

THE UNIVERSITY OF MANITOBA

THE DEVELOPMENT OF RESIDENTIAL DIFFERENTIATION
IN CANADIAN METROPOLITAN AREAS, 1951-71:
AN APPLICATION OF A STOCHASTIC MODEL

by

KURT B. HOLFEUER

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ABSTRACT

This thesis re-examines the major hypothesis derived from the concentric zone theory of E.W. Burgess which states that a direct relationship exists between social status and distance from the center of the city. While contradictory evidence has been compiled against this hypothesis, it has typically been of a cross sectional nature. Since the original formulation of the concentric model was stated in terms of the growth and process of urban structural development, much of the contradictory evidence levelled against the Burgess model is placed in a questionable position. Therefore this thesis involves a longitudinal assessment of Canadian urban residential development to determine whether time is a factor in the emergence of the status gradient. Two propositions gleaned from the literature are tested by a cross sectional and longitudinal methodology. The first hypotheses assumes that all cities which are not characterized by the status gradient in 1951 will show residential development in this direction over time. Secondly those cities which already exhibit the status gradient in 1951 will continue to manifest this spatial arrangement over time. The cross sectional evidence provided limited support for both hypotheses by the three socioeconomic variables, income, education and occupation. Two major trends of residential redistribution were uncovered between 1951 and 1971. The first of these showed an increase of higher status groups

in the suburbs for nearly all the cities in the 1950's while the results for the 1960's showed a reversal of this pattern of residential differentiation. A stochastic analysis of the changes in the socioeconomic characteristics of census tracts from 1951 to 1971 by a markov chain suggests some evidence for an evolutionary process, again providing only limited support for the hypotheses. Although the results suggest that a direct relationship between status and distance is appearing in some cities over time, these results are less pronounced than those found in studies of American urban areas. The author suggests the use of a combined indicator of socioeconomic status which may produce results indicating more conclusive patterns of residential development.

Kurt Holfeuer

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CHAPTER ONE

The Development of Residential Differentiation.

I. Introduction

The analysis of the residential structure of the urban community has been a subject of continuing interest in urban sociology and human ecology. The primary interest has been, and still is, in discovering broad regularities underlying the spatial distribution of socio-economic characteristics of the urban population. Theoretical developments in this area of research have generally addressed themselves to the question of how the residential patterns of cities change over time (Burgess, 1924 and Hoyt, 1939). The "concentric zonal model" as suggested by Burgess in 1924 has been viewed as a "growth model" which attempts to explain the process of urban structural development (Schnore, 1963, and 1965; Haggerty, 1971).

Empirical studies in this line of research have attempted to test one of the basic assumptions underlying the Burgess model which states that urban communities become stratified on a socio-economic basis, with higher-status groups tending to concentrate at the periphery and low-status groups tending to be located in the inner parts of the city.

The empirical evidence that urban areas exhibit an inverse relation between central location and socio economic status has been reported for U.S. cities by many investigators (Duncan et al 1962; Uyeki, 1964; Schnore, 1965; Guest, 1969; Smith, 1970; Haggerty, 1971; and Schnore and Winsborough, 1972).

Although most of the empirical studies in this area have aimed at capturing the over-all historical series of outward shifts of high status groups from the center to the periphery, very few have acknowledged the developmental process in neighborhood shifts as a continuous movement as called upon by the Burgess model. In other words, many investigators have failed to acknowledge time as an important dimension in neighborhood change. To the contrary, these investigations have been typically confined to analysis of cross-sectional data, analyses which do not account for the changes that take place through time (Greer, 1962). Thus, the generalizations which have emerged from these cross-sectional studies may not be more than mere artifacts of the static boundary lines of the central city.

Because of this, generalizations with respect to the underlying patterns of residential differentiation in urban community have typically been derived from cross-sectional data. Accordingly, there remains a pressing need for longitudinal analyses which may reflect the growth and changing spatial structure of the modern city. Such a need has recently

been acknowledged by Schnore and others. After his cross-sectional examination the socio-economic status of U.S. cities and suburbs, Schnore (1963), for example, concluded that older areas generally conform to the Burgess model, but that the centers of the smaller and newer areas tend to rank higher in income, education, and occupation than their suburbs. Schnore's data revealed that both age and size of the city are the best predictors of city-suburban status differentials. In addition, Haggerty's (1971) attempt to test the concentric zonal hypothesis has made it quite clear that any empirical test of the foregoing assumptions appear to require a longitudinal analysis to determine if time creates an inverse relationship between socio-economic status and distance from the city center.

Similar empirical findings on Canadian cities are relatively few. One major generalization which has emerged from the comparative literature on U.S. and Canadian cities is that both countries appear to have already passed through the most rapid phase of the process of urbanization and are now solidifying their positions as highly urbanized societies (Schnore and Petersen, 1959). In addition, historical analysis of the development of metropolitan areas in Canada suggest that the rate of Canadian deconcentration of urban population has been accelerating since 1921, with sharp increases recorded for 1951-1961 decade over 1930's and 1940's (Stone, 1967). Accordingly, there is reason to believe

as Guest (1969) suggested, that the residential structure of cities in both countries should evolve in a predictable pattern, that which is characteristic of U.S. cities, is also applicable to Canadian cities as well.

In an attempt to test the foregoing generalization, Guest (1969) concluded that:

"Canadian metropolitan areas, which tend to be younger and smaller than United States urbanized areas, are less apt to have a clear pattern of upper status groups over-represented in the suburbs and lower-status groups over-represented in the central city. When Canadian areas are compared with one another, there is a tendency for the higher educational and income groups to be over-represented in the suburbs of older, larger and heavily suburbanized places. However the differences are by no means conclusive. City-sururban comparisons of change over the 1950 decade in the representation of education groups also suggests that upper-status groups are becoming more concentrated in suburbs while the lower-status groups are becoming more concentrated in the central city. But zonal comparisons of change for four of these areas suggest less clear patterns of change in relation to distance from the center of the area" (Guest, 1969: 276).

It should be noted, however, that Guest's analysis provides us with cross-sectional examinations of city-suburban differences and fails to acknowledge the developmental process in neighborhood shifts as a continuous movement as well as distance from the center of the city as a continuous variable. The present study attempts to fill the gap in this line of research and to provide a more comprehensive analysis of residential structure for the period of 1951 to 1971.

II. THEORETICAL BACKGROUND

1. The North American Model:

A sizable body of research has studied the process of centralization within the urban community. This research generally indicates that North American cities have followed similar patterns of growth which can best be described as concentration succeeded by decentralization of urban population. The ecological manifestations of this decentralization process has produced a residential structure which is believed to be applicable to all North American cities. The direct "status gradient" model or which is now called the "North American model" assumes that there is a direct relationship between social status and distance from the center of the city.

The North American Model was derived from the classic zonal hypothesis of Burgess (1924) who suggested that there is a direct relationship between socio-economic status and distance from the center of the city. For Burgess this pattern of residential differentiation occurs through urban growth and radial expansion. Typically this process is initiated by the population growth of the central city through the immigration of foreign migrants.

Burgess assumed that there were a number of forces in operation within the urban complex which differentiated both the population and various functions into specific

spatial arrangements. He suggested that the city was divided into five zones, each characterized by a different homogeneous population. Typically industry and commerce were located in the innermost zone near transportation and power facilities. Due to the high demand for limited space in this area housing was limited to high density use, generally used by lower status groups, newly arrived in the city. Higher status groups having command over greater locational freedom ordinarily preempted the newer and more spacious housing developments cropping up in the urban fringe. Therefore one basic underlying assumption of the Burgess' model is that urban communities become stratified on a socio-economic basis, with higher-status people concentrated at the periphery and lower-status people living in the inner parts of the city. Although this model has proved to be a popular model amongst sociologists since the late 1920's, it has been criticized on both theoretical and empirical grounds (Davie, 1938; Alihan, 1938; Quinn, 1940; Schnore, 1963; Hoyt, 1939; Harris and Ullman, 1945).

Alihan (1938) criticized the concentric model on the use of both the zonal and distance gradient concepts. According to her the use of the gradient as a methodological device is inconsistent with the theoretical assumptions of zones. Davies (1938) criticized the concentric pattern after an unsuccessful attempt at applying it to New Haven. Instead he found that New Haven was divided into 22 natural

areas which in no way fit a concentric pattern.

In a similar argument Harris and Ullman (1945), through their development of the multiple nuclei model suggest that unlike the Burgess formulation there is no one basic pattern of ecological structure common to many cities. Instead of a single center, the authors hypothesized that urban land uses concentrated around several nuclei related to the various alternative functions present in the city.

An alternative explanation for the residential differentiation of the urban population was Hoyt's Sector Model (Hoyt 1939).

Hoyt hypothesized that while the central business district remains circular in form, socio-economic status is distributed along sectors, which extend from the CBD to the urban fringe. He assumed that high quality residences spread out along the major transportation routes, as well as, along high ground. Spaces between these areas are filled in by poorer quality homes occupied by lower status groups. Within the various socio-economic sectors we generally find an direct relationship between socio-economic status and distance from the city center.

Quinn (1940) provided both a criticism and a re-evaluation of the concentric model. He felt that Burgess had ignored the factor of inertia or "the spatial and ecological structure of a city at any given time depends upon its past history" (Quinn, 1940:216). The degree to

which a city re-orders itself to the new influences depends on the mobility of people and capital, the readiness with which people will move and write off earlier capital investments. For inertia to be adequately studied it is necessary to take into consideration the history of the city. Instead of considering spatial distance Quinn suggests that an adequate test of the Burgess model must take into consideration the time cost factor.

While much criticism has been leveled at the underlying assumptions of the concentric zone model itself, these criticisms have been derived from cross sectional examinations of what is essentially a longitudinal question. However, there seems to be general consensus today concerning the validity of at least the status gradient concept as an adequate device for explaining the development of the residential structure of urban communities (Loewenstein 1965; Houser 1960).

2. Empirical Verifications of the North American Model:

Empirical verifications of the basic underlying assumption of the "North American Model" have gained their momentum in the late 1950's and the 1960's. Most studies in this area have attempted to explain why urban communities become stratified on a socio-economic basis, with higher-status groups tending to concentrate at the periphery and low-status groups living in the inner parts of the city.

Most of the discussions have addressed themselves to the factors associated with suburbanization and metropolitan growth.

Duncan et al (1962) suggests that population growth in the metropolitan area creates a conducive environment for the forces leading to suburbanization. This decentralization continues until it presents problems for internal transportation and communication, thus creating upward expansion at the city core.

This process can only occur with increasing housing construction at the periphery of the city, usually in the form of single unit family dwellings (Duncan et al, 1962; and Guest, 1971).

Hoover and Vernon (1962) suggest that the increasing demand for space in the central city, due to population growth leading to high density, results in the conversion of dwelling units from low density use to high density use. This down-grading of existing facilities is usually associated with the spread of segregated communities. Murdie (1969) states:

Rich people tend to value land over transportation costs so that they live on relatively inexpensive land at the periphery of the city, consume a great deal of this land, and incur high transportation costs in reaching the center of the city where most employment for them is located. Poor people, on the other hand, live near the center of the city on more expensive land but consume little of it thereby creating peak density just outside the CBD (Murdie 1969:13).

Both Burgess and Hoyt have summarized these arguments in their discussions of two basic processes leading to decentralization, these being succession and filtering. Burgess felt that the emergence of the distance gradient was due to the process of succession. This process was initiated through the immigration of low status and foreign groups, consequently concentrating in the inner core and zone of transition, which according to Burgess "puts up notoriously little resistance to the intrusion of new groups" (Burgess 1928:109). Due to the increased population pressure through this immigration, the population of the inner parts of the city tend to spill outward into the immediate surrounding areas. These areas also feeling the pressure of increasing density, create a wave of population movement throughout the city. Thus, each inner zone extends its area by invading the next outer zone.

Although Hoyt took into consideration the pressure of high density due to immigration and land conversion his primary concern was in the process of filtering. He believed that filtering was a central mechanism which stimulated as well as facilitated the process of decentralization. The filtering process implies the periodic demand for newer housing by high status groups. Typically these newer homes are at the periphery of the city. Those homes left by these groups are usually bought by lower status city residents attempting to move up the housing scale.

Up to this point the suggestion is that decentralization is caused by two basic processes termed centrifugal and centripetal forces (Colby, 1933). Centrifugal forces impell functions and populations to flee to the periphery with such factors as density, deterioration of the housing stock, and the invasion of lower status groups to the city center promoting this force. On the other hand, centripetal forces are composed of attractions within the central city which tend to hold functions and certain residents there. Such attractions may be the ideal location of the central city for industry and commerce due to its accessibility or the existence of cheap housing for new residents to the city.

More recently Schnore (1963) has attempted to substantiate the distance gradient hypothesis by carrying out a fairly extensive analysis of American urban areas. His results qualify this concept by suggesting the explanation of, that both age and size of cities play an important role in urban growth patterns. He states:

"Size per se is perhaps not so critical as the organizational concomitants of size; larger populations for example are known to permit greater functional specialization, and small communities cannot be expected to exhibit the highly segregated patterns of specialized land uses that can only be expressed in larger aggregates" (Schnore 1965B:382).

However, when controlling for size, age was found to be the best predictor of the direction of city-suburban differences in socio-economic status. The oldest urban areas tend to

conform to the distance gradient concept with the highest socio-economic groups over represented in the urban fringe. While the youngest urban centers tend to exhibit the reversal of this pattern.

Schnore suggests that the existing housing stock, transportation and communication facilities provide possible explanations for the impact of age. In the oldest cities the housing stock near the central city is generally dilapidated and outdated. It would require enormous expenditures to bring it up to par with the remainder of the urban community. Therefore they have become the homes of the lowest socio-economic groups, foreign immigrants and members of other races. Typically, new housing developments for these cities have been on the urban fringe since land here is relatively less expensive. Thus they become the domain of the well to do who prefer spacious living over easy access to the city center.

However, the growth experience for younger cities has been altogether different. Schnore states:

"In newer urbanized areas, the housing stock of the central city itself is neither so old nor so run-down as to be unattractive to potential home owners of the expanding middle class. At the same time, the pressures exerted by the competition of alternative (now residential) land uses on inner zones now appear to be less intense in these newer cities than they were in older cities at comparable stages in the past; with the availability of the automobile and the truck, industrial and commercial land uses are less likely to be thrusting out inexorably from the heart of the city, and more likely to be "leap-frogging" the interior residential

zones for new shopping centers and industrial parks at the outer periphery. As a consequence, central residential zones in newer cities may be less likely to undergo the "succession" or "sequent occupance" of progressively lower status groups experienced by neighbourhoods in the older cities" (Schnore 1965A:214).

Thus, the underlying factors leading to decentralization discussed earlier may only apply to the largest and oldest urban centers in North America which would subsequently lead to the emergence of the distance gradient.

i) The American Evidence

To test the empirical validity of the "North American Model", researchers in this area have typically followed two major approaches. One approach, suggested and employed by Schnore can be best described as the "cross-sectional approach". Recent efforts following this kind of methodology have given a fair amount of support to the "North American Model". Typically, this approach makes comparisons between cities and suburbs in terms of certain socio-economic status variables.

If a direct relationship exists between socio-economic status and distance from the center of the city, then it follows that in a city-suburban comparison one would expect to find the city population exhibiting a lower socio-economic status than sub-urban population. In testing the above proposition Schnore generally gives it support, although variations exist which raise significant questions.

(Schnore 1963, 1964, 1965, 1972). Calculating the city-suburban comparison of percentage white collar occupation, the percentage of those who had completed high school and median family income Schnore found that both age and size were related to a cities status differentiation (Schnore 1963). Schnore (1964) carried out a more detailed analysis of 200 urban areas in the United States using only education as his status indicator. Through this analysis Schnore uncovered six patterns of city-suburban contrast leading him to conclude that an evolutionary pattern of city growth and development existed. More recently Schnore (1966) has replicated the above study using income as his status indicator. Again he found that no simple pattern adequately described American urban areas. Schnore concluded that as cities grew older and larger they evolved in a distinct pattern with the youngest and smallest cities exhibiting an over representation of higher status groups in the central city. With the passage of time the central city becomes inhabited by both the lowest and highest status groups while the suburbs are dominated by the middle classes. Finally a polarization is achieved when the suburbs become the domain of the urban elite and the central city is the home of the lowest income groups (Schnore 1964, 1966 and Jones 1969). A number of structural factors are said to influence the emergence of the distance gradient characteristic of the zonal hypothesis, age and size,

region, population growth, annexation and color composition and functional base of the city (Schnore, 1965; Schnore and Palen 1965; and Schnore and Winsborough, 1972).

Indications are that there is considerable variation in differential residential structure in various regions throughout the United States. This may be a reflection of the age of the city, as well as the color composition of its population. Typically, cities in the east are the oldest urban areas in the United States and generally exhibit an over representation of higher socio-economic groups in the suburbs. On the other hand, cities in the south have an over-representation of higher status groups in the city center with a large black population at the periphery. However, in the north the non-whites also exhibit the same patterns of residential location found for the whites. Schnore suggests:

"Some of the unusual features of the southern non-white findings are probably due to the effects of housing segregation, which recent research... shows to be increasing in that section of the country while decreasing in the north and south west. However, the most probable reason why the southern non-whites fail to show the usual city-suburban status differences is that in the South, as opposed to the North, the poorer and less advantaged non-white residents traditionally lived on the periphery of the city" (Palen & Schnore 1965:91).

Schnore speculated that the residential patterns for the south may be shifting towards those found in the other parts of the country.

Schnore and Winsborough (1972) have attempted to explain the differential residential location of various social groups through the economic function of the city. The authors suggest that, "the dirt, noise, odors, physical hazards, residential crowding and traffic congestion associated with the concentration of industry within the central city have driven out the social elite and the broad middle classes, who have increasingly taken up suburban residence" (Schnore & Winsborough 1972:139). The authors found that the manufacturing ratio of the city was indeed a good indicator of suburban selectivity. Those cities high on the manufacturing ratio exhibited an over representation of higher socio-economic groups in the city.

