if every industry in every urban centre demonstrated a location quotient value of one then there would be total diversification of the economic base in every urban area. It follows that the Gini Indices for all these cities would have attained the theoretical value of zero.

Table 3.4 Mean Location Quotients 1951 - 1986: By Industry

Industry	1951	1961	1971	1981	1986
Forestry	0.18	0.40	0.69	0.71	1.51+
Mining and Oil	1.34	1.15	1.16	1.06	1.16
Manufacturing	1.03	0.99	0.98	1.00	0.98
Construction	0.91	1.00	0.92	0.98	1.01+
Transportation	1.00	0.89	0.88	0.83	0.92
Commun/Utilities	1.13	1.11	1.08	1.10	0.97
Wholesale	1.01	0.98	0.91	0.90	0.89
Retail	1.08	1.08	1.07	1.13	1.08
Finance	0.93	0.91	0.80	0.81	0.76
Insurance/Real Estate	0.92	0.89	1.28	0.83	0.88
Business Services	0.87	0.84	0.75	0.75	0.71
Education	0.93	1.01	1.07	1.03	1.07+
Health	1.30	1.34	1.18	1.15	1.10
Accommodation/Food	0.99	0.90	1.01	1.10	1.08+
Government	0.91	0.96	1.03	0.74	1.04+
Other	1.05	1.04	1.01	1.02	0.99
Mean LQ	0.973	0.968	0.988	0.946	1.010
Standard Deviation	0.250	0.195	0.159	0.150	0.124*

* If the forestry LQ is removed 0.124 is obtained, actual value is 0.180.

To relate this to the growth of cities, the assumption is made that as cities grow in population a specific industry should become less important to a city in terms of the percentage of the workforce involved in that industry and thus the location quotient values

will approach unity as the city grows in population. Measures which can be used to examine if convergence has occurred are the mean and standard deviation of the Location Quotient for each industry and how these values change through time. A decrease in the values of the standard deviations through time implies that urban places are becoming more equal in the representation of their workforce in the specific sector in question. The Mean Location Quotients for each industry from 1951 to 1986 and the Mean and Standard Deviations for those values can be found in Table 3.4.

A number of points can be noticed in Table 3.4. Most importantly the amount of variability has been reduced through time. This can be seen by examining the Mean Location Quotient for 1986 and noticing that it is closer to 1.00 than in 1951 and that the standard deviation about that mean has decreased 0.126 from 0.250 to 0.124 between 1951 and 1986.

An examination of individual industries showed that there is a sizable decline in the mean location quotient from 1951 to 1986 in a number of industries, particularly Finance, Business Services, and Health. This is an indication that the first two industries are more and more often concentrating in the largest centres, thus lowering the location quotient for the system as a whole. In the case of Health, the opposite appears to be true - health care employment tended to be less concentrated in the larger cities in 1986 than was the case in 1951. This is probably related to the fact that more people actually lived in the larger centres in 1986 and were covered by fewer facilities than would have been necessary in 1951 to cover the whole population, also outside of the largest centres health care coverage has improved over the 35 year period. Therefore in many cases those in need of this service did not have to come to the larger centres, thus lowering employment relative to the national figure in the larger centres in 1986.

Less specifically, the first point to note is that there is no obvious trend to indicate that the mean location quotient for all industries is approaching unity through time. While

no smooth trend is apparent, the fact that the mean location quotient of all industries in 1986 is closer to unity than in 1951 leads one to believe that there may be some weight to the argument that city economies are converging. Also, 11 out of 16 industries showed a decline in their mean location quotient from 1951 to 1986, as opposed to an increase in only five industries (see Table 3.4) which is evidence that this group of places was becoming less specialized. The problem with this interpretation is that the 1981 value shows a relatively large swing in the opposite direction from the previous period's value, which in a large part can be explained by the large jump in the mean location quotient for Forestry from 1981 to 1986. The end result is that we cannot use the mean location quotient for each year in question as a true indication that the location quotients for all industries are approaching unity.

If the standard deviations are examined a more definite trend is obtained. These standard deviation values represent a measure of the variance about the mean location quotient for all the industries in any given period of the study. A decline in the standard deviation values through time would indicate that there is less variation in the location quotients and thus imply that the cities were indeed becoming less different in their composition. A decline can in fact be observed in the standard deviation value from 1951 to 1981 with a jump upwards in 1986. This upward jump can be explained in part by the addition of Courtenay and Williams Lake to the study, both of which were in British Columbia, which displayed high location quotients in Forestry, as can be attested by the LQ value of 1.51 in this industry in 1986. If the forestry LQ is removed in 1986 a value of 0.124 for the standard deviation is attained which fits into the overall picture of decreasing variation within the data set. This would lend credence to the idea that *city economies are becoming less variable*.

This assumption and the whole expectancy of actually finding a convergence of economic bases obviously does not take into account the individuality of urban places.

Examples of this occurrence are cities which grow in population mainly due to the fact that one industry is growing very rapidly, e.g. the Oil industry in Fort McMurray in the Seventies. An example such as this will obviously lead to very high location quotient values in some sectors of the economy which grow very rapidly. But if one looks at the long term, a city like Fort McMurray will have to diversify its economic base so it may survive the eventual depletion of the resource that caused its growth.

Despite the existence of these centres which should distort any attempt to prove that economic convergence is in fact taking place, these centres must be included in the study. The preceding results show that even including these cities there is evidence for the economic base convergence of cities over 30,000 in Canada.

3.5 Free standing cities

Alexander (1954) suggested that cities at a great distance from other centres might be more diversified than centres in close proximity to each other. This was due to the different perceived function of an isolated central place surrounded by a large hinterland as compared to a centre surrounded at close proximity by other large centres where functional interdependence might occur. To test this idea the distances between all the centres in this study were found and subsequently broken into groups based on their distances from each other using 1986 Gini values. The list of centres and the distance from the nearest centre with a population over 30,000 can be found in Appendix C.

Table 3.5 does not confirm this linear hypothesis. There is a jump in the level of concentration from cities at the less than 50km range to centres in the 51-100km range. This might be considered surprising because one might expect that centres separated by distances less than 50km might be less diversified than other centres if they are dormitory satellite centres where much of the populace work in the larger centre, but more diversified if they are industrial satellites.

Table 3.5 The Change in Gini Index as the Distance between Centres Changes (1986)

Distance (kms)	Number of Centres	Mean Gini
less than 50 km	25	.1853
51 -100 km	29	.2085
101 - 150 km	8	.2058
151 - 200 km	9	.1836
greater than 200 km	9	.2226

Distance is based on distance to nearest centre with population >30,000

Therefore these centres might not necessarily have to have diversified economies to guarantee their well being. The reason that this is not the case is that so few of the centres in this study can really be considered to be part of the urban field of a large Metropolitan area. The centres that are in this situation are centres just outside Montreal, such as St. Jerome and Granby. After this initial jump in concentration there is a slight increase in the level of diversification as the distance between cities increases up to the 101 - 150km range with another more pronounced decrease in the level of concentration at the 151 - 200km range which displays the highest degree of diversification. This high degree of diversification was expected at this distance range due to the service centre function towns at this distance from each other are perceived to fulfill. This is followed by the greater than 200 km range where the centres exhibit the lowest levels of diversification for any range of centres, which was expected due to a number of places in this distance range that were remote resource centres. Obviously these results will change if the distance interval that was chosen is altered but even if 80km (50 miles) is used as the first interval the mean Gini Index only changes from .1853 to .1830. The point is that some interval has to be chosen and while being a subjective decision it was felt that a distance greater than 50km was

beyond the contiguous urban area of even the largest metropolitan areas and similar intervals were then used up to the greater than 200km range.

At the less than 50km distance one will find that a large number of these centres are actually large cities, e.g. Montreal and Vancouver and surrounding centres which can be considered to be suburbs of the larger centres. The rest of the centres are located in Ontario and Quebec with the exception being the Okanagan Valley centres of Kelowna, Penticton, and Vernon in British Columbia.

The increase in the Gini Index value for the next range can be explained by the fact that these centres are too close to each other to really be trade centres for a large surrounding area and the fact that many of these centres are specialized manufacturing centres and also include six capital cities which also display high levels of concentration.

The decrease in the Gini Index for the next range, 101 - 150 km, can be explained by the location of these centres in the periphery of the country mostly in the Canadian Shield or the Prairies and their higher levels of diversification can be attributed to a certain trade component. This range of distance shares a lot of characteristics with the next range of places. For the 151 - 200 km range none of the places are in southern Ontario or Quebec and they tend to be located in the Canadian Shield and the Prairie areas. This is certainly not unexpected as one expects the Prairie centres to be service-oriented trade centres with high levels of diversification. This has been documented by Davies (1988).

Finally an increase is noticed at the over 200km range. This can be explained by the fact that all these centres are in areas of low population density - many are mining centres in the Canadian Shield or in non-agricultural areas. Therefore, with no real hinterlands to act as service centres for, many cases display a specific concentration in one industry, e.g. Fort McMurray and Sault Ste. Marie at 367 km and 260 km respectively from their nearest neighbour.

Based on what can be observed from Table 3.5 it is apparent that distance from the nearest sizable centre certainly plays a part in the level of diversification to be found in cities. The findings tend to back up what Alexander (1954) suggested but breaks down at the greater than 200km range due to reasons already mentioned. However, the results provide a contrast with Marshall's (1989) view that there was no systematic relationship between level of diversity and the factor of location. The apparent relationship found here is difficult to quantify but the explanations put forward can explain some of the characteristics one would expect to find in centres at these distances from each other.

3.6 Conclusion

In this chapter a number of topics have been dealt with which pertain to the overall system of cities being observed. A number of relationships which have previously been discussed were examined and attempts to determine the utility of the relationships in the context of the Canadian urban system were undertaken. A number of relationships which were alluded to were also studied. Four conclusions were reached:

- (i) larger centres were more diversified than small centres;
- (ii) Canadian centres with populations greater than 30,000 did become more diversified as they grow through time;
- (iii) there was a convergence in the economic bases of Canadian centres with populations greater than 30,000;
- (iv) the relative location of a place was a factor in describing the level of diversification present, but the relationship was not linear.

These topics dealt with the system as whole but more than this is needed. To describe the centres in the study in more detail other techniques must be applied to give a better description of what is occurring at the individual level. The next step therefore is to move away from the holistic systems-wide approach used in this chapter to a regional approach in the next Chapter which will be followed up by a classification of individual

places in the subsequent Chapter to provide more information about individual centres and their common traits.

CHAPTER 4

REGIONAL DIFFERENCES IN ECONOMY OF THE CITIES

4.1 Introduction

Before dealing with the changes in the individual cities some background relating to the changes at a regional scale is needed. In other words, do the centres of the Prairies Provinces, for example, differ from those of the Atlantic Provinces in size, the growth of their respective workforces, their level of diversification, etc.? All the centres included in this study and their Gini Coefficients for 1951 to 1986 can be found in Appendix B. This chapter will discuss and evaluate *regional differences* in the economic character of the Canadian urban system dealing with issues such as diversification, industrial concentrations by region and population trends. The rationale for this approach stems from the work of Webber (1982) and Kellerman & Krakover (1986). This regional aspect to the study of urban systems may have been best described by Webber (1982), who asserted that regional distinctions are regarded as important phenomena in the social organization of advanced capitalistic societies. As a country and its economy develop through time there are many explanations offered which attempt to predict and describe these changes as in Keinath (1985) who, while discussing some of the differences which exist between the core and the periphery of a country, predicts that as an economy moves into the post-industrial stage the changes would be much more regional than national. Any study of the Canadian urban system must deal with the differences between regions because, as Kellerman & Krakover (1986) have pointed out, locational patterns, changes through time and major economic activities are the three components which must be utilized in any attempt to describe and analyze urban change.

4.2 Regional Data

Canada is historically a country with many divisions - physical and cultural - between various areal regions of the country. Marshall (1981) utilized a regional breakdown of the country into four areas: the Atlantic Provinces (Newfoundland, Nova Scotia, New Brunswick and Prince Edward Island); Ontario; Quebec; and the Western Provinces (Manitoba, Saskatchewan, Alberta and British Columbia). Li, Scorrar & Williams (1978) proposed an alternate classification of regions using the Atlantic Provinces, Ontario, Quebec, Prairies and British Columbia. The main difference between this and Marshall's grouping of 1981 is the separation of B.C. out from the western Provinces into a group on its own. Indeed, Marshall (1975) used this same grouping as Li, *et al*, in a previous paper. It appears that Marshall was unhappy with this grouping and changed to the former for his 1981 paper. Marshall (1988) once again changed his regional classification by using 6 regions as follows: Atlantic, Southern Ontario, Southern Quebec, Canadian Shield (northern Ontario and Quebec), Prairies and British Columbia. What all this shows is that there is no one correct or accepted method for dividing Canada into regions. Any attempt that is made to break the country into regions will be subjective and has to be seen as such. Various authors have different purposes and emphasis to their studies and this is the main deciding factor which dictates the regional breakdown which is applied.

For the purposes of this study a regional breakdown with some similarities to those already mentioned will be adhered to. The breakdown used in this study keeps the same grouping known as the 'Atlantic Provinces'. Ontario and Quebec are grouped together and can be referred to as either the 'Central Canada' as was used by Siegel and Woodyard (1971) or 'The Heartland', this grouping was utilized by Maxwell (1965) and popularized by McCann (1982) in his book entitled *Heartland and Hinterland*. The Provinces of Manitoba, Saskatchewan and Alberta are grouped together to form the 'Prairie Provinces'

and British Columbia is on its own as a separate regional entity. The large size of the Ontario-Quebec region is taken into account - the two areas could be subdivided but it is considered more useful to group these Provinces together as the Heartland concept implies there are more similarities than differences between them - as compared to the other regions of the country.

The basis for the composition of these areal groups is a combination of physical factors, some shared characteristics as well as the intra-urban structures of the urban centres in the various component regions that make up Canada. The Atlantic Provinces are grouped together due to their location and perceived cultural and economic differences from the rest of Canada. Ontario and Quebec are put together because of their shared concentration of population along the St. Lawrence Seaway and other structural similarities such as the concentration of manufacturing in these provinces. It is believed that whatever cultural differences exist between these two Provinces, the similarities in terms of the economic base of cities were more important to this study. The Prairie Provinces are a physical designation based on the similarities that exist between these Provinces due to the large distances that are found between centres and a shared historical dependence on agriculture. British Columbia makes up a group on its own for a number of reasons. Firstly, it is inappropriate to group it with the other Prairie Provinces because its economy and topography is so different from that of the Prairies. Likewise, its economic base and the relative isolation of some of its urban centres from each other lead one to remove it from Marshall's broad grouping of 'Western Canada'. The last factor in this day and age is the rise to economic prominence of the countries of the Pacific Rim which British Columbia is so suitably located to deal with. For these reasons British Columbia is deemed a separate region within Canada for this study. In broader terms one could look at Canada in terms of the Heartland-Hinterland or Core-Periphery concept, with Ontario-Quebec being the core

and the rest of the country representing the periphery, and with southwest British Columbia being considered as an incipient core region.

Having established these regional entities, there is now a basis for examining the comparisons and contrasts which may exist between the urban and economic structures of the urban centres in those areas. In turn, these relationships will be looked at in terms of the various indicators which are being utilized in this study.

4.3 Population

A very steady increase in the mean city size of Canadian urban centres has taken place between 1951 and 1986, both nationally and regionally. The total urban population for all the cities in this study has risen from 6,847,685 for 78 places in 1951 to 18,212,040 for 80 places in 1986. This represents a 165% increase, while the national population has increased only 81% from 14,009,429 in 1951 to 25,309,330 in 1986. In 1986 approximately 72% of the Canadian population lived in the 80 centres of over 30,000 as opposed to the 49% of the Canadian population in the 78 centres in 1951. Moreover, it should be noted that Toronto and Montreal together account for one third of the population of the centres being examined.

It is also worth observing the relationship of the increase in population in the centres in this study compared to the overall increase in the numbers in the workforce. While the population of these centres grew by approximately 165% the workforce grew by approximately 300% from 1951 to 1986. This is related to the increased participation of females in the workforce during the period of this study, as can be witnessed by the decreasing birthrate in Canada and the decreasing population/workforce ratio. There is little doubt that this greater workforce participation was mostly directed towards the service sector of the economy, which itself has experienced tremendous growth over the span of this study.

The regions of Canada also differ in the proportion of their population in the largest places and in the mean sizes of places. The mean population size of cities by region can be observed in Table 4.1a. Even though population statistics were available for 78 of the centres in 1951 it was decided to only include the centres that workforce data was available for so that the population and workforce could be directly related.

Table 4.1a Mean City Size by Region 1951 - 1986

	1951	1961	1971	1981	1986
Atlantic	45,167 (8)	56,646 (9)	68,508 (11)	88,874 (11)	97,193 (11)
Central	108,158 (43)	165,189 (43)	226,632 (45)	252,894 (45)	275,247 (45)
Prairie	81,802 (9)	122,114 (10)	158,537 (10)	203,742 (11)	233,212 (11)
B.C.	62,879 (3)	102,887 (9)	138,764 (11)	183,626 (11)	183,331 (13)
National	88,926 (63)	131,491 (71)	176,979 (77)	206,081 (78)	227,650 (80)

() - number in brackets represents the number of centres in each region.

