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LOCATIONAL PATTERNS OF RESIDENTIAL BUILDING ACTIVITY

IN WINDSOR, ONTARIO: 1961 and 1971

A Thesis
Submitted to the Department of Geography of the University of Windsor, in partial fulfillment of the requirements for the degree of Master of Arts.

by,

Diana M. Dewar

University of Windsor
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1974
ABSTRACT

The growth of the urban complex, and the expansion and change of residential neighbourhoods has generally been described in terms of socio-economic structure and has been shown to take the form of concentric, sector, or nucleated patterns of growth, or any combination thereof. However, the major processes through which cities undergo continuous changes take place in their building inventories in terms of new construction and major modifications to existing buildings.

This study analyzed nine types of residential construction taking place in the City of Windsor in 1961 and 1971 in an attempt to evaluate the usefulness of existing models of neighbourhood growth in describing residential structural change. Variations in type of building activity throughout the city were described in terms of accessibility, centrality, and selected neighbourhood characteristics.

Correlation analysis was carried out to test the degree of association between each type of building activity and the selected locational variables for each year. Linkage analysis was applied to building permit data to illustrate the city's changing ecological structure as summarized by new building activity.

Although deviations were apparent, each type of construction was found to be distributed concentrically
with intensity of use decreasing from the center outwards. Furthermore, construction type exhibited a concentric expansion over time for all but that which resulted in higher density uses. Finally, development is not solely a function of distance from the city center or accessibility, but rather a combination of location factors which act to accelerate some forms of construction and hinder others.
ACKNOWLEDGMENTS

I would like to thank my primary advisor, Dr. Vernon A. Smith for his continual guidance and for giving so unspARINGLY of his time at all stages of preparation of this thesis.

Appreciation is also expressed to Professor Ronald Seale, Dr. T. H. White, and Professor Trevor Price for their very helpful comments and editing of this paper.

Timothy Greenhow must receive credit for his excellent cartography and Mrs. W. J. Dewar for her masterful typing at very short notice.

Finally, to my parents, who continually encouraged me, I am grateful.
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Chapter 1

INTRODUCTION

In the twentieth century, vast and complex changes have been taking place in the spatial structure of North American cities. During this time, many attempts have been made by social scientists to discern various kinds of orderly spatial patterns underlying the nature and growth of residential areas of the present day city. From these studies, a number of traditional models have emerged, identifying these patterns, and have been employed to explain the existing spatial structure of urban areas.

Among the earliest descriptive generalizations were those of Hurd, who related homogeneous neighbourhood characteristics, especially rent and income, to two simultaneous patterns of growth which he called central and axial growth. He developed the concept that growth tends to occur in all directions outward from the center of the city, and most rapidly along major transportation routes. In applying the concepts of "competition", "dominance" and "invasion and succession" (characteristics of biotic activity) to the analysis of urban areas, Burgess emphasized that socio-economic status varies directly with distance from the city center causing concentric zonations of similar urban characteristics. He upheld the idea that change.
occurs by outward movement of the wealthier to the periphery and by the continued expansion of the inner zones upon the outer in a process of invasion and succession by the lower status groups living closer to the city center. Hoyt emphasized the significance of axial growth when he developed his sector concept. According to this notion, status differences established around the city center are projected outwards along the same sector as the city grows, thus creating a wedge-shaped distribution of neighbourhoods by type with the higher status groups following scenic amenities and higher ground. Harris and Ullman postulated that land patterns develop around several nuclei within the city rather than a single center. Although simplistic and somewhat contradictory, these theories have led to further investigation into the complexity of the city.

More recently, there have been studies of the socio-economic structure of residential areas which tend to reinforce the concentric sector and multiple nuclei theories mentioned above and conclude that urban residential patterns are a result of all three models mentioned above. As a technique for classifying subcommunities on the basis of a series of census variables, modifications of technique called social area analysis have been used during the last decade to show that, over time, the economic status pattern tends to expand sectorially, the pattern of family status tends to move outwards from the
city center in a wave-like concentric fashion, and ethnic status expands according to a spatial diffusion process.

The theories which have been developed thus far have concentrated on the socio-economic factors related to urban expansion and have neglected, for the most part, the physical residential structures of the city.

Only recently has there been an attempt to derive a model for urban growth based on new construction in an effort to explain the complex patterns of metropolitan spatial organization. Hypothesizing that changes in the condition of building stock represent a summation of the many complex factors acting to alter the spatial arrangement of the city, Bourne studied the nature and pattern of private redevelopment in the City of Toronto. Dealing primarily with new apartment and office building construction, it is one of the few studies which sought to establish the location and process of structural change in the standing stock of building in a city, and to describe the characteristics of the sites and the areas undergoing change.

In effect, the existing theories of residential land use characteristics do not take into account the variable character of the structural stock and the processes of change within this stock. The fact that physical change, as reflected
in new construction and major modifications to the existing stock is a basic means of redistributing land uses, and hence altering the urban form, has received little attention and it is from here that this study is based.

The purpose of this study is to investigate trends in new building construction and major modifications to existing residential stock under the 1961-1971 period in the City of Windsor. An attempt will be made (a) to examine and evaluate the existing traditional theories of urban growth and spatial patterning for an understanding into processes and patterns of residential structural change, and (b) to describe and analyze the nature and spatial pattern of various types of new construction and structural change in the existing stock in relationship to selected neighbourhood characteristics.
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Chapter 2
PREVIOUS RESEARCH

The diffuse body of theory pertaining to intra-urban residential structure and growth originated in a variety of disciplines and has shown to be independent but complimentary. Initially, findings concentrated heavily on socio-economic characteristics of the study areas, while theoretical development later led to a gradual interest in the physical residential structures.

Classical Models

Among the original theorists was E. W. Burgess, who studied land use and social characteristics in Chicago. He hypothesized that, based on ecological principles of invasion and succession, urban patterns could be briefly described in terms of five concentric zones: (a) The Central Business District, (b) The Zone of Transition, (c) The Zone of Independent Workingmen's Homes, (d) The Zone of Better Residences, and (e) The Commuter's Zone. He argued that the principle of invasion and succession attributed to these resulting zonations of urban growth. Most subsequent researchers have construed these zones as denoting a continual increase of socio-economic status away from the city center, and have
criticized Burgess' theory because it studies only one city from one point in time.