Schnore and his colleagues have provided the most complete test of the original concentric zone hypothesis, qualifying the generality of the original proposal with a number of structural variables affecting suburban selectivity. His results provide credibility for the distance gradient concept as the underlying factor describing urban residential differentiation. However, Schnore has based his conclusions; especially the evolutionary hypothesis; almost entirely on cross sectional evidence.

Using a similar methodology as that of Schnore a number of researchers have generally come to the same basic conclusions (Smith 1970, Johnston 1971; Guest 1969, 1971; Goldsmith and Lee 1966; Goldsmith and Stockwell 1969a, 1969b;

Smith and Collins 1965; Lazerwitz 1960 and; Powers 1964). However, the discrepancies between the findings are important here.

Smith (1970) using a city, suburb, fringe areal delineation suggests that:

The data have to be taken as confirming Schnore's broadest findings. They also indicate that the total urban area is a city/suburb/fringe mosaic and that there are circumstances when simple inside-outside descriptions of differentiation will hide a more complexly differentiated reality.

Using similar units of analysis adopted by Smith, Goldsmith and his colleagues found that while the areas surrounding the central city were characterized by a higher socio-economic status typically the suburbs had a higher status than their surrounding fringe areas (Goldsmith and Lee 1966; Goldsmith and Stockwell 1969a, 1969b).

One possible explanation for the lower socio-economic status of the fringe areas has come from the work of the Duncan's (1962). Duncan and Duncan (1955) directly testing the distance gradient through the use of an "index of centralization" found support for the Burgess hypothesis. The most decentralized group were those high on socio-economic status. However they found two exceptions to the rule. First, clerical and sales workers were more centralized than lower status, craftsmen, foremen and kindred workers. The suggestion here was that clerical and sales workers chose to spend more on housing than the craftsmen thus having less money to spend on transportation costs. This meant they

would be less decentralized than their white-collar counterparts. The second exception to the rule was the relative decentralization of lower status groups in various sectors throughout the city. This seemed to be due to the decentralization of industry in these same areas.

Johnston (1971) after a re-evaluation of Schnore's evolutionary hypothesis suggests that the evolution of city growth occurs from the highest class moving outward, then being followed by the middle classes. In contrast Schnore had hypothesized that the middle class was the first group to move to the suburbs. Similarly, Guest (1971) has qualified some of Schnore's original assumptions. Guest concludes from his analysis of seventeen United States cities that the decentralization of white collar occupational groups can best be explained by the existence of single unit dwellings in the periphery rather than by the centrifugal force due to the increasing dominance of the central city for different racial minority groups.

It becomes obvious that the numerous attempts to test the validity of the distance gradient concept have resulted in a number of discrepant findings. Upon closer examination of these various studies a number of significant points appear which may provide a possible explanation for these discrepancies (Pinkerton 1969).

The array of analysis which has been carried out has covered a large time span with various research efforts

oriented towards different periods. For example, Burgess and Hoyt both derived their results from the analysis of cities before the Second World War. Subsequent analysis aimed at verifying their results have derived their data from post-war analysis. Perhaps the differences in the findings are due to the differing time periods.

A second factor leading to discrepant results are the various units of analyses, as well as, sample sizes incorporated into the different studies. Units of analyses ranged from five zones to a simple city-suburban comparison; while, sample sizes have ranged from single city studies to a comprehensive analysis of all the areas in a country. Thirdly, the measures of socio-economic status have varied greatly, although they have all used one or more of the traditional indicators of socio-economic status.

Finally, while the cross-sectional examination of city-suburban differences has captured the over-all historical series of outward shifts of high status groups from the center to the periphery, it does not, however, acknowledge the developmental process in neighborhood shifts as a continuous movement. The review of literature, however, generally reveals that there is a paucity of research addressing itself to this question. For in the research which has been carried out, support for the emergence of the distance gradient has been mixed (Schnore and Pinkerton 1966; Schnore and Jones 1969; Guest 1969; Farley 1969, Uyeki 1964 and;

Haggerty 1971).

Schnore and his collaborators have produced two longitudinal analyses of the 1950-1960 intercensal decade. These studies have provided mixed support for the expected pattern (the emergence of an over representation of higher status groups in the suburbs). Schnore and Pinkerton (1966) hypothesized that certain status groups were changing their residential location in a predictable pattern. They concluded that for the 363 urban areas studied, the suburbs were becoming over represented by high status groups with the central city becoming the home of the less well to do.

However, an effort to determine the validity of the evolutionary hypothesis met with less success (Schnore and Jones 1969). The results indicated two interpretations. A negative interpretation suggests that the results dis-
prove the evolutionary hypothesis. However, due to the methodological difficulties encountered in the analysis, a second interpretation presents a more positive picture, giving greater confirmation to the existence of the hypothesis. Although evidence for the existence of the evolutionary hypothesis is by no means conclusive this study confirms the results of Schnore's earlier longitudinal analysis that a greater polarization was emerging between low and high status groups in cities and suburbs.

Both Farley (1964) and Uyeki (1964) support the emergence of the distance gradient over time. Farley

analysed 137 suburbs of 24 cities for the period 1920-1960. He found that the proportion of white collar workers and high school graduates remained nearly constant for the central city while the suburbs saw a disproportional increase in these two groups. Uyeki (1964) studying the changing location of occupational groups in Cleveland supports Farley's findings concluding that the trend over time has been the greater polarization between white collar and blue collar workers with the exception of clerical workers who were becoming more centralized.

Haggerty (1971) using a stochastic model has also provided support for the emergence of the distance gradient. In his analysis of eight American cities he found that his longitudinal methodology uncovered the emergence of the Burgess zonal pattern over time where previous cross-sectional analysis by Schnore (1963) had not. Haggerty's article demonstrates the importance of using a longitudinal approach to test longitudinal assumptions.

ii) The Canadian Evidence

Evidence for Canada is less conclusive. Murdie (1969) found that over time the distance gradient best described the distribution of familism while socio-economic status was followed essentially a sectoral pattern. However the results from a single city can hardly be considered representative of Canadian cities in general.

Clarke (1966) also discussing residential differentiation in Toronto shows similar results to those of Murdie. According to Clarke there are two types of suburbanites, the home oriented and the community oriented. His results suggest that in fact the predominate suburban resident is the home oriented. This home oriented, group (comparable to the familism construct) where individuals who, due to the particular stage in life required, or felt they required a home.

Clark stresses the point that it was this home orientation and not centrifugal factors which initiated the move from the city to the suburbs. It was the individuals in the second category that best represented the Burgess hypothesis. Generally the community oriented group were previous home owners who moved only if that move held the promise of an increase in their social and residential status. However, this group was a minority in suburbia. Therefore, at least for Toronto, suburbia was the home of the family oriented.

Schwirian and Matre (1974) in an analysis of eleven Canadian cities have also found discrepant findings. They hypothesized that socio-economic status would be distributed by sectors, familism by zones with ethnicity following no significant pattern. Although the results generally confirm the hypothesis significant variations existed. For Ottawa equal amounts of the status factor are distributed by sector

and zones, while for Edmonton, Winnipeg and Windsor status is exclusively distributed by zones. Thus, although the results from these factorial studies provide alternative explanation for the effects of the distance gradient, the evidence is by no means conclusive.

Using a similar methodology to that of Schnore,, Guest (1969) carried out an analysis of 37 Canadian urban areas. He hypothesized that the patterns of residential differentiation in Canadian cities would be similar to the distance gradient found for American cities. His rationale behind this was that since Canada resembles the United States in terms of timing and level of urbanization, it seems logical to assume a similarity in residential differentiation (Schnore & Petersen 1959). Although the largest and oldest cities do exhibit an over representation of higher status groups in the urban fringe the final results are not as conclusive as those found by Schnore for American cities. Guest's results generally confirm the assumption that the highest income groups tend to become over represented in the suburbs over time. In a more detailed analysis of four cities Guest found a lack of clear patterns of over representation by zones in contrast to the patterns found on the basis of city-suburban comparison. He adds that "This result thus suggests that city-suburban comparison may capture only very gross changes, and that significant variation in change exists within central cities and suburbs"

(Guest 1969:276).

Similarly, Latif and Lutfiyya (1971) have also found discrepancies in their application of the 'North American Model' to five western Canadian metropolitan areas. They found that for Vancouver and Victoria the distance gradient was not supported, that instead, the highest status groups were the most centralized. However, the remaining cities in the sample confirmed the existence of the North American Model, at least for this part of Canada. Although evidence confirms the existence of the distance gradient alternative explanations for residential differentiation and status location have also been advanced.

THE RESEARCH PROBLEM

A review of the cross-sectional and longitudinal analyses of residential differentiation in cities has uncovered three major shortcomings in the literature.

The first problem deals with the lack of longitudinal research into the patterns of residential redistribution over time. Past efforts to provide support or refute the distance gradient concept have been mainly cross sectional in nature. Since this concept is derived from a model dealing with process and change previous cross sectional analyses must be interpreted with caution. Haggerty's analysis has demonstrated the problem of cross-sectional inferences to

what is essentially a longitudinal question.

Secondly, though this problem is especially relevant to research in Canadian urban development and residential change. With the exception of Guest (1969), research into Canadian cities has been either cross-sectional or limited to the analysis of a single city (Schwirian and Matre, 1974; Murdie, 1969; Clarke, 1966; Latif and Lutfiyya, 1971). The most comprehensive study of the changing residential distribution has been that of Guest (1969), who calculated the changing city-suburban status over representation for 15 Canadian cities. He calculated representation ratios for education and income groups in both cities and suburbs. His measure of change was the difference between the 1951 and 1961 ratios of over representation in the central city for a given status group. He concluded that the higher status groups were indeed shifting into the suburbs. However in a more detailed analysis using mile distance zones Guest found that a city-suburban comparison obscures variations which exist in these two areas, a finding supported by Smith (1970) who suggested that the urban area was a city-suburb-fringe mosaic. Thus, the third problem is related to the units of analysis used in the various analytical procedures. A simple city-suburban comparison may not reflect the more intricate patterns of intra-city residential structure, which possibly exist in urban centers.

What is called for then is a longitudinal analysis of Canadian cities using more than just a city-suburban differentiation. Haggerty (1971) has employed a different strategy which considers distance from the center of the city as a continuous variable, and attempts to examine the shifts in neighborhood characteristics over time. His application of Markov chain analysis to changes in socioeconomic characteristics of census tract populations in eight large United States cities over a 30-year period has provided a powerful approach to the solution of this problem, and one to which the present analysis subscribes:

The trend in change over time in S.E.S. (socio-economic status) can be analysed by using a stochastic process called a Markov Chain (Kemeny and Snell, 1960). After dividing each city to be analysed into three concentric zones, longitudinal observations were made for each tract in each zone using data for 1940, 1950, 1960. A matrix of transition probabilities was calculated separately for each zone in each city. If a given tract is characterized by a median education below that of the city, then it is in State 2. The matrix of transition probabilities then gives the probability of going from one state to another or remaining in the same state over a period of one decade (Haggerty 1971:1088).

In this proposed research, the Markov Chain Model will be applied to examine the relationship between socioeconomic characteristics of census tract populations and distance from the center of the city over a twenty year period.

Based on existing ecological theories and limited empirical findings for Canadian cities, the following

hypotheses will be tested:

1) Over time a direct relationship will emerge between socioeconomic status and distance from the center of the city for those metropolitan areas not yet manifesting this relationship.

2) For those metropolitan areas in which a direct relationship between socioeconomic status and distance from the center of the city already exists, this relationship will continue over time; or there will be a greater solidification of this relationship over time with a continuing decrease in socioeconomic status for the inner zones and a continuing increase in socioeconomic status for the outer zones.

If it appears as if these hypotheses are not true, then an attempt will be made to assess the nature of the changes which have occurred over time.

CHAPTER TWO

ANALYTICAL PROCEDURE

In chapter one the need is established for carrying out research on the development of residential differentiation in Canadian metropolitan areas over time. It is also mentioned that this particular line of research has received relatively little attention in Canada. The existing Canadian literature has serious limitations in its attempt at establishing the applicability of the North American model to Canadian cities. The review of the literature in chapter one establishes some of the major shortcomings in this area of research. First, there is a lack of longitudinal analysis dealing with residential differentiation; secondly, much of the pre-existing literature is based on the study of only a few Canadian cities (Murdie 1969; Clarke 1966); and finally, research testing the applicability of the North American model are based on a simple cross-sectional comparison of various socio-economic status indicators, a method which may not reflect the more intricate patterns of residential differentiation in urban areas (Guest 1969; Smith 1970). Therefore this chapter addresses itself to these shortcomings. In doing so, an attempt will be made to utilize two methods of analysis that, it is hoped, will establish the applicability of the North American model to urban Canada.

The first method employed is an analytical procedure adopted by Schnore and his collaborators, which involves carrying out a simple city-suburban comparison between various social status indicators. By using an index of over-representation the relative position of these various status groups can be determined. Our hypothesis will be supported to the extent the city is over-represented by lower status groups, while the suburbs are over-represented by higher status groups. Using the same units of analysis, an assessment of the trends in over-representation over time will be made using an index of disproportionate change (Schnore and Pinkerton 1966). Again, this analysis will support our hypothesis to the extent that over time the suburbs will become dominated by the urban elite while the city becomes the domain of the lower status groups.

The second method is specifically directed toward a longitudinal analysis of neighbourhood changes over time. By using three zones we hope to uncover any pattern of residential differentiation which may not be apparent through a simple inner-outer comparison, one of the problems mentioned above. Using a stochastic technique as described by the Markov chain analysis, the trend in residential differentiation for each zone will be calculated. Thus, our hypothesis will be supported to the extent that over time the inner zones exhibit a lowering socioeconomic status while the outer zones exhibit an increase in socio-

economic status.

I. Source of the Data

The data will be obtained from various census bulletins dealing with the population characteristics of the twelve metropolitan areas. There are two reasons behind our choice of these twelve metropolitan areas as the sample base. The first, and probably most important reason lies in the fact that socioeconomic data relevant to this analysis is unavailable for any other urban centers besides the metropolitan area. This information has only been available since 1951, thus, only those twelve metropolitan areas fulfilling the criteria set by the Dominion Bureau of Statistics (from now on to be called Statistics Canada) defined as a metropolitan area are included in the analysis.

The second reason behind the choice of 1951 as a starting point rests in the fact that previous analysis of urbanization in Canada suggests that the phenomenon of decentralization reached a peak in the 1950's (Stone 1967). The data indicate that the 1950's decade witnessed the greatest difference in growth rates in favour of the suburban areas, leading one to speculate that this was indeed a suburban explosion.

The metropolitan area is defined by Statistics Canada as "groups of urban communities in Canada, which are in close economic, geographic and social relationships"

(1961 Census, D.B.S. 92-540 pxi). Therefore, the metropolitan organization is basically a system of economic relations among urban centers. According to Stone, "these centers comprise a metropolitan region, at whose node is the largest urban center - the metropolis. Within the maximum feasible distance of daily commutation to the metropolis lies its metropolitan area. The metropolitan area consists primarily of closely related centers of population concentration" (Stone 1967:231).

Information gathered for the city-suburban comparison is obtained from those census bulletins also using the above mentioned component parts of the metropolitan area.

Data for the stochastic analysis is obtained from the various census tract bulletins published in 1951, 1961 and 1971. According to Statistics Canada's definition, census tracts are "small permanent census statistical areas established in larger urban communities with the help of a local committee". Census tracts are delineated by Statistics Canada according to the following criteria: "(i) a population between 2,500 and 8,000 except for tracts in the central business district or institutional tracts which may have a lower population; (ii) an area that is as homogeneous as possible in terms of economic status and social living conditions; (iii) boundaries that follow permanent and easily recognized lines on the ground; (iv) as much as possible, a compact shape."

This data source was chosen because of its use in

comparable analysis and the availability of information based on this unit, (Haggerty, 1971).

II. Data Preparation

i) Units of Analysis

The present study involves two methods for delineating the units of analysis. Each method is related to one of the analytical procedures outlined below. The city-suburban comparison rests on a dichotomous spatial delineation while the markov chain analysis is related to a three zonal delineation. Regardless of the number of zones chosen for the two analytical procedures, both methods are alternative means of operationalizing the distance gradient concept.

While various methods have been adopted to test the distance gradient concept, zones have been the most popular. However, there is great diversity in the use of zones itself. Burgess (1924) the original proponent of the North American model suggested that each zone was comprised of a homogeneous population, characterized by a similar social status and life-style. More recently researchers have been more concerned with the distance gradient concept than zonal homogeneity since it was suggested the two concepts were incompatible (Alihan 1938).

For example, Hoover and Vernon (1962) studied the residential differentiation of New York by dividing the city

into a core area, inner and outer suburbs. Both Murdie (1969) and Smith (1970) have also used this basic spatial delineation. Schnore and his collaborators have adopted an even simpler areal delineation by using a simple city-suburban comparison, a methodology adopted by this thesis as well (Schnore 1963, 1964, 1965, 1972; Guest 1969). Thus, the reason for adopting a city suburban unit of analysis rests in its simplicity and previous use in testing the distance gradient, as well as, the availability of socioeconomic data based on these spatial components. The census provides information on population characteristics for the central city or city proper and the urban fringe (here referred to as suburbs). The city proper is usually the most populated municipality within the metropolitan area, although it may not necessarily be the focal point for all functions or the historical center of development. The fringe consists of the remainder of the metropolitan area outside the city proper and may consist of both urban and rural parts which may cut across municipalities. Also included in the fringe are towns, villages, municipalities, townships, local improvement districts, parishes and boroughs.

In an effort to go beyond a simple inside, outside comparison the second method employed divides each city into three zones. To test the hypothesis, ideally distance should be treated as a continuous variable from the city center to the outskirts of the metropolitan area. To

accomplish this end as many zones as possible should be used. Since the primary source of socioeconomic data are census tracts the number of zones possible for testing the distance gradient, is related to the number of tracts available for the purpose of analysis.