Table 4.1b Percentage Change in Mean City Size by Region 1951-1986

	1951/61'	1961/71'	1971/81'	1981/86'	1951/86'
Atlantic	25.4	20.9	29.7	9.4	115.2
Central	52.7	37.2	11.6	8.8	154.5
Prairie	49.3	29.8	28.5	14.5	185.1
B.C.	63.6	34.9	32.3	-0.2	191.6
National	47.9	34.6	16.4	10.5	156.0

(percentage values)
italics represent above average values

The cities of Ontario and Quebec have the largest mean population throughout the study, followed by the Prairie centres, British Columbia, and Atlantic Canada in that order. The relationship of population size between the regions has been constant while all the regions have witnessed a steady increase through time. It is also quite evident that the western Provinces, which comprise the Prairie and B.C regions, had the most rapid rate of change in their urban centres. The negative value for British Columbia is misleading and this should be noted here. The small centres of Courtenay and Williams Lake were included in the study only after 1981 and therefore have the effect of lowering the mean city

size in B.C. Therefore the value of -0.2 does not mean that the B.C. centres showed negative growth and the actual change is more in line with the changes found in the other regions for the 1981-1986 time frame.

Table 4.1b is a proportional representation of the changes that occur in Table 4.1a. It can be observed that throughout the time frame being used the mean city size in all regions has increased by lesser and lesser amounts. This can be related to the general slowdown in the rate of increase for the country as a whole from 30.2% for the 1951-1961 period to 5.1% for the 1981-1986 period. Even if one extrapolates for the 1981-1991 time period a decline in the rate of increase is still noticeable. Another feature is that even though the rate of increase for cities is decreasing it is actually increasing in proportion to the overall national population increase. In simple terms, while the growth rate for urban centres and the national population is slowing, the percentage of growth in cities proportional to the rest of the country is increasing, thereby ensuring a more rapid concentration of the population that live in urbanized areas. This continued concentration certainly lends credence to those who question the concept of counter-urbanization (Davies, 1990b) although it cannot be denied that decentralization has taken place around these centres.

4.4 Population Change

So far the discussion has focused on the percentage changes and average population of centres in each region. The next logical point to discuss deals with the rates of urban change for each individual centre and then to use their mean values. Differences in levels of population change have been examined in the United States by Phillips & Vidal (1983) in their discussion on the effects of the regional dimension of metropolitan employment growth as it pertains to changes in the structures of the Frostbelt and Sunbelt regions of that country.

Table 4.2 Mean of Percentage Changes in Urban Centre Populations by Region 1951-1986

	1951-61	1961-71	1971-81	1981-86
Atlantic	<i>74.1</i>	40.4	<i>69.9</i>	12.0
Central	41.8	41.7	26.8	7.9
Prairies	46.2	35.4	<i>59.7</i>	<i>15.4</i>
B.C.	78.2	<i>119.2</i>	<i>87.8</i>	<i>19.8</i>
National	52.2	52.8	47.4	14.8

(percentage values)

italics represent above average values

The national mean growth rate for the centres in this study increased slightly in the decade preceding 1971 from 52.2% for the 1951-61 period to 52.8% in the 1961-71 and then decreased subsequently to 47.4% from 1971 to 1981. This decline in the rate of population change continued from 1981 to 1986. Even after doubling the percentage change to allow for the shorter time span of that period the decline to 14.8% was just over half the rate of the previous decade. The regional values can be seen in Table 4.2, where it can be noticed that the centres of B.C. have displayed the most rapid growth in all periods covered. The Atlantic Provinces urban centres increased at a comparable rate for the 1951-61 period and at a rate which was a distant second in the 1971-81 period. The centres of Ontario and Quebec were increasing at the slowest pace for all time periods except 1961-71 when the Prairie Provinces exhibited the slowest rate of increase. It should be explained that the rates of change in population discussed in Table 4.1b were based on the aggregated absolute values of increase for the mean city size in each region. Table 4.2 reflects a mean of the rates of change of each individual centre in each region. For that reason the apparent increases are much larger. In reality, this reflects the impact of smaller centres having very rapid rates of growth and distorting the data e.g., city X has a population of 30,000 and city Y has a population of 2,000,000. If both places increase by a population of 30,000, then city X would have a growth rate of 100% while it would be 1.5% for city Y. Put

together these two hypothetical cities in Table 4.1b would give a mean growth rate of 2.9% verses a mean rate of approximately 52% in Table 4.2. Table 4.1b is intended to give an overview of absolute and average urban growth in the regions while Table 4.2 is intended to give some indication of the mean rates of growth of individual centres within a region.

From 1951 to 1986 the urban areas in British Columbia and the Atlantic Provinces both grew at rates well above the national average for urban areas. At the same time the Central region increased the least while the Prairie centres grew only at a slightly higher rate. In the period from 1961 to 1971 the urban places of British Columbia showed a very high rate of growth - well above the national level. The cities of Ontario and Quebec increased in population at a rate almost identical to their rate of increase in the preceding ten year interval while the population growth in the Atlantic and Prairie provinces declined from the previous ten year period, with the Prairie centres having the lowest rate of population increase of any region between the years 1961 and 1971.

From 1971 to 1981 there is a noticeable decline in the rate of population change in the Central region which has the lowest value of all regions during this decade. The urban areas of British Columbia were still growing well above the national mean followed by the Atlantic and Prairie Province centres, both of which also displayed a population increase greater than the national level. In this period there is a very obvious core versus periphery differentiation in urban population growth. A similar pattern can also be observed for the five year period from 1981 to 1986. The Central Provinces had the lowest rate of increase amongst its urban centres while British Columbia continued to demonstrate the highest level of population growth. The Prairie and Atlantic Province centres displayed growth rates slightly above and below the national growth rate respectively.

A cyclical pattern is therefore noticeable throughout the time-frame of this study for the Atlantic and Prairie Province urban areas. British Columbia exhibits a pattern of rapid

growth followed by slow decline over this time span. The Central region population growth rate has decreased steadily since 1951. These cyclical patterns can be attributed to various changes in the economy at varying times in these regions, which lead to increased or decreased growth based on prosperity or recession in the regional and national economies.

4.5 Workforce

From 1951 to 1986 the workforce for cities included in this study has increased at least four times over its 1951 value. Although 63 of the 80 urban centres in this study had workforce data readily available in 1951 - this change is a very real one unaffected by the fact that places are added to the survey as the data becomes available. However, the different number of places explains the drop in mean regional workforce levels for the Atlantic Provinces and British Columbia between the years 1951 and 1961. The addition of new data, in the form of more cities, lowers the mean value from the preceding mean workforce value because the centres for which the data becomes available are much smaller than the centres which are already included in the study. The problem is minor except for the case of the change from 3 centres in 1951 to 9 centres in 1961 in British Columbia, this explains why the 1951 value is not italicized in Table 4.3a. Examining Table 4.3a we can observe the mean sizes of urban centre workforces in the regions of the country.

Table 4.3a Mean Workforce Size of Centres by Region 1951 - 1986

	1951	1961	1971	1981	1986
Atlantic	<i>33,182</i> (8)	21,383 (9)	26,811 (11)	38,438 (11)	47,735 (11)
Central	<i>34,033</i> (43)	62,738 (43)	96,522 (45)	<i>125,420</i> (45)	<i>144,475</i> (45)
Prairie	31,637 (9)	<i>51,750</i> (10)	75,236 (10)	<i>110,095</i> (11)	<i>125,672</i> (11)
B.C.	54,940 (3)	45,599 (9)	63,946 (11)	92,788 (11)	96,544 (13)
National	<i>31,930</i> (63)	<i>53,808</i> (71)	79,065 (77)	106,368 (78)	121,180 (80)

() - number of centres in each region
 italics represent above average values

Table 4.3b Change in Mean Workforce by Region 1951 - 1986

	1951/61'	1961/71'	1971/81'	1981/86'	1951/86'
Atlantic	-35.6	25.4	<i>43.4</i>	<i>24.2</i>	43.9
Central	84.3	53.8	29.9	<i>15.2</i>	324.5
Prairie	63.6	45.4	<i>46.3</i>	<i>14.1</i>	297.2
B.C.	-17.0	40.2	<i>45.1</i>	4.0	75.7
National	68.5	46.9	34.5	13.9	279.5

(percentage changes)

italics represent above average values

In 1951 the urban centres in British Columbia displayed the largest average city size. This is due in part to the low number of centres in British Columbia for which workforce data was available and also due to the overt influence of Vancouver inflating the mean workforce value. The other three regions showed values close to the national mean Workforce size of 31,930 per urban area in the study.

In 1961 the urban centres of Ontario and Quebec were the largest in average workforce size followed by the Prairie centres - slightly lower than the national workforce value for urban areas - and then British Columbia. The Atlantic Provinces urban areas were the smallest in average workforce size in 1961. The trend which was in evidence for 1961 then continued up until 1986. Throughout the period workforce mean size increased steadily but relative to each other the areal differences in mean workforce size stayed the same. In order from largest mean workforce to lowest - Central, Prairies, British Columbia and Atlantic Provinces - the relative rank remained the same through 1986, demonstrating great stability.

4.6 Changes in the Size of the Workforce

Table 4.4 shows the change in the size of urban workforces measured over ten year inter-censal periods from 1951 to 1981 and for the five year period from 1981 to 1986. This Table is similar to Table 4.2 in that it represents the mean of percentage changes in the

workforce calculated from the rate of change of the workforce for the individual centre rather than a rate of change based on aggregated values as in Table 4.3b.

Table 4.4 Mean of Percentage Changes in Urban Workforce by Region 1951-1986

	1951-61	1961-71	1971-81	1981-86
Atlantic	33.0	41.5	<i>56.6</i>	<i>45.3</i>
Central	45.0	63.4	35.7	38.5
Prairie	<i>52.3</i>	37.6	<i>59.6</i>	24.4
B.C.	37.6	<i>117.7</i>	<i>71.4</i>	20.7
National	49.7	77.4	39.8	41.9

(percentage changes)

italics represent above average values

The period from 1951 to 1961 is marked by the rapid growth of the Prairie centres followed in turn by the centres of the Central Provinces, British Columbia and the Atlantic Provinces, which exhibits the slowest pace of workforce growth in its urban places. Only the Prairies demonstrate a mean workforce growth value above the national value for growth. The next ten year interval of change, from 1961 to 1971, shows a dramatic change in the regional disparities of workforce growth. British Columbia has a very high value of workforce growth for its centres while the Prairie region was growing the least in terms of urban workforce. The Central area was next to British Columbia in terms of growth while the Atlantic Provinces centres - with growth rates well below the national figure - were next.

The ten years from 1971 to 1981 show the continued high rate of increase within the workforce of urban areas in British Columbia as well as displaying a resurgence in growth rates of Prairie centre workforces. The Atlantic region during this time increased its urban workforce mean to a rate above the national value while a definite slowdown in workforce growth was noticed amongst the cities of Ontario and Quebec.

The five year period from 1981 to 1986 does not permit direct comparison between the values (although extrapolated values may be used) for this period and other ten year inter-censal periods already utilized, but it will allow us to search for relationships amongst the regions as well as comparisons to the national means for workforce growth of these urban areas. It is apparent that the Atlantic region over these five years had the greatest mean rate of workforce growth in its urban centres. The Prairies and British Columbia show a marked decline in growth rates for their respective workforces during these years - with values well below the national level of growth. The Central area mean was close to the national value through this period.

One of the most important points to note when examining these mean regional values for workforce growth is the unstable manner in which they alter, both in terms of growth rates and the regional differences. Over the four inter-censal period being researched, all the regions, with the exception of the Central Provinces, were at some time the region with the fastest rate of workforce change. The national mean growth rate for the urban areas in this study fluctuates greatly in a cyclical manner reflecting the various fluctuations and regional differences in the economy. This cyclical trend may also be observed in the differences amongst the regional groupings - not only in terms of fluctuations in the workforce growth rate but also in the unsynchronized pattern in which they take place. This differential timing of high and low rates of workforce growth can be attributed to the various susceptibilities and responses of the urban centres in these regions to various economic stimuli.

4.7 Diversification

Given the economic differences between the regions of Canada it might be expected that the levels of industrial diversification will vary from region to region. It has already been observed that the mean size of places has increased from 1951 to 1986 for the system

of cities as a whole while at the same time Gini Coefficients have declined. Yet, in contrast to the regional differences discussed already, Marshall (1989) contended that location does not significantly influence the level of diversification attained by any particular city. This statement can be explained by the belief that diversification is related to functional type, Marshall (1981). The main problem though seems to be not whether diversification is affected by location but rather functional type. If one takes location to mean region then there is a need to examine the differences in the levels of diversification between regions.

The mean level of economic diversification does not vary tremendously for urban places from region to region of the country. The larger centres in all these areas have demonstrated that they have comparable mean Gini Index values - to each other as well as the National Mean value - from 1951 to 1986, these National Mean Gini Index values can be seen in Figure 3.1 in the previous chapter and the relationships found show that there are differences in the levels of diversification between regions.

Table 4.5a and 4.5b highlight the regional differences in the mean Gini Index and the fact that urban centres in all regions had declining mean values of the Gini Index for the duration of this study. Perhaps the most important point to be derived from Table 4.5a is the fact that the centres of the Prairies and B.C. were the most diversified from 1951 to 1971 while after a complete reversal they were the most specialized regions in 1986, although they have become more diversified through time. This implies that the centres in these regions have diversified at a slower pace than the centres in the Central and Atlantic Provinces from 1951 to 1986.

In 1951 the Prairies and British Columbia exhibited the greatest mean levels of diversification in their urban centres while the urban places in the Atlantic Provinces were the least diversified on average. Marshall (1975) explained this disproportionate number

Table 4.5a Mean Gini Indices: Centres by Region 1951 - 1986

	1951	1961	1971	1981	1986	Decline 51-86
Atlantic	.318	.280	.252	.239	.199	.119
Central	.312	.282	.255	.241	.193	.119
Prairie	.295	.248	.235	.250	.214	.81
B.C.	.297	.255	.251	.231	.222	.75
National	.310	.272	.251	.241	.201	.109

italics represent above average values

Table 4.5b Mean Changes in the Gini Index by Region 1951 - 1986

	1951/61'	1961/71'	1971/81'	1981/86'	1951/86'
Atlantic	-11.9	-10.0	-5.2	-16.7	-37.4
Central	-9.6	-9.6	5.5	-19.9	-38.1
Prairie	-15.9	-5.2	+6.4	-14.4	-27.5
B.C.	-14.1	-1.6	-8.0	-3.9	-25.5
National	-12.3	-7.7	-4.0	-16.6	-35.2

(percentage changes)
italics represent above average values

of Prairie centres which were diversified by pointing out that the Prairie centres acted as regional service centres. Marshall found that in 1971 Quebec was more specialized than other regions while Ontario, B.C., and the Atlantic Provinces did not differ much based on their expected levels of diversification. The fact that a similar result is reported here even with Quebec being grouped together with Ontario, shows that the specialization reported in Quebec was based purely on differences within the manufacturing sector, as Marshall pointed out, and therefore shows that the industrial classification used in this study justifies Ontario and Quebec being grouped together into one region based on their non-manufacturing similarities in the urban centres.

The Ontario-Quebec region showed a mean value very close to the national urban diversification level for all years examined. In 1961 a similar pattern is found to that from 1951 with the urban centres of the Prairies and British Columbia again having the most diversified urban economic base mean values - both below the National Mean. The Central

and Atlantic Provinces - as in 1951 - were less diversified than the National Mean Gini Index value. In 1971 only the urban centres of the Prairies demonstrated a mean Gini Index value below the National value, the other regions of the country closely approximated the National Mean value.

Between the census years of 1971 and 1981 an appreciable shift from the earlier patterns of diversification is noticeable at the regional scale. During this period the Prairie centres changed from having the most diversified urban economy to an area whose urban centres were now the least diversified of any region in Canada, although these centres are by no means what one would consider concentrated. This is also true for 1986 and considering the previously mentioned service centre orientation of Prairie centres, it is difficult to explain. It is most likely that the non-Prairie centres, in becoming more service oriented through time as manufacturing declines, now tend to approximate more closely the national profile of services employment and therefore the concentration in some services that were traditionally held as diversifying forces in Prairie centres are viewed as specialized industries. British Columbia's urban centres in 1981 displayed the greatest levels of diversification as is evidenced by the lowest Mean Gini Index value. As in 1971, Central and Atlantic Canada were very close to the National Gini Index Value for urban centres.

The reasons for these changes are not obvious, but one must recognize that while the Prairie centres may have been just as diversified as they were in 1971 - based on their internal economic structure - the composition of the economic base relative to the national economic base may have become more concentrated. An alternate explanation, to the one presented previously dealing with the changing role of services as a diversifying force, may be the impact of the oil industry in the boom years of the late seventies, particularly in Alberta (which has the largest number of Prairie Centres in the study), leading to increased concentrations in this and associated sectors of the economy throughout the Prairies. This

can be observed by examining the Regional location quotients for this industry in Tables 4.6 and 4.7. This being the case, the result would be reflected by less diversification in the Prairies as a whole and a higher mean Gini Index value than at the previous census due to increased concentration in some urban areas, and in particular centres in Alberta.