The sector model, originally described by Hurd and later formulated by Homer Hoyt, explains the movement of residential neighbourhoods. Hoyt proposed a theory of location of rent areas and theorized that they "tend to conform to a pattern of sectors rather than concentric circles. The highest rent areas of the city tend to be located in one or more sectors of the city, and there is a gradient of rentals downwards from these high rental areas in all directions." This model has been modified to maintain that the "Central Business District remains as a circular form at the center of the city while residential areas of similar socio-economic status originating near the center tend to migrate in sectors towards the urban fringe." A third classical model, as devised by Harris and Ullman in 1945 as a modification to the two previous models, suggested that rather than concentrating around a single core, urban land uses arrange themselves around several nuclei. In some cases, these nuclei have existed from the origin of the city, but others may develop during the growth of the city and may constitute a commercial, manufacturing, or industrial district. Unlike concentric and sector models, this theory does not suggest that one model is common in explaining urban growth in all cities.
These three spatial models are not mutually exclusive, but have become the building blocks for subsequent theorists of intra urban spatial patterns and have been integrated in an attempt to explain the total socio-economic structuring of neighbourhoods.

Social Area Analysis

The primary means by which these models were merged into one framework to explain social, and to a lesser extent, structural patterning of cities was with the development of social area analysis. Originally developed by Eshref Shevky, this technique suggests that the complexity of urban social structure can be classified under three basic constructs which he called 'social rank' (occupation, education and rental variables), 'urbanization' (fertility variables), and 'segregation' (the measure of the concentration of ethnic or minority groups). His typology isolated and classified urban subareas in terms of three basic parameters of urban social structure. Analysis was based on census tract units and was first applied by Shevky and Williams to the city of Los Angeles. Three indices were proposed (one per construct) made up of from one to three census variables, and were designed to rate census tract populations on the basis of economic, family and ethnic status. As a result, census tracts were grouped into social areas based
on their scores.

Several researchers applied the methodology to investigate the nature of social area patterns within cities. In most instances, three major patterns of socio-economic structure emerged: the social rank dimension was distributed in a sectoral pattern, the urbanization dimension was concentrically distributed, and the segregation dimension formed distinct multiple nuclei.

**Factorial Ecology**

Improved methodology was later developed to include a wider set of socio-economic variables in an attempt to isolate those dimensions which explain the socio-economic differentiation within urban areas. Multivariate statistical techniques such as principle component analysis and factor analysis have been employed to investigate spatial variations in the urban ecological structure by mapping the scores of census tracts on the components or factors. The method is commonly known as factorial ecology.

Several cities have been studied based on various numbers and combinations of socio-economic variables, and using various areal units. The same basic patterns evolved for each city and substantiated the earlier findings based on concentric and sector models of socio-economic patterning.
Furthermore, both social area analysis and factorial ecology have been employed and related to other topics such as voting behaviour, attitudes towards education, crime, intra-urban migration, and industrial location.

**Comparative Factorial Ecologies**

Most factorial ecologies have confined themselves to one point in time. Comparative studies, however, have shown temporal changes in the spatial patterning of the factor structure and have demonstrated that over time, economic status tends to expand sectorially, family status expands concentrically, and ethnic status expands according to a spatial diffusion process.

**Housing Characteristics and Socio-economic Correlates**

The above studies are primarily descriptions of the social geography of the city, and are only indirectly concerned with its physical structures. Recently, however, work has been done which has attempted to identify the basic relationships which exist between residential structures and the social geography of urban areas and have resulted in general statements concerning locational patterns of both based on the classical models of urban structure.

Berry and Murdie were among the first to recognize the need for further study into this relationship in their
work on urban renewal treatment. Based on the assumption that programs of urban renewal must involve an evaluation of characteristics such as economic status, family size and composition, ethnic concentrations, and residential stability, they correlated various socio-economic variables with housing stock characteristics first in Metropolitan Toronto and then in the center city, in an attempt to classify enumeration areas according to the need for renewal treatment.

They found that although deviations were apparent, housing type appeared to be distributed concentrically, with apartment dwellings and related population mobility and rental characteristics locating in the central city, while single family homes, accompanied by neighbourhood stability and home ownership, were found at peripheral locations. Single attached homes, at higher densities were located outside the central core, in older residential neighbourhoods built up primarily before 1920. Lower value homes, and homes in need of structural repair correlated highly with areas where high proportions of single attached homes existed. Houses lacking household amenities such as hot and cold water and bath were found to be correlated with rooming houses, a high percentage of single people, females employed as domestics or in other service occupations and low income. They were found in the oldest sectors of the city near the core, and on fringe areas where land use was predominantly rural. Stable residential neighbourhoods correlated highly with
lack of mortgage and houses built prior to 1945, and were located in older neighbourhoods of the inner suburbs. As expected, they found that low value housing correlated with low levels of education, labouring occupations, large numbers of immigrants, overcrowding, and many lodgers. Housing value displayed sectoral patterns.

In examining the relationship between residential morphology and social structure throughout the entire urban complex, McCann and Smith found that several dimensions emerged when applying factorial analysis of South Edmonton. Housing age, they found, was strongly related to family status, and both displayed similar concentric patterns. Hence, areas of older housing, where a high proportion had been converted to multiple occupancy co-existed in concentric fashion with areas of non-family households, families with few or no children, and an older population base. Newer developments, where the proportion of single family units was high were found to correlate strongly with areas characterized by larger families and younger children. Further, they found housing quality and socio-economic status exhibited corresponding sectoral distributions with lower socio-economic status evident in those areas of older and smaller sized homes and areas of land use transition. Conversely, high socio-economic status correlated strongly with areas of new and larger homes, and residential stability. They found, also, a strong association between areas of land use transition
characterized by houses converted to multiple uses and areas of non-family status, high proportion of rented dwellings, and areas where the turnover rate was highest. Finally, they concluded that housing condition displayed a clustered pattern, and correlated insignificantly with social characteristics.

Bourne and Murdie, in studying the interrelationships and corresponding spatial patterns of social and physical space in the city of Toronto, found six underlying dimensions of urban structure. They identified the core area, where land use density and mobility is high, and family status and economic status low, and the suburban fringe, with low density uses and middle class occupations exhibiting nucleated spatial patterns. Partly filling the void between these two dimensions were four other variations of the traditional socio-economic models of urban spatial structure. A radial or sectoral pattern was evident in examining industrial neighbourhoods, where older housing stock, low socio-economic status, a large number of Italians and unstable environments predominated. The ethnicity and suburbanization dimension characterized by large numbers of apartments, high socio-economic status and Jewish ethnicity also showed a sectoral pattern. However, suburbanization environments characterized by suburbanization, high family status, dominance of physically homogeneous units, low density uses and high mobility, and stable residential neighbourhoods characterized by older
neighbourhoods, land use homogeneity, low family status and stability in occupancy exhibited zonal patterns.