This point is related to the criteria established for the selection of census tracts for each zone, (Haggerty 1971). Haggerty suggests that "(1) all tracts in a particular zone are about the same distance from the center of the city, (2) each zone contains around twenty tracts so as to avoid the problems of percentaging on too small a base and (3) all cities analysed have the same number of zones for the purpose of comparability" (Haggerty 1971:1088). Following these guidelines only three zones could be established for many metropolitan areas, due to the small number of census tracts established in these areas in 1951. Although a number of cities did not meet the basic requirement of sixty tracts for three zones, as many as possible were included in the sample.⁽¹⁾

Various methods have been employed to determine zonal boundaries. The most popular method in applying the concentric zone scheme has been to mark off arbitrary

(1) Five metropolitan areas were dropped from the analysis due to the small number of tracts drawn up by the Dominion Bureau of Statistics in 1951. These metropolitan areas are, Calgary, Edmonton, Halifax, Saint Johns and Victoria.

distances from the city center that yield regular concentric circles, usually at a one mile distance from each other (Guest 1969; Murdie 1969).

Schwirian 1974 suggests that:

"In using these arbitrary delineations ecologists have been all too eager to assume that their arbitrary urban geometrics are adequate operationalizations of the classic schemes. There is danger in such a practice. In a 1940 paper James Quinn pointed out that a crucial test of the basic models can be made only if ecological and not arbitrary spatial delineations are followed. Thus in laying off distance gradients within a city a time-cost function should be employed rather than a set mileage factor" (Schwirian 1974:25).

In testing the problem of linear versus time cost distance in the establishment of zonal boundaries, Schwirian found that both methods of spatial delineation provided essentially the same results. Thus, one would expect the results derived from an arbitrary technique of zonal delineation to provide a fairly accurate representation of the urban residential structure.

The establishment of zonal boundaries in this analysis was arbitrary. This method of delineation deviates slightly from traditional techniques. Instead of using mile distance zones (a commonly used method), natural boundaries such as streets, rivers or railway tracks were used. This particular method of establishing zonal boundaries avoids the subdivision of various census tracts into different parts. This would be unavoidable using a method such as establishing

mile distance boundaries. Moreover, the splitting of census tracts would lead to their elimination from the analysis which could pose a serious problem in those cities selected for the analysis which already had below sixty tracts.

The first two zones nearest the city center will remain the same size over the three census periods for the purpose of longitudinal comparison. The third zone will remain malleable to reflect the growth of the metropolitan area, which, in most cases has been in the urban fringe.

Finally, changes in the boundaries of tracts between census pose a particular serious problem for comparative analysis. Subdivisions of existing tracts which are made necessary by population increases often result in boundary changes. Since the Markov chain analysis rests on the results from longitudinal observations of census tracts boundary changes could affect these results. Thus, one would be unsure whether the results were actually due to socioeconomic changes in the tract itself, but rather an artifact of the boundary change. To alleviate this problem the median observation was calculated for those subdivided census tracts which fell within the boundaries of the original census tract. Despite problems of comparability and the elimination of uncomparable census tracts in most cases, over 90 percent of the total number of tracts were suitable for the analysis.

2. The Selection of Variables Employed in the Present Study

The traditional socioeconomic variables were selected as our status indicators, namely, education, income and occupation. In operationalizing the variables, we have considered both availability of relevant data, as well as their comparability over time taking into consideration the requirements imposed upon us by the various analytical procedures employed. Thus, the different categories delineated below reflect the differences between the cross-sectional analysis based on a city-suburban comparison and the Markov chain analysis. The variables are operationalized as follows:

i) Educational Status:

The indicator for the educational variable is the highest grade attained by the population five years of age and over not attending school. For the cross-sectional analysis this variable is divided into three categories, grade school (Grades 1 - 8), high school (Grades 9 - 13), and college (one or more years of college education). The Markov chain analysis will involve determining the percentage of the college educated class in each selected census tract compared to the metropolitan area percentage for the same group.⁽²⁾

(2) Two problems were encountered using this variable. In 1951 the group designated as college educated also included the grade thirteen educational category. No precise match with the 1961 group "attending University"

ii). Income Status

The income variable is defined by the income of the family head. This refers to the wages and salaries received by the head of the family, either male or female, in the twelve months prior to the enumeration. For the cross-sectional analysis this variable was broken into a number of income categories, the number depending on the census year. For this type of analysis the number of categories was not as important as the patterns of over-representation. The expected pattern would be supported to the extent that the highest income groups are over-represented in the suburbs. Average income of family head for each census tract was employed for the purpose of carrying out the stochastic analysis.

Again, the average for each tract was compared to the metropolitan average to determine whether it fell above or below this measure.

The only discrepancy in definition using this variable was encountered in 1951. Instead of providing the average income of the family head, median income of the

(2) Cont.--can be made with the 1951 data. Most, but not all members of the 1951 group used by way of comparison would have attended university. The second problem lies in the availability of relevant data for 1971. For this particular census year the census tract information does not distinguish between those attending and those not attending school. Accordingly, changes in spatial distribution for this socioeconomic class may be artifacts of the changing definition in 1971, forcing its elimination from the analysis.

head was calculated. Regardless, income was still the most sensitive socioeconomic indicator.

iii). Occupational Status

The occupational variable is defined by the males in the labour force who are engaged in white collar occupations. The census states that "persons in the labour force who had a job during the week prior to enumeration were asked to state the kind of work in which they were engaged in that period." (Census Tract Bulletin, 1961). Persons holding more than one job reported the occupation in which they worked the most hours. Generally occupational divisions are characterized by the type of processes involved in the job. In determining the census divisions to be included in white collar occupations, we attempted to follow as closely as possible the divisions used by Schnore in his analysis (1972). (See Appendix.)

The results of both the city suburban comparison and the stochastic analysis depend to a large extent on the reliability of census data published by Statistics Canada. It is generally recognized that at the census tract level, some errors in the raw data are inevitable. The severity of such errors varies across the urban area depending on several characteristics such as the nature of the variables being measured, the biases and errors of both the enumerator and the respondent, and the sample size.

III. Methods of Analysis

1. A City-suburban Comparison

i). The index of over-representation

For the cross-sectional analysis an index of over-representation will be used following the methodology of Guest 1969. "The measure of over-representation is the ratio of the percentage of the central city residents in the given group to the percentage of metropolitan area residents in that group" (Guest 1969:272). The resulting values will deviate around 100 with values greater than 100 signifying over-representation in the central city and values below 100 signifying an over-representation in the suburbs.

ii). The index of disproportionate change

An analysis of the changing residential differentiation between the city and the suburb will accompany the cross-sectional analysis. This analysis involves taking the differences between the city and the suburban proportions in each socioeconomic class for two successive census years. The results from the initial year are then subtracted from the results of the next successive year with a minus value indicating a decrease and a positive value indicating an increase of a particular status group in the suburbs.

2.) An Application of a Stochastic Model

Since Guest (1969) and Haggerty (1971) indicated that city-suburban comparisons did not reveal the more

detailed patterns of changing population differentiation over time, the analysis of Chapter Two will be compared to the Markov chain analysis of Chapter Four. This more sophisticated form of analysis will indicate the trends in population differentiation over time for various census tracts in three designated concentric zones.

Following the zonal delineation longitudinal observations are made for each tract in each zone for 1951, 1961, and 1971. The median income for family heads the percentage of the population who have one or more years of education or the percentage white collar occupation in each census tract will be compared to the same measure for the entire metropolitan area. Census tracts which are below the metropolitan average are said to be in state two while those which are above are said to be in state one. "The matrix of transition probability gives the probability of going from one state to another or remaining in the same state over a period of one decade" (Haggerty, 1971:1088).

Table 1 indicates an example of the transition probability matrix P , for zone I of Winnipeg.

Thus, in considering the dynamic aspects of neighborhood change over time, a matrix of transition probabilities (P_{ij}) which reflects the transition or change from a state "i" to a state "j" in a given time interval will be employed. The transition probabilities (P) are to be derived from a row data matrix (D) which is subsequently scaled by dividing each element (D_{ij}) by its row sum ($\sum_j D_{ij}$). Such

scaling produces maximum likelihood estimates of the P_{ij} , where i and j are either locations or locationally relevant classes (Kemeny and Snell, 1960). The matrix of transition probabilities gives the probability of changes from one state to another over a period of a decade. Our hypothesis will be supported to the extent zones near the city center exhibit a trend in lower status while the zones farther from the city center exhibit an increase in status over time. There are three mechanisms implicit in this model concerning census tract changes: 1) change may be due to vertical social mobility of its residents, 2) change may be due to higher status people moving in, and 3) change may be due to lower status people moving out. Therefore the transition matrix P , indicates the trend in socioeconomic status shifts in the census tracts which are affected by this aggregate of causal variables.

The equilibrium vector of the transition matrix indicates the degree and the direction of change over a long period of time for this aggregate of causal variables. This equilibrium distribution gives the proportion of above average tracts or below average tracts, calculated by subtraction, for each zone if the Markov process were to continue into the future. If we were to take successive powers of P by multiplying the matrix with itself, then every row of P will come closer to the vector of the matrix, or in other words will converge on an equilibrium distribution.

Thus, this vector is a convenient measure of the changing socioeconomic distribution for each zone were it to continue into the future following present trends captured by the transition matrix.

However, in calculating the equilibrium distribution two assumptions must be made when applying the Markov chain to change over time. First, the Markov process assumes that the matrix remains constant over time, and second, the probability of reaching the equilibrium is dependent only on the starting state of the matrix at $t-1$ (Kemeny and Snell 1960). Therefore, the transition matrix for each zone will be provided to indicate the socioeconomic shifts for the tracts in each zone as well as the equilibrium vector which will indicate the final outcome of these shifts if the Markov process were to continue into the future.

CHAPTER THREE

A City Suburban Examination of Residential Differentiation in Canadian Metropolitan Areas 1951-1971

I. The Development of Canadian Metropolitan Areas and its Implications for Residential Differentiation:

The following section provides a brief account of metropolitan development in Canada. Since this thesis is primarily concerned with the changing residential differentiation of the urban population, then the twentieth century phenomenon of metropolitan development must be considered, in light of its implications on the changing residential differentiation. It would seem appropriate, then, to consider the timing and trends of population deconcentration, the factor facilitating this deconcentration, and finally the possible impact this phenomenon may have on residential differentiation.

According to most demographers, urban development follows a specific pattern. Generally, increasing urbanization is associated with increasing concentration of the population, within a limited physical space. However, size and density alone do not necessarily imply urbanization since there have been concentrations of population in the past which can hardly be described as urban. Schnore and Petersen

(1959:61) suggest that, "concentrations of people can properly be called urban only if the residents spend most of their time in activities that are not directly connected with food production".

Thus the emergence of the industrial city stemmed partly from increasing industrialization and economic expansion, as well as, the increasing efficiency of agriculture (Schnore and Hauser 1965). Innovations in agriculture released hundreds of people from rural life, many of whom migrated to urban centres in search of economic opportunities. Steam, the major power source of the 19th and early 20th century created a centripetal force for both industry and population since it must be used close to where it is produced. Consequently, the population without the benefits of modern means of transportation found it necessary to remain near their place of employment. This increasing scale of industrialization and the necessity of remaining close to the place of employment helped create an increase in population density as well as total numbers.

Moreover, the twentieth century saw the development of a new form of urban agglomeration, the metropolis. The modernization of industrial technology; the development of new forms of energy; transportation, and, communication, generated a centrifugal force leading to population deconcentration. The introduction of electricity and the automobile freed both industry and population, allowing them to move to

the more attractive outlying areas which provided more space than the already crowded urban core. Therefore, the rise of the metropolitan area is associated with a different pattern of growth and development. Whereas urban growth is associated with the concentration of the population into a limited area, metropolitan development can best be associated with the deconcentration of that population. In this context it can be said that cities grew and developed in two phases, the first characterized by higher growth rates for the central city over its hinterland and the second characterized by higher growth rates for the hinterland over the central city.

Peripheral growth alone is not, however, an adequate explanation for metropolitan development since the periphery is the logical area of growth in any urban center, due to the greater availability of space for new residential development. A more important feature of the growth of the periphery is the change in the relationship between it and the central city. As Schnore and Petersen (1959) suggest, the areal parts take up rather narrowly specialized functions, and they become tied together in what has been called a 'territorial division of labour'. The central city need no longer remain the home of the vast majority of the urban population. Instead the metropolitan area experiences a rise in suburbs, or what has popularly been termed "dormitory towns" and "bedroom cities", an example of this territorial division of labor based on specialization (Schnore 1965; Schnore and Hauser 1965; Schnore and Petersen 1959; and Stone 1967).

In summary, the metropolitan area is characterized by two changes in structure over previous urban forms. The general increase in urban space generated by the deconcentration of the population is perhaps the most pervasive feature of today's metropolitan area. Second and equally as important is the increasing specialization in function of the various parts comprising the metropolitan area. Together they form what is considered a distinctly twentieth century phenomenon.

The following section provides a brief summary of the timing and major demographic factors related to metropolitan development in Canada. An important issue in the study of metropolitan development is the determination of those factors which are said to contribute to the differential growth rate of the two component parts of the metropolitan area. The available data suggest that this decentralization was the direct result of net migration.

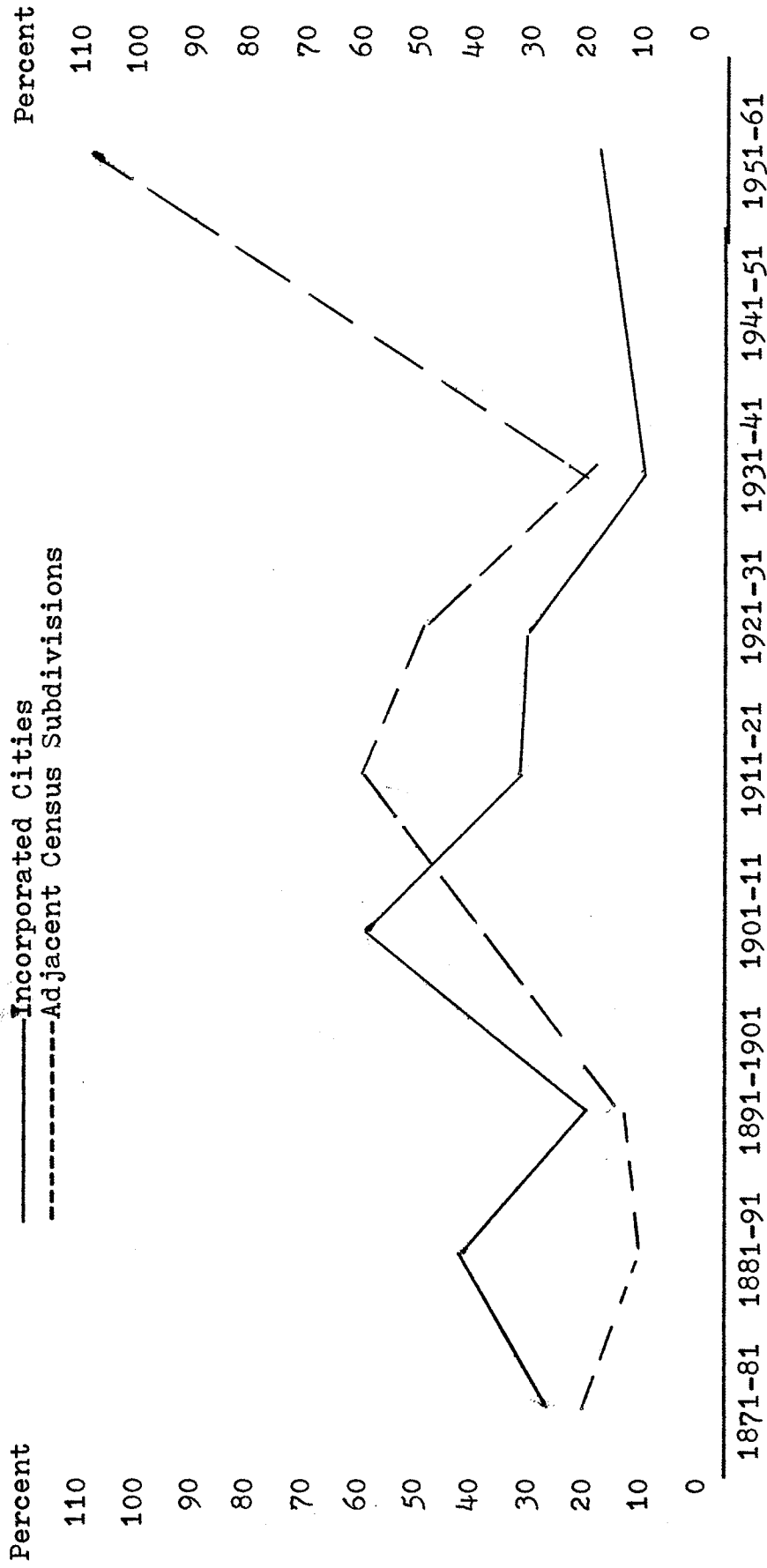
Any historical account of metropolitan development tends to emphasize the changing internal organization of these areas, taking into consideration the economic linkages between the central city and its surrounding hinterland. Due to the lack of such data, however, we must rely entirely upon published demographic data which deal with population distribution of over urban space.

Table 2 provides an account of differential population growth between the central city and its hinterland based on aggregate data for incorporated cities of 30,000 and over from

Table 2

PERCENTAGE CHANGE IN POPULATION FOR INCORPORATED CITIES OF 30,000
AND OVER AND FOR THEIR ADJACENT CENSUS SUBDIVISION, CANADA,
1871-81 TO 1951-61

(City Size Determined At The Beginning of Each Decade)



1871 to 1961. The data indicate that up till 1921 the central cities grew at a higher rate than their hinterland. After the 1911-21 decade all indications are that the peripheries of the largest urban areas had higher growth rates than their centers. Stone (1967) and Schnore and Petersen (1959) suggest that metropolitan development did not begin until the 1911-21 decade, although there were individual cities whose hinterland had higher growth rates than their centers before this period. The data also indicate that since the 1931-41 decade growth in the hinterland has remained higher than in the central city and that, in fact, it has successively grown larger each decade since this period from a differential rate that was less than "25 percentage points up and including 1931-41, jumping to 48 percentage points in 1941-51 and reaching 86 percentage points in 1951-61" (Stone 1967:135). Therefore, in Canada the emergence of metropolitan development seems to have occurred somewhere between 1921-1951.

1 The analysis by Stone used throughout this section are based on special computer runs made by Statistics Canada. For this a comparable analysis for 1971 is not available.