In 1986 it is British Columbia which shows the lowest mean level of diversification amongst its urban centres, followed by the Prairies, both above the mean National Gini Index. The Atlantic and Central Provinces are now the areas whose urban centres demonstrate the most diversified economies on average; both have Gini Index values below the national mean Gini Index.

4.8 Location Quotient Changes by Region 1951 - 1986

Table 4.6 and Table 4.7 show regional means for the location quotient for each industry, 16 categories were used because of the 1986 reduction of categories therefore the 21 categories in 1951 were reduced to 16 categories for comparability. This helps to show

Table 4.6 Mean Regional Location Quotients for 1951

Industry 1951	Central	Atlantic	Prairie	B.C.
Forestry	0.20	0.14	0.03	0.35
Mining/Oil	<i>1.66</i>	1.00	0.58	1.20
Manufacturing	1.27	0.57	0.58	0.53
Construction	0.88	0.77	1.06	1.10
Transportation	0.75	1.46	<i>1.58</i>	1.39
Comm & Utilities	1.15	1.07	1.14	1.07
Wholesale	0.68	<i>1.64</i>	<i>1.75</i>	1.49
Retail	0.97	1.30	1.27	1.28
Finance	0.80	1.18	1.15	1.29
Insurance/Real Estate	0.81	0.87	1.21	<i>1.61</i>
Education	0.94	1.04	0.84	0.85
Health	1.09	<i>1.72</i>	<i>1.75</i>	<i>1.55</i>
Business	0.84	1.07	1.24	1.43
Accommodation/Food	0.90	1.10	1.14	1.46
Government	0.70	1.49	1.05	1.45
Other	1.01	1.07	0.98	1.14
No. of LQ's >1.0	5	12	11	13

LQ values >1.5 are italicized

21 categories reduced to 16 for 1951 to be comparable to 1986 categories

which individual industries have been and are concentrated in the various regions through the use of Mean Location Quotient values for the regions. This data is available for 1951 and 1986 and can help clear up some of the points which have been discussed. The changes in the structure of the internal urban economies can illustrate why the levels of diversification have changed through time for the various regions. Table 4.6 is for 1951 and Table 4.7 is for 1986 with both Tables using the 1986 Standard Industrial Classification.

The regional Gini Index for the Central Provinces in 1951 has already been shown to be high. This is very much influenced by the high Manufacturing location quotient in this region, as opposed to the very low values in the other regions. Not only does this show the relative importance of Manufacturing to the Provinces of Ontario and Quebec but also this industry's absolute employment is the largest of all those being studied. The main explanation for the Atlantic Provinces' high overall level of concentration was probably due to the high location quotients for Government and Mining. The Prairies and B.C. which exhibited the most diversified economies in 1951 both displayed high location quotients in the services industries reflecting the service centre function of those centres.

Table 4.7 shows the location quotients for each region in 1986 as well as an indication of the direction of change in the location quotient since 1951. In 39 out of 64 cases the location quotients are lower in 1986 than 1951. In the case of the Central region, 9 out of the 16 cases increased which, based on their initial low values in 1951, meant that the centres of the region as a whole became more diversified. Table 4.7 offers a possible explanation for the phenomenon noticed in Table 4.5a where it was observed that centres in B.C. and the Prairies were diversifying at a slower pace than the other regions.

Table 4.7 Mean Regional Location Quotients for 1986 and Direction of Changes from 1951 to 1986

Industry 1986	Central	Atlantic	Prairie	B.C.
Forestry	0.63 +	<i>1.62 +</i>	0.43 +	<i>5.38 +</i>
Mining/Oil	0.84	<i>1.17 +</i>	<i>3.08 +</i>	0.64
Manufacturing	1.24	0.66 +	0.49	0.73 +
Construction	0.93 +	1.07 +	1.19 +	1.10
Transportation	0.79 +	1.12	1.02	1.11
Comm & Utilities	0.94	1.10 +	1.09	0.86
Wholesale	0.84 +	1.03	1.03	0.79
Retail	1.06 +	1.12	1.06	1.12
Finance	0.76	0.71	0.86	0.71
Insurance/Real Estate	0.79	0.82	1.04	1.07
Education	1.09 +	1.10 +	1.10 +	0.91 +
Health	1.12 +	1.12	1.15	0.99
Business	0.70	0.63	0.86	0.70
Accommodation/Food	1.00 +	0.99	1.18 +	1.34
Government	0.91 +	1.42	1.18 +	1.03
Other	0.93	1.03	1.07 +	1.11
No. of LQ's increasing	9	6	7	3

LQ values >1.5 are italicized

+ indicates increase in the Location Quotient from 1951 to 1986

The extreme values seen in the case of Mining and Oil in the Prairie Provinces and Forestry in B.C. go a long way in explaining why these two regions - whose urban centres were the most diversified in 1951 - now have the least diversified urban economic bases as was shown in Table 4.5a. It can be also noted that the values, particularly for service industries, have become more ubiquitous through time which tends to back up the fact that, while centres in other regions may be becoming more diversified, the Prairies are becoming less so due to the changing national profile of employment. This was discussed earlier and is mentioned here to highlight the possible reason for the relative concentration found in Prairie centres compared to centres of other regions even as it is becoming more diversified in general. This trend found in the Prairies seems to be the direct opposite of what was predicted by Keinath (1985), based on a study of regions in the U.S.A., who maintained that diverse regional economies, or those that are diversifying, possess a greater probability of above average growth than those that are not. Based on this hypothesis one would expect the Prairies and B.C. centres, which diversified at the slowest rate, to increase their populations at the slowest pace. In fact, the opposite is true with these two regions and

their respective urban centres growing at the fastest rate from 1951 to 1986 well above the national average and the Atlantic and Central regions which showed the greatest diversifying trend increasing their urban populations at the slowest rate.

4.9. Conclusion

This chapter has described some of the differences between the centres on a regional basis. It was shown that the centres of the four regions vary in terms of their populations, workforces, rates of growth and level of industrial diversification. The next chapter deals with individual centres and examines in particular how their economic characteristics vary. Based on the differences observed these individual centres will be classified to form a taxonomy that groups places with similar industrial characteristics together.

CHAPTER 5

CLASSIFICATION OF CANADIAN URBAN CENTRES

5.1 Introduction

The purpose of this Chapter is to outline and summarize the differentiation of Canadian cities and industries between 1951 and 1986, not from the viewpoint of general or regional characteristics, but from the perspective of individual places. There is a vast amount of data in a study of this nature and how to summarize this information is a difficult decision. A number of approaches were contemplated and it was decided to attempt to generalize the data into a summary form rather than detailing all the individual characteristics of the industries or places. This meant that a method which makes the data set easier to interpret was needed, one that searches for generalizations, so that one is not faced with a burgeoning set of numbers but produces a condensed version of the data set. The best way of achieving this is to define a series of groups of centres which can be used to describe the salient features of the Canadian system of cities with populations greater than 30,000. This Chapter explains how this was carried out, displays the results for the years 1951 and 1986 by a set of groups and compares the groups to see how they have varied over the 35 year period of this study.

5.2 Background

The idea of grouping and comparing sets of cities from the perspective of their economic characteristics is far from new, but has gone out of favour in recent years. In the not so distant past attempts were made to classify and sort information about places and regions by using what must be considered very subjective and descriptive methods (Carter, 1975). Carter noted that Auroseau (1921) approached the problem by creating subjectively identified categories of places and then assigning cities and towns to these groups in a very subjective manner. As recently as 35 years ago Nelson (1955) stated that:

"most students of urban geography would probably agree that the problem of classification has never been satisfactorily solved." While there can never be a single method of classification suitable for all uses the advent of the quantitative revolution in Geography in the 1960's introduced a number of new quantitative techniques which could quickly and easily assess very large data sets for the purposes of classification.

Quantitative studies were carried out in many countries. In Canada Maxwell (1965) utilized a very similar data set to that found in this study and derived five classes of urban places using Ullman and Dacey's (1960) Minimum Requirements technique. These groups were:

- (a) Regional Centres (Manufacturing important);
- (b) Regional Centres (Manufacturing unimportant);
- (c) Major Metropolitan Centres;
- (d) Specialized Manufacturing Centres;
- (e) Special Centres (Mining and Government).

Another classification of the Canadian urban system which did not utilize a standard multivariate approach was based on a functional classification using dominant functions as the basis for differentiation between centres, Li, Scorrar & Williams (1978). These researchers found six types of urban centres:

- (a) Manufacturing (type I);
- (b) Manufacturing (type II);
- (c) Extraction;
- (d) Community Service;
- (e) Transportation;
- (f) Retail.

Marshall (1981) devised a functional classification of Canadian centres which utilized a dominant function method, this method searched for the individual industry which had the highest concentration of employment in a centre. Four types of centre were found:

- (i) Mixed Centres;
- (ii) Nodal Centres;
- (iii) Manufacturing Centres;
- (iv) Special Activities Centres.

A more elaborate method of functional classification in a study of urban centres in the USA and Canada was utilized by Marshall (1989) where the Special activities he outlined in his Canadian study in 1981 were changed to exceptional centres and were subdivided into four groups:

- (a) Mining Centres;
- (b) Government Centres;
- (c) Resort Centres;
- (d) University Centres.

The classes of Mixed, Nodal and Manufacturing remained the same as in his previous Canadian Study. Another study dealing with the classification of the urban areas was undertaken by Noyelle (1983) who, in his study of the 140 largest American SMSA's, found four main types of centre with sub-groups within each class using a functional classification approach;

- (i) Diversified advanced service centres (National, Regional, Sub-Regional)
- (ii) Specialized advanced service centres (Government , Education)
- (iii) Production centres (Manufacturing, Military, Mining)
- (iv) Consumer centres (Residential, Resort, Retirement)

All of the above types of urban centres are based on functional classifications using dominant economic functions as the basis for the creation of these groups of places. While there is nothing incorrect about this approach it is undesirable to classify a centre based on one industry's dominance of a centre. An approach is required that can classify places based on all their economic characteristics simultaneously. The use of multivariate techniques allows for this type of approach and has been used in many cases to date. Multivariate techniques can be used at a number of scales from national and regional down to the intra-urban and even the neighborhood level. The applicability of these techniques at various scales has led to a great diversity in the types of studies which have been carried out.

Davies (1984) has outlined some of the previous problems in classifications of urban places. He noted that many of the earlier works were concerned with economic

aspects of a place and noted that , "intuitively, it is much more likely that city systems will be composed of several dimensions or sources of variation." (1984, 257) This explains why most work concentrated on looking at as many sources of differentiation between cities as possible. Davies pointed to the availability of high speed computers in the 1960's as the take off point for the use of multivariate techniques, such as factor analysis, which proved to be very useful in preparing urban classifications. The work of Moser & Scott (1962) in the United Kingdom, Berry (1965) and Hadden & Borgatta (1965) in the U.S.A. and King (1966), Hodge (1968), Ray & Murdie (1972) and Simmons (1978) in Canada are all discussed by Davies (1984). He compared the results attained by these scholars and derived a number of generalizations common to their research.

Other examples of the use of factor analysis include a study of the northern Midwest of the United States by McConnell & Horton (1969), who utilized Principal Components Analysis to classify counties. Welling (1977) used a similar technique in his study of centres in the Canadian Prairie Provinces. Davies (1984) used 33 socio-economic variables in a case study of French planning regions as a basis for a principal components analysis and rotation to highlight differences between the regions. By contrast Mulligan & Reeves (1986) used a hierarchical cluster analysis of 40 centres in Arizona to classify centres based on the economic structures that were found.

A common thread running through all these studies was the search for socio-economic sources of variation utilizing a variety of census-based indicators, demographic, social, economic, housing, ethnic, etc.. In each case one or more economic base components were derived. Berry (1972) noticed that the economic base of a centre frequently acts independently of the other urban dimensions. So it is logical to investigate economic base variations separately from other characteristics so as to define this aspect of the urban system.

5.3 The Generalization of Information

A number of multivariate techniques exist which can be applied to large data sets for the purpose of facilitating the interpretation of results through the extraction of generalizations. Cluster Analysis (Wishart, 1978) and Factor Analysis (Davies, 1984) have proven to be the most popular. These two techniques can be used to break the data down into generalizations and groups of data, either on the basis of grouping variables to extract common characteristics of variables or grouping cases to provide clusters of similar cases. It is these common characteristics which can be used to give an insight into the structure of Canadian cities and the types of activities which can best explain the differences that arise between places.

5.4 Data Used

The data set used for this part of the study is comprised of the location quotients of the industries for all the places in the study. This indicator provided a means for establishing the proportion of employment in an urban place as opposed to the absolute employment values. The data in this form was then standardized for analysis, so that each variable (location quotients for an industry group) is weighted the same, by converting the values to standard scores so as to remove the impact of extreme values on the data set, even though the location quotient can be looked upon as a form of standardized data in its own right. The analysis that ensued used the industries as the variables (that provide the differences between cases) and the urban centres in the data set as the cases (which are to be grouped together). The purpose for doing this should be apparent. The objective of the study at this stage is to show the differences and similarities between the places so that they can be classified by the similarities that exist in their economic base structures.

5.5 Cluster Analysis

For this study Cluster Analysis was preferred over Factor Analysis methods, even though a Q-mode Factor Analysis could give similar results based on the extraction of industry characteristics (Appendix D). The problem with the preferred use of Factor Analysis in Geography (Principal Axis Component Analysis) is that it only deals with common variance, therefore error variance is lost which could exclude some of the individuality of specific places (Davies, 1984). Cluster Analysis technique uses all the data and has the ability to group large data sets into groups of cases that share common characteristics. A description of the technique will allow one to understand the way in which it works. There are two main types of classification, the agglomerative method and the divisive method (Wishart, 1978). The former, which is most often used in Geography or Urban Studies, builds up generalizations from individual places, not vice versa like the latter method. The agglomerative method is used in this study. There are many types of clustering method, two of which are the hierarchical (Ward's Method) and non-hierarchical (Wishart's Relocate procedure). This study utilizes the non-hierarchical approach, due to the greater flexibility in the allocations of group memberships, with Euclidean distance as the measure of dissimilarity.

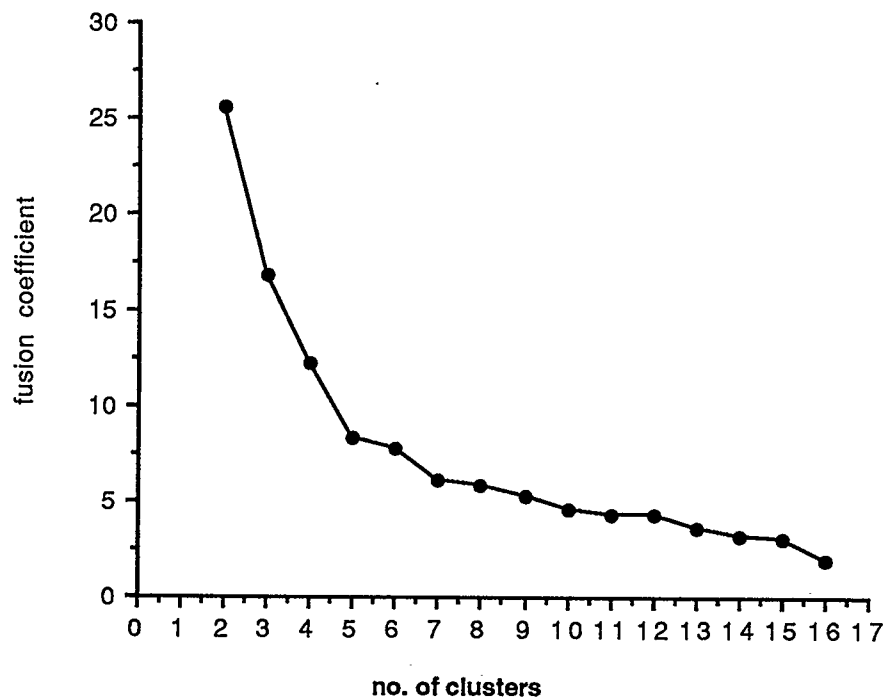
The *Relocate* procedure of the Clustan package utilizes an iterative relocation without the restrictions of a rigid hierarchic fusion - such as Ward's Method. Dr. W.K.D. Davies deserves thanks for making Wishart's method available at the University of Calgary through his purchase of the package for mainframe use. The Relocate procedure allows for the possibility of cases switching clusters that reflect the similarities of cases to each other at various stages of the analysis rather than being fixed in a group. Therefore a case in the analysis may be in different clusters based on the cluster solution selected. As fewer and fewer clusters remain in the analysis one can observe the fusion coefficient for the clusters getting higher and higher. This is a direct result of the loss of information encountered in

attempting to fuse together clusters which are dissimilar to each other. These fusion coefficient values are a very useful guide in aiding in the selection of the most appropriate solution for the data set and help in the justification for such decisions. This most appropriate solution is the most succinct summary that can be used while losing as little explanation as possible.