Theories of Residential Transition

In general terms, residential neighbourhoods themselves have been described as evolving through various stages of development over time. Hoover and Vernon, in studying New York, identified five stages which are continually acting to restructure the form of the city.

The earliest stage, they concluded, is that of construction of single family homes and very rapid population growth. In most cities, this stage is long past in the central city, has stabilized in the inner suburbs, and is only beginning in the outer suburbs. Stage 2 is a period of transition in which the majority of new construction takes the form of apartments, frequently replacing older single family homes. A downgrading stage (Stage 3) follows, although the distinction between this and the previous stage is not clear cut. This is a period in which older, rented housing is converted to higher densities than it was originally intended for and new construction is minimal. Crowding results as frequently neighbourhood districts of this type are occupied by segregated ethnic and minority groups, recent immigrants, and households with lodgers. Stage 4, "the thinning out process", is characterized by little or no construction
and a decline in population resulting from a reduction in the household size in these neighbourhoods. The stage of replacement follows (Stage 5) whereby obsolete areas of housing are replaced by higher density uses or are rehabilitated and restored by extensive repairs and remodeling more often through public intervention than not. Thus they theorized that, as all areas of the city pass through these stages at various points in time, and in differing degrees, the city is transformed.

L. D. McCann, in studying transitional areas, hypothesized that areas undergo a succession of changes which are recurrent through space and time in various parts of the city, and are directly related to changes in population composition. He studied seven areas of dwelling conversion and apartment redevelopment in Edmonton to determine the interrelationship which existed among functional patterns, structural stock, and population characteristics. Identifying the Central Business District, major arterials and functional growth points as being the more susceptible transitional areas, McCann suggested that concentric, sector and multiple nuclei patterns are each exhibited by this process.

T. A. Hartshorne, recognizing the lack of adequate theoretical foundation to explain the residential structure of central cities, studied the behavioral and transitional processes modeling the residential structure of the deterior-
ated and declining areas of Cedar Rapids. His findings con-
curred with those of the social area analysts and he agreed
that their findings are applicable to the inner core with
its downgraded socio-economic character and abundant sub-
standard housing. He found that decline follows a concen-
tric ring expansion process most accelerated along those
sectors experiencing the most rapid outmigration, and con-
cluded that decline is due to two major factors - the aging
of housing, and intra-urban migration, particularly the
filtering down process.

Trends in Location of Residential Construction

Thus, studies of the growth of the urban complex, identi-
fication, expansion and changes of homogeneous residential
neighbourhoods have taken varied approaches and have sub-
stantiated the already well-known fact that residential pat-
terns take the form of a combination of the three classical
models of urban growth. What remains to be understood, however,
is that the major processes under which cities undergo these
continuous changes take place in their building inventories
in terms of new construction and structural modifications to
existing buildings. This is the process by which cities are
rebuilt, and it is essentially the major means of re-allocating
land uses. However, it is within this area that research is
most deficient and data most inadequate.
Research pertaining to the location of new residential units has concentrated heavily on trends in apartment developments, and has excluded, perhaps because of the complexity of the housing market, other forms of construction.

Anshel Malamid, for example, recognized that, although the largest concentrations of apartments still existed in the center city, more high rental units were being built in the suburbs than in the downtown area. Units in both areas were found to be located within easy reach of public transportation despite the fact that apartment dwellers were extremely mobile via all modes of transportation (i.e., 85% of the suburban apartment dwellers, and 65% of the downtown, high-rent apartment tenants owned cars.).

Characteristics of the dwellings showed variations between the core area and the urban fringe. Densities of high-rise, high rent units tended to vary in inverse ratio to their distance from the city center. Downtown apartment clusters averaged a density of 553 units per acre, while inner city and suburban apartments were built at densities of 92 and 25 units per acre, respectively. Building height also followed a sharp gradient from the center outward. The average number of stories in core area units was more than double that of apartment buildings in the urban fringe, and 75% higher than those in the inner suburban area.
Distinctions in site acreage were also apparent. The average apartment site in the inner city was less than 0.6 of an acre, one-twelfth the size of high-rental apartment sites in the inner suburban area, and one-fourteenth of those on the fringe. Rents varied widely, but the highest rents occurred in the downtown area, compared with 5% and 11% lower rents for comparable accommodation in the inner suburbs and outer suburban area, respectively.

Similar findings were expressed by Nowbray, who, by studying trends in apartment location in Washington, Philadelphia and Baltimore, recognized the overall trend of apartments to the suburbs.

Smith studied trends in low-rise apartment construction in Oakland during the 1953-1963 period, as he recognized that locational patterns of this type were distinct and did not follow the same directions as high-rise developments. Initially, he found that low-rise apartments were located close to major streets and on the fringes of neighbourhoods primarily in multiple family use bordering on single family districts. The trend over the five year period was for multiple dwelling construction to break away from major streets and locate mainly in single family areas. Accessibility to major arteries and mass transportation, he found, was of no greater importance to apartment occupants than to the home owning public. The number of automobiles and their use per
household appeared to be no less among these occupants than among the population as a whole. Accessibility was, instead, of major importance only to the developer who felt that apartments are more easily rented when they can be seen from heavily travelled streets.

Other research dealt with changes in the land market as causes for the trend towards apartments locating in outer areas. Neutze, in the middle 1960's, felt that family structure and changing tastes and preferences were among the reasons for the increase in apartment activity in the suburbs. But more importantly, large concentrations of apartments scattered around the fringe because developers took advantage of the opportunity to speculate on the developmental possibilities of large tracts of land in suburban areas where problems of assembling large tracts of land and high land prices are not encountered. Furthermore, he maintained that the public sector could not control this land market efficiently.

Later, Bourne examined how recent trends in housing supply and demand increase the rate of apartment construction and the spread of apartments to a wide variety of locations, hence shifting the location of urban residential inventory away from traditional patterns. In the past, residential location had been explained by theories of land value whereby "the price of land at any location is considered
to be a function of accessibility to the city center with land uses sorting themselves out in accordance with their ability to pay for each site. In this respect, uses which cannot compete are forced to locate on the urban periphery. Thus, as distance increases and land prices diminish, there is a shift to duplexes, single family homes, and finally houses on large lots from the center outwards. Apartments, because of their land-rent-paying ability, can compete for almost all locations, and as a result locate in the city center.

Bourne found, that to the contrary, apartments are increasingly found throughout the urban area, including the fringe. This spread of apartments to a wide variety of locations has for the most part been shown to represent a logical extension of recent trends in housing supply and demand.