While comparable data for 1971 is lacking there are indications from other sources which suggest that metropolitan peripheral growth has continued to exceed central city growth (Perspective Canada 1975:10). In fact all twelve metropolitan areas in our sample, with the exception of Calgary experienced a continuing higher differential growth rate for the suburbs over the central city.

For Canada, these differential growth rates in favor of the periphery are said to be due to increasing industrialization; a declining rural population, and a explosion in urban building in the outlying areas for most cities (Stone 1967).

Table 3 discloses the trends in differential growth rates for the 1951-61 decade. Although all indications are that metropolitan development occurred before 1951, the data suggest that the 1950's was the decade of the greatest amount of population growth for the peripheral areas since its onset in the 1911-21 decade. In the 1950's the lowest growth rate for central cities was 24 percent with the growth rate for the urbanizing being somewhere around a decennial rate of 111 percent (Stone 1967). Thus we can safely say that the Canadian 'suburban explosion' was well underway and probably at its peak in the 1950's.

Caution must be exercised however, in the interpretation of the differential growth rates between the city and its periphery. Stone (1967:134) suggest that there are three possible distorting factors in the above phenomenon:

- "1. There is the theoretical objection that the observed rates of population growth for the hinterland are influenced by the normally higher natural increase rates shown in the hinterland, than in the central city.
2. The central city is not a fixed geographical area, and its recurrent boundary changes may distort the observed central city - hinterland

Table 3

Percentage Change in Population For the Central Cities and Remaining Parts of the 1961 Census M.A. Canada 1951-61

Census Metropolitan Area	Percentage Changes in Population				Percentage of 1961 M A Population		
	MA	Central City	Other Center of 10,000+	Remainder of MA	MA	Central City	Other Center of 10,000+ Remainder of MA
Allmas	44.8	23.8	57.0	110.7	100	61.9	5.8 32.3
Atlantic	31.9	11.7	78.6	70.6	100	57.1	16.4 26.5
St. John's ..	32.4	20.4	---	72.3	100	70.0	--- 30.0
Halifax	37.3	8.1	101.1	78.0	100	50.3	25.5 24.2
Saint John ..	22.0	8.6	29.5	57.5	100	57.7	14.5 27.8
Quebec	41.1	27.9	53.6	117.7	100	75.0	3.8 21.6
Montreal	43.3	30.9	71.9	141.9	100	79.6	3.1 17.3
Quebec	29.4	4.9	24.1	76.3	100	48.1	8.2 43.7
Ontario:.....	45.8	15.5	54.5	116.3	100	53.4	4.4 42.2
Hamilton	41.0	21.8	148.5	103.7	100	69.3	11.9 18.8
Kitchener ...	44.1	53.5	31.2	31.0	100	61.9	18.0 20.1
London	40.6	40.9	---	35.9	100	93.5	--- 6.5
Ottawa	46.9	34.2	---	150.6	100	81.4	--- 18.6
Sudbury	49.9	40.8	---	80.7	100	72.4	--- 27.6
Toronto	50.7	-0.5	30.7	125.0	100	36.8	3.9 59.3
Windsor.....	18.2	-4.7	---	81.3	100	59.2	--- 40.8
Prairies:.....	61.6	50.2	---	133.0	100	12.9	10.9 16.2
Winnipeg.....	33.4	12.6	70.4	78.6	100	55.8	25.0 19.2
Calgary.....	96.1	87.0	---	233.5	100	89.5	--- 10.5
Edmonton.....	91.0	74.9	---	251.4	100	83.2	--- 16.8
British Columbia:...	39.9	10.9	29.3	90.7	100	46.5	6.1 47.4
Vancouver.....	40.6	11.5	29.3	101.6	100	48.7	7.2 44.1
Victoria.....	36.2	7.0	---	60.3	100	35.6	--- 64.4

Adapted From: L. Stone, Urban Development in Canada, Dominion Bureau of Statistics, 1967 pp. 157.

differentials in population growth.

3. The boundaries of the hinterland area must be delineated somewhat arbitrarily. In using the census data for example, one is confined largely to information from municipalities or census subdivisions (incorporated cities, towns, villages and rural municipalities) which are essentially administrative units."

Although the second and third factors are difficult to control for, the the differential impact of natural increase versus net migration can be calculated. Again, the results must be interpreted with caution.

Table 4 shows that in the 1950's net migration was by far the most important factor in urban fringe population increase. Data for this period generally indicate that "the central cities sustained a net migration loss which was one percent of their 1951 population, while the remaining parts of the metropolitan area had a net migration gain which was 69 percent of their 1951 population" in terms of individual cases. Six of the 15 incorporated central cities sustained net migration losses over the 1951-61 decade. The central cities of the Calgary and Edmonton MA's each sustained high net migration ratios of over 20 percent and Ottawa had a ratio of 15 percent. For each MA, the proportion outside of the central city had a crude 1951-61 net migration ratio of over 25 percent. This means that through net migration alone, each

Table 4

Estimated Net Intercensal Migration and Natural Increase Ratios
For The Central Cities and Remaining Parts of The
1961 Census Metropolitan Areas, Canada 1951-61

Metropolitan Area	Central City				Remainder of M A	
	1951 Population (,000)	1951-61 Natural Increase Ratio	1951-61 Net Migration Ratio	1951 Population (,000)	1951-61 Natural Increase Ratio	1951-61 Net Migration Ratio
Allmas	3,610	17.2	- 1.2	1653	28.0	69.0
Atlantic	189	21.6	- 9.9	90	29.2	44.8
St. John's	53	27.2	- 6.9	14	36.7	39.1
Halifax	86	20.0	-11.9	48	32.7	56.4
Saint John	51	18.3	- 9.7	28	19.2	27.5
Quebec	1,186	18.0	- 3.0	485	26.7	58.6
Montreal	1,022	18.2	- 1.6	374	26.7	64.3
Quebec	164	16.6	-11.8	111	26.5	39.4
Ontario	1,313	14.3	- 6.1	661	31.0	78.4
Hamilton	220	18.3	- 0.6	53	35.4	95.1
London	96	15.4	- 6.3	33	29.9	102.4
Ottawa	202	17.7	15.0	90	34.7	43.9
Toronto	676	11.7	-12.2	442	29.5	34.7
Windsor	120	15.0	-19.8	44	34.1	47.2
Prairies	526	26.4	16.7	143	29.7	97.6
Winnipeg	236	14.7	- 2.1	118	23.2	51.3
Calgary	130	33.2	33.0	11	50.4	427.7
Edmonton	160	38.2	33.1	14	69.1	240.4
British Columbia	396	9.9	1.0	274	21.6	57.9
Vancouver	345	10.2	1.3	217	23.8	63.0
Victoria	51	7.4	0.4	57	13.4	38.2

Adapted From: L. Stone, Urban Development in Canada, Dominion Bureau of Statistics
1967 pp. 59.

of these 'non-central city' parts would have grown by one fourth over the 1959-61 decade. The crude net migration ratio exceeded 50 percent in the 'non-central city parts' of nine of the 15 MA's; in Hamilton, Calgary, Edmonton and London it exceeded 90 percent (Stone 1967:160).

In summary Canadian metropolitan areas experienced a great deal of change in residential structure in the 1950's. This change was dominated by an increasing population in the suburbs of all major metropolis. It is also noted that the growth of the urban fringe was in all likelihood the result of the outward movement of the population from the central city.

The North American model outlined in Chapter One hypothesized that this 'radial extension' of the population was dominated by higher socioeconomic groups fleeing the deteriorating environment of the urban core. The remainder of this chapter attempts to describe the changing residential structure of the major metropolitan areas in Canada in an effort to determine the validity of the North American model as a heuristic device in describing the changing patterns of residential differentiation of Canadian metropolitan areas.

II. A City-Suburban Comparison For Three Consecutive Census Years 1951, 1961 and 1971

The following section provides a cross sectional examination of city-suburban residential differentiation for three selected status indicators, income, education, and occupation for three consecutive census periods, 1951 through 1971. The objective here is to determine whether in fact the proportion of higher socioeconomic status groups have been increasing in the fringe area or decreasing in the city, over time.

To achieve this objective two techniques of analysis have been employed as described in Chapter Two: A) An index of over underrepresentation for the central city to determine the relative dominance of these various status groups in this area for the periods 1951, 1961 and 1971 respectively, and B) an index of disproportionate change which determines the relative increase or decrease in the urban fringe for these status groups over a ten year period; in this case 1951-1961 and 1961-to 1971.

It may be recalled that the index of overrepresentation yields values which range around a hypothetical 100. A value of 100 represents an equal distribution of a status group between the city and the suburbs while values over 100 indicate an overrepresentation in the central city and values below 100 indicate an overrepresentation in the suburbs for a particular status group.

2

The results of this analysis will be interpreted following five general patterns of socioeconomic distribution employed by Schnore and Guest. The low-pattern is characterized by an overrepresentation of the lowest status groups in the city with a corresponding underrepresentation of high status groups for the same area while the high pattern represents the reversal of this form of distribution. In this case the highest status groups are overrepresented in the city and the lowest status groups are underrepresented for this same area. The high-low and intermediate patterns represent variations from the high and low pattern. The intermediate pattern is characterized by an underrepresentation of the lowest and highest status groups in the city with an overrepresentation of the intermediate status groups, while the high-low pattern represents an overrepresentation of the lowest and highest status groups in the central city with a corresponding underrepresentation of the intermediate status groups in the same area. Finally an erratic pattern frequently describes the residential differentiation of cities. This pattern is characterized by an erratic fluctuation of status groups when they are arrayed from high to low.

Tables 5 through 9 show the results of the index of overrepresentation for education, income and occupation.

1. Residential Differentiation by Educational Status
1951 - 1971

Table 5 summarized the results of the index of overrepresentation for the educational groups in twelve

Table 5

Central City Over or Underrepresentation of Educational

Groups in Metropolitan Areas 1951-71

	1951		1961		1971		The Emerging Patterns of Overrepresentation	
	Elemen- tary	High College	Elemen- tary	High College	Elemen- tary	High College	1951* 1961	1971
Calgary	97	101 103	95	101 107	---	---	H	---
Edmonton	96	101 104	98	100 103	99	100	H	H
Halifax	99	99 101	102	97 104	100	95	H	H-L
Montreal	99	101 101	106	95 86	112	91	H	L
Ottawa	83	109 107	85	107 117	116	96	H	L
Quebec	94	106 110	100	100 92	106	98	H	L
Saint John	97	103 94	102	99 85	102	99	I	L
Toronto	107	96 91	122	94 91	122	94	L	H-L
Vancouver	97	100 106	103	97 104	109	93	H	H-L
Victoria	107	96 94	122	95 80	119	95	L	L
Windsor	99	100 100	100	94 92	100	97	H	H-L
Winnipeg	100	98 105	106	96 100	115	92	H-L	H-L

SOURCE: * Dominion Bureau of Statistics, 1951 Census of Canada, Volume 3, Table 130;
 Dominion Bureau of Statistics, 1961 Census of Canada, Bulletin 92-550;
 Statistics Canada, 1971 Census of Canada, Bulletin 92-746.

metropolitan areas. For 1951, patterns of differentiation tend to demonstrate a reversal of the expected pattern. The expected pattern refers to the previously mentioned low distribution which is characterized by an overrepresentation of higher status groups in the suburbs with a corresponding overrepresentation of lower status in the suburbs. Thus, around two-thirds of the sample exhibit the high pattern, while only two cities (Toronto, Victoria) support the expected pattern. Of the remaining two cities, Winnipeg has an overrepresentation of the highest and lowest educational class in the central city with the middle income group polarized in the suburbs. Saint John exhibits the reverse of this pattern.

The 1961 data show that the modal pattern of educational differentiation is the low one with almost fifty percent of the cases falling into this category. Of the remaining cities the next highest category describing residential differentiation is the high-low. A closer examination of this category indicates that for those metropolitan areas falling into this pattern there is a tendency for the highest and lowest educational classes to be overrepresented in the central city with a corresponding overrepresentation of the middle income class in the suburbs. Only three metropolitan areas (Calgary, Edmonton and Ottawa) represent a reversal to the expected pattern.

Due to the annexation of the fringe in 1971 for Calgary, the census data does not provide data on a city-fringe basis, thus leading to its elimination from the analysis for this particular census year.

Of the eleven cities analyzed, five conform to the expected pattern. The next most predominant distribution is the high-low one, which again indicates that both the high and low educational groups are situated in the city center with the high school group in the fringe. Although Winnipeg falls into the high-low pattern it generally conforms to the low distribution with the exception of the college educated class. While overrepresented in the suburbs, this class is less predominant in this area than the high school category. Edmonton is the only city which actually falls within the high pattern, although the slight deviation of the three educational classes around the hypothetical 100 suggests an almost equal distribution of all three classes throughout the city.

An examination of the educational data for all three census periods indicates the low, high and high-low patterns of distribution appear most frequently in metropolitan areas. While the status gradient does not appear frequently in 1951 it becomes the modal pattern of differentiation in both 1961 and 1971. This suggests the Burgess pattern is becoming more predominant overtime.

Of the ten cities which were not characterized by the low pattern in 1951 only four experienced the emergence of this pattern by 1971. While this provides some support for the first hypothesis, this support is limited. Two cities represented the low pattern in 1951 with only one maintaining this pattern up to 1971. The small number of metropolitan areas in this category makes an assessment of the second hypothesis difficult.

2. Residential Differentiation by Income Status 1951-1971

Tables 6 through 8 summarize the results of the index of overrepresentation for income groups in 12 metropolitan areas. Only two cities fall within the high pattern in 1951, while the modal pattern of overrepresentation is the high-low one. Nevertheless, a closer examination of this distribution suggests two major trends in residential patterns.

The first trend indicates that while only two metropolitan areas follow the low pattern, three others represent varying degrees of support for this distribution. All three cities are characterized by an underrepresentation of the two highest income groups in the central city with an overrepresentation of the two lowest income groups in the same area.

The second trend is the polarization of the high and low income groups in the central city and medium income

Table 6
Central City Over or Underrepresentation of Family Wage Earner
Heads for Metropolitan Areas 1951

Metropolitan Area	Under 1000	1000 1999	2000 2499	2500 2999	3000 3999	4000 5999	6000 Over	Patterns of Overrepresentation
Calgary	98	98	98	100	103	105	106	HIGH
Edmonton	94	95	99	101	105	106	107	HIGH
Halifax	102	99	97	94	102	114	135	HIGH-LOW
Montreal	105	107	104	99	94	85	72	INTERMEDIATE
Ottawa	98	92	94	96	107	122	122	HIGH-LOW
Quebec	88	99	100	104	103	104	94	INTERMEDIATE
Saint John	104	103	100	98	89	82	65	LOW
Toronto	126	126	113	96	82	72	76	HIGH-LOW
Vancouver	109	106	97	94	99	103	116	HIGH-LOW
Victoria	115	113	105	96	90	76	57	LOW
Windsor	110	107	100	98	101	99	96	ERRATIC
Winnipeg	114	107	98	95	94	98	111	HIGH-LOW

SOURCE: Dominion Bureau of Statistics, 1951 Census of Canada, Volume 1, Table 62.

Table 7

Central City Over or Underrepresentation of Family Wage Earner
Heads for Metropolitan Areas 1961

Metropolitan Area	Under 2000	2000-2999	3000-3999	4000-4999	5000-5999	6000-6999	7000-9999	10000 Over	Patterns of Overrepresentation
Calgary	99	96	95	98	102	107	109	109	HIGH-LOW
Edmonton	133	120	103	90	82	82	86	131	HIGH-LOW
Halifax	123	123	110	99	89	77	65	52	LOW
Montreal	94	90	91	94	98	110	121	130	HIGH-LOW
Ottawa	112	114	107	97	87	83	71	58	INTERMEDIATE
Quebec	117	113	105	94	81	70	60	50	LOW
Saint John	173	166	130	87	60	48	42	61	HIGH-LOW
Toronto	124	125	110	96	87	83	85	100	ERRATIC
Vancouver	148	134	113	95	80	77	59	65	HIGH-LOW
Victoria	122	123	112	100	84	74	66	76	ERRATIC
Windsor	130	125	109	99	78	76	80	103	HIGH-LOW
Winnipeg	104	102	103	98	97	99	101	106	ERRATIC

SOURCE: Dominion Bureau of Statistics, 1961 Census of Canada, Bulletin 93-519.

Table 8
Central City Over or Underrepresentation of Family Wage Earner
Heads for Metropolitan Areas 1971

Metropolitan Area	Under 2000	2000-2999	3000-4999	5000-6999	7000-9999	10,000 Over	Patterns of Overrepresentation
Calgary	----	----	----	----	----	----	
Edmonton	94	97	98	99	100	100	HIGH
Halifax	102	103	100	95	97	88	ERRATIC
Montreal	102	100	100	100	99	91	LOW
Ottawa	100	100	101	99	99	100	ERRATIC
Quebec	100	102	97	97	97	103	ERRATIC
Saint John	104	100	100	99	98	100	HIGH-LOW
Toronto	102	100	102	100	100	99	ERRATIC
Vancouver	97	95	98	99	99	101	HIGH-LOW
Victoria	102	97	102	100	100	98	ERRATIC
Windsor	100	100	102	98	99	100	ERRATIC
Winnipeg	100	100	100	99	99	100	HIGH-LOW

SOURCE: Statistics Canada, 1971 Census of Canada, Bulletin 93-724.

groups in the suburbs for three metropolitan areas. According to Schnore (1964) this represents the stage of residential development subsequent to the low or Burgess pattern. Thus, in a looser interpretation of the income data only four cities represent a direct contradiction of the expected pattern.

The majority of the cities in 1961 tend to fall into the high-low or erratic pattern, although a closer examination of the data indicates a more positive interpretation. Of the twelve cities in the sample, seven, give varying degrees of support for the expected pattern even though their distribution places them into various other categories. When these income classes are ranked from high to low, successive lower classes should exhibit a greater overrepresentation in the city to qualify for the low pattern. While this is not always the case in 1961, the data clearly indicate that, with the exception of Vancouver which has an equal distribution throughout the city of its highest income class, the majority of the metropolitan areas demonstrate a greater polarization of the highest income groups in the suburbs with an overrepresentation of lower income groups in the central city. Of the remaining five cities three show an overrepresentation of both high and low income groups in the central city with the middle income groups dominating the suburbs. Thus, almost three quarters of the sample follow the expected pattern to a certain extent, while only two cities (Calgary and

Ottawa) representing a reversal of the pattern.