5.6 Justification for the use of a 7 Cluster solution

Fusion coefficients can be used to decide which solution presents the best reflection of the data set. Figure 5.1 is a graph of the fusion coefficients for the cluster solutions in 1986. The graph shows the increasing loss of information in fusing two clusters together

Figure 5.1 Fusion Coefficients for Cluster Solutions 1986



so the value is quite high to fuse the last two remaining clusters together, because they are so different, whereas the values are low for fusions carried out at earlier stages of the procedure. From the graph it can be noted that there are two sizeable breaks of slope at

the five cluster and seven cluster solutions; these breaks represent stages where big changes in the fusion coefficient occur. The change from the seven cluster solution to the six cluster solution shows an increase in the fusion coefficient which implies that when less than seven clusters are used the cases are forced into clusters which might not be as suitable as the seven cluster solution results. The case can also be made for using the five cluster solution because there is a huge jump in the fusion coefficient when one uses the four cluster solution. The *main* difference between these two breaks of slope however is that in the case of the 7 cluster solution the jump in the fusion coefficient was the first large jump in this coefficient beyond any of those seen in the preceding changes in cluster solutions. It was decided that a seven cluster solution would be most suitable to describe this data set.

As a check on the results of the Cluster Analysis an R-mode Principal Axes Components Analysis was run on a 16 x 80 matrix. This was followed by an oblique Oblimin rotation and calculation of scores for seven axes was undertaken to aid in classifying centres in the Canadian urban system in 1986, some of the results of which can be found in the Appendix D. Each factor identified different sets of industries and high loadings on the axes indexed the places most typical of the industry set. The high loadings found in each factor resemble the groups found using the Relocate procedure for a seven cluster solution and added to the confidence that the Cluster Analysis results were not technique dependent, i.e. a product of Cluster Analysis alone. These results can be found in Appendix D.

5.7 Presentation of the results from 1986

The results that were derived for 1986 from the analysis using the Clustan technique indicated that a seven cluster solution was the most suitable. The best way to describe these results would seem to require a detailing of the clusters : their composition, their characteristics as they apply to some of the general trends that have already been

discussed, and finally their relationship to the system of cities as a whole. Each cluster was numbered and given a title which seems to best describe that cluster based on the characteristics observed in that cluster. Once these titles have been established the results for the two years in question will be compared.

5.8 1986 Results of Cluster Analysis

Table 5.1a Characteristics of the Clusters in 1986 based on Mean Location Quotients for Industries

16 Industry Groups	C 1	C 2	C 3	C 4	C 5	C 6	C 7	%
Forestry	0.51	2.19	0.18	0.87	12.06	2.26	1.76	0.9
Mining and Oil	0.22	0.40	1.05	0.23	0.93	7.47	0.99	0.9
Manufacturing	1.52	0.64	0.78	0.42	0.97	0.63	0.74	18.0
Construction	0.92	0.99	1.03	0.95	0.89	1.07	1.20	6.2
Transportation	0.70	1.57	1.08	0.79	1.02	0.84	0.95	4.6
Commun/Utilities	0.88	1.01	1.23	1.25	0.64	0.85	0.92	3.4
Wholesale	0.83	1.10	1.16	0.81	0.45	0.79	0.86	4.8
Retail	1.07	1.11	1.00	1.01	1.04	1.06	1.18	13.2
Finance	0.70	0.70	1.16	0.92	0.47	0.60	0.71	3.8
Insure/Real Estate	0.71	0.79	1.18	1.01	0.75	0.65	1.07	1.9
Business Services	0.62	0.56	1.17	0.99	0.41	0.47	0.68	4.8
Government	0.73	1.32	0.90	2.12	1.06	1.02	0.97	8.0
Education	1.05	1.03	1.01	1.34	0.97	1.21	0.97	6.9
Health	1.09	1.18	1.09	1.19	0.79	1.01	1.15	8.6
Accommodation/Food	0.96	1.14	1.02	1.03	1.28	0.97	1.33	6.6
Other	0.89	0.99	1.07	1.04	0.92	0.93	1.13	7.3
No. of LQ's > 1.0	4	9	13	7	5	7	7	100.0

LQ values >1.5 are italicized

C - represents Cluster

% represents the percentage of the workforce involved in each industry in Canada in 1986

Table 5.1a shows the mean location quotient for each industry in each of the seven clusters in 1986. The values in this table are useful in highlighting some of the salient features that help explain the composition of each cluster of places. Using this as a basis, the character of each cluster will be described in turn. Additional information about the Clusters can be seen in Table 5.1b which outlines some of the characteristics of the clusters with regard to the indicators of urban change in the form of mean Gini Indices, Rates of

Gini Index Decline, Workforce, Workforce Growth and distances from the centres nearest neighbour with a population of at least 30,000.

Table 5.1b Mean Gini Index values and other Urban Indicators 1986

Cluster	Gini Index	Workforce	Growth	Gini Decline	Distance(km)
Cluster 1	.1910	55,857	250%	-35.1%	<u>58.6</u>
Cluster 2	.1970	31,101	<u>196%</u>	-33.4%	193.5
Cluster 3	<u>.1500</u>	<u>569,264</u>	<u>389%</u>	-43.3%	99.2
Cluster 4	.2514	153,189	365%	<u>-25.9%</u>	128.0
Cluster 5	<u>.2844</u>	<u>16,165</u>	N.A.	N.A.	96.0
Cluster 6	.2586	33,746	213%	<u>-46.8%</u>	<u>150.0</u>
Cluster 7	.1816	29,476	295%	-36.8%	72.9

The High and Low Values in each column are underlined

5.8.1 Cluster 1

This is the largest of all the clusters with 28 members over 30,000 in population, as are listed in Table 5.2 below.

Table 5.2 Members of Cluster 1

New Glasgow	Sherbrooke	Trois Rivières	Oshawa
Hamilton	St. Catharine's	Kitchener	Brantford
Guelph	Windsor	Sault Ste. Marie	Shawinigan
St. Hyacinthe	Chatham	Granby	Valleyfield
Baie Comeau	Drummondville	Joliette	St. Jean
St. Jerome	Sorel	Victoriaville	Belleville
Brockville	Cornwall	Midland	Chic/Jong

The majority of the centres in this cluster are located in Ontario and Quebec, New Glasgow in Nova Scotia was the only centre not in the core area. Four of the sixteen location quotients for this cluster are greater than 1.0 (i.e. higher than the average employment in that industry for the nation as a whole) - Manufacturing, Health, Retail and Education - but only one of industries had a location quotient greater than 1.5 - Manufacturing. Obviously, therefore, the latter is the most important feature, especially given the importance of Manufacturing in the national economy.

The mean Gini Index for this group is .1910 which is in the middle of Gini Indices for the seven clusters. Similarly the mean workforce size for this cluster is 55,857, which is in the middle of the range of values for the other clusters. Two other indicators which were applied to attempt to describe the groups also show up as being in the middle range of possible values exhibited by the other clusters: a 250% growth in the size of the workforce since 1951 is the third highest; and a 35.1% decline in the Gini Index from 1951 to 1986 shows that they have become less specialized. The mean distance of these centres from their nearest neighbour in the study is 58.6 km which is the lowest mean distance for any of the clusters indicating that they are close to other large centres with populations over 30,000. This seems to agree with the findings in section 4.5.

The dominance of Manufacturing activity in centres of this cluster combined with the areal clustering of centres makes the title of *Manufacturing - Heartland* an appropriate one.

5.8.2 Cluster 2

Nine of the sixteen industries in this cluster had location quotients greater than 1.0. Activities with below average concentrations are Mining and Oil, Manufacturing, Finance, Insurance & Real Estate and Business Services. Given the number of high location quotients these centres seem to be regional service centres, but not business centres. Yet two industries displayed location quotients greater than 1.5 - Transportation and Forestry. Although Forestry has a higher location quotient than Transportation, Table 5.1a shows it is more important in two other clusters (Clusters 5 and 6) and one must remember that the actual numbers employed are low with only 0.9% of the Canadian workforce involved in this activity. Cluster 2 is the only set of places with a location quotient greater than 1.5 for Transportation.

Table 5.3 Members in Cluster 2

Moncton	North Bay	Thunder Bay	Brandon
Moose Jaw	Corner Brook	Truro	Prince George

Most of the centres in this cluster are scattered throughout the periphery of the country. While two of the centres are located in Ontario they are not in Southern Ontario and can still be considered as part of the periphery. Moreover, all of these centres are located either on the major national road network or along the railways, with one of the centres being a large port. It is significant that many of them were originally regional railheads with large yards.

This cluster displays the slowest growth in its workforce from 1951 to 1986 with an increase of 196%. On average these centres tend to be small in size (mean workforce size of 31,101) and are neither very diversified or concentrated (mean Gini of .1970). The reason for these values is probably due to some central place service component which exists in these places. These centres on average are further away from the nearest centres than any other cluster being examined. The rate of Gini decline is relatively slow at 33.4% and this can be explained by the inability of these places to diversify through time. Also it was noted that of those centres which exhibited high location quotients in Transportation, the centres with the largest location quotients were included in this group, other places which showed high location quotients in Transportation were found in the Unspecialized Regional Centres cluster. Based on the relative importance of the Transportation industry to places in this cluster and the apparent lack of concentration in any other industries in absolute terms the title *Transportation Centres* is given to places in this cluster.

5.8.3 Cluster 3

Despite using data in standardized form which removed the exaggeration of size, the largest centres in the country still showed up in this group, these can be found in Table 5.4. All three Canadian centres with populations greater than 1 million are included and 3

of the 6 places with populations greater than 500,000 are included. The other 4 centres had populations greater than 100,000.

Table 5.4 Members of Cluster 3

Toronto	Montreal	Vancouver	Edmonton	Calgary
Winnipeg	London	Saskatoon	Regina	Saint John

There is no regional character to these centres as they are located throughout the country. In industrial terms it must be emphasized that no less than thirteen of the sixteen industries displayed location quotients greater than 1.0 in this cluster while no industry had a location quotient value greater than 1.5. This indicates a lack of concentration in any one industry and a diversity in the economies of these centres. The fact that these are the largest urban centres or those isolated in their region leads one to believe, that compared to the national profile of the economic base, it is in the largest urban centres where one would expect to find the greatest proportions of employment in the services industries - this is reinforced by the incidence of location quotients greater than 1.0. It is significant to note the low LQ of 0.784 for Manufacturing which backs up this point.

Another point to note is that for the Finance, Insurance & Real Estate and Business Services the location quotients found were higher in this cluster than for any other, even though they did not exceed 1.2. This confirms that the largest centres are the financial and business centres of the country and their respective regions. Seven of the ten centres in this group are the largest population nodes in their respective provinces and therefore are taking on the role of business centre for their immediate areas.

This cluster has a Gini Index of .1500 which is by far the lowest value of all the clusters and certainly backs the arguments about large city diversification that have already been discussed. Another feature of this cluster is the very rapid rate of growth which has occurred during the period being studied. At 389% this cluster also has the fastest rate of growth. This would tend to back up the argument that increased growth leads to

diversification as well as the size of a centre. This can also be seen in the rate of Gini Index decline which at -43.3% is the second greatest decline of all the clusters. Based on the low Gini Indices observed, the diversifying trend over the previous 35 years, the large size of the centres and the large rate of growth that was noticed the centres in this cluster will be named *Diverse Metropolitan Centres*. The fact that this cluster was created despite the fact that standardized data was used is a sign that large cities are becoming more similar and predictable in their structures.

5.8.4 Cluster 4

This cluster which is made up of eight cities reflects the importance of Government in the Canadian urban system. Five of the eight centres in this cluster are Provincial Capitals while one is the National Capital. The two exceptions - Kingston and Rimouski - displayed high location quotients in Government employment related to jails and the armed forces. The composition of this cluster can be seen in Table 5.5.

Table 5.5 Members of Cluster 4

Ottawa	Quebec	Victoria	Kingston
St. John's	Fredericton	Halifax	Rimouski

In this cluster half of the industries display location quotients greater than 1.0 indicating a certain level of diversity, but with a mean Gini Index for the centres in this group of .2514 it can be seen that these centres were not diversified when compared to Cluster 3. The concentration in Government is obvious with a location quotient of 2.12, the only industry to have a location quotient above 1.5. Another aspect of this cluster is the relatively high location quotients for Education and Communications. This is not surprising since in many cases large Universities are located in the Capitals of each Province and the high employment levels in Communications reflect the associated information requirements that exist in centres of government.

One important feature of this cluster is that there is no regional association - in the sense that there is no concentration in any one specific area. Seven of the eight centres in this cluster are in Eastern Canada with Victoria being the exception. The reasons for this are not clear. Despite having a high regional location quotient for Government (see Table 4.8) none of the Prairie Capital cities are included in this Cluster. The relative impact of the Government sector is not as strong here as it is in the eastern centres because of the lack of very large concentrations into single centres, e.g. the Government location quotient for Edmonton is 1.24 as opposed to 2.18 for Halifax or 2.09 for Quebec. Another possible explanation is the fact that apart from Ottawa and Quebec many of the eastern centres are smaller and older cities than their counterparts in the west and thus this sector is more deeply entrenched in the local economy. The cities of Kingston and Rimouski are the only two centres in this cluster that are not Capital cities. Kingston is included due to the presence of a number of prisons there, thus there was a large number of Government employees leading to a location quotient of 1.88.

The presence of Rimouski in this group is not as easy to explain. It is apparent that Rimouski has a very high percentage of its workforce in the Communications & Utilities sector and due to the lack of similarity to any other group of cities it was included in this cluster. Indeed, in 1951 Rimouski's internal economic structure was so different from any other centres it formed a cluster on its own - even at the 4 cluster solution level. Rimouski has location quotients greater than 1.5 for Forestry, Communications & Utilities and Education with values of 2.24, 2.65 and 1.71 respectively. The only other values that are relatively high are Health, 1.21, and Government, 1.13. The primary reason Rimouski was placed in this group were the high location quotients found for Communications & Utilities and Health.

In terms of the level of diversification present in this cluster it can be seen that these centres are relatively highly concentrated in the government sector compared to the

concentrations that exist in other clusters. A mean Gini Index of .2514 is well above that of many of the other clusters. The only clusters that have lower levels of diversification are those clusters representing Mining and Forestry. It is apparent that of those clusters which are not based on concentration in Primary industries; the Government sector centres together with centres of specialization in Quaternary activities possesses the highest degree of concentration within its economic base.

Examining the aspects of size, one discovers that these centres are the second most populous on average of all the clusters with a mean workforce size of 153,189 - this is due mainly to the presence of Ottawa and Quebec in this cluster, two of the largest urban centres in Canada - and a rate of growth (365%) which is also the second highest among all the clusters. This reflects the fact that the larger centres in the country were growing at the fastest pace from 1951 to 1986

The rate of decline of the Gini Index for this cluster is 25.9% for the 35 year period being examined and this is the least percentage decline of any cluster. It seems to indicate that centres with high levels of concentration in service oriented industries will diversify at a slower rate than centres concentrated in other sectors of the economy. This fact will be discussed again when the Mining sector is described. Based on one of the possible divisions of the service sector into Tertiary, Quaternary and Quinary sectors (see Section 2.5) and the high location quotient for Government activities, the title used to describe centres in this group is *Government and Quinary Centres*.

5.8.5 Cluster 5

This cluster is the smallest of all the clusters in this study with only three centres included in it. The three centres are *Williams Lake, Port Alberni and Courtenay*. All three centres are all located in British Columbia and are relatively small in size with an average population of 32,412 and an average workforce of 16,165. Two of the centres are located

on Vancouver Island while Williams Lake is in the interior of British Columbia. These centres as a cluster have a very high mean Location Quotient of 12.06 for *Forestry* which is by far the highest level of concentration found in any cluster in the survey while four other industries had location quotients greater than 1.0 - these were Accommodation and Food (1.28), Government (1.06), Retail (1.04) and Transportation (1.02). Of these, the only industry to display a location quotient that is relatively large is the Accommodation and Food sector which is indicative of a certain tourism component in that part of the country. The high level of concentration in this sector is also evidenced by the mean Gini Index of .2844 which is the highest value for all the clusters. These centres also have the smallest mean size of all clusters. There is no information on the rate of growth or Gini Index decline because none of these centres were large enough to be included in the study in 1951.

5.8.6 Cluster 6

This cluster is composed of those centres which display concentrations in the industrial classification of Mining, Quarries and Oil with a mean location quotient for that activity of 7.47. These centres are called *Mineral Extraction Centres* for the purposes of this study. There are 7 centres in this cluster and these are located throughout the country in places where the specific resources being extracted are located. The centres in this cluster are listed in Table 5.6.

Table 5.6 Members of Cluster 6

Sydney	Thetford Mines	Timmins	Fort McMurray
Bathurst	Rouyn	Sudbury	

Six other industries exhibit location quotients greater than 1.0 for this cluster, the highest of these being Forestry (2.26) and Education (1.21). The Forestry component to these centres is fairly small as the numbers actually employed are quite low, no other industry exhibits a high level of importance in this cluster. After the Forestry cluster the

Resource cluster displays the highest levels of concentration in its workforce. This is evidenced by the mean Gini Index of .2586 which reflects a low level of diversification when compared to the other types of centre in the urban system. These centres have a relatively small size with a mean workforce size of 33,746 while they have grown at a rate which is very slow at 213% second only to the Transport cluster in their lack of growth. Possibly the most significant point to note is the very rapid rate at which these centres have been diversifying during the period being studied. Unlike the Government cluster which is highly concentrated and diversifying at a slow pace the Resource centres are highly concentrated and diversifying at a very rapid rate. This is a result of the type of employment in which the concentration occurs - in the case of the Government centres, the concentration is in the Services Sector of the economy while in the Resource centres the concentration is in the Primary Sector. This fact, allied with the knowledge that during the 35 year period of this study the Service sector has expanded its share of the workforce in the urban centres being examined from 63.3% to 80.2%, explains why the rate of diversification has been much greater in the Resource centres. The Resource centres have to diversify at much greater rates than other centres for their employment profiles to approximate that of the rest of the centres in the study. It gives an idea of how concentrated these Resource centres were in 1951 when they were still among the least diversified centres in the country, even after exhibiting the greatest rate of diversification.