On the supply side, he attributed the lack of reasonably priced land on the fringe, and the increasing costs of providing municipal services as the major factors leading to high density development. On the demand side, he noted that changes in family size and structure, housing and locational preferences, and rising real income (especially among non-family households) have partially been responsible for the growing demand for new housing at a time when high construction costs and competition for sources of capital financing have reduced the supply of homes for all but the higher
income groups.

To examine those characteristics which control their location, Bourne tested several components against the distribution of apartments in the City of Toronto. Among the most important were (1) the composition and distribution of the existing stock of residential structures, (2) accessibility to the urban center, mass transit and place of employment, (3) existing apartment developments, (4) socio-economic status, (5) costs and availability of land and (6) costs of municipal services and social and educational facilities.

He found that, contrary to traditional theory, apartment construction was not related to proximity to the urban core, or accessibility to employment opportunities. Very low positive correlations existed between apartment construction and areas of older mixed land use and deteriorated housing, and consequently Bourne observed that the replacement of older residential buildings is not a result of aging and obsolescence as the classical economic theory implies. A high positive correlation was evident between new apartments and areas of existing apartment concentrations, proximity to major transportation routes, and areas of high income status. Although a definite pattern of localization was apparent, he noted that apartment construction has exhibited an increasing spread to a variety of locations during the eleven year period.
under study.

Studying the nature, location, and rate of redevelopment in the City of Toronto, Bourne found that the spatial behaviour of such was not simply exhibited in concentric or axial patterns. Instead, it was highly localized, specialized in type (apartments and office buildings accounted for 75% of the floor area added), and extremely variable over time. A combination of neighbourhood amenities and accessibility to the central city combined to give an area potential to attract new investment, and when aggregated over large areas, redevelopment bore little relationship to the distribution of vacant land. Furthermore, it did not show a consistent decline with distance from the city center and was not construed to be a function of aging and obsolescence. He found that less intensive uses were replaced by more intensive uses and that these were directly related to distance from the city center. In addition, the degree of stability in land use was related to the intensity of that use. That is, properties in the inner part of the city were redeveloped for uses other than their previous use while land in the outer areas was generally redeveloped for residential uses.

In general, redevelopment was sectoral rather than concentric, and appeared in clusters, but each of the major types

* Redevelopment was defined as a replacement process in the building stock of the city.
exhibited a distinct spatial pattern independent of all others.

Bourne extended his studies by evaluating conditions in various census tracts in the central city of Toronto and developing a predictive model to measure an area's potential for new residential construction in general. He hypothesized that the distribution of building activity was a function of the character and distribution of the existing stock of building and land uses, accessibility to the city center and mass transit, the physical and social environment, the cost and ease of land assembly, and the availability of vacant land. He found that new construction tends to follow existing land use concentrations and previous directions of growth. Although new construction tended to locate in higher status areas, there was no evidence that it was related to local amenities such as parks and playgrounds. Furthermore, a negative correlation existed between older, deteriorated neighbourhoods and new construction. Although proximity to mass transit was an important factor in the location of new dwelling units, proximity to the city center was not. In general, new construction was more likely to locate in areas where vacant land was available (this was evident when individual properties were examined, but not at the census tract level) and land assembly facilitated. Finally, although not concerning himself with the various types of new residential
construction, Bourne did point out that single family
construction in particular showed a significant positive
relationship with distance to the city center, and a negative
-correlation with employment density.

Thus, descriptions of urban residential patterning
have been concerned primarily with population distributions.
The gradual interest in relating housing characteristic
variables to socio-economic conditions has been done without
reference to process, or has provided detail for small
areas without considering the entire urban complex. Those
few studies attempting to explain patterns in new construction
have dealt with one or two forms of development at the most.
No empirical documentation exists concerning recent
modifications, repairs and maintenance of the existing
residential stock and existing literature does not provide
a logical basis to account for such changes. This study stems
from this deficiency.
References


3. Richard M. Hurd, Principles in City Land Values (New York; Real Estate Record Association, 1903).


5. Ibid. p. 76.


Robert A. Murdie, op. cit.


Frank L. Sweetser, Patterns of Change in the Social Ecology of Metropolitan Boston, 1950-1960 (Boston: Massachusetts Department of Mental Health, 1962).

20. Brian J. L. Berry and Robert A. Murdie, Socio-Economic Correlates of Housing Condition (Toronto: Metropolitan Toronto Planning Board, August, 1965).


Chapter 3

METHODOLOGY

In the present study, nine types of new construction and major modifications to the existing stock taking place during 1961 and 1971 were studied in relation to selected locational variables at the census tract level. This chapter provides an examination of the nature of the data and unit of analysis, and an explanation of the locational variables and statistical techniques employed.

The Data

The main source of data employed for the analysis of new construction and structural changes to the existing stock was derived from building permits provided by the Building Department of the City of Windsor. Whereas housing

* As a means of public control on private construction, the purpose of a building permit is to ensure that the intended use conforms to municipal building standards and zoning bylaws. All new construction, demolitions and physical improvements over $500 require such a permit in the City of Windsor. Although the acquisition of a permit is not a guarantee that the construction will take place immediately, the City's Plan Inspector assured the writer that the intended work was carried out in the same year for at least 90% of the permits issued in 1971.3
start statistics are available only for the city as a whole, use of building permits allows the exact location, value and type of construction taking place on each individual property to be identified.

The permits were broken down into nine main categories and mapped to illustrate the exact location of each property undergoing change. Each type of building activity was defined as follows:

(1) Single detached - a detached dwelling designed, intended or used for the occupancy by not more than one family.

(2) Semi-detached - a pair of attached one family dwellings divided by a vertical plane which is approximately perpendicular to the street.

(3) Duplex - a dwelling divided horizontally into two separate dwelling units, each having an independent entrance.

(4) Row or Group Housing - a series of more than two attached one family dwellings, divided vertically.

(5) Apartment or Multiple Dwelling - a building used, designated as a residence for three or more families living independently of each other and doing their own cooking therein.

(6) Conversion - a change from one major type of occupancy or use to another.

(7) Repair - renewal or replacement of any part of a building.

(8) Addition - any modification to a building causing an increase in the amount of floor space.

(9) Alteration - a structural change affecting any part or fixture of a building and not resulting in an increase in floor space or change in function, and not constituting a repair.
The spatial pattern of each of the above types of building activity was investigated in terms of (a) centrality, (b) accessibility as measured by nearness to transportation routes, (c) type of existing residential structures, (d) age and condition of existing residential structures, (e) median value of existing residential structures, (f) neighbourhood amenity, and (g) neighbourhood stability.