In 1971 only one city (Montreal) falls within the low pattern of the income distribution. While at first glance this seems a disappointing development from the trends uncovered in the 1960's, again, the data has a more positive interpretation. The most important trend uncovered is the general lack of deviation around the 100 value for almost every income class. Seven of the eleven cities analyzed register only one to three percentage points above or below 100. Thus, in these seven cities there tends to be an equal distribution between the central city and its suburbs for all six income classes.

Thus, a closer examination of this data provides greater confirmation of the Burgess hypothesis than first appearances suggest. With the exception of the highest income group, there tends to be a successive increase in overrepresentation in the central city as we move down the income scale. While four metropolitan areas have an overrepresentation of the highest income group in the suburbs, only two of the remaining cities exhibit an overrepresentation of this group in the central city (Quebec and Vancouver). The remaining metropolitan areas exhibit an equal distribution of the highest income classes between the city and the suburbs.

It becomes apparent throughout the discussion of the results derived from the income data that in none of the census years does the low pattern emerge as the major pattern

of residential distribution. This fact, however, lies in the interpretive value of the predetermined patterns of residential differentiation as adequate explanatory devices of income distribution. At face value these patterns provide little support for the applicability of the Burgess pattern to metropolitan areas in Canada. Yet, a closer examination of the data indicates greater support for this relationship. This re-examination also indicates that the Burgess pattern is more predominant in 1961 than 1951, but that this predominance does not increase in 1971. Thus, the income data provides some support for the emergence of the status gradient.

Due to the variation in income categories adopted for the three census years, an assessment of the validity of the two hypotheses is made more difficult. Nevertheless there are indications that cities which did not exhibit a direct relationship between income status and distance from the city center are moving in this direct while those cities characterized by the expected distribution in 1951 are continuing to do so. Although this suggests support for both hypotheses it is only minimal.

3. Residential Differentiation by Occupational Status

Table 9 summarizes the results of the index of overrepresentation for white collar workers in the selected metropolitan area.

Since the occupational variable is comprised of only one category its inclusion into the various residential patterns is impossible. The 1951 occupational data of table 9 demonstrate that it is comparable to the educational data, thus providing little support for the expected pattern. Again the results indicate that at least two thirds of the metropolitan areas exhibit an overrepresentation of the white collar class within the central city, with values of overrepresentation ranging from a high of 106 in Windsor and Quebec to a low of 84 in Toronto.

Similar results found for the educational data are uncovered in the information of occupational overrepresentation for 1961. For this variable eight out of the twelve metropolitan areas have an overrepresentation of white collar workers in the suburban areas. While both Calgary and Edmonton have an increase of white collar employees in the urban core, Halifax has seen a decrease and Ottawa's distribution has remained the same. Latif and Lutfiyya (1971) suggest that the position of the university near the downtown area in Edmonton provides a possible explanation for the relative centralization of higher status groups.

Table 9

Central City Over or Underrepresentation of White Collar
Workers in Metropolitan Areas, 1951-71.

Metropolitan Area	1951	1961	1971
Calgary	105	106	---
Edmonton	105	172	101
Halifax	111	104	110
Montreal	91	89	78
Ottawa	113	113	112
Quebec	106	89	77
Saint John	94	85	94
Toronto	84	70	94
Vancouver	105	97	101
Victoria	93	83	85
Windsor	106	86	105
Winnipeg	101	91	87

SOURCE: Dominion Bureau of Statistics, 1951 Census of Canada, Census Tract Series for Metropolitan Areas; Dominion Bureau of Statistics, 1961 Census of Canada, Census Tract Series for Metropolitan Areas; Statistics Canada, 1971 Census of Canada, Census Tract Series, B.

Six of the eleven cities analysed in 1971 show an overrepresentation of white collar workers in the suburbs. An overview of all three census years suggests that while the status gradient describes the occupational distribution of the majority of metropolitan areas there is a decline in support for this relationship in 1971 from 1961.

The occupational variable provides less support for the first hypothesis than the income and educational variables. Of the eight metropolitan areas not exhibiting an underrepresentation of white collar workers in the central city in 1951, only two do so by 1971. Nevertheless, all four characterized by the expected pattern in 1951, continue to do so up to 1971, thus providing strong support for the second hypothesis. Yet all metropolitan areas, with the exception of Toronto, experienced a decline in central city white collar worker overrepresentation between 1951 and 1971.

The calculation of social status overrepresentation of the last section has produced varying degrees of support for the two hypotheses by the three socioeconomic variables. All three variables show support for the first hypotheses although this support appears stronger for the educational variable. Again while all three variables show support for the second hypothesis, the results for occupation show greater significance for this relationship than income and education.

111. A City-Suburban Comparison: Trends in Residential
Development 1951 - 1971

Since the emphasis of this thesis is on the changing residential structure of the urban community, an analysis of the trends in residential changes was undertaken for the census periods 1951-1961 and 1961-1971. Comparable statistics were available in this analysis for three educational groups, five income groups, as well as, white collar employees.

1. Trends in Educational Redistribution, 1951-1971

Table 10 shows the changing educational structure for twelve metropolitan areas between 1951 and 1971. The data for 1951-1961 clearly indicate that the Burgess pattern is emerging in Canadian metropolitan areas.

Table 11 outlines three patterns of disproportionate change for 1951-61 using this socioeconomic indicator. The first of these indicates a decrease in the urban rings elementary school category with a corresponding increase in its high school and college population. This is the expected pattern of change.

Table 10
Suburban Residential Development by Education
For Metropolitan Areas, 1951-71.

Metropolitan Area	1951 - 1961			1961 - 1971		
	Elementary	High	College	Elementary	High	College
Calgary	- .8	+ .6	+ .2	-----	-----	-----
Edmonton	-16.7	+11.6	+5.3	- 1.4	+ .4	+ .8
Halifax	- 4.5	+ 1.5	+3.3	+ 1.8	+ 2.6	- 4.3
Montreal	- 2.8	+ 3.1	+3.6	- 2.5	+ 1.9	+ .8
Ottawa	- 9.6	+ 4.1	+5.6	- 7.0	+ 6.4	+ .5
Quebec	-10.1	+ 5.5	+3.6	- 4.0	+ 1.2	+ 2.9
Saint John	- 3.5	+ 5.7	+1.0	- 2.0	+ .9	+ 2.3
Toronto	- 7.2	+ 9.3	-5.3	+ 4.9	- 1.1	- .5
Vancouver	- 5.7	+ 4.5	+1.1	- 1.6	+ 3.2	- 1.6
Victoria	- .5	- .1	+2.0	+ 3.4	+ .1	- .9
Windsor	- 9.6	+ 7.8	+1.8	+ 7.9	- 4.4	- 3.5
Winnipeg	- 5.0	+ 3.5	+1.2	3.9	+ 2.6	+ 1.7

SOURCE: Dominion Bureau of Statistics, 1951 Census of Canada, Volume 3, Table 130;
Dominion Bureau of Statistics, 1961 Census of Canada, Bulletin 92-550;
Statistics Canada, 1971 Census of Canada, Bulletin 92-746.

Table 11

PATTERNS OF RESIDENTIAL REDISTRIBUTION OF EDUCATIONAL
CLASSES IN SUBURBS FOR METROPOLITAN AREAS, 1951-71

Education	<u>1951-1961</u>			<u>1961-1971</u> <u>Type of Pattern</u>			
	1*	2	3	1	2	3	4
Elementary	-	-	-	-	+	+	-
High	+	-	+	+	+	-	+
College	+	+	-	+	-	-	-
N	10	1	1	6	2	2	1

* A minus value indicates a disproportionate decrease in the suburbs for a particular status group while a positive value indicates an increase in the suburbs for a particular status group.

Table 11 shows that suburban growth has been dominated by the higher status groups. Ten metropolitan areas followed the expected pattern with only one (Toronto) experiencing a decrease in the fringe for the college category. While the cross-sectional data for Toronto shows that it has an over-representation of the college and high school population in the urban fringe, this pattern is not increasing.

The educational data for 1961-1971 indicate that the modal pattern of educational redistribution is the expected one. Nevertheless, five of the eleven cities experienced a decrease in the ring of the highest educational class while one city experienced a decrease of the high school class. The majority of these same cities experienced a corresponding increase in the ring for the lowest educational classes.

The educational results suggest two trends in residential redistribution. The first of these is an increase in the suburbs of high school and college educated with a corresponding decrease in the elementary school population for the 1950's. This indicates strong support for the emergence of the distance gradient overtime. While there is a continuation of this trend into the 1960's for some of these same metropolitan areas, in some cases a reverse trend is in operation. The result is a suburban decrease of the high school and college educated and an increase in the elementary school group. Thus, the results of the 1950's show a great deal of support for both hypotheses; this support becomes more limited in the 1960's.

2. Trends in Income Redistribution for 1951-1971

Table 12 shows the trends in income redistribution in suburban areas between 1951-71. It, too shows that the suburbs are experiencing an increase in the ring for the highest income groups with a corresponding decrease for low income groups.

Table 12

Suburban Residential Development by Income
for Metropolitan Areas 1951 - 71

Metropolitan Area	1951-1961					1961-1971				
	Under 2000	2000- 2999	3000- 3999	4000- 5999	6000- Over	Under 2000	2000- 2999	3000- 3999	4000- 5999	6000- Over
Calgary	- 8.1	- 3.9	+21.1	-13.8	-11.1	-----	-----	-----	-----	-----
Edmonton	-16.9	- 3.6	+ 8.2	-15.7	+ .9	+ 4.0	+ 2.7	+ 1.8	+ 4.1	- 3.9
Halifax	+ 4.6	- 8.8	+ 3.7	+10.6	+ 4.4	+ 4.0	+ 4.4	+ .3	- 5.8	+ .3
Montreal	+ 2.3	- 2.9	- 9.3	+ 3.9	+ 9.5	+ 3.2	+ 6.6	+ 6.2	- 7.5	+12.4
Ottawa	- 5.9	- 5.0	+ 9.2	+12.2	-10.0	- .6	- 2.6	- 5.6	- 5.9	+23.4
Quebec	- 4.8	- 3.2	- 3.3	+ 4.7	+ 7.3	+ 1.7	+ 4.4	+ 4.3	- 1.5	- 9.2
Saint John	-10.2	- 4.7	- 6.9	+ 4.0	+ 7.0	+ 3.4	+ 6.3	+ 4.9	- 6.8	- 8.3
Toronto	+ 2.7	- 5.1	-18.0	+ 7.2	+14.5	+ 7.5	+10.0	+ 8.5	-13.9	-12.8
Vancouver	+ .2	- 9.8	- 3.6	+ 6.5	+ 6.7	+ 4.3	+ 5.1	+ 4.3	- 5.2	- 8.7
Victoria	+ 1.0	- 2.8	- 7.8	+ 4.6	+ 6.7	+ 4.8	+ 4.9	+ 3.3	- 7.7	- 5.5
Windsor	+ 1.8	- 8.5	- 4.8	+ 5.2	0 0	+ 5.5	+ 5.2	- 5.0	- 5.6	-11.4
Winnipeg	- 1.5	-10.9	- 7.7	+10.9	+ 6.8	+ 4.5	+ 5.4	+ 6.0	- 9.4	- 7.2

SOURCE: Dominion Bureau of Statistics, 1951 Census of Canada, Volume 1, Table 62;
 Dominion Bureau of Statistics, 1961 Census of Canada, Bulletin 93-519;
 Statistics Canada, 1971 Census of Canada, Bulletin 93-724.

The data indicates that eight metropolitan areas followed the expected pattern, including four which experienced an increase in the suburbs for the lowest income group. The four remaining cities exhibit a random redistribution of income classes for this time period.

In contrast, the income data for the 1960's exhibit almost a complete reversal of the trend uncovered between 1951-61. Only two cities experienced an increase in the highest income group for the suburbs during this period. Table 13 provides a clear picture of these two trends.

Table 13

THE EMERGING PATTERNS OF RESIDENTIAL REDISTRIBUTION OF
INCOME CLASSES IN METROPOLITAN
AREAS 1950-60

	1951-61						1961-1971			
	<u>Type of Pattern</u>						<u>Type of Pattern</u>			
	1	2	3	4	5	6	1	2	3	4
Under 2000	-	+	-	+	-	-	+	+	+	-
2000 to 2999	-	-	-	-	-	-	+	+	+	-
3000 to 3999	-	-	+	+	-	-	+	+	+	-
4000 to 5999	+	+	+	+	-	-	-	+	-	-
6000 over	+	+	-	+	+	-	-	-	+	+
N	4	4	1	1	1	1	8	1	1	1

Two major trends appear in the residential redistribution by income status of over the twenty year period under analysis. The 1950's experienced a polarization of higher

income groups in the suburbs with a decrease of the lower income groups. The data for the 1960's exhibit a complete reversal of this trend indicating a lack of support for the hypotheses during this period.

3. Trends in Occupational Redistribution 1951 - 71

Table 14 below shows the trends in the residential redistribution of white collar workers between 1951 and 1971. Again the same trend disclosed in the analysis of income and education appears for this variable.

Table 14

Suburban Residential Development by Occupation
for Metropolitan Areas, 1951-71.

Metropolitan Areas	1951-1961	1961-1971
Calgary	- 5.2	-----
Edmonton	-----	-----
Halifax	+ 3.4	- 3.0
Montreal	+ 2.4	- 1.0
Ottawa	+ 1.1	- 5.3
Quebec	+ 7.8	+ 3.4
Saint John	+ 4.5	- 2.0
Toronto	+ 3.3	-10.1
Vancouver	+ 3.4	- 1.7
Victoria	+ 3.9	- 1.6
Windsor	+ 7.0	-10.5
Winnipeg	+ 5.1	- .1

SOURCE: Dominion Bureau of Statistics, 1951 Census of Canada, Census Tract Series for Metropolitan Areas; Dominion Bureau of Statistics, 1961 Census of Canada, Census Tract Series for Metropolitan Areas; Statistics Canada, 1971 Census of Canada, Census Tract Series B.

Ten metropolitan areas between 1951-1961 experienced an increase in white collar workers for the suburbs.⁽¹⁾ Only one area, Calgary showed any sign of a decrease in the suburbs. The trends for 1961-71 however, show a decrease of white collar workers in nine metropolitan areas. Only Quebec exhibits a continuing increase of this status group for the city periphery although this increase is less for the 1960's than that experienced in the 1950's.

Again both hypotheses receive strong support for the first decade analysed, although this same support is lacking for second decade.

Thus for all three status variables two major trends are uncovered. First, between 1951 and 1961 nearly all suburban areas experienced an increase of higher status groups with a corresponding decrease in lower status groups. Secondly, while the Burgess pattern was emerging in the 1950's, this trend is reversing in the subsequent decade. Cities in which the expected pattern had already emerged were beginning to loose their higher status groups in the ring while gaining lower status groups.

A brief summary of the results found in this chapter shows mixed support for the two hypotheses by all three socioeconomic variables. The results indicate that a direct relationship between social status and distance from the city center

(1) Due to an error in the census data Edmonton was eliminated from the analysis.

is becoming more apparent overtime.

While all three variables provide support for the hypotheses this support tends to be of medium strength and is usually much stronger for the first than second hypotheses. The analysis of residential redistribution in the later half of this chapter suggests that the general decrease in the suburbs of the highest status groups may account for the generally weak support for the two hypotheses.

Perhaps the reason behind the lack of emergence of a clear pattern of residential differentiation is due to the separate analysis given to each variable. A social status indicator combining all three socioeconomic variables may produce more clear cut results.

While the analysis has been aimed at capturing the overall historical series of outward shifts of high status groups from the center of the metropolitan area to the periphery it does not acknowledge the developmental process in neighbourhood shifts as a continuous movement as called by the Burgess model. For this reason Chapter Four stresses time as an important dimension in neighbourhood change.

CHAPTER FOUR

THE APPLICATION OF A STOCHASTIC MODEL

I. Introduction

The present chapter involves the application of the markov chain to the changing residential structure of Canadian metropolitan areas. The use of this stochastic model arose out of the need for a comprehensive longitudinal analysis in a substantive area dominated by cross-sectional research. Recent studies in urban sociology have recognized the limitations of applying a cross-sectional analysis to what is essentially a longitudinal question (Schnore 1963; Haggerty 1971).

The original formulation of the North American Model by Burgess (1929) was stated in terms of the process in residential development. Yet later reinterpretations and tests of the original model viewed the residential structure in terms of a static five zonal organization. Haggerty (1971) indicates that this lack of concern with the process and trends in change places much of the critical re-evaluation of the concentric model in a questionable position. Thus, it is essential to search for the trends in the changing residential structure to fully comprehend the development of organizational form in the urban community. The markov chain is a unique analytical procedure, well adapted for uncovering these trends in social and spatial change.

The results from the stochastic analysis will then be interpreted in terms of the degree of support they provide for the two hypothesis under investigation. To facilitate the task of data interpretation, these results will be placed into a number of patterns, each characterized by varying degrees of conformity to the status gradient. Table 15 below provides examples of these patterns, based on the results obtained from the transition probability matrix.

Table 15

PATTERNS OF RESIDENTIAL REDISTRIBUTION
FOR THREE ZONES IN METROPOLITAN
AREAS: 1951-1971

ZONE	<u>TYPE OF PATTERN</u>			
	1 Low (Ottawa)	2 Intermediate (Quebec)	3 High-Low (Montreal)	4 High (Toronto)
I	.63*	.00	.87	.85
II	.82	.80	.78	.78
III	.86	.74	.83	.71

* Gives the probability of the census tracts in a zone being above the metropolitan average socioeconomic status.

Pattern one (the expected pattern) characterized by Ottawa shows a direct relationship between socioeconomic status and distance from the center of the city with the inverse of this relationship shown by pattern four. Both the intermediate and the high-low patterns represent variations to these patterns. The intermediate pattern exhibits a lower probability

of being above the city socioeconomic status average for the inner and outer zones than the middle zone while the inner and outer zones in the high-low category have a higher probability of being above the city average than the middle zone.