5.8.7 Cluster 7

The last of the seven clusters is a rather diverse group. These centres have no great levels of concentration in any one sector of the economy. No location quotient values greater than 1.80 are observed and these centres tend to be relatively small in size with an average workforce of 29,476 - the next to lowest of all the clusters.. The centres are located throughout the country and a list can be found in Table 5.7. Of those centres which

are in the Heartland they are peripheral to the main areas of urbanized belt or core area of Southern Ontario. It is worth noting that none of the centres in this cluster are in Quebec.

Table 5.7 Members of Cluster 7

Sarnia	Barrie	Peterborough	Orillia	(Central)
Charlottetown				(Atlantic)
Lethbridge	Medicine Hat	Red Deer	Prince Albert	(Prairies)
Matsqui	Nanaimo	Kelowna	Vernon	(B.C)
Kamloops	Penticton	Chilliwack		

Seven of the sixteen industries have location quotients greater than 1.0 with only Forestry (1.76) having a value greater than 1.50. Though one might think Forestry is of great importance to these centres, the location quotient for Forestry is higher in 3 other clusters and the actual numbers employed in this cluster is less than 2% of the clusters' workforce and much less in many of the centres, e.g. Lethbridge and Medicine Hat. Accommodation and Food (1.33), Construction (1.20) and Retail (1.18) are the highest following forestry. In fact, *Retail has a higher value in this cluster* than that found in any other cluster. On the other side of the coin, the centres of this cluster show low location quotients in Manufacturing (0.74), Finance (0.71) and Business Services (0.68). The lack of employment in these sectors is a major reason why these centres are grouped together. It can be seen that 10 of these centres are located in Alberta and British Columbia, which is an area which has been traditionally bereft of the manufacturing base which one would expect to find in centres of similar size in Ontario and Quebec. This may explain the unspecialized nature of these centres. The only other industries to display location quotients that were relatively high were Construction and Accommodation and Food. This is explained by the fact that many of these centres are small and are actively expanding, thus fueling the Construction Industry employment and the fact that so many of the centres are in British Columbia which has a large tourism component to its economy explains the high location quotient for the Accommodation and Food industry in this cluster.

Some of the other indicators which may be used to describe this group of places show that after the Metropolitan type centres this cluster is the most diversified with a mean Gini Index of .1816 which is well below the national mean for centres included in this study. The centres in this cluster are relatively small with a mean workforce size of only 29,476 and a growth rate of 295% over the 35 year period. This growth rate is the third highest of all the clusters while the rate of diversification is also in the middle of the range of values displayed by the other clusters with a decline in the Gini Index of 36.8%. The various indicators imply that the term 'unspecialized' is a useful label for this cluster in the sense that, besides lacking concentration in any specific industries, there is also a lack of any distinguishing features of change when compared to the other clusters. Similarly, the fact that most of these centres are smaller peripheral places leads to the label 'regional' being applied. The centres in this cluster are named *Unspecialized Small Regional Centres*.

5.9 Other Cluster Solutions 1986

For the sake of completeness its worth noting the results if three to eight clusters were extracted instead of the favoured seven. Table 5.8 shows that at the eight cluster level

Table 5.8 A Comparison of Different Cluster Solutions in 1986

Cluster Title	NUMBER OF CLUSTERS					
	3	4	5	6	7	8
Manufacturing Centres	X	X	X	X	X	X
Manufacturing/Utilities Centres						X
Metropolitan Centres				X	X	X
Services Centres	X					
Transportation					X	X
Government Centres				X	X	X
Extraction Centres			X	X	X	X
Regional Unspecialized Centres		X	X	X	X	X
Resource (Mining, Oil, Forestry)		X				
Large Metro and Government	X	X	X			
Forestry			X	X	X	X

X - represents presence or absence in a cluster solution

the Manufacturing sector splits into two parts with the smaller cluster having an emphasis on the Utilities and Communication sector. If a six cluster solution was used one would

have found that the Transportation centres would have joined together with the Regional Unspecialized Cluster.

The five cluster solution had the effect of joining together the Metropolitan centres and Government centres clusters. This is not surprising when one considers the size of many of the centres where Government activity was prevalent. At the four cluster solution the Mining and Oil based Extraction centres were fused together with Forestry centres to create a Resource centres cluster. At the three cluster stage three broad groupings remained, Manufacturing centres, Metropolitan and Government centres, and Service centres. The Resource centres cluster found in the four cluster solution disappeared with the places in it being dispersed amongst the Manufacturing and Service centres cluster based apparently based on size, with the larger centres included in the Manufacturing cluster and the smaller ones in the Regional Service cluster.

5.10 Results of Cluster Analysis on 1951 Data

The same analysis that was carried out in 1986 was completed for the 1951 data set. This was undertaken to provide a basis for comparison of the 1986 results so changes that occurred between 1951 and 1986 can be observed and detailed. It is important to note two changes in the data set.

The use of the 30,000 population cut-off in 1986 meant that the number of places in the 1951 analysis was different - 63 places included as opposed to 80 in 1986. The second change was that the 21 variable set of industries in 1951 (Chapter 2) was altered to the set of 16 industries provided for in 1986. This ensured that as comparable a data base as possible was obtained. The first problem to be addressed in the case of the 1951 results is the number of clusters that are required to explain the generalities in the data set in a suitable manner.

Figure 5.2 Fusion Coefficients for Cluster Solutions 1951

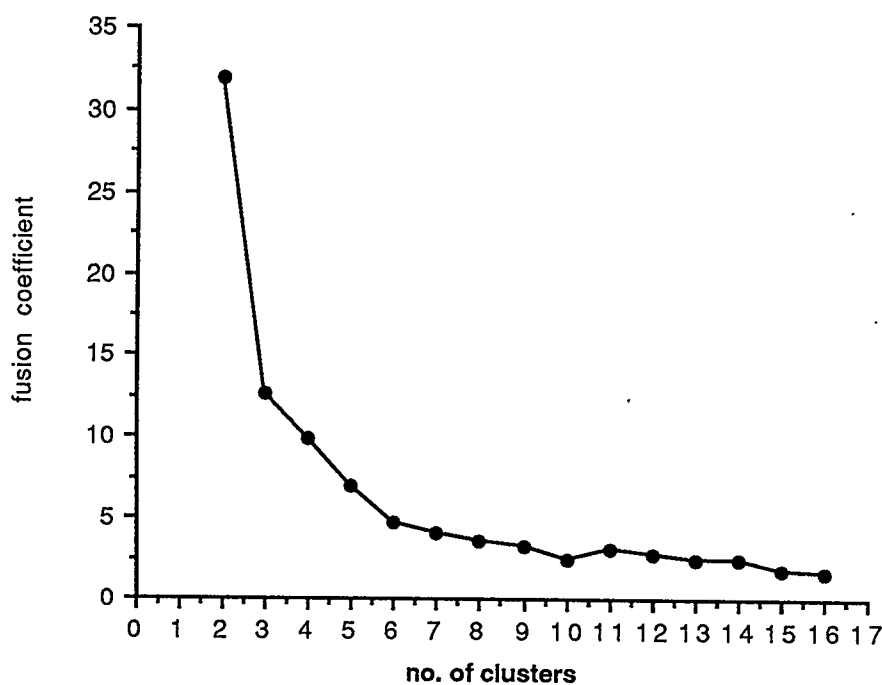


Figure 5.2 shows that the first large break of slope occurred between the six and five cluster solution. This implied that after the six cluster solution it was becoming more and more difficult to fuse clusters together because of the greater amount of information being lost. Using the six cluster solution isolated Government centres as a cluster which would not have been identifiable in the five cluster solution. Government centres are an inherent part of the urban system and their isolation as a group was definitely desirable, reinforcing the six cluster solution decision. Tables 5.9a and 5.9b repeat the description of the 1986 analysis by showing the mean location quotient for each industry in each of the six clusters in 1951 as well as the Mean Gini Indices and Workforce sizes. The values in this table are useful in highlighting some of the salient features that help explain the composition of each cluster of places. Using this basis the characteristics of each cluster are described in turn.

Table 5.9a Characteristics of the Clusters in 1951 based on Mean Location Quotients for Industries

16 Industry Groups	C 1	C 2	C 3	C 4	C 5	C 6	%
Forestry	0.11	0.15	0.09	0.18	0.63	1.47	3.0
Mining and Oil	0.45	0.08	0.57	0.02	<i>16.46</i>	0.30	2.4
Manufacturing	<i>1.60</i>	0.71	0.68	0.56	0.36	0.4	31.3
Construction	0.85	0.88	1.02	0.88	0.82	<i>2.07</i>	8.1
Transportation	0.58	<i>1.77</i>	1.16	0.76	0.56	0.64	8.0
Commun/Utilities	1.02	1.28	1.19	1.12	0.89	<i>2.07</i>	2.7
Wholesale	0.56	1.25	<i>1.95</i>	1.11	0.67	0.89	4.5
Retail	0.88	1.29	1.24	1.15	0.95	1.01	11.9
Finance	0.69	1.08	1.32	1.32	0.67	0.94	1.6
Insure/Real Estate	0.68	0.90	<i>1.63</i>	1.17	0.59	0.63	1.7
Business Services	0.60	0.74	1.43	1.02	0.60	0.23	1.3
Government	0.49	0.98	1.01	2.77	0.39	0.54	7.6
Education	0.86	0.84	0.87	1.21	0.89	3.55	3.4
Health	0.92	<i>1.77</i>	<i>1.54</i>	<i>1.79</i>	0.56	0.84	3.6
Accommodation/Food	0.49	1.15	1.11	1.13	1.03	<i>1.67</i>	3.6
Other	0.98	1.19	1.08	1.13	0.97	<i>2.04</i>	5.2
No. of LO's > 1.0	2	8	12	11	2	7	100.0

LQ values >1.5 are italicized

C - represents Cluster

% represents the percentage of the workforce involved in each industry in Canada in 1951

Additional information about the Clusters can be seen in Table 5.9b, which outlines some of the characteristics of the clusters with regard to the indicators of urban change in the form of mean Gini Indices and the mean sizes of centres found in each cluster.

Table 5.9b Mean Gini Index and Workforces 1951

Cluster	No. of Places	Gini Index	Workforce
Cluster 1	26	.2896	29,894
Cluster 2	17	.2753	8,917
Cluster 3	9	.2635	89,119
Cluster 4	6	.3300	40,146
Cluster 5	4	.5295	8,997
Cluster 6	1	.3989	<i>3,840</i>

The High and Low Values in each column are italicized

5.10.1 Cluster 1

The 26 centres which make up Cluster 1 are found in Table 5.10.

Table 5.10 Members of Cluster 1

Brantford	Guelph	Hamilton	Kitchener
Oshawa	Peterborough	Sarnia	SaultSte.Marie
Windsor	Cornwall	Granby	Montreal
Drummondville	St. Jean	St. Jerome	Sorel
St. Catharine's	St. Hyacinthe	Shawinigan	Sherbrooke
Trois Rivières	Valleyfield	Joliette	Victoriaville
Chicoutimi/Jonquiére	Sydney		

It can be seen in Table 5.10 that the majority of the centres in this cluster were involved in Manufacturing which, with a location quotient of 1.60, was the only one greater than 1.5. This industry represented 50.1% of the workforces of these centres. The Gini Index of .2900 for this cluster meant these centres were less diversified than those in two other clusters (those two clusters that are service based) and less concentrated than the centres found in three other clusters. The centres in this cluster were the second largest in mean size of all the clusters. With the exception of Sydney all of these centres were in the Provinces of Ontario and Quebec. The fact that Montreal was included in this cluster was surprising considering its very different cluster membership in 1986. This cluster represents those centres which are involved primarily in Manufacturing with no concentrations in any other industries and hence the centres in this grouping are called *Manufacturing Centres*.

5.10.2 Cluster 2

Table 5.11 Members of Cluster 2

Chatham	Belleville	Brockville	Thunder Bay
North Bay	Orillia	Barrie	Truro
Moncton	St. John's	Saint John	Charlottetown
Brandon	Moose Jaw	Prince Albert	Medicine Hat
Penticton			

The centres in Cluster 2 can be found in Table 5.11. Eight of the industries in Cluster 2 had location quotients greater than 1.0 with Health and Transportation having values greater than 1.5 - both with location quotients of 1.77 - while Transportation had

more than twice as many employees on average than were found in the Health sector in these centres. These centres seem to have been quite diversified based on the number of location quotients greater than 1.0. This is also backed up by the low mean Gini Index for this cluster of .2753 which displays only slightly less diversification amongst these centres than was found in Cluster 3. These centres tended to be small, with a mean workforce of 8,917 in 1951. There is no regional component to the location of centres in this cluster with centres being located throughout the country, but only four of these centres were in the core area of Ontario and none in Quebec. These centres are given the titled *Small Regional (Transportation and Health) Centres*.

5.10.3 Cluster 3

The centres found in this cluster are identified in Table 5.12.

Table 5.12 Members in Cluster 3

Toronto	Vancouver	Winnipeg	Calgary
Edmonton	Saskatoon	Regina	London
Lethbridge			

Twelve of the industries in this cluster have location quotients greater than 1.0 with three of the industries having location quotients greater than 1.50 - Wholesale (1.95), Insurance and Real Estate (1.63) and Health (1.54). This implies that a rather diversified economy existed in the centres of this cluster which can also be noticed from the relatively low Gini Index of .2653 for the cluster which is the lowest Gini Index found for any Cluster. These centres were also the largest in 1951 with a mean population of 287,055 and a mean workforce of 89,119 which included five of the ten largest centres in the country. These two facts highlight the relationship discussed earlier, in Chapter 3, between the level of diversification and city size. Excluding Wholesale, which had the highest location quotient for an industry in this cluster, compared to the other clusters a number of other industries displayed the same phenomenon. Finance, Insurance and Real Estate and Business Services all had higher location quotients in this cluster than found in any of the

other groups of places. This coupled with the size of these centres indicates the large city nature of these industries in 1951. Of these centres only Toronto and London were in the core area of the country with one centre in British Columbia and the remaining six centres located in the Prairie Provinces. Lethbridge was relatively small in size and doesn't seem to belong in this group of large centres. It is difficult to say why this centre shows up in this cluster and in an eight cluster solution Lethbridge is not present in the large centres cluster. Based on the diversified nature of these centres and the excess of employment to a higher degree in a number of service sector industries over and above that found in other clusters these centres are called *Metropolitan and Large Service Centres*.

5.10.4 Cluster 4

Table 5.13 Members of Cluster 4

Ottawa	Halifax	Quebec	Victoria
Fredericton	Kingston		

The centres of Cluster 4 are dominated by the presence of the Government and Defense sectors of the economy and can be found in Table 5.13. Four of the six centres were Provincial Capitals and Ottawa, of course, is the National Capital. The exception was Kingston which had large numbers of people employed in Defence accounting for 8.1% of the workforce in 1951. Only two industries displayed location quotient values greater than 1.5 - Government and Health with values of 2.77 and 1.79 respectively. Eleven of the industries had location quotients greater than 1.0 which reflects the large city size that is also a characteristic of these centres. The centres in this cluster had the second largest mean workforce size, at 40,146, which may explain why in 1951 these centres seemed to be diverse due to the large number of sectors that had location quotients greater than 1.0, but in reality were not. This is shown by the relatively high mean Gini Index of .3300 for the cluster as a whole which backs up the opinion that these centres were not diversified. This high level of concentration was the highest for centres in a cluster which was service based

in its structure. It is worth noting the fact that defense was included in government employment. Given these characteristics the cluster was named *Government Centres*.

5.10.5 Cluster 5

This cluster is made up of the following four centres: *Rouyn, Thetford Mines, Timmins, and Sudbury*. The level of concentration in these centres was dramatic with a mean location quotient of 16.46 for the Mining and Oil sector (although none of these centres were involved in oil related industries), this accounted for approximately 40% of the workforce in these centres compared to national level of 2.4% in 1951. The location quotient of 16.46 was by far the highest concentration found in any industry or cluster in 1951. Only one other industry had a location quotient greater than 1.0 in this cluster and that was Accommodation and Food with a value of 1.03. These mining centres were relatively small in size with a mean workforce size of 8,997 and showed the highest levels of concentration with a mean Gini Index for the cluster of .5295. There is no doubt that the centres in this cluster should be named *Mining Centres*.