Except for variables relating to centrality, neighbourhood amenity, median value, and nearness to major transportation routes, all data was obtained basically from 1961 and 1971 published census bulletins. All values, excluding the accessibility variable, were measured on an interval scale. The nature of the data, and the rationale for selection of each variable, are as follows:

(a) Centrality

Centrality, or nearness to the city center is still a meaningful measure of many urban structural patterns. It is included in the present study as a possible means of testing the concentric theory. The mid point of each census tract was measured as the distance from the peak land value intersection at Ouellette Avenue and University. Further, visual map interpretation allowed analysis of an activity's position within the central city, inner suburbs, and outer suburbs.

*Summary statistics are provided in Appendix A.*
(b) **Accessibility**

In its broadest form, accessibility refers to "potential opportunities for interaction." In this study, it refers only to ease of movement allowed by nearness to major thoroughfares. Many studies have already illustrated the relationships between accessibility and the location of land uses and here we are concerned with the relationships existing between new construction and major transportation routes as a possible means of examining the sector theory.

Due to the positioning of Windsor's census tracts relative to transportation routes, analysis of this variable was carried out at a purely descriptive level, and relied heavily upon visual interpretation of observations which were apparent when new construction and major modifications were plotted on maps.

As previous studies have shown, neighbourhood character, whether measured by physical attractiveness, structural quality, environmental amenities, or socio-economic status may act to accelerate some forms of construction and hinder

---

Initially, the location of each census tract was treated as a dichotomous variable, but since major transportation routes, in most cases, act as a boundary for census tract divisions, analysis by this method proved to be unsatisfactory.
others. For example, Hoover and Vernon have suggested that areas of older, rented housing characterized by low socio-economic status do not attract new construction but are more susceptible to the conversion of dwellings to higher densities. In addition, Bourne stressed that new residential construction follows existing land use concentrations and tends to locate in higher status areas. The following variables have been selected to examine the relationships which exist between neighbourhood characteristics and the various forms of new construction:

(c) **Type of Existing Residential Structures**

It has been suggested that "zoning and propinquity among similar land uses tend to channel the location of new construction". Accordingly, the proportion of single detached, single attached, and apartment units for each census tract were selected from the 1961 and 1971 census bulletins in an attempt to evaluate the extent to which new construction is affected by previous directions of growth.

(d) **Age and Condition of Existing Structures**

The number of homes built prior to 1920, and homes in need of major repair were selected from the 1961 census in an effort to test the transition process, and the extent to which age and condition of existing structures affects
each of the various types of building activity. Although
age and condition variables were available for 1961 only,
the assumption was made that the number of homes built prior
to 1921 and in need of major repair would not change significantly
to alter the results.

(e) Median Value of Existing Residential Structures

A further measure of neighbourhood quality, and one
which can be considered a measure of an area's position on
the socio-economic scale is that of the median value of
the housing stock in each census tract. Values were available
for 1961 from the census. For 1971, however, data was
supplied by the Windsor Real Estate Board.

(f) Neighbourhood Amenities

Unlike pollution, noise, conflicting land uses, and the
like, the presence or absence of park space is one aspect
of environmental amenity that is easily measured. The
number of acres of park space per 1,000 people was
employed in the present study to evaluate the extent to
which variations in neighbourhood quality affect the type of
new construction which is attracted to an area.

(g) Neighbourhood Stability

The percentage on non-movers during ten years was
selected as a measure of neighbourhood stability in an
attempt to evaluate the extent to which this factor contributes to various forms of new development. As data was available for 1961 only, this factor was excluded from 1971 analysis as the comparison would not be accurate.

Unit of Analysis

The basic unit of area employed for our analysis was the census tract which was thought to be the most suitable for several reasons. The most important of these is that census tracts are the smallest area for which aggregate statistics can be compared over time. The boundaries of the smaller enumeration districts are continually being altered with the taking of each new census. Secondly, they are the geographical area for which the greatest amount of data is conveniently available, and as previously discussed, several of the location variables were obtained from this source. Thirdly, due to the nature of the building permit data and the small number of some types of building activity, anything smaller than a census tract would make it difficult to obtain meaningful results. Finally, analysis by census tract allows comparisons with other studies which have for the most part been analyzed on the basis of the same areal units.

Due to varying population sizes within census tracts, adjustments to the data involved conversion to percentages to overcome bias. Variables were considered as a percentage
of total occupied dwellings or total population, where appropriate, for each respective census tract.

**Analytic Procedure**

Analysis was carried out at the census tract level to test the amount of association between each type of building activity and the selected location variables for each year. The statistic employed to describe the degree of association between two sets of interval data was Pearson's coefficient of correlation (r) and was obtained from the SPSS (Statistical Package for Social Sciences) Pearson Corr program. The significance of each observed coefficient was then tested against the appropriate tabulated r at the .05 level of significance.

One additional statistical technique was applied to only building permit data as a means of adding collaborative evidence to basic residential change. In order to group the city on the basis of similar building activity for each year, census tracts for which data was available were subjected to a nonparametric cluster technique called "Linkage Analysis". Linkage analysis is a method of grouping objects (in this case, census tracts) based on the concept that similar items have certain properties in common and are highly correlated with one another. The grouping technique resulted in five groups for each year, which were internally homogeneous in terms of their building activity.
References


3. Ibid.

4. Ibid.

5. Bylaw 728, City of Windsor (1948).

6. Ibid.

7. Ibid.

8. Ibid.


13. Interview with Paul Hewitt, Senior Planner, Planning Department, City of Windsor, April 30, 1974.


Chapter 4
BACKGROUND TO THE ANALYSIS

Recent trends in urban structural change cannot be fully understood without a knowledge of the City's past growth. This chapter traces the main development outlines of this urbanized area as they emerged, and provides a summary of the magnitude and composition of residential construction and resultant changes in population composition and residential differentiation for the ten year period under study.

Evolution of Existing Spatial Structure

The City of Windsor is situated in Southwestern Ontario on the extreme northwestern tip of a peninsular extension which protrudes into one of the most urbanized areas of the United States. It is situated opposite the City of Detroit on the south side of the Detroit River which separates the State of Michigan, U.S.A. from the County of Essex in the Province of Ontario.