These same patterns will be used in the interpretation of the data derived from the analysis of the equilibrium distribution. The results will conclude whether the status gradient has indeed emerged at some future time, on the basis of present trends for those cities not yet characterized by the Burgess pattern in 1971, as well as, determining whether the Burgess pattern has continued for those cities already manifesting the status gradient in 1971.

II Trends in Residential Redistribution from 1951 to 1971.

It may be recalled that the results provided by the transition probability matrix are the sum of the total shifts in socioeconomic status experienced by the census tracts in each of the zones over the twenty year period under study. These summary measures, however, are based on a starting state, which refers to the socioeconomic status of all the tracts in 1951 upon which subsequent observations are made, to determine the direction of these same shifts. These starting states refer to the census tracts as being either above or below the metropolitan average in socioeconomic status. These tracts may then stay either above or below the metropolitan average or else shift from above to below or from below to above the metropolitan average overtime. Of

course this latter information is provided by the transition probability matrix.

The starting state, however, also provides an initial test of the status gradient upon which later comparison can be made to test the hypotheses, by presenting data on the proportion of the census tracts in each zone which are above or below the metropolitan average. It is a simple matter then, to determine whether successive zones farther from the city center exhibit a larger proportion of census tracts above the metropolitan average socioeconomic status. In fact, the same patterns representing the four forms of residential distribution in table 15 can be adopted to describe the 1951 residential differentiation. Based on these initial patterns of residential distribution an assessment can be made to determine whether the two hypotheses are accurate by comparing these initial patterns disclosed in 1951 to those uncovered in 1971 by the transition probability matrix. Therefore, the proportion of census tracts above or below the metropolitan average socioeconomic status in each zone for 1951 will be provided prior to the presentation of each transitional probability matrix for this comparison.

The initial patterns of income distribution are provided in table 16. The data indicate that five of the seven cities analysed followed the Burgess pattern, with successive zones from the city center exhibiting a larger percentage of census tracts above the average income for metropolitan areas. The two remaining cities, Windsor and Winnipeg followed the high-low and intermediate patterns respectively.

Table 16

THE PROPORTION OF CENSUS TRACT ABOVE AND BELOW
THE METROPOLITAN AVERAGE BY INCOME IN
THREE ZONES FOR METROPOLITAN AREAS
IN 1951

Metropolitan areas	Zone I		Zone II		Zone III		Pattern of Distribution
	A*	B	A	B	A	B	
Quebec	.15	.85	.20	.80	.70	.30	L
Montreal	.15	.85	.50	.50	.65	.35	L
Ottawa	.27	.73	.59	.41	.63	.37	L
Windsor	.38	.62	.36	.64	.43	.57	H-L
Toronto	.10	.90	.68	.32	.83	.17	L
Winnipeg	.20	.80	.62	.38	.59	.41	I
Vancouver	.25	.75	.43	.57	.64	.36	L

*A - above the metropolitan average status, B - below the metropolitan average status.

The transition probability matrix for income is provided in table 17. Only three cities represent the expected pattern after twenty years of residential redistribution. Of the remaining four, one city exhibits an inverse relationship between income and distance from the city center while the remaining three metropolitan areas fall into the high-low and intermediate patterns. A comparison between the trends in residential structure and the starting state indicate two major findings with respect to the hypotheses. First, only one city representing the expected pattern in 1951 continued to do so

Table 17

THE SHIFTS IN RESIDENTIAL DISTRIBUTION BY INCOME IN THREE
ZONES FOR METROPOLITAN AREAS 1951 TO 1971

Metropolitan area	AA*	Zone I		Zone II		Zone III		Patterns of Distribution
		AA	AB	AA	AB	AA	AB	
Quebec	80	1.00	.96	.80	.20	1.00	.00	I
Montreal	80	.20	.95	.51	.49	.98	.02	H-L
Ottawa	00	1.00	1.00	.69	.31	.94	.06	I
Windsor	.40	.60	.96	.25	.25	.95	.05	L
Toronto	.45	.55	.99	.57	.43	.99	.01	L
Winnipeg	.25	.75	.95	.53	.47	.96	.04	L
Vancouver	.83	.17	1.00	.76	.24	.83	.17	H

*AA - represents the probability of a census tract above the metropolitan average status remaining above this status over a twenty year period.

AB - represents the probability of a census tract above the metropolitan average status shifting below this status over a twenty year period.

BB and BA - represent the opposite to the above.

for the next twenty years. Secondly, the four remaining cities exhibiting this pattern in 1951 divided equally into the high-low and intermediate patterns. Thus, the findings provide minimum support for the second hypothesis. However, there is a greater degree of support for the first hypothesis. While Windsor and Winnipeg did not exhibit the expected pattern in 1951, they seem to have achieved this status by 1971.

Tables 18 and 19 show the starting state and subsequent trends in residential redistribution for the occupational variable. Very few cities in 1951 followed the expected pattern. The predominant distribution was the intermediate followed next by the low pattern. The transition probability matrix for occupation discloses that the predominant pattern of residential differentiation is the high one which is then followed by the high-low pattern. Only two cities, Ottawa and Windsor follow the expected pattern. Three major developments are uncovered in a comparison between the initial state and the trends in redistribution occurring up to 1971. First there is no support for the second hypothesis since neither of the two cities exhibiting the expected pattern in 1951 continue to do so by 1971. Secondly, there is some evidence to support the first hypothesis.

Both Ottawa and Windsor experienced a shift in residential redistribution towards the expected pattern from an intermediate and high-low starting state. Finally, the most predominant shifts for those cities not following the low pattern in 1951 were towards the high or high-low pattern thereby

Table 18

THE PROPORTION OF CENSUS TRACTS ABOVE AND BELOW
THE METROPOLITAN AVERAGE BY OCCUPATION IN
THREE ZONES FOR METROPOLITAN AREAS, 1951

Metropolitan area	Zone A	I B	Zone A	II B	Zone A	III B	Pattern of Distribution
Quebec	.19	.81	.20	.80	.60	.40	L
Montreal	.20	.80	.36	.74	.30	.70	I
Ottawa	.36	.64	.59	.41	.56	.44	I
Windsor	.38	.62	.21	.79	.29	.71	H-L
Toronto	.12	.88	.53	.47	.46	.54	I
Winnipeg	.29	.71	.52	.48	.53	.47	L
Vancouver	.50	.50	.36	.64	.36	.64	H

Table 19

THE SHIFTS IN RESIDENTIAL DISTRIBUTION BY OCCUPATION
IN THREE ZONES FOR METROPOLITAN AREAS, 1951 to 71

Metropolitan area	Zone I			Zone II			Zone III			Pattern of Distribution			
	AA	AB	BB	BA	AA	AB	BB	BA	AA		AB	BB	BA
Quebec	1.00	.00	1.00	.00	1.00	.00	1.00	.00	.74	.26	.78	.22	H
Montreal	.87	.13	.94	.06	.78	.22	.99	.01	.83	.17	.93	.07	H-L
Ottawa	.63	.37	.90	.10	.82	.18	.41	.59	.86	.14	.86	.14	L
Windsor	.50	.50	1.00	.00	.66	.34	.95	.05	1.00	.00	.82	.18	L
Toronto	.85	.15	.90	.10	.78	.22	.97	.03	.71	.29	.72	.28	H
Winnipeg	.83	.17	.94	.06	.54	.46	.96	.03	.74	.26	.88	.12	H-L
Vancouver	.94	.06	.73	.27	.93	.07	.95	.05	.79	.21	.92	.08	H

representing a reversal to the expected shift. These results indicate that trends in residential change are not similar to those found by Schnore in the United States. He hypothesized that cities following the high-low and intermediate patterns would shift towards the low pattern overtime. However the experiences of Canadian metropolitan areas based on occupational redistribution provide little support for this assumption.

The data on the educational variable for both the starting states and trends in residential change are found in tables 20 and 21. The reader should note the differences between the transition probability matrix for education and those for income and occupation. The transition probability matrix for income and occupation are based on census tract shifts between 1951 to 61 while comparable educational data was not available for 1971, necessitating the elimination of this census year from the analysis. Therefore the educational matrix is based on a ten year period only.

The starting state educational patterns are identical to those found for the occupational data with one exception. Vancouver represents the high-low pattern for education instead of the high pattern found for occupation. No predominant patterns appear in the data based on the probability matrix. However, five of the seven metropolitan areas do not conform to the expected pattern. Those cities which were characterized by the expected pattern in 1951 do not continue to follow this pattern on the basis of trends between 1951 and 1961, again

Table 20

THE PROPORTION OF CENSUS TRACTS ABOVE AND BELOW
THE METROPOLITAN AVERAGE BY EDUCATION IN THREE
ZONES FOR METROPOLITAN AREAS, 1951

Metropolitan area	<u>Zone I</u>		<u>Zone II</u>		<u>Zone III</u>		Pattern of Distribution
	A	B	A	B	A	B	
Quebec	.23	.77	.25	.75	.50	.50	L
Montreal	.28	.72	.30	.70	.17	.83	I
Ottawa	.29	.71	.59	.41	.50	.50	I
Windsor	.28	.62	.21	.79	.29	.71	H-L
Toronto	.19	.81	.60	.40	.44	.56	I
Winnipeg	.29	.71	.38	.64	.39	.61	L
Vancouver	.63	.37	.36	.74	.40	.60	H-L

Table 21

THE SHIFTS IN RESIDENTIAL DISTRIBUTION BY EDUCATION
IN THREE ZONES FOR METROPOLITAN AREAS, 1951 to 71

Metropolitan area	Zone I			Zone II			Zone III			Pattern of Distribution			
	AA	AB	BB	BA	AA	AB	BB	BA	AA		AB	BB	BA
Quebec	1.00	00	1.00	00	.67	.33	1.00	00	.60	.40	1.00	00	H
Montreal	.57	.43	.98	.07	.74	.26	.99	.01	.64	.36	.91	.09	II
Ottawa	.75	.25	1.00	00	.80	.20	1.00	00	.88	.12	.75	.25	L
Windsor	1.00	00	1.00	00	1.00	00	1.00	00	1.00	00	.80	.20	E
Toronto	.87	.13	.95	.05	.85	.15	.95	.05	.63	.37	.74	.26	H
Winnipeg	.86	.14	1.00	00	.64	.36	.89	.11	.83	.17	.84	.16	H-L
Vancouver	.60	.40	.83	.17	1.00	00	1.00	00	1.00	00	.80	.20	L

indicating no support for the second hypothesis. The educational data also shows that of the five cities not following the expected pattern in 1951 only two (Vancouver, Ottawa) converged upon this particular distribution by 1971. Although this suggests some support for the first hypothesis, this support is not overwhelming.

The results derived from an analysis of the transition probability matrix for all three socioeconomic variables demonstrate that those cities which were characterized by a direct relationship between social status and distance from the city center are not maintaining this relationship. Thus, neither occupation nor education provide support for the second hypotheses while the support shown by income is limited.

On the other hand, the results from all three variables indicate varying degrees of support for the first hypothesis. While the income data show strong support for the emergence of the Burgess pattern overtime, both occupation and education provide only minimal support for this hypothesis. The predominant trend in residential redistribution for all three variables seems to be the high or high-low pattern. This suggests that over time an inverse relationship emerges between socioeconomic status and distance from the center of the city.

III The Equilibrium Distribution

The equilibrium distribution is a summary measure of the processes of socioeconomic redistribution within each city. This measure is derived from the trends in census

tract shifts from above or below the metropolitan average between 1951 to 1971 and is based on the proportion of above average tracts which would exist in each zone if these processes were to continue into the future under the assumptions of the markov chain. Tables 22 through 24 provide the equilibrium distribution for all three socioeconomic variables based on the trends in residential change from 1951-71. This data is compared to the patterns of residential distribution uncovered by the transition probability matrix to determine whether trends in residential redistribution are moving in the expected direction thereby providing support for the hypotheses.

The income data, based on present trends, indicate that at some future point only three cities will conform to the Burgess pattern with the remainder divided between the intermediate, high-low and high patterns. A comparison between the equilibrium distribution and the probability matrix for income discloses two major findings. First, three cities following the low pattern in 1971 continue to manifest this pattern in the future, with the remaining two shifting to a high-low and intermediate pattern. Secondly, of the two cities not following the expected pattern in 1971, neither will converge onto the low pattern over time. This indicates greater support for the second than first hypothesis.

The equilibrium distribution for the occupational data indicates that, again, three cities conform to the Burgess pattern over time. However, the majority of the cases in the sample fall into the high-low and high categories suggesting

Table 22

PROPORTION OF TRACTS ABOVE THE CITY
AVERAGE IN INCOME BY CITY, ZONE,
AND DISTRIBUTION

City and Distribution	Zone I	Zone II	Zone III
	Low Pattern		
Windsor			
1951	.38	.36	.43
1961	.13	.21	.43
1971	.13	.29	.69
Equilibrium	.06	.17	.74
N*	(32)	(28)	(26)
Toronto			
1951	.10	.68	.83
1961	.04	.33	.73
1971	.04	.26	.54
Equilibrium	.02	.02	.61
N	(153)	(191)	(108)
Winnipeg			
1951	.20	.62	.59
1961	.13	.45	.50
1971	.04	.14	.66
Equilibrium	.06	.08	.57
N	(48)	(58)	(61)
	Intermediate Pattern		
Ottawa			
1951	.27	.59	.63
1961	.0	.41	.81
1971	.0	.29	.50
Equilibrium	.21	.77	.50
N	(28)	(34)	(32)
Vancouver			
1951	.25	.43	.64
1961	.19	.36	.57
1971	.13	.52	.37
Equilibrium	.00	.41	.26
N	(32)	(35)	(57)

* Number of inter decade shifts upon which the equilibrium distributions are based.

Table 22 - Continued

City and Distribution	Zone I	Zone II	Zone III
High-Low Pattern			
Montreal			
1951	.15	.50	.65
1961	.14	.25	.30
1971	.17	.12	.43
Equilibrium	.20	.04	.15
N	(144)	(232)	(139)
High Pattern			
Quebec			
1951	.15	.20	.70
1961	.0	.17	.40
1971	.08	.11	.61
Equilibrium	1.00	.00	.00
N	(26)	(29)	(27)

Table 23

PROPORTION OF TRACTS ABOVE THE CITY
AVERAGE IN OCCUPATION BY CITY ZONE
AND DISTRIBUTION

City Distribution	Zone I	Zone II	Zone III
Low Pattern			
Quebec			
1951	.19	.20	.60
1961	.23	.17	.40
1971	.23	.17	.67
Equilibrium	.00	.00	.46
N	(26)	(30)	(28)
Ottawa			
1951	.36	.59	.56
1961	.21	.41	.31
1971	.29	.47	.58
Equilibrium	.00	.16	.42
N	(28)	(34)	(42)
Windsor			
1951	.38	.21	.29
1961	.25	.21	.43
1971	.06	.14	.46
Equilibrium	.00	.13	1.00
N	(32)	(28)	(27)

Table 23 Continued

City Distribution	Zone I	Zone II	Zone III
	High-low Pattern		
Montreal			
1951	.20	.36	.30
1961	.21	.26	.29
1971	.24	.24	.40
Equilibrium	.32	.04	.29
N	(145)	(233)	(150)
Toronto			
1951	.12	.53	.46
1961	.16	.40	.61
1971	.25	.33	.40
Equilibrium	.40	.09	.49
N	(147)	(191)	(106)
Winnipeg			
1951	.29	.52	.53
1961	.21	.31	.34
1971	.25	.17	.61
Equilibrium	.29	.06	.32
N	(48)	(58)	(60)
	High Pattern		
Vancouver			
1951	.50	.36	.36
1961	.56	.36	.36
1971	.69	.43	.30
Equilibrium	.82	.42	.28
N	(32)	(35)	(57)

Table 24

PROPORTION OF TRACTS ABOVE THE CITY
AVERAGE EDUCATION BY CITY, ZONE,
AND DISTRIBUTION

City and Distribution	Zone I	Zone II	Zone III
	Low Pattern		
Montreal			
1951	.28	.30	.17
1961	.18	.23	.19
1971	--	--	--
Equilibrium	.04	.04	.24
N	(74)	(118)	(64)

Table 24 Continued

City and Distribution	Zone I	Zone II	Zone III
Low Pattern			
Ottawa			
1951	.29	.59	.50
1961	.21	.47	.56
1971	--	--	--
Equilibrium	.00	.00	.68
N	(14)	(17)	(16)
Windsor			
1951	.38	.21	.29
1961	.38	.21	.43
1971	--	--	--
Equilibrium	.00	.00	1.00
N	(16)	(14)	(14)
Winnipeg			
1951	.29	.38	.39
1961	.25	.31	.42
1971	--	--	--
Equilibrium	.00	.23	.48
N	(24)	(29)	(31)
High-low Pattern			
Toronto			
1951	.19	.60	.44
1961	.19	.53	.42
1971	--	--	--
Equilibrium	.28	.25	.43
N	(78)	(102)	(55)
Vancouver			
1951	.63	.36	.40
1961	.44	.36	.43
1971	--	--	--
Equilibrium	.30	.00	1.00
N	(16)	(14)	(14)
No Pattern			
Quebec			
1951	.23	.25	.50
1961	.23	.17	.30
1971	--	--	--
Equilibrium	.00	.00	.00
N	(13)	(12)	(10)

a trend towards or a continuation of a reversal to the expected pattern.

Again, support for the first hypothesis is minimal. Of the three cities not following the expected pattern in 1971 only one (Quebec) shows a promise of converging onto the low pattern. There are two trends uncovered from those cities which exhibit a direct relationship between socioeconomic status and distance from the city center. While two metropolitan areas will continue to follow the expected pattern over-time, two more will shift towards the high-low pattern. Although there is some support for the second hypothesis it is not as strong as that uncovered in the income data. Overall, the major trend disclosed in the occupational data seems to be a shift toward or a continuance of an inverse relationship between socioeconomic status and distance from the city center.

Data provided on the future educational structure indicates a greater degree of support for the expected pattern. Over time four cities have converged on the low pattern. An interpretation of the trends for Quebec is difficult since none of the zones show any probability of having census tracts above the metropolitan average. Both of the remaining two cities represent the high-low pattern.