5.10.6 Cluster 6

This cluster only has one member - *Rimouski*, Quebec. In 1951 Rimouski had very high location quotients for Education (3.55), Communications and Utilities (2.07), Construction (2.07), and Accommodation and Food (1.67). In total, seven of the industries had location quotients greater than 1.0 while the four mentioned above had values greater than 1.50. The Gini Index was .3989 which showed that the level of concentration was quite high. This centre was amongst the smallest in the study in 1951 with a population of 11,564 and a workforce of 3,840. Due to the small numbers in the workforce and the lack of concentration in any large industries it is very difficult to say what caused Rimouski to be so unique that it came out of the analysis as a cluster on its own. Another point to note is that Rimouski had a very low percentage of its population

employed in the manufacturing sector - only 13.5%. All that can be said is that in 1951 Rimouski displayed an extremely unique industrial composition and in no way resembled the structure of any of the other centres that were studied. The cluster analysis identifies this individual case rather than generalizing it into other groups. It is worth noting that Rimouski is separated at lower cluster levels, even down to the four cluster solution. At the three cluster solution it joined the cluster of Mining centres along with Chicoutimi/Jonquière due to high location quotients of 1.47 and 1.59 respectively for Forestry. These two centres were the only centres with any concentration in Forestry in 1951.

5.11 Other Cluster Solutions

Although the fusion coefficients pointed to the utility of the six cluster solution it is worth noting the differences that would have resulted from using alternative solutions in 1951. If a five cluster solution was used the Government centres would not have been removed from the data set and all but one of the centres that were found in that cluster using the six cluster result would have gone into the large city cluster, with Fredericton going into the Regional Centres cluster. If a four cluster solution were utilized the breakdown would have been Manufacturing centres, Service centres, Extraction centres and Rimouski. The

Table 5.14 A Comparison of Different Cluster Solutions in 1951

Cluster Title	NUMBER OF CLUSTERS				
	3	4	5	6	7
Manufacturing Centres	X	X	X	X	X
Manufacturing/Utilities Centres					X
Metropolitan Centres			X	X	X
Services Centres	X	X			
Government Centres				X	X
Extraction Centres	X	X	X	X	X
Small Unspecialized Centres			X	X	X
Rimouski		X	X	X	X

X - represents presence or absence in a cluster solution

three cluster solution reflects the traditional three way division of economic activity into Primary, Secondary and Tertiary activities (Noyelle & Stanback, 1983). If one decided to use more than the six cluster solution a division of Manufacturing centres into two sub-groups was found at the seven cluster level with the basis for the division being those centres which showed high concentrations in Utilities being separated from the other Manufacturing centres. The different cluster solutions can be best summarized by comparing them in Table 5.14.

5.12 Comparison of 1951 and 1986 Results

The most striking aspect of the comparison of the classifications from 1951 and 1986 is that very little has actually changed in the Canadian system of cities during that time in terms of the classification of centres. The 1986 classification does have a number of centres that were not included in the study in 1951 but even taking this into account the results are still very similar for both time periods. While individual centres may have altered dramatically the system as a whole has developed in unison. While centres have grown and become more diversified they have done so at similar rates to their respective partners with similar characteristics. The levels of concentration in industries have decreased relative to the overall composition of the workforces in those centres. It is worth noting that while the groups are similar there are some differences that deserve

Table 5.15 A Comparison of the Clusters found in 1951 and 1986

<u>1986 (7 clusters)</u>	<u>Most Similar 1951 (6 clusters)</u>
Manufacturing - Heartland Centres	Manufacturing Centres
Transportation Centres	Small Regional (Trans and Health) Centres
Diverse Metropolitan Centres	Metropolitan and Large Service Centres
Government and Quinary Centres	Government Centres
Forestry Centres	Mining Centres
Mineral Extraction Centres	Rimouski
Unspecialized Small Regional Centres	

mention. The traditional three-way division of activity noted in the three cluster solution in 1951 was not noticed in 1986. This is evidence that the Primary based centres are not as

specialized as they were in 1951 and that they are clustered into other groups in 1986 rather than a separate cluster of their own. The result of this was that at the three cluster solution level in 1986 there were two Serviced based groups and one Manufacturing. This illustrates a shift in the Canadian urban system over the 35 year period examined, which is indicative of the move towards the post-industrial society. A comparison of the types of centres used in both years can be found in Table 5.15.

5.13 Comparison of Cluster Membership in 1951 and 1986

Directly comparing the results from 1986 to those found in 1951, it can be seen that some changes have occurred. It must be remembered that there are 17 more centres in the study in 1986 compared to 1951 yet the differences in the structure of the system are small. The only direct result of this addition of places is the creation of clusters for Forestry and Transportation in 1986. The Forestry cluster is made up of centres that were not included in the study in 1951. All of the centres in the Transportation Cluster in 1986 were included in the Small Regional (Transportation and Health) Centres Cluster in 1951. The remaining centres in that cluster in 1951 are found in the Unspecialized Regional Centres cluster in 1986. The reason a separate cluster for Transportation exists in 1986 is not clear. There was a higher proportion of the workforce working in those centres than in other clusters but the actual percentage engaged in the Transportation sector has declined from 19% to 7.2% over the period studied for those centres from Cluster 2 in 1986. The decline of the Transportation sector employment in the other centres of Cluster 2 in 1951 has led to the Transportation rich centres becoming more different and therefore a separate group of places in 1986, with most of the other centres from Cluster 2 in 1951 found in Cluster 7 in 1986. If an eight cluster solution was used in 1951 it would have identified this Transportation cluster. Rimouski has changed to the degree that in 1986 it is no longer as unique as was the case in 1951 and in 1986 is included in the Government Centres Cluster.

The Manufacturing - Heartland cluster is found in both years. All of the centres found in the Government and Mining Centres clusters in 1951 were found in the Government and Resources centres clusters in 1986 with a few additions. The Metropolitan and Regional Service Centres cluster in 1951 does not separate out only the larger centres as is the case in 1986 where a Diverse Metropolitan Centres cluster exists - this is in part due to the much smaller sizes of Metropolitan centres in 1951. It seems that the smaller centres in the 1951 Metropolitan and Regional Service Centres cluster and some of the centres from the Small Regional (Transport and Health) Centres, along with a number of British Columbia centres that were added to the study, have in 1986 formed the Unspecialized Regional Centres cluster. These are the main changes in group memberships between 1951 and 1986.

5.14 Comparison to Previous Classifications

Both of these classifications have much in common with each other as well as with previous classifications. The separation of a distinct Manufacturing group has been found in every classification undertaken in Canada. Other studies have always found specialized resource based and government centres. The Metropolitan Centre cluster found in this study was noticed by Maxwell (1965). The importance of Transportation was noted explicitly by Li et al (1978) and was a major part of what made up Marshall's (1981) Nodal Centres. This importance is not illustrated here, particularly when one has to go to an eight cluster solution to isolate Transportation in 1951. The small Unspecialized Regional Centres found in 1986 have been noted previously by Maxwell (1965) and Noyelle (1983) who called them Diversified Advanced Service Centres. It can be seen that all of these clusters or types of centres have at some time in the past been described but never in this combination in a Canadian context using a multivariate clustering technique.

5.15 Changes in the Urban System

Primary economy based centres of concentration have diversified at the greatest rates while large Service based economy cities have grown at the most rapid rate. It appears that large city economies are converging even faster than the rate which was discussed for the system as a whole in Chapter 4. It is apparent that for the largest centres there is much less reliance on some of the activities which have traditionally been associated with large cities, particularly those activities directly involved in trade. Despite the lesser reliance on some traditional activities it appears that the largest centres are becoming more and more service oriented at the expense of manufacturing in proportional terms. This aspect alone is probably due to improved modes of transportation and communications where it is now not so important for industries to be place specific. While changes have occurred, the most important point to note is the relatively unchanged composition of Canadian urban centres relative to each other, despite the great growth that has been experienced. Over the time period of the analysis centres have become more diversified in general while individual concentrations of industries have in most cases decreased dramatically. This is further evidence that some form of convergence has been taking place in the urban system. Even the very specialized centres have been becoming less concentrated through time.

5.16 Conclusion

This study summarizes some of the major aspects of the economic structure of Canadian centres larger than 30,000. This study shows that there is more variation in the types of centres that exist than one may have previously thought. Four of the types of centre described in this study have Service sector industries as their basis. While some of the clusters that were discovered reflect traditional urban types i.e., Government and Trade centres, this study shows that there is a move away from specialized centres to centres that do not concentrate in any specific industries. While proof exists that larger centres are more diversified than their smaller counterparts there is now evidence of a trend to

diversification in many smaller centres. The results were very close to what one might have expected intuitively before this study was undertaken and admittedly this was a surprise. The changes that took place between 1951 and 1986 were much less than expected given:

(a) the increase in population from 6,847,685 for 78 centres, where the population figures were available, in 1951 to 18,212,040 for the 80 centres in 1986;

(b) the increase in the workforce from 2,011,609 for 63 places, where the workforce data was available in 1951 to 9,514,275 for 80 places in 1986;

(c) the documented shift in emphasis away from manufacturing as a building block for city economies.

The similarity in the patterns, despite the growth in the system, demonstrates a basic stability but an evolution to a more service orientated form in the economic character of the Canadian urban system has undoubtedly occurred.

CHAPTER 6

SUMMARY and CONCLUSIONS

Few previous studies have dealt specifically with the changes in the economic structure of Canadian cities, particularly as these changes relate to the Service sector and to changes in the population. Instead, studies have focused on the economic base at specific points in time with the bulk of the emphasis placed on changes in the Manufacturing sector. This thesis has studied changes in the economic structure of urban places, with a bias towards the Service sector, and explored how those places altered over time in the Canadian urban system of places larger than 30,000.

The evolution of the economic characteristics of Canadian urban centres was traced from 1951 to 1986 using a data set that increased in size through time from 63 places to 80 places. There was also a change in the number of industrial categories from 21 in 1951 to 16 in 1986. For the sake of comparison the 21 categories were condensed to 16 categories wherever it was possible, but, as was seen in Chapter 2, the differences that arose from the changes in the number of industrial categories had a minimal impact on the results that were obtained.

Between 1951 and 1986 a number of changes in the economic character of Canadian cities was noticed, and the search for explanations of these changes was predicated on a number of objectives. These objectives each dealt with different areal levels in Canada, so that a number of themes could be analyzed from the national scale to the regional scale down to the individual places that constituted the data set.

The first objective was to examine, at the national scale, the relationships between the level of diversification found in cities, with respect to the size of those centres, employing a number of approaches. One approach was to study the level of diversification found in different sized cities at a particular point in time, while an alternate approach

observed the levels of diversification as the centres increased in size through time. These two relationships were examined utilizing the Gini Index to measure the diversification level present for individual places and for the system as a whole. It was found that larger centres tended to have a more diverse economic structure than smaller centres and that as cities increased in size they became more diversified. Continuing on the same general theme, the idea of economic structure convergence was investigated, and the results indicated that the variability between places over 30,000 had declined over the 35 year period studied. This decline permitted the generalization to be forwarded that the economic characteristics of Canadian urban places were becoming more similar. It was also found that the location of a centre in relation to the nearest place over 30,000 also had a limited effect on the level of diversification, with a weak linear relationship observed.

The second objective of the study was to highlight the economic characteristics of centres and show how they differed from region to region within the country. An integral part of this was the division of the country into four regions: The Atlantic Provinces, the Central Provinces, the Prairie Provinces and British Columbia. This division of the country into four regions facilitated the comparison of centres based on size, rates of change and levels of diversification. First, it was found that the size of centres found in the regions had not changed relative to the other regions over the period studied - the centres in Ontario and Quebec were on average the largest followed, in order, by the centres of the Prairies, British Columbia and the Atlantic Provinces. Second, it was observed that the centres of the two western regions grew at the greatest pace while the centres of the Atlantic region displayed the slowest rate of growth. Third, a reversal in the levels of diversification found was observed from 1951 to 1986. In 1951 the Prairie Provinces and British Columbia exhibited the lowest Gini Indices; by 1986 these two regions had been surpassed by the other two regions, thus relegating them to the position of possessing the least diversified urban economies despite the increase in diversification measured in those

regions. An alternate method of describing the economic characteristics of centres was the use of mean location quotients for each individual industry by region. These values were measured for 1951 and 1986 and provided a valuable insight into the changing economic structure of centres in the various regions. These values were also useful in the subsequent classification of places, as they illustrated the increased or decreased importance of specific industries to places in the regions of Canada.

The final objective of the thesis was to examine individual places in the data set and to arrive at a taxonomy of places based on their economic characteristics for both 1951 and 1986. For reasons explained in Chapter 5, Wishart's 'non-hierarchic' Cluster Analysis was adopted as the procedure for classifying the 63 centres in 1951 and the 80 centres in 1986. The resulting clusters, or groups of urban centres, were discussed and described in light of their characteristics. Two separate taxonomies allowed for direct comparison of the results of the Cluster Analysis for both years and provided an added understanding of the structural changes of the economic bases of centres in the Canadian urban system. For 1986 a seven cluster solution was deemed the most suitable. It was found that the following grouping of places satisfactorily described the centres over 30,000 in Canada:

Manufacturing - Heartland Centres;
Transportation Centres;
Diverse Metropolitan Centres;
Government and Quinary Centres;
Mineral Extraction Centres;
Forestry Centres;
Unspecialized Small Regional Centres.

In 1951 a slightly different taxonomy was observed; it was found that a six cluster solution was the most appropriate solution to describe the centres in the study:

*Manufacturing - Heartland Centres;
 Diversified Metropolitan and Regional Centres;
 Government Centres;
 Small Regional (Transportation and Health) Centres;
 Mining Centres;
 Rimouski.*

These two classifications had many similarities, considering how much the centres in Canada have changed in the 35 year interval studied. Many of the centres were in similar clusters in both years. If one discounts Rimouski, which has to be viewed as an anomaly as has already been discussed, the main change from 1951 to 1986 was the creation of a Transportation cluster, which drew all of its members from the Small Regional Centres cluster in 1951. The creation of the Forestry cluster in 1986 was explained by the addition of a number of smaller places, particularly in British Columbia, which displayed high employment concentration in that sector. The end result of comparing these taxonomies, based on economic activities, is that not all that much has changed in terms of the sources of differentiation in the Canadian urban system, despite the continued decrease in specialization that was observed.

A number of alternate cluster solutions were investigated for both years. The alternate solutions provided a valuable insight into the changing importance of specific activities as they related to the system as a whole. The traditional three-way division of labour into *Primary, Secondary, and Tertiary* activity was discovered if one collapsed the number of clusters in 1951 to three. However, in 1986 when this same method was applied a different result was obtained. When collapsed to three clusters, *Manufacturing Centres, Large Metropolitan & Government Centres and Other Service Centres* were the three clusters discovered. This is the biggest change in the urban system as a whole and certainly should be viewed as evidence of the emergent service-oriented economy predicted for the post-industrial era.

The findings herein certainly concur with much of what has been studied in Urban Geography to date. The replication of previous research has shown that despite the changing urban characteristics and functions certain trends continue to be found. Larger urban economies in general remain more diverse than those found in smaller places. Differences in economic characteristics based on location in the system can still be found, although the differences seem to be getting smaller and smaller. The research clearly indicates that, in the Canadian case, urban centres with populations greater than 30,000 are more diverse now than at any time in the recent past. At the same time they retain a number of economic characteristics that separate them from one another. Any future research will have to examine the continued convergence of city economies to discover if centres will continue to cling to their more unique traits or increasingly turn into generic places; as well as examining smaller centres which were not included here. Also, will the general stability in the economic character of places relative to each other that has been displayed from 1951 to 1986 continue in light of the increasing dominance of the service sector in the economy? The results of the 1991 Census of Canada are anxiously awaited to discover if these trends have continued over the past five years.