Its original settlement dates back to 1742 when Indians settled the south shore of the Detroit River opposite the original settlement of Detroit which had been
settled by the French in 1701. Their trails converged at the narrowest crossing point of the river. Later, land grants by the French Crown encouraged settlement along the south shore which resulted in ribbon-like farms extending southerly from the river in order to give maximum access to water transportation. This pattern of settlement is one of the major factors influencing the form of subsequent growth since it facilitated the southerly extension of street without regard to east-west arterials. With the British conquest of 1760, there was little change in the size of settlement. The close of the American Revolution, however, saw large numbers of British supporters moving to the south side of the river. By 1780, Sandwich, to the west of the previously built up area on the south shore, had been developed by the British as a center of population, functioning as an administrative seat and a supply and distribution center for the surrounding agricultural community. Sandwich was subdivided into rectangular one-acre parcels with the major streets paralleling the river. The settlement at Sandwich spread eastward over the next few years and became sufficiently urbanized around a nucleus of commercial uses to merit the name "Windsor" in 1834. In 1854, Windsor was selected as the westerly terminus of the Great Western Railway, and for this reason, population began to concentrate in Windsor rather than in the surrounding settled areas. Consequently, in the same year, Windsor was incorporated as a village.
Four years after the opening of the Great Western Railway, Hiram Walker founded the first modern industry in the Windsor area, a distillery, on a site east of Windsor. On a grid pattern, he laid out a planned community in the area in order to provide accommodation for the firm's employees. Incorporated in 1890 as the Town of Walkerville, this industrial community became the third urban center achieving corporate status.

In 1904, Ford founded an automotive plant on the south side of the River, east of the Walkerville distillery. A period of rapid industrial expansion followed, and growth in the vicinity of the Ford plant lead to the incorporation of the east end as the Town of Ford City which, in 1929, became the City of East Windsor.

Resultantly, the area had developed politically as four separate municipalities which were referred to as the "Border Cities" of Sandwich, Windsor, Walkerville and East Windsor.

In 1913, it was announced that Ojibway would be the site of the United States Steel Corporation's plant. As a result, it was incorporated as a town in the same year. Large parcels of land were subdivided, and services provided in anticipation of future development. Cancellation of the plans during the war years, however, resulted in
minimal growth of this area in the following years.

Changes in the pattern of development of the Border Cities occurred with the growing popularity of the automobile. In 1929, the Ambassador Bridge was completed, and in the following year the Windsor-Detroit tunnel was opened. The latter had a profound effect on the commercial core of Windsor which had developed laterally along the riverfront in order to maintain proximity to the waterfront. In response to the location of the tunnel terminal at Park Street, and the trend toward southerly growth, commercial development began to concentrate along the Ouellette frontage marking the Windsor settlement the nucleus of growth.

During the Depression years, the four Border Cities faced financial difficulties and, in 1935, were forced to amalgamate into a single municipality having a population of 114,000.

With the Second World War, industrial plants were converted into war production, and with the heavy influx of employees, the City experienced an acute housing shortage. The result was the construction of 3,500 wartime units. As the City's areas became largely developed, the growing population spilled over the municipal boundaries into the surrounding Townships of Sandwich East and Sandwich West.
Suburban growth resulted in the settlement of the Town of Riverside, and in 1921 it was incorporated as a town with a population of 1,155. By 1950, Riverside and the Townships of Sandwich East and Sandwich West were developing without the benefit of municipal services. Consequently, in 1966, the Ontario Municipal Board requested the annexation of Riverside, Ojibway, Sandwich East and part of Sandwich West to the City of Windsor.

Thus, Windsor is now the largest urban center, and the only incorporated city in Essex County. It ranks tenth largest in Canada in terms of population, and fifth in terms of manufacturing. With 47% of its 1971 taxable assessment based upon industry and commerce, Windsor is considered to be one of Canada's leading industrial cities. Having increased its size in terms of both population and area, 1971 statistics show figures of 203,000 and 31,583 acres respectively.

Magnitude and Composition of New Residential Construction

Accompanying this growth was a steady increase in new construction in terms of both value and units added. For the study period, the number of dwelling starts (new single detached, semi-detached, duplex, row and apartment) in 1971 more than quadrupled those of 1961 (Figure 4).
TOTAL RESIDENTIAL HOUSING STARTS
WINDSOR — 1961 - 1971

Number of Units

Source: CMHC. CANADIAN HOUSING STATISTICS (Ottawa: 1968 & 1971)

Figure 4
Concurrent with trends in housing supply and demand in most North American cities, the dominance of single family homes over others appeared to decline in favour of medium density dwellings for the city as a whole (Figure 5). Of significance was the substantial increase in the percentage of row houses built during the ten year period. Between 1961 and 1964, none were added to the housing stock, while between 1965 and 1971, the proportion added each year increased steadily to 22.58% in 1971. Similar trends can be seen with the increasing popularity of semi-detached and duplex-type houses, although not of such magnitude.

As in most Canadian cities during the 1961-1971 decade, there was a much greater increase in the number of non-family households than in actual total population during the same period (Table 1). This resulted in a greater demand for apartment accommodation and is reflected in the very large amount of apartment construction.

In terms of value, a precise comparison cannot be made since figures prior to 1966 included only Windsor proper. It is interesting to note, despite the inaccuracy, that residential construction rose from one and a half million in 1961 to over thirty eight million in 1971* (Figure 6).

* This data, and any subsequent data, is based on "current dollars."
PERCENTAGE DWELLING STARTS BY TYPE

Source: CMHC, CANADA HOUSING STATISTICS (Ottawa: 1966 and 1971)

Figure 5
### HOUSEHOLDS BY TYPE

**WINDSOR, ONTARIO**

<table>
<thead>
<tr>
<th></th>
<th>1961</th>
<th>1966</th>
<th>1971</th>
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<tr>
<td>Total Households</td>
<td>53,315</td>
<td>58,250</td>
<td>74,235</td>
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<td>Family Households</td>
<td>45,881</td>
<td>48,995</td>
<td>61,000</td>
</tr>
<tr>
<td>Non-family Households</td>
<td>7,434</td>
<td>9,255</td>
<td>13,235</td>
</tr>
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</table>


*Table 1*
VALUE OF RESIDENTIAL CONSTRUCTION

Millions of Dollars

Year

Source: Bldg., Dept. City of Windsor, ANNUAL REPORT, 1971

Figure 6
General Ecological Structure and Change

The above resulted in obvious alterations in population composition and residential differentiation in various areas of the city during the 1961-1971 decade. Lack of complete census data makes impossible comparisons of income, occupation, religion, ethnicity, and occupancy characteristics. Data was available, however, so that more general population and dwelling characteristics trends could be illustrated.