Again, caution must be exercised in the interpretation of educational trends since these trends are based on census tract shifts for only a ten year period. However, the longitudinal analysis based on a city suburban comparison suggests that trends in education redistribution indicate a decrease

in the college educated population for outlying areas in the metropolis. Keeping this in mind, in all likelihood, the educational data would be less supportive of the expected pattern than it now is, if it were based on a twenty year period.

A comparison between the 1961 matrix patterns and those disclosed by the equilibrium distribution indicate greater support for both hypotheses than that shown by the previous two variables. Two cities not exhibiting the expected pattern in 1961 will converge onto the low pattern in the future while the remaining two in the same condition show a shift towards a reversal of the expected pattern. Therefore support for the first hypothesis tends to be mixed. Both cities showing the low pattern in 1961 will continue to support this distribution in the future thereby confirming the second hypothesis.

While the data from the transition probability matrix provide greater support for the first than second hypothesis, the information gathered by the equilibrium distribution presents a reverse interpretation. All three variables show support for the second hypothesis although this support is greater in the income and occupational results than it is for education. This suggests that those metropolitan areas which exhibit a direct relationship between social status and distance from the center of the city in 1971 will continue to be characterized by this distribution into the future.

Only the educational data provide any significant support for the first hypotheses. For occupation only one city which did not show the Burgess pattern in 1971 will move in this direction in the future while income shows no support for this relationship at all.

CHAPTER FIVE.

Summary and Discussion

The purpose of this study is to provide a longitudinal test of the distance gradient concept to determine whether it can be applied to the development of residential differentiation in Canadian metropolitan areas. This hypothesis suggests that a direct relationship exists between socioeconomic status and distance from the city center. While the original hypothesis was stated in terms of the process or the importance of time in the development and emergence of this relationship subsequent interpretations and tests were operationalized as a static cross sectional representation of residential differentiation. More important, this lack of an adequate test of the original hypothesis dominates the current literature dealing with the residential structure of Canadian urban areas. Thus the present study documents this gap in the literature and attempts to alleviate this shortcoming with a longitudinal analysis of the spatial distribution characterizing Canadian metropolitan areas.

To test the longitudinal implications of the status gradient two hypotheses were developed. The first of these suggests that those metropolitan areas which did not display the status gradient in 1951 would be characterized by this spatial arrangement overtime.

Alternatively the second hypothesis suggests that those

metropolitan areas which were characterized by the status gradient in 1951 would continue to exhibit this spatial arrangement into the future. Socioeconomic data for testing these hypotheses was taken from the information gathered by Statistics Canada dealing with metropolitan areas over the last twenty years.

Two methods were adopted in this thesis to test the hypothesis, one a traditional cross-sectional procedure and the second a stochastic test to provide a longitudinal analysis of residential differentiation.

The cross-sectional approach involved a city-suburban comparison using two measures of residential differentiation, an index of over-representation and an index of disproportionate change. The index of over-representation calculates the over or under representation of a specific status group in the central city, while the index of disproportionate change determines the percentage point increase or decrease of various status groups in the suburbs. These two methods were applied to three socioeconomic variables, income, education and occupation.

The cross-sectional analysis of all three socioeconomic variables has disclosed differing degrees of support for both hypotheses. Three patterns seem to predominate in the education distribution over the three census years, these being the low, high-low and high. While the modal pattern of differentiation is low in 1961 and 1971 but not in 1951 indicating the status

gradient is becoming predominant overtime, actual support for both hypotheses is limited. In one instance this is problematic since there are only two cities which are applicable to the second hypotheses making an assessment of its validity difficult.

An interpretation of the income data by the predetermined patterns of differentiation indicates little support for the Burgess hypothesis. In fact the most representative patterns of differentiation for all three census periods are the high-low or erratic patterns. A plausible explanation for this apparent divergence from the expected pattern are the different income categories adopted by Statistics Canada for the three census periods. However, a less stringent reanalysis of the data suggests a trend in the expected direction. The data disclose a polarization of the highest income groups in the suburbs with the lower income groups exhibiting a predominance in the central city. The general lack of deviation around the hypothetical 100 for a large number of the metropolitan areas in 1971 makes an assessment of the validity of the hypothesis difficult. Again the data demonstrates the emergence of the Burgess hypothesis yet the analysis provides only limited support for this hypotheses.

The analysis of the occupational data is made easier since we have adopted a general category of white collar workers as the single status indicator for the occupational variable. This variable provides a great deal of support for the second hypothesis although the results are less supportive of the first one.

While all three variables exhibit a trend towards the expected pattern, this trend is slight. Generally the data for all three variables provides some support for both hypotheses, this support is not strong although it is usually stronger for the first than second hypotheses.

The analysis of the percentage point difference through the use of an index of disproportionate change provides an explanation as to why the cross-sectional data of this thesis provided little support for the two hypotheses.

The analysis of disproportionate change for all three variables between 1951 and 1961 demonstrates an overwhelming convergence towards the expected pattern. Thus, in almost every metropolitan area the highest income, education or occupational groups are becoming over represented in the suburbs while the lower status groups are converging in the central city.

However, this polarization seems to weaken or in some cases even reverse in the analysis of the 1961 to 1971 period. For this particular period there is a continuation of the emergence of the status gradient by the educational variable. The income data, however, exhibits a decrease in the suburbs for the highest income groups with an increase in this same area of lower income groups.

Undoubtedly this trend away from the expected pattern in the 1960's underlies the general lack of deviation around the 100 evident in the income data derived from the analysis of over-representation.

The occupational results also indicate a trend away

from the expected pattern with a general decrease of white collar workers in the suburbs, of nearly all twelve metropolitan areas in the analysis in the 1960's

The results obtained from the cross-sectional analysis have provided some insights into the residential distribution along the various socioeconomic variables. Yet the focus of this research has been on the process of residential development thereby stressing the longitudinal nature of the problem. For this analysis the markov chain was adopted which allows the researcher to make future predictions on the residential structure of urban communities on the basis of past trends, in this case the trends between 1951 to 1971.

The analysis of the income variable by the transition probability matrix disclosed the fact that the majority of the metropolitan areas in 1951 already conformed to the Burgess pattern. Our observation of the trends suggest that the majority of these cities are moving away from this pattern providing little support for the second hypotheses.

Nevertheless, those cities which did not conform to the status gradient in 1951 converge upon this pattern by 1971 thus providing strong support for the first hypothesis.

Alternatively, both the occupational and educational variable provide limited support for the first hypotheses with no support being extended to the second hypotheses.

The analysis between 1951 - 1971 disclosed by the transition probability matrix indicate two major patterns of residential differentiation emerging overtime.

These tend to be the high-low pattern which is characterized by a predominance of the highest and lowest status groups within the city center with a corresponding over-representation of middle status groups predominant in the suburban areas and; the high pattern which is characterized by an inverse relationship between social status and distance from the city center.

While the transition probability matrix indicates the trends in residential differentiation between 1951-1971, it is the equilibrium distribution of the markov chain which presents a profile of the future socioeconomic structure of the metropolitan areas.

A comparison between the results of the transition probability matrix and the equilibrium distribution indicate little support for the first hypotheses by the income and occupational variable with some support extended to the second.

While support for both hypotheses by the educational data is much stronger than that of income and occupation it is undoubtedly due to the fact that the analysis for this variable is based on the observation of residential trends for a ten year period only.

While the results for chapter four suggested a slight trend in the expected direction of residential redistribution for some cities, others saw changes in unexpected directions. These anomalies may be the result of certain structural variables such as age and size which are said to be important factors in the emergence of the Burgess pattern.

IV The Impact of Age and Size on Patterns of Residential Redistribution

The metropolitan areas chosen for the markov chain analysis are generally the oldest and largest urban areas in Canada. In this case they should conform to the Burgess pattern according to the work carried out by Schnore in the United States and Guest in Canada. Since our analysis has only provided limited substantiation of the position postulated by Schnore and Guest, an effort will be made to uncover the patterns of residential differentiation of metropolitan areas of various sizes and age.

While our sample is representative of the oldest and largest urban areas in Canada there is considerable variation between metropolitan areas on both these structural variables. In terms of size the metropolitan areas range from a high of over two and a half million in Montreal to one quarter million in Windsor. Generally the oldest urban centers are also the largest, yet this is not always the case, exemplified by Vancouver and Winnipeg, which are younger but considerable larger than Quebec.

Table 25 based on the equilibrium distribution provides the figures on the distribution of the various patterns of residential differentiation throughout the age and size categories for all three socioeconomic variables. It is difficult to discern trends based on this data due to the small sample as well as the large number of categories into which the sample can be included. However, there is a greater tendency

TABLE 25
EQUILIBRIUM DISTRIBUTION FOR CANADIAN METROPOLITAN AREAS BY
PATTERNS OF STATUS GROUP DIFFERENTIATION IN THREE ZONES
BY SELECTED CHARACTERISTICS OF THE URBAN AREAS

Characteristics of area	Income			Occupation			Education			E*		
	L	I	H	L	I	H	L	I	H			
Year census count for central city reached 20,000	1	0	1	1	0	2	0	1	0	1	0	0
Before 1851	1	1	0	1	0	1	0	2	0	0	0	0
1861-1891	0	1	0	0	0	0	1	0	0	1	0	0
1891-1901	1	0	0	1	0	0	0	1	0	0	0	0
1901-1921												
1971 area population												
over 2 million	1	0	0	0	0	2	0	1	0	1	0	0
1 to 2 million	0	1	0	0	0	0	1	1	0	1	0	0
$\frac{1}{2}$ to 1 million	1	1	0	1	0	1	0	2	0	0	0	0
below $\frac{1}{2}$ million	1	0	1	2	0	0	0	1	0	0	0	1

*E - erratic pattern for Quebec necessitates the inclusion of this pattern.

for the high and high-low patterns to emerge in the oldest urban areas for all three socioeconomic variables. In contrast the youngest urban areas tend to converge onto the low pattern. While this relationship is not strong it does suggest that these results run counter to the expectations of the previous literature in the area.

While no consistent pattern emerges for the largest urban areas in the size category there is a tendency for the smallest cities to fall into the low pattern. Again the data reveals contrasting results to those of Guest (1969).

However, the analysis by Guest was based on observations of residential redistribution for a ten year period while the observations of this thesis are based on a twenty year period.

In conclusion, the results of the patterns of differentiation throughout the various age and size categories provides little support for the expected effects of these to structural variables and residential differentiation. Instead of appearing in the oldest and largest urban centers, the expected pattern seems to be characteristic of younger and smaller urban centers.

Suggestions for Further Research

While this thesis has provided some insights into the development of residential redistribution overtime, indicating some support for the emergence of a direct relationship between social status and distance from the city center, it has also provided some results which are in opposition to popular

expectations, such as the impact of certain structural variables ie. age and size.

Although descriptive analyses such as this provide valuable insights into the urban residential structure, future research should take into consideration variables which may explain the residential location of the various social classes.

Recent research into this area have used such independent variables as the functional base of the various cities along with a number of other traditional structural factors to provide models of urban structural growth and development (Schnore & Winsborough, 1972).

This thesis also suggests that a more refined indicator of socioeconomic status be adopted which combines all three traditional status indicators. People, of course, do not have incomes independently of their occupations, nor occupations independently of their education. So were patterns might be quite variable for the separately analyzed indicators (as demonstrated by the research in this thesis), the patterns might be less ambiguous for a combined indicator.

APPENDIX A

OCCUPATIONAL CATEGORIES INCLUDED IN WHITE COLLAR OCCUPATION VARIABLE

Schnore in his analysis of American cities, included the following divisions under the white collar occupational classification:

- 1) Professional, technical and kindred workers.
- 2) Managers, officials and proprietors, except farm.
- 3) Clerical and kindred workers.
- 4) Sales workers. (Schnore, 1972:33).

Due to the changing occupational categories between 1951 and 1971 we have selected the following occupational divisions to represent the white collar occupational variable:

1951 - 1) Proprietary and managerial

2) Professional

1961 - 1) Managerial

2) Professional and technical

1971 - 1) Managerial, administrative and related occupations.

2) Teaching and related occupations.

3) Occupations in medicine and health.

4) Occupations in Natural Sciences, Engineering and mathematics.

5) Occupations in social science and related fields.

6) Occupations in Religion.

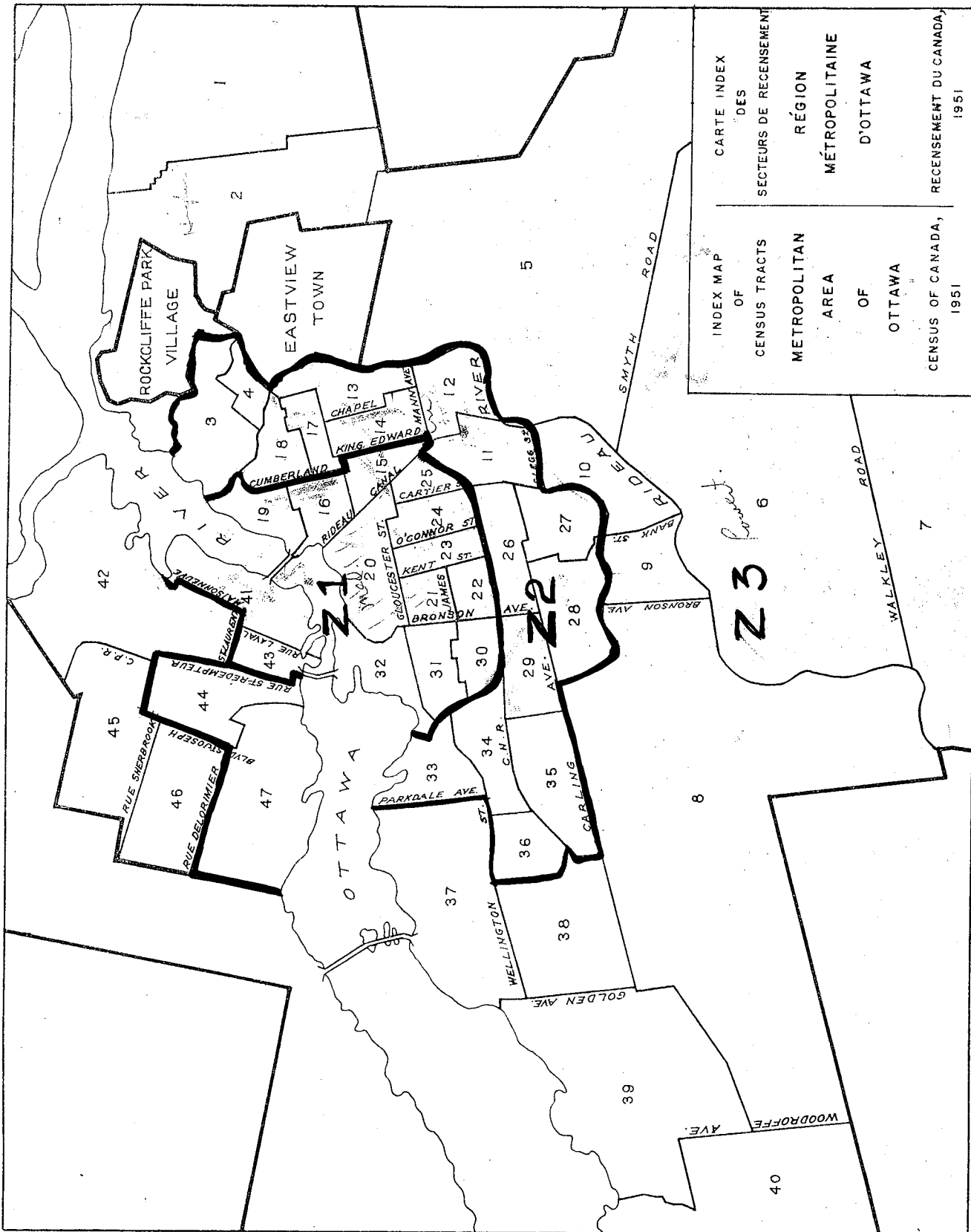
7) Artistic, literary, recreational and related occupations.

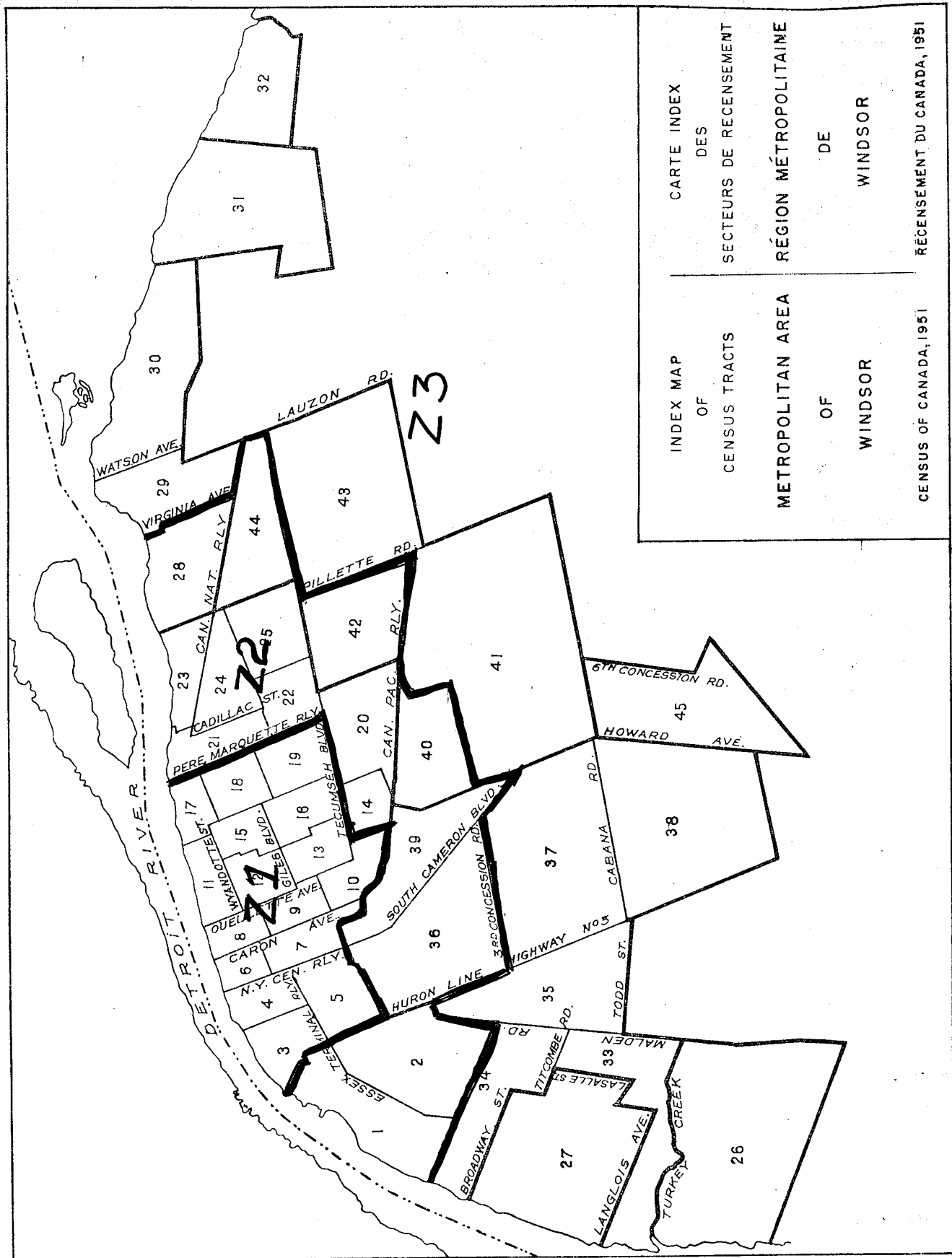
With the exception of the income data neither occupation nor education have been controlled for the impact of inflation. While the number of income categories have been increased in both 1961 and 1971 to reflect this inflationary trend the occupational and educational categories in this study have remained the same over the twenty year period under analysis. Yet Canadian society witnessed an educational upgrading for the whole population. Conversely the white collar occupational category has in the last few years witnessed a deflation of certain professions in relation to blue collar workers as well as inter occupational disparities. All of these conditions could of course produce certain artifacts distorting the results of the present analysis. For example certain blue collar occupations now have the purchasing power to live in suburban areas which were once beyond their reach. Also central city over representation of the high school or college educated may only be the result of the educational upgrading, not inter metropolitan migration.