BIBLIOGRAPHY

- Alexander, J.W.(1954) "The Basic/Non-Basic Concept of Urban Economic Functions." *Economic Geography* , 30, 246-61.
- Alonso, W. & Medrich, E. (1978) "Spontaneous Growth Centres in Twentieth Century American Urbanization." in *Systems of Cities*, 349-62 edited by L.S. Bourne and J.W. Simmons, (New York: Oxford University Press).
- Applebaum, R.P.(1978) *Size, Growth and U.S. Cities*. (New York: Praeger Publishers).
- Ashcroft, B. & Swales, J.K(1982) "Estimating the Effects of Government Office Dispersal." *Regional Science and Urban Economics* ., 12,.81-97.
- Bahl, R.W. , Firestine, R. & Phares, D. (1971) "Industrial Diversity in Urban Areas: Alternative Measures and Intermetropolitan Comparisons." *Economic Geography*, 47, 414-21.
- Barber, G.M. & Britton, J.N.H.(1971) *Occupational Structure and Population Growth in the Ontario-Quebec Urban System 1941-1966*. Centre for Urban and Community Studies, (Toronto: University of Toronto, Research Paper #49).
- Beattie, E.W. & Watts, H.D.(1983) "Some Relationships between Manufacturing Activity and the Urban System: an Exploratory Study." *Geoforum*, 14, 125-32.
- Bender, L.D.(1987) "The Role of Services in Rural Development Policies." *Land Economics* , 63, 62-71.
- Berry, B.J.L.(1972) *The City Classification Handbook* (New York:John Wiley and Sons).
- Beyers, W.B. & Alvine M.J.(1985) " Export Services in Postindustrial Society." *Papers of the Regional Science Association*, 57, 33-45.
- Blumenfeld, H.(1955) "The Economic Base of the Metropolis." *Journal of the American Institute of Planners* , 21, 114-35.
- Bourne, L.S. & Simmons, J.W., eds(1978) *Systems of Cities* . (New York: Oxford University Press).
- Bramley, G.(1986) "Defining Equal Standards in Local Public Services." *Urban Studies* , 23, 391-412.
- Cadden, P.G.(1979) *The Public Sector as an Urban Employer: The Local Importance and Locational Distribution of Public Employment in Alberta..*, Unpublished PhD Thesis (Canada: University of Calgary).
- Carter, H.(1975) *The Study of Urban Geography*. (London: Arnold Edwards Publishers. Ltd.).
- Census of Canada (1951) *Labour Force, Occupations and Industries*, vol. 4, Ottawa
- _____ (1961) *Labour Force, Industries*, vol. 3, part 2, Ottawa
- _____ (1971) *Economic Characteristics, Industries*, vol. 3, part 4, Ottawa

- _____ (1981) *Provincial Series*, vol. 2, 93-961 to 93-972, Ottawa
- _____ (1986) *Profiles*, part 2, 94-128, Ottawa
- Christian, C.M. & Harper, R.A. (1982) *Modern Metropolitan Systems*. (Columbus, Ohio: Charles E. Merrill Publishing Co.).
- Clemente, F. & Sturgis, R.B. (1971) "Population Size and Industrial Diversification." *Urban Studies*, 8, 65-68.
- Coffey, W.J. & Polese, M. (1988) "Location Shifts in Canadian Employment, 1971-1981: Decentralization V. Decongestion." *The Canadian Geographer*, 32, 248-56.
- Crowley, R.W. (1973) "Reflections and Further Evidence on Population Size and Industrial Diversification." *Urban Studies*, 10, 91-94.
- _____ (1978) "Labour Force Growth and Specialization in Canadian Cities." *Systems of Cities*, 207-19, edited by L.S. Bourne and J.W. Simmons, (New York: Oxford University Press).
- Daniels, P.W. (1982) *Service Industries : Growth and Location*. (England: Cambridge University Press).
- _____ (1983) "Service Industries: Supporting Role or Centre Stage?" *Area*, 15, 301-09.
- _____ (1985) *Service Industries*. (New York : Methuen).
- Davies, W.K.D. (1984) *Factorial Ecology*, (England: Gower).
- _____ (1988) "Service Centres in the Canadian Prairies, 1951-86: Procedures and Preliminary Findings." Paper given at I.G.U. Commission on "Urban Systems in Transition", Melbourne, Monash University, Australia. August 1988.
- _____ (1989) "Towards a Conceptual Integration of the Urban System Literature." in *The Changing Geography of Urban Systems* by Bourne, L.S., Sinclair, R., Ferrer, M. & d'Entremont, A., (eds), I.G.U. Commission on Urban Systems in Transition, 61 - 86, (University of Navarra: Spain.)
- _____ (1990a) "Urban Systems Development and Policies: The Alberta Experience." in *Urbanization and Urban Development* by Bannon, M., Bourne, L.S., & Sinclair, R., (eds) I.G.U. Commission on Urban Systems in Transition, 223 - 239, (Trinity College Dublin: Ireland).
- _____ (1990b) "What Population Turnaround?: Some Canadian Prairie Settlement Perspectives, 1971-1986." *Geoforum*, 21, 303-320.
- Eckstein, A.J. & Heien, D.M. (1985) "Causes and Consequences of Service Sector Growth - The U.S. Experience." *Growth and Change*, 16, 11-16.

- Erickson, R.A., et al (1986) "The Economic Impacts of the Hospital Sector." *Growth and Change* , 16, 17-27.
- Fothergill, S. & Gudgin, G.(1979) "Regional Employment Change: A Sub-Regional Explanation." *Progress in Planning*, 12, 159-219.
- Fuchs, V.R.(1968) *The Service Economy* , (New York: Columbia University Press).
- Gershuny, J.I.(1978) *After Industrial Society? The Emerging Self Service Economy*, London: MacMillan).
- Giarini, O. ed.(1987) *The Emerging Service Economy*, (Oxford: Pergamon Press).
- Gottman, J.(1970) "Urban Centrality and the Interweaving of Quaternary Activities." *Ekistics* , 29, 322-31.
- Gottman, J. (1976) "Megalopolitan Systems Around the World." *Ekistics* , 41, 109-13.
- Gratton, C.(1979) "Industrial Diversification in New Towns." *Urban Studies*, 16, 157-64.
- Gregory, S. (1973) *Statistical Methods and the Geographer*. (London: Longman).
- Gyuse, T.T.I. (1974) *Service Centre Change in Metropolitan Hinterlands : A Case Study of Calgary and Saskatoon 1951-1971*. Unpublished MA Thesis, (Canada: University of Calgary).
- Harvey, D.(1985) *The Urbanization of Capital*. (Baltimore: John Hopkins University Press).
- Haworth, C.T., et al (1978) "Income Distribution, City Size, and Urban Growth." *Urban Studies*, 15, 1-7.
- Hodgetts, J.E. & Dwivedi, O.P.(1974) *Provincial Government as Employers*. (Canada: McGill-Queens University Press).
- Holton Wilson, J. & Raymond, R.(1973) "The Economic Impact of a University upon a Local Community." *Annals of Regional Science*, 7, 130-42.
- Ironside, R.G. & Peterson, D.(1982) "Edmonton's Wholesale Relationships with Northwest Canada." *Canadian Geographer*, 26, 207-23.
- Isserman, A.M.(1977) "The Location Quotient Approach to Estimating Regional Economic Impacts." *Journal of the American Institute of Planners*, 43, 33- 41.
- Jacobs, J.(1970) *The Economy of Cities*. (London: Jonathan Cape Ltd.).
- Jakle, J.A., Brunn, S. & Rosemann, C.C.(1976) *Human Spatial Behaviour : A Social Geography*. (Massachusetts: Duxbury Press).
- Keinath, W.F.(1985) "The Spatial Component of the Post-Industrial Society." *Economic Geography*, 61, 224-40.

- Kellerman, A. & Krakover, S.(1986) "Multi-Sectoral Urban Growth in Space and Time: An Empirical Approach." *Regional Studies* , 20, 117-129.
- Kipnis, B.(1977) "The Impact of Factory Size on Urban Growth and Development." *Economic Geography*, 53, 295-302.
- Li, S., Scorrar, D. & Williams, M.H.(1978) "City Functions, Manufacturing Activity and the Urban Hierarchy." in *Readings in Canadian Geography*, 89-101, edited by Irving, R.M., (Canada: Holt, Rinehart and Winston, Canada, Ltd.).
- Lord, J.D.(1984) "Shifts in the Wholesale Trade Status of U.S. Metropolitan Areas." *Professional Geographer* , 36, 51-63.
- Magun, S. (1982) "The Rise of Service Employment in the Canadian Economy." *Relations Industrielles*, 37, 528-54.
- Marquand, J.(1979) "A Locational Analysis of the U.K. Service Sector." Centre for Environmental Studies, (Great Britain: Occasional Paper #.9).
- _____ (1979) "The Service Sector and Regional Policy in the United Kingdom." Centre for Environmental Studies, (Great Britain: Research Series#.29).
- Marshall, J.U.(1969) *The Location of Service Towns*. (Toronto: University of Toronto Press).
- _____ (1975) "City Size,Economic Diversity, and Functional Type: The Canadian Case." *Economic Geography*, 51,37-49.
- _____ (1981) "Industrial Classification in the Canadian Urban System." *Canadian Geographer*, 25, 316-32.
- _____ (1988) "Recent Structural Changes in the Canadian Urban System : An Analysis of Employment Profiles and Industrial Diversification." (York, Ontario: University of York)
- _____ (1989) "The Structure of Urban Systems." paper presented at Canadian Association of Geographers Meeting, Halifax 1988.
- Massam, B.(1975) *Location and Space in Social Administration*. (London: Edward Arnold Publishers).
- _____ (1980) *Spatial Search*. (London: Pergamon Press).
- Mathur, V.K.(1970) "Occupational Composition and its Determinants: an Intercity Size Class Analysis." *Journal of Regional Science*, 10, 81-91.
- Maxwell, J.W.(1965) "The Functional Structure of Canadian Cities : A Classification of Cities." *Geographic Bulletin* , 7, 79-104.
- Mayer, H.M. (1955) "Urban Nodality and the Economic Base." *Journal of American Institute of Planners* , 55, 117-20.
- McCann, L.D.(1982) *Heartland and Hinterland* (Scarborough, Ontario: Prentice Hall).

- McConnell, H. & Horton, F.E.(1969) " Spatial and Temporal Variation in Metropolitan Economic Structure." *Geografiska Annaler*, 52B, 72-85.
- Moore, C.L.(1974) "The Impact of Public Institutions on Regional Income: Upstate Medical Centre as a Case in Point." *Economic Geography* , 50, 124-29.
- _____ & Suffrin, S.C.(1974) "The Impact of a Nonprofit Institution on Regional Income." *Growth and Change* , 5, 36-39.
- Morgan, N.(1986) *Implosion : An Analysis of the Growth of the Federal Public Service in Canada 1945-1985*. (Montreal: The Institute for Research on Public Policy).
- Mulligan, G.F. & Reeves, R.W.(1986) "Employment Data and the Classification of Urban Settlements." *Professional Geographer*, 38, 349-58.
- Nelson, H.J.(1955) "A Service Classification of American Cities." *Economic Geography*, 31, 189-205.
- Norheden, K.O.(1973) *A Spatial Analysis of Selected Aspects of Alberta's Health Care Delivery System*. Unpublished MA Thesis. (Canada: University of Calgary).
- Norcliffe G.(1977) *Inferential Statistics for Geographers*. (London:Hutchinson & Co.).
- _____ (1983a) " Using Location Quotients to Estimate the Economic Base and Trade Flows." *Regional Studies*, 17, 161-168.
- _____ (1983b) "Industrial Specialization Versus Industrial Diversification: An Assessment of Policy Alternatives." in *Regional Diversification and Structural Change*, (Canada: Tantalus Research Ltd, B.C. Geographical Series, # 39).
- Noyelle, T.J. (1983) " The Rise of Advanced Services: Some Implications for Economic Development in U.S. Cities." *Journal American Planners Association*, 49, 280-90.
- _____ & Stanback, T.M.(1983) *Economic Transformation of American Cities*. (New Jersey: Rowman & Allanheld).
- Parrot, N. & Forer, R.(1986) "The Information Sector in New Zealand 1971-81." *New Zealand Geographer*, 42, 25-30.
- Phillips, R.S. & Vidal, A.C.(1983) "The Growth and Restructuring of Metropolitan Economies." *Journal American Planners Association*, 49, 291-306.
- Pinch, S.(1985) *Cities and Services: The Geography of Collective Consumption*. (London: Routledge & Kegan Paul plc).
- Richardson, H.W.(1978) "Theory of the Distribution of City Sizes: Review and Prospects." in *Systems of Cities*, 169-84, edited by L.S. Bourne and J.W. Simmons, (New York: Oxford University Press).
- Roterus, V. & Calef, W.(1955) "Notes on the Basic-Non Basic Employment Ratio." *Economic Geography*, 31, 17-20.

- Seigel, J. & Woodyard, M.(1971) "*Urban Growth and its Relation to the Urban Hierarchy in Central Canada.*" Centre for Urban and Community Studies, (Toronto: University of Toronto,.Research Paper #52).
- Semple, R.K.(1974)*Trends in Geographical Concentration of Corporate Headquarters in Canada.* (Ohio: Ohio State University Press, Discussion Paper # 44).
- _____ & Smith W.R.(1981) " Metropolitan Dominance and Foreign Ownership in the Canadian Urban System." *Canadian Geographer*, 25, 4- 26.
- Shelp, R.K.(1981) *Beyond Industrialization, Ascendancy of the Global Service Economy.* (New York: Praeger).
- Siddall, W.(1961)"Wholesale-Retail Trade Ratios as Indices of Urban Centrality." *Economic Geography*, 37, 124-132.
- Simmons, J.W. (1976) "Canada as an Urban System: A Conceptual Framework." *Ekistics*, 41, 68-76.
- _____ (1981) "*The Impact of Government on the Canadian Urban System..*" (Toronto: University of Toronto, Research Paper # 126.
- _____ (1985) " The Impact of Distribution Activities on the Canadian Urban System." *Paper Presented to Canadian Urban Studies Conference, Winnipeg, 1985*
- Singelman, J.(1978) *From Agriculture to Services : The Transformation of Industrial Employment..* (Beverly Hills: Sage Publications).
- Stanback, T.M. & Knight R.V.(1970) *The Metropolitan Economy.* (New York: Columbia University Press).
- Stanback, T.M. (1979) *Understanding the Service Economy.* (Baltimore: John Hopkins University Press).
- Stanback, T.M. & Noyelle, T.J.(1981) *Services, The New Economy.* (New Jersey: Allenheld Osmun Publishers).
- Taylor, M. & Thrift, N.(1986) *Multinationals and the Restructuring of the World Economy,* (London: Croom Helm Ltd.).
- Teitz, M.B.(1968) "Toward a Theory of Urban Public Facility Location." *Papers of the Regional Science Association*, XXI, 35-51.
- Ullman, E.L. & Dacey, M.F.(1960) "The Minimum Requirements Approach to the Economic Base." *Papers and Proceedings of the Regional Science Association*, 6, 175-94.
- Walker, S.R.(1979) "Education Services in Sydney : Some Spatial Variations." *Australian Geographical Studies*, 17, 175-92.
- Webber, M.J.(1982) "Agglomeration and the Regional Question." *Antipode*, 14, 1-10.
- Welling, S.L.(1977) *A Socio-Economic Classification of Prairie Towns in 1971.* Unpublished MA Thesis. (Canada: University of Calgary).

Wishart , D.(1978) *Clustan 1c*. (London: Universtiy College).

Wood, P.A. (1983) "The Regional Significance of Manufacturing-Service Sector Links: Some Thoughts on the Revival of London's Docklands." in *Regional Diversification and Structural Change*, (Canada: Tantalus Research Ltd., B.C. Geographical Series, #39).

Yeates, M. & Garner, B.(1976) *The North American City*. (New York: Harper & Row).

APPENDICES

APPENDIX A 1951 and 1986 Population and Workforce Data

Population and Workforce of Urban Areas Used (CMA or CA) in 1986
ranked by population

Centre	Type	Population	Workforce	
TORONTO	CMA	3427170	1946520	consolidated CMA
MONTREAL	CMA	2921360	1459810	consolidated CMA
VANCOUVER	CMA	1380730	721345	consolidated CMA
OTTAWA	CMA	819265	449615	consolidated CMA
EDMONTON	CMA	785465	422795	consolidated CMA
CALGARY	CMA	671325	380865	
WINNIPEG	CMA	625305	327965	
QUEBEC	CMA	603265	292860	
HAMILTON	CMA	557025	285480	
ST.C / NIAG	CMA	343255	164860	consolidated CMA
LONDON	CMA	342300	181165	consolidated CMA
KITCHENER	CMA	311195	168085	
HALIFAX	CMA	295990	159180	
VICTORIA	CMA	255545	122900	consolidated CMA
WINDSOR	CMA	253990	125030	
OSHAWA	CMA	203545	105910	consolidated CMA
SASKATOON	CMA	200665	100925	
REGINA	CMA	186520	96605	
ST. JOHN'S	CMA	161900	75495	consolidated CMA
CHIC/JONQ	CMA	158470	65480	consolidated CMA
SUDBURY	CMA	148880	68950	consolidated CMA
SHERBROOKE	CMA	129960	61685	
TROIS RIVIERES	CMA	128890	56425	
KINGSTON	CA	122350	63310	
THUNDER BAY	CMA	122215	62185	
SAINT JOHN	CMA	121165	54640	
SYDNEY	CA	119470	49050	consolidated CA
MONCTON	CA	102085	48555	
BRANTFORD	CA	90520	43880	
KELOWNA	CA	89730	38585	consolidated CA
MATSQUI	CA	88420	35510	
BELLEVILLE	CA	87530	52020	
PETERBOROUGH	CA	87080	42415	
GUELPH	CA	85965	46030	
SARNIA	CA	85700	42730	
SS MARIE	CA	84620	40045	
BARRIE	CA	67700	40365	
PRINCE GEORGE	CA	67620	34365	
FREDERICTON	CA	65765	39980	
SHAWINIGAN	CA	61965	27345	

KAMLOOPS	CA	61775	30200
NANAIMO	CA	60420	26695
ST. JEAN	CA	59960	34315
LETHBRIDGE	CA	58840	29360
NORTH BAY	CA	57420	27485
DRUMMONDVILLE	CA	56285	27745
RED DEER	CA	54425	30545
CHARLOTTETOWN	CA	53870	29430
CORNWALL	CA	51720	28390
GRANBY	CA	51180	30480
MEDICINE HAT	CA	50730	25345
CHILLIWACK	CA	50285	27210
FT. MCMURRAY	CA	48500	34390
ST. HYACINTHE	CA	48300	27030
TIMMINS	CA	46655	27905
RIMOUSKI	CA	46210	22170
SOREL	CA	46095	20800
ST. JEROME	CA	44050	21315
VERNON	CA	42800	20600
CHATHAM	CA	42210	23625
TRURO	CA	41515	21145
PRINCE ALBERT	CA	40845	19395
PENTICTON	CA	38965	18290
VALLEYFIELD	CA	38795	18215
NEW GLASGOW	CA	38735	15465
BRANDON	CA	38710	21785
VICTORIAVILLE	CA	38005	19550
COURTENAY	CA	37550	20180
MOOSE JAW	CA	37215	18100
BROCKVILLE	CA	37115	23230
ROUYN	CA	36495	22680
MIDLAND	CA	35005	20685
JOLIETTE	CA	34895	20175
BATHURST	CA	34895	16970
CORNER BROOK	CA	33730	15185
WILLIAMS LAKE	CA	33555	17060
BAIE COMEAU	CA	33045	17700
THETFORD MINES	CA	31940	16275
ORILLIA	CA	31255	14940
PT. ALBERNI	CA	26130	11255