For purposes of general discussion, the city was divided into three areas (Figure 7) similar to Murdie's trichotomy, which he employed to compare Metro Toronto's growth with several other North American cities. Central city in this study is that area which is delineated by Wellington, Giles, Pierre and the Detroit riverfront and comprises those census tracts (6, 8, 11, 12 and 15) which generally include the area of Windsor's settlement. The inner suburbs refer to the remainder of the area within the 1966 pre-amalgamation boundary and comprise twenty census tracts which were predominantly built up before 1928, with some infilling occurring during the 1928-1945 period. That area which was annexed to Windsor in 1966 (i.e., the former Riverside, Sandwich East, Sandwich South and Sandwich West) is referred to here as the outer suburbs, the majority of which has been developed during the last two decades.
By 1961, both the central city and the inner suburbs had been built up, with a population increase of only 1,344 (5%) and 2,499 (2%) respectively, being added to each during the 1961-1971 decade. In contrast, the outer suburbs experienced a substantial growth of 24,176 (39%). Changes in the age composition of this population show marked differences from area to area. For example, in both 1961 and 1971, the inner city contained a much higher percentage of persons over 65 years of age (12% and 15%) than did the inner suburbs and outer suburbs (10% and 13%; 4% and 13%). In contrast, the outer suburbs had a much younger population in 1961 and 1971 (38% and 31%) as compared to 25% and 24% in the inner core and 30% and 22% in the inner suburbs for the two years. Overall, the percentage of population under 15 years of age decreased for all three areas of study, and the proportion of those over 65 increased (Table 2). Surprisingly, and contrary to changes in population distribution in other metropolitan areas, the largest percentage increase of those over 65 occurred in the outer suburbs, with an increase of 9%, as compared to the other two areas who saw a substantially lower increase of 3% each. While a large decrease in the proportion of children took place in the inner and outer suburbs (6% and 7%), the central city remained relatively unchanged with a loss of only 1%. Accordingly, all areas decreased in the average number of persons per family, with the most noticeable difference seen in the central city, where the average
### SELECTED CHARACTERISTICS OF INNER CITY, INNER SUBURBS, OUTER SUBURBS

#### 1961-1971

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Inner Core</th>
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<th>Inner Suburbs</th>
<th></th>
<th>Outer Suburbs</th>
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<tr>
<td></td>
<td>1961</td>
<td>1971</td>
<td>% change</td>
<td>1961</td>
<td>1971</td>
<td>% change</td>
</tr>
<tr>
<td>Population</td>
<td>22,416</td>
<td>23,760</td>
<td>5.995</td>
<td>91,951</td>
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<td>18,810</td>
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<td>31</td>
<td>-25</td>
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<td>Apartments</td>
<td>3.193</td>
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<td>57.532</td>
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<td>Owner-Occupied</td>
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<td></td>
<td>72</td>
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<td>Rented</td>
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<td>5,270</td>
<td>39.013</td>
<td>7,605</td>
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<td>32.216</td>
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<td>55</td>
<td>64</td>
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<tr>
<td>With Lodgers</td>
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<td>760</td>
<td>0.085</td>
<td>1,765</td>
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<td>0.73</td>
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<td></td>
<td>6</td>
<td>6</td>
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<tr>
<td>15 &amp; over (single)</td>
<td>4,501</td>
<td>5,080</td>
<td>12.86</td>
<td>14,386</td>
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<td></td>
<td>15</td>
<td>19</td>
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<tr>
<td>Over 65</td>
<td>2,686</td>
<td>3,570</td>
<td>23.700</td>
<td>9,339</td>
<td>11,845</td>
<td>26.833</td>
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<td>13</td>
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<td>Under 15</td>
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<td>22</td>
<td></td>
</tr>
</tbody>
</table>

Source: Census of Canada, 1961 and 1971

Table 2
decreased from 3.38 to 2.78. In contrast, the outer suburbs saw only a slight change, with a decrease from 3.80 to 3.75. The largest percentage increase of those over the age of 15, who are unmarried, occurred in the inner suburban area, where the proportion increased from 15% to 19%. Change in the inner city was insignificant (1% increase) while no change occurred in the outer suburbs (Table 2).

Reflecting the changes in population distribution are striking differences in the nature of housing stock, and the associated characteristics of owner occupancy between the central city, the inner suburbs, and the outer suburbs. Again, incomplete census data places limitations on the extent of the analysis. For example, information relating to length of occupancy, structural size and condition had not been compiled at the time of this writing.

In both 1961 and 1971, the largest proportion of single detached dwellings occurred in the outer suburbs (95% and 92%), as compared to 41% and 31%, and 71% and 65% for the central city and inner suburbs, respectively. As statistics show, this proportion decreased throughout the entire city during the decade, with the largest decrease evident in the central city. Accordingly, the inner city had, and continues to have, a greater percentage of multiple family units (Table 2). A proportion increase of 15% is seen during the ten year period, while the proportion of apart
ment units to other types of dwellings increased 9% in both the inner and outer suburbs. Responding to these trends were changes in the ratio of owner occupied to tenant occupied dwellings throughout the entire city. As expected, the largest decrease occurred in the central city, where the proportion dropped from 44% in 1961 to 35% in 1971. The inner suburbs exhibited the least change (7%), and the proportion in the outer suburbs decreased by 8%.

In summary, the changing ecological structure of Windsor is not unlike that of most North American cities. Although the trend towards smaller, or non-family households and the demand for rental accommodation is seen to some extent throughout the entire city, the inner city continues to have the largest proportion of apartment units. The outer suburbs, by contrast, have seen a substantial increase in the number of single family homes, and remain to be characterized by young families with children. The inner suburbs have characteristics which lie between the two extremes, but are experiencing, to a much less extent, trends similar to those seen in the central city.
References

1. The following works were relied on heavily to provide facts and information pertinent to the historical development of the City of Windsor: Murray V. Jones and Associates, Background Studies: The City of Windsor Planning Area (Windsor; 1971), R. Alan Douglas, A Brief Historical Sketch of Windsor and Area (Windsor: Windsor Chamber of Commerce, 1962).


4. Ibid., p. 1.

5. Central Mortgage and Housing, Canadian Housing Statistics (Ottawa; 1966 and 1971) Changes in area definitions and population size groupings were incorporated in the surveys to facilitate comparison of data. Figures prior to annexation included Windsor, Sandwich East, Riverside, and those portions of Sandwich South and Sandwich West which were incorporated into the 1966 boundary.