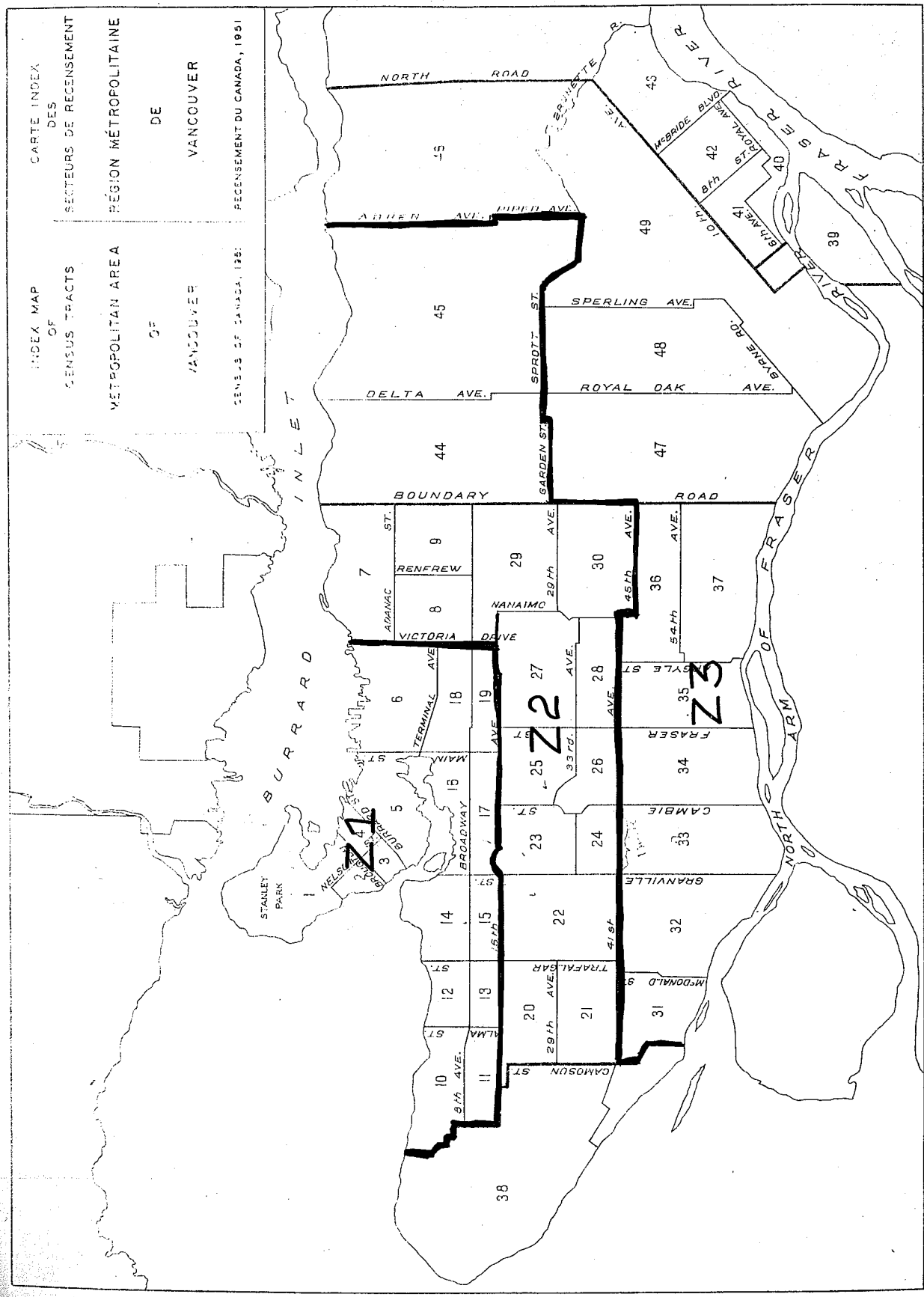
APPENDIX B

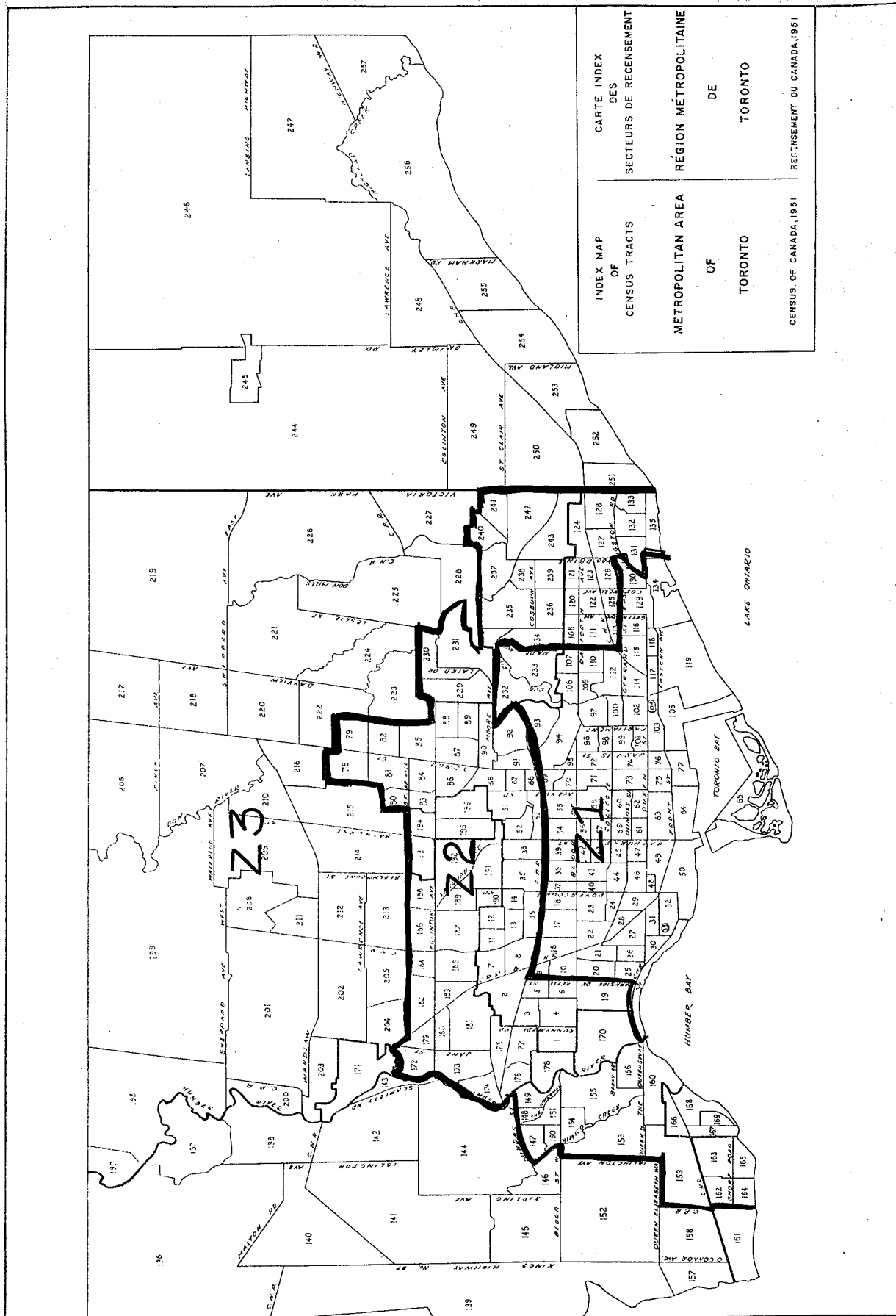
MAP OF METROPOLITAN AREAS INDICATING THEIR ZONAL BOUNDARIES

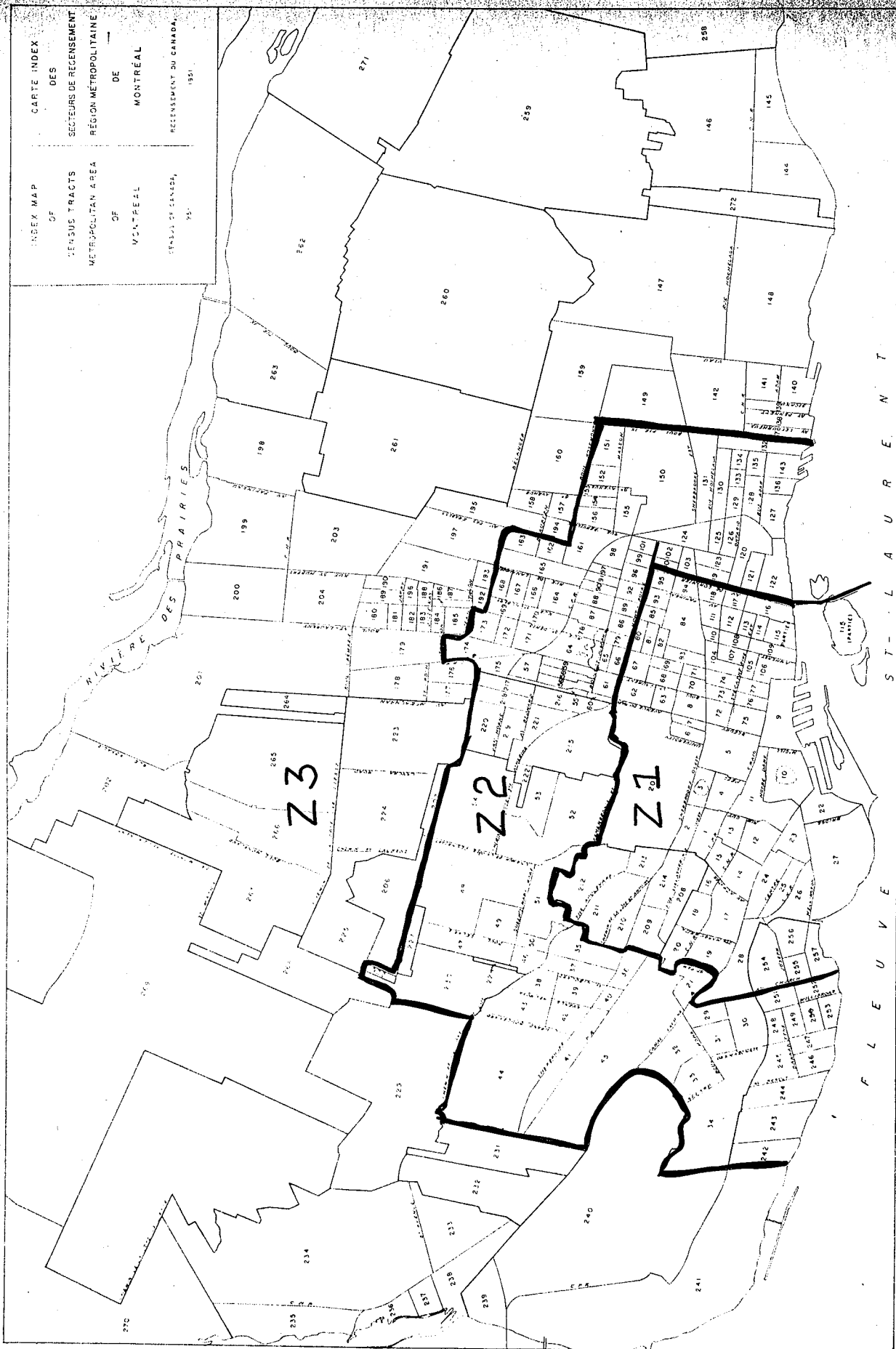
This Appendix includes all seven metropolitan areas used for the markov chain analysis of chapter four. Each metropolitan area has the boundary lines delineating the zones drawn on it. These boundaries remain the same over the three census years. Census tracts within each zone are traced over the twenty year period under study to determine whether any of them experienced boundary changes. Those tracts which were simply subdivided were kept as part of the sample although the mean social status of its parts was taken to represent the status of the original tract. Those tracts which experienced boundary changes other than subdivision were eliminated from the analysis. If this were not done changes in the social status of the tracts over the twenty year period might be an artifact of the boundary change.

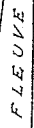


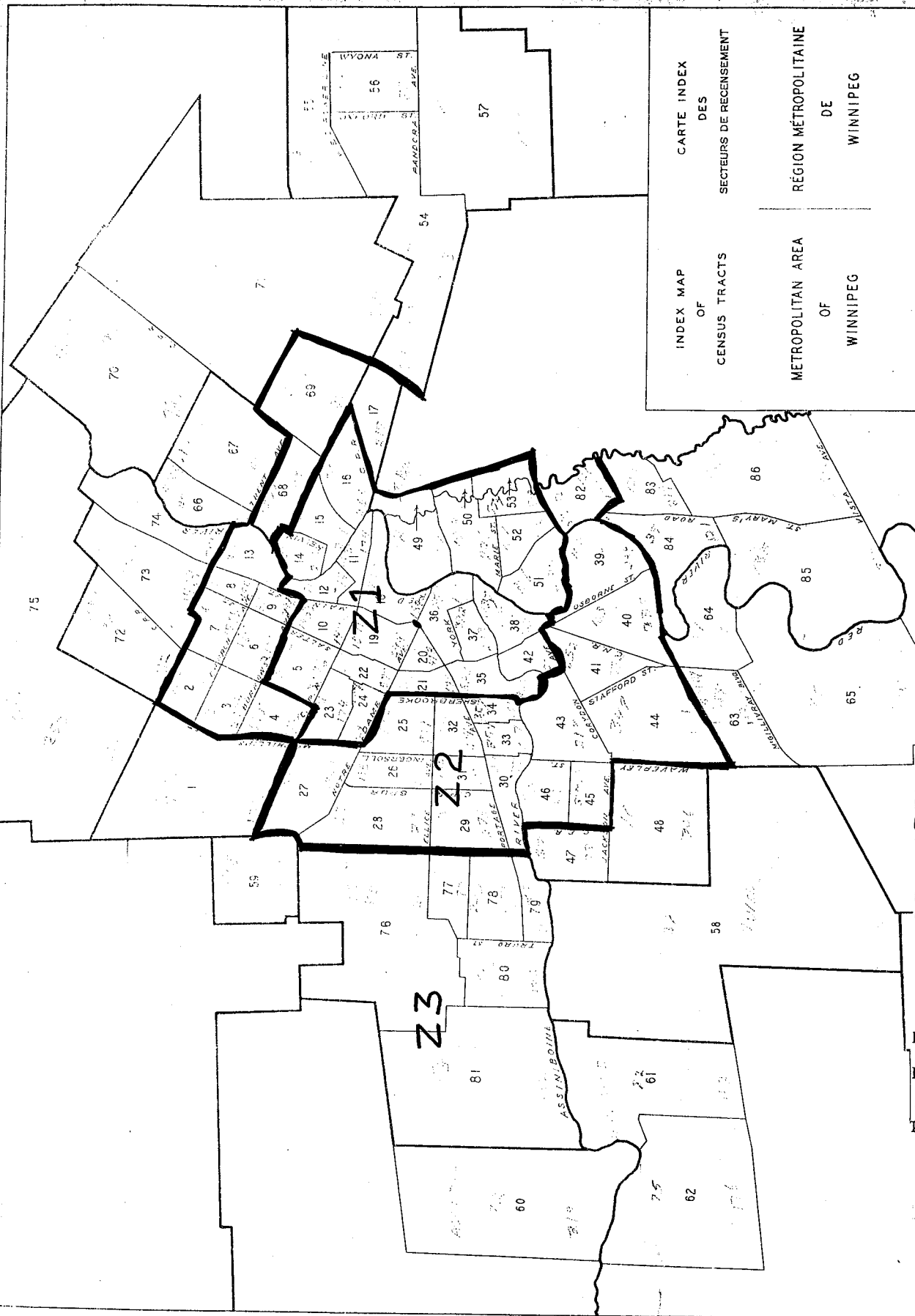












INDEX MAP
OF
CENSUS TRACTS
METROPOLITAN AREA
OF
WINNIPEG

CARTE INDEX
DES
SECTEURS DE RECENSEMENT
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Table 1. Population
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