Population and Workforce of Cities in 1951 ranked by population

City	Population	Workforce
MONTREAL	1395400	352168
TORONTO	1117470	330013
VANCOUVER	530728	141360
WINNIPEG	354069	106832
OTTAWA/HULL	281908	101220
QUEBEC	274827	62254
HAMILTON	259685	93453
EDMONTON	173075	65988
WINDSOR	157672	50937
CALGARY	139105	55004
HALIFAX	133931	36489
LONDON	121516	42465
VICTORIA	104303	20246
SYDNEY	104224	17953
SAINT JOHN	78337	18917
REGINA	71319	30704
THUNDER BAY	71191	24115
SUDBURY	70884	16872
TROIS RIVIERES	68306	16575
ST. JOHN'S	67749	18641
ST. C/NIAG	67065	26526
KITCHENER	63009	21528
SHERBROOKE	56128	19189
SASKATOON	53268	20684
BRANTFORD	52231	15839
OSHAWA	51582	18014
SHAWINIGAN	49719	8947
KINGSTON	49327	14378
MONCTON	45283	11141
CHIC/JONQ	44834	12806
SARNIA	41303	14205
PETERBOROUGH	41191	15641
SS MARIE	40490	13015
GUELPH	30387	11846
TIMMINS	27743	9327
MOOSE JAW	24355	9278
LETHBRIDGE	22947	9024
VALLEYFIELD	22414	8265
GRANBY	21989	8559
CHATHAM	21218	8625
BRANDON	20598	7507
ST. HYACINTHE	20236	8384
BELLEVILLE	19519	8264
ST. JEAN	19305	8734
NORTH BAY	17944	6677
ST. JEROME	17685	6632
PRINCE ALBERT	17149	6184
CORNWALL	16899	6710

MEDICINE HAT	16364	5525
JOLIETTE	16064	5366
FREDERICTON	16018	6288
CHARLOTTETOWN	15887	5000
THETFORD MINES	15095	4885
SOREL	14961	5554
ROUYN	14633	4904
DRUMMONDVILLE	14341	5572
VICTORIAVILLE	13124	4825
BARRIE	12514	4663
BROCKVILLE	12301	5023
ORILLIA	12110	4588
RIMOUSKI	11564	3840
TRURO	10756	4225
PENTICTON	10548	3216
CORNER BROOK	10276	N/A
NEW GLASGOW	9933	N/A
KELOWNA	8517	N/A
KAMLOOPS	8099	N/A
PORT ALBERNI	7845	N/A
VERNON	7822	N/A
RED DEER	7575	N/A
MIDLAND	7206	N/A
NANAIMO	7196	N/A
CHILLIWACK	5663	N/A
PRINCE GEORGE	4703	N/A
BATHURST	4453	N/A
BAIE COMEAU	3972	N/A
COURTENAY	2533	N/A
WILLIAMS LAKE	913	N/A
MATSQUI	N/A	N/A
FORT MCMURRAY	N/A	N/A

Appendix B Gini Indices for Urban Places included in Study 1951 - 1986

	1951	1961	1971	1981	1986
BAIE COMEAU			.2726	.4092	.2029
BARRIE	.2951	.2356	.1455	.1755	.1028
BATHURST			.2588	.2786	.2013
BELLEVILLE	.1773	.1429	.1506	.1330	.1330
BRANDON	.3367	.2659	.3214	.2523	.2380
BRANTFORD	.3404	.3118	.2809	.2907	.2591
BROCKVILLE	.2173	.2853	.2651	.2690	.1978
CALGARY	.2547	.2597	.2256	.2801	.2228
CHARLOTTETOWN	.3313	.2929	.3103	.3025	.2255
CHATHAM	.1913	.1643	.1953	.1957	.1993
CHIC / JONQ	.1850	.2180	.2051	.1404	.1167
CHILLIWACK			.3135	.2563	.2514
CORNER BROOK		.1900	.1723	.1610	.1583
CORNWALL	.2660	.2141	.2055	.1853	.1598
COURTENAY					.2755
DRUMMONDVILLE	.3602	.3296	.2770	.2582	.2244
EDMONTON	.2658	.2039	.1715	.1709	.1374
FREDERICTON	.3137	.3464	.3217	.3076	.2682
FT. MCMURRAY				.5110	.4607
GRANBY	.3630	.3680	.3148	.3039	.2443
GUELPH	.2815	.2663	.2559	.2479	.2220
HALIFAX	.4117	.4031	.3207	.2586	.2183
HAMILTON	.3001	.2569	.2187	.1999	.1729
JOLIETTE	.2222	.2302	.2434	.2536	.1949
KAMLOOPS		.2653	.2639	.1864	.2055
KELOWNA		.2031	.2149	.1976	.1375
KINGSTON	.2736	.2610	.3116	.2506	.2355
KITCHENER	.3308	.3205	.2860	.2673	.2532
LETHBRIDGE	.2866	.2565	.1708	.1657	.1476
LONDON	.1638	.1711	.1456	.1338	.1338
MATSQUI			.1868	.2684	.1247
MEDICINE HAT	.2113	.1523	.1446	.2418	.1818
MIDLAND			.2279	.3411	.1988
MONCTON	.3389	.3010	.3046	.2297	.2159
MONTREAL	.2923	.1347	.1514	.1183	.1069
MOOSE JAW	.3056	.2782	.3177	.3017	.2550
NANAIMO		.2067	.1782	.1951	.1806
NEW GLASGOW			.1672	.3169	.1982
NORTH BAY	.3297	.2883	.2767	.1883	.2217
ORILLIA	.2552	.2376	.2391	.2180	.1670
OSHAWA	.3935	.3250	.2670	.2178	.2029
OTTAWA	.4329	.3904	.3767	.3649	.3210
PENTICTON	.3459	.2931	.2253	.1918	.1943
PETERBOROUGH	.3307	.2706	.3027	.1901	.1370

	1951	1961	1971	1981	1986
PRINCE ALBERT	.2780	.2630	.2301	.2462	.2025
PRINCE GEORGE		.1940	.2001	.1526	.1802
PT. ALBERNI		.3487	.3934	.3866	.3210
QUEBEC	.2120	.1943	.2476	.2510	.2276
RED DEER		.3174	.3279	.2981	.2572
REGINA	.3851	.3038	.2597	.2304	.2030
RIMOUSKI	.3989	.3571	.3337	.3464	.2482
ROUYN	.5167	.4484	.3886	.3080	.2684
SAINT JOHN	.2684	.1949	.1945	.1667	.1214
SARNIA	.2507	.2298	.1789	.2311	.1968
SASKATOON	.3205	.2659	.2597	.1818	.1574
SHAWINIGAN	.2954	.2938	.2770	.3110	.1727
SHERBROOKE	.2108	.1711	.2211	.2058	.1680
SOREL	.3173	.2827	.2997	.2139	.2642
SS MARIE	.2579	.2137	.2041	.2151	.1486
ST. HYACINTHE	.3471	.3180	.2479	.2339	.1793
ST. JEAN	.4489	.3634	.3019	.2959	.1663
ST. JEROME	.3243	.2579	.1776	.2152	.1436
ST. JOHN'S	.3345	.3269	.2852	.2274	.2194
ST. CATHARINE'S	.2625	.2326	.2191	.2125	.1803
SUDBURY	.4168	.4200	.3682	.2704	.2319
SYDNEY	.3146	.2552	.2270	.2292	.2068
THETFORD MINES	.5872	.5542	.4771	.3250	.2513
THUNDER BAY	.2317	.2380	.1823	.1791	.1499
TIMMINS	.5974	.5310	.4155	.3638	.1896
TORONTO	.1820	.1866	.1852	.1631	.1670
TROIS RIVIERES	.1951	.1985	.1783	.1819	.1275
TRURO	.2321	.2083	.2087	.1507	.1570
VALLEYFIELD	.4100	.3286	.2520	.2381	.1927
VANCOUVER	.2085	.1583	.1716	.1433	.1485
VERNON		.2305	.2278	.2413	.1930
VICTORIA	.3364	.3451	.3089	.2832	.2733
VICTORIAVILLE	.3347	.2885	.2485	.2631	.1913
WILLIAMS LAKE					.2568
WINDSOR	.3284	.2022	.2052	.2338	.2340
WINNIPEG	.3042	.1568	.1597	.1161	.1019

Appendix C Distance of Centres from the Nearest Centre over 30,000 in 1986

Baie Comeau	232 km	Oshawa	53 km
Barrie	33 km	Ottawa	93 km
Bathurst	180 km	Penticton	45 km
Belleville	73 km	Peterborough	80 km
Brandon	187 km	Prince Albert	135 km
Brantford	33 km	Prince George	202 km
Brockville	80 km	Port Alberni	52 km
Calgary	135 km	Quebec	80 km
Charlottetown	90 km	Red Deer	135 km
Chatham	73 km	Regina	60 km
Chicoutimi	178 km	Rimouski	233 km
Chilliwack	82 km	Rouyn	172 km
Corner Brook	420 km	Saint John	82 km
Cornwall	60 km	Sarnia	67 km
Courtenay	52 km	Saskatoon	135 km
Drummondville	45 km	Shawinigan	28 km
Edmonton	142 km	Sherbrooke	65 km
Fredericton	82 km	Sorel	30 km
Fort McMurray	367 km	Sault Ste. Marie	260 km
Granby	34 km	St. Hyacinthe	34 km
Guelph	23 km	St. Jean	35 km
Halifax	90 km	St. Jerome	40 km
Hamilton	33 km	St. John's	420 km
Joliette	30 km	St. Catharine's	53 km
Kamloops	82 km	Sudbury	125 km
Kelowna	45 km	Sydney	195 km
Kingston	80 km	Thetford Mines	50 km
Kitchener	40 km	Thunder Bay	426 km
Lethbridge	157 km	Timmins	172 km
London	83 km	Toronto	60 km
Matsqui	40 km	Trois Rivières	28 km
Medicine Hat	157 km	Truro	52 km
Midland	40 km	Valleyfield	50 km
Moncton	135 km	Vancouver	40 km
Montreal	35 km	Vernon	45 km
Moose Jaw	60 km	Victoria	90 km
Nanaimo	67 km	Victoriaville	45 km
New Glasgow	52 km	Williams Lake	202 km
North Bay	125 km	Windsor	73 km
Orillia	33 km	Winnipeg	187 km

APPENDIX D Component Loadings for Canadian Cities >30,000 in 1986

Loadings* on Component I - Manufacturing

Midland	97	Orillia	62
Sorel	95	Sherbrooke	62
Brockville	94	St. Jean	56
Drummondville	92	Trois Rivières	55
Granby	91	Belleville	51
Brantford	87	Barrie	50
Windsor	87	Oshawa	48
St. Catharine's	84	London	47
Sarnia	81	Shawinigan	40
Joliette	78	Matsqui	33
Valleyfield	77		
Victoriaville	74		
Peterborough	73		
Hamilton	72	Fredericton	-36
Kitchener	71	Rimouski	-36
St. Hyacinthe	70	Vancouver	-33
Guelph	68	Kamloops	-32
Chatham	66		
St. Jerome	66		
Sault Ste. Marie	65		

Loadings* on Component II - Small Forestry and Transport/ Large Diversified or Alberta

Baie Comeau	100	Saskatoon	-79
New Glasgow	94	Edmonton	-70
Shawinigan	89	Toronto	-56
Port Alberni	79	Calgary	-50
Chilliwack	79	Lethbridge	-43
Thunder Bay	79	Medicine Hat	-42
Prince George	78	Montreal	-42
Truro	78	Orillia	-41
Courtenay	76	Red Deer	-40
Williams Lake	75	London	-39
Vernon	75	Winnipeg	-37
Fredericton	71	Hamilton	-34
Nanaimo	70	Regina	-31
Sault Ste. Marie	66	St. John's	-30
Rimouski	66		
Chicoutimi	63		
Penticton	62		
Corner Brook	60		
Prince Albert	52		
Kamloops	40		
Timmins	32		

* Decimal points are removed 80 is +0.80

Loadings* on Component III - Government

Kingston	88	Kamloops	-33
Quebec	86		
Ottawa	83		
Victoria	81		
Halifax	72		
St. John's	68		
Charlottetown	65		
Chicoutimi	55		
Fredericton	55		
Lethbridge	53		
St. Jean	52		
Brandon	46		
Sherbrooke	45		
Belleville	42		
Moose Jaw	41		
Prince Albert	40		
North Bay	35		
Regina	31		
Guelph	31		
Corner Brook	30		

Loadings* on Component IV - Extraction / Metropolitan

Sydney	91	Vancouver	-86
Sudbury	84	Toronto	-77
Red Deer	84	Montreal	-66
Medicine Hat	84	Winnipeg	-51
Thetford Mines	83	Saskatoon	-47
Fort McMurray	80	Moncton	-41
Rouyn	79	Windsor	-40
Bathurst	74	Hamilton	-40
Timmins	64	Kitchener	-38
Calgary	64	Barrie	-35
Edmonton	52	St. Hyacinthe	-30
Valleyfield	44		
Moose Jaw	37		

* Decimal points are removed: 80 is +0.80.

Loadings* on Component V - British Columbia / Accommodation and Food

Kelowna	87	Oshawa	-45
Matsqui	53	St.Jean	-42
Penticton	52	Belleville	-41
Prince Albert	51	Ottawa	-33
Vancouver	44		
Orillia	43		
Kamloops	42		
Nanaimo	37		
Vernon	34		

Loadings* on Component VI - Communications and Utilities

Saint John	79
Rimouski	75
Regina	64
St.Jerome	53
Trois Rivières	52
Chatham	48
Brandon	46
Oshawa	40
Peterborough	32
Lethbridge	31
Windsor	31
Sherbrooke	30

Loadings* on Component VII - Guelph / Transportation

Guelph	35
Moncton	-81
North Bay	-73
Moose Jaw	-66
Winnipeg	-48
Charlottetown	-47
Matsqui	-40
Saint John	-37
Belleville	-37
Brandon	-36
Cornwall	-31

* Decimal Points are removed: 80 is +0.80.

The Communalities for the Individual Places from the Principal Axis Component Analysis 1986

Matsqui	.7776	St. John's	.9244
Nanaimo	.9897	Halifax	.9673
Shawinigan	.9718	Moncton	.8518
St. Hyacinthe	.8779	Saint John	.9666
Timmins	.9911	Chicoutimi	.9217
Chatham	.8762	Quebec	.9248
Granby	.9560	Sherbrooke	.8680
Brandon	.8908	Trois Rivières	.9409
Valleyfield	.9652	Montreal	.9674
Moose Jaw	.9251	Ottawa	.9161
Corner Brook	.7796	Kingston	.9635
Charlottetown	.9419	Peterborough	.9652
New Glasgow	.9718	Oshawa	.9449
Truro	.9837	Toronto	.9904
Bathurst	.9925	Hamilton	.9765
Fredericton	.9959	St. Catharines	.9035
Baie Comeau	.9791	Kitchener	.9512
Drummondville	.9156	Brantford	.9581
Joliette	.8402	Guelph	.7919
Rimouski	.9514	London	.9514
Rouyn	.9951	Windsor	.9298
St. Jean	.9790	Sarnia	.8445
St. Jerome	.9700	North Bay	.9735
Sorel	.9873	Sudbury	.9935
Thetford Mines	.9896	Sault Ste. Marie	.9378
Victoriaville	.7836	Thunder Bay	.9504
Barrie	.8445	Winnipeg	.9526
Belleville	.9491	Regina	.9206
Brockville	.9416	Saskatoon	.8938
Cornwall	.9820	Lethbridge	.9424
Midland	.9118	Calgary	.9914
Orillia	.8117	Edmonton	.9671
Prince Albert	.9746	Kelowna	.8356
Fort McMurray	.9963	Kamloops	.9814
Medicine Hat	.9831	Vancouver	.9565
Red Deer	.9783	Victoria	.8987
Chilliwack	.9826	Prince George	.9944
Courtenay	.9975	Sydney	.9892
Penticton	.9677	Vernon	.9934
Port Alberni	.9976	Williams Lake	.9975

**APPENDIX E CENTRES THAT WERE CONSOLIDATED PRIOR TO 1986
SO AS TO BE COMPATIBLE WITH 1986 DATA SET**

ST. CATHARINE'S - NIAGARA

OTTAWA - HULL

CHICOUTIMI - JONQUIERE

KITCHENER - WATERLOO

SYDNEY - SYDNEY MINES

PORT ARTHUR/FORT WILLIAM - THUNDER BAY

Appendix F Three Way Division of Services, based on 1986 SIC

Tertiary	Quaternary	Quinary
Transportation	Finance	Education
Communications & Utilities	Insurance & Real Estate	Health
Retail	Business Services	Government
Wholesale		
Accommodation & Food		
Other Services		