Chapter 5

ANALYSIS

Designed to accommodate the demands for space which cannot be met within the existing residential stock, new construction and modifications to the existing stock represent a continuous source of urban growth and structural change. Although the process of change occurs in varying degrees for each type of activity and within different subareas of the city, distinct regularities in the patterns of growth become quite apparent.

The purpose of this chapter is to investigate these spatial patterns in terms of (a) centrality, (b) accessibility, as measured by nearness to transportation routes, (c) type of existing residential structures, (d) age and condition of existing residential structures, (e) median value of existing structures, (f) neighbourhood amenity, and (g) neighbourhood stability. To add collaborative evidence of basic residential change, the maps derived from Linkage Analysis will be utilized and referred to where applicable, and are designed to illustrate the city's changing ecological structure summarized by new building activity during the ten year period under study.
In defining the processes of residential expansion, twenty-nine census tracts were analyzed on the basis of six dependent (building activity) and nine independent (locational) variables for 1961. For 1971, forty-one census tracts were considered on the basis of nine dependent and nine independent variables. Analysis was intended to test the degree of association between each of the building activity variables and the locational variables, and to describe any apparent trends over the ten year period. Most of the relationships emerged as expected, although many of the correlations were only marginally significant.
Conversions

In general terms, residential neighbourhoods have been described as evolving through various stages of development over time. For example, Hoover and Vernon have suggested that all areas swing full circle from the single family construction phase to the redevelopment phase and pass through the intermediate stages of transition, conversion and thinning out. Thus, as all areas of the city pass through these stages at various points in time, and in differing degrees, the city is transformed.

This transformation has often been described as taking the form of gradually widening concentric circles pushing out in all directions from the growing Central Business District. The Central Business District impinges upon the immediately surrounding old residential areas. This, augmented by the fact that near-core residential areas must accommodate an influx of low income people and immigrants, causes a downgrading and conversion of old residences to higher densities. Thus, the trend continues, and "less intensive uses are replaced by more intensive uses in a step-like hierarchy directly related to the intensity of use and distance from the city center."

As expected, and concurrent with this theory, during both 1961 and 1971 the greatest number of single family homes being converted to multiple uses in Windsor was
Table 3

SIMPLE CORRELATIONS BETWEEN CONVERSIONS
AND SELECTED LOCATION VARIABLES-1961 and 1971

<table>
<thead>
<tr>
<th>Variable</th>
<th>1961</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>-0.4976*</td>
<td>-0.3466*</td>
</tr>
<tr>
<td>Existing Single Family</td>
<td>-0.5421*</td>
<td>-0.3836*</td>
</tr>
<tr>
<td>Existing Single Attached</td>
<td>---</td>
<td>0.0086*</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>0.4082*</td>
<td>0.4093*</td>
</tr>
<tr>
<td>Before 1920</td>
<td>0.7193*</td>
<td>0.3251*</td>
</tr>
<tr>
<td>Major Repair</td>
<td>0.6153*</td>
<td>0.2783*</td>
</tr>
<tr>
<td>Value</td>
<td>-0.1530</td>
<td>-0.2437</td>
</tr>
<tr>
<td>Park</td>
<td>-0.3453*</td>
<td>-0.2193</td>
</tr>
<tr>
<td>Non-movers</td>
<td>-0.2226</td>
<td>-0.5236*</td>
</tr>
</tbody>
</table>

---  Correlation Coefficients could not be computed
*  Significant at .05 level
located in the urban center. None appeared in the outer suburbs, and only a few scattered properties within the inner suburban area were the subject of conversion activity. Although more frequent and concentrated within the inner city area during 1971, the trend over the ten year period under study indicated that the conversion area was invading the inner suburbs. Further evidence of this pattern can be seen by examining the strong negative coefficient which resulted when conversion activity was correlated with distance from the city center in 1961 (r=-0.4976) as opposed to a much weaker one in 1971 (r=-0.3466).

During both years, conversion activity was clearly related to areas of older housing (1961 - r=0.7193, 1971 - r=0.3251) although the relationship was stronger in 1961 when the greatest percentage of those structures being transformed to higher density uses was located in the central city where older housing is more prevalent. Consequently, and since areas of older homes near the core are frequently characterized by higher proportions of dilapidated housing, a strong positive correlation existed between conversion activity and houses in need of major repair (1961 - r=0.6151, 1971 - r=0.2783). Again, the relationship was stronger in 1961.

When related to a further measure of neighbourhood quality - the presence of park space - a negative correlation
existed between conversion activity and this measure of locational amenities in both years. The relationship was evidently stronger in 1961 ($r = 0.3453$) when the transformation to multiple use was taking place primarily in the core area where parks acreage is least. The direction of the relationship continued in 1971, although the association was weak ($r = -0.2193$).

Conversion activity, in both years, was positively associated with areas where large concentrations of multiple unit dwellings were already in existence (1961-$r = 0.4082$, 1971-$r = 0.4093$), and was inversely related to areas of predominantly single family homes (1961-$r = 0.5421$, 1971-$r = -0.3836$). This fact substantiates previous findings that indicate that new construction tends to follow past trends of development. Furthermore, converted dwellings were more frequent in areas where stability was low ($r = -0.2226$), areas characterized by many lodgers, transients, recent immigrants, students and single people — those who prefer to live in various types of rental accommodation.

No significant relationship appeared between conversions and median value in either year. The value of the coefficient resulted from the fact that, although prevalent in older areas of dilapidated housing in the Central Business District where median value is low, a few properties, which were located in older, wealthy neighbourhoods did undergo this change. These wer
along Victoria Avenue, Riverside Drive, and adjacent to the University of Windsor, where pressures for student housing began the transformation of large, once exclusive homes to rooming houses.

The expansion of conversion areas took the form of two extending sectors, one of which was related to a major transportation network. Primarily confined to a small area between Wyandotte Street and Riverside Drive in 1961, a distinct east-west extension along Wyandotte Street was an evident trend ten years later.

The second sector was a well defined north-south linear pattern expanding from Wyandotte Street south along McDougall Street, east of the Central Business District. McDougall Street, one of Windsor's original streets, is now characterized by some of the oldest homes, many in need of major repair, and definitely susceptible to conversion to higher densities.

It is evident, then, that the conversion of single family dwellings to multiple use in Windsor occurred in subareas and under circumstances similar to conditions which have been identified in previous studies. Independent of median value of homes in an area, conversion activity was attracted to areas of older homes and was clearly a function of aging and obsolescence during the ten year
period under study. The trend in spatial patterning took the form of a combination of concentric and sectoral expansion; that is, conversion activity which previously had been confined to the center city was found to be impinging on the inner suburban area, and spread southerly along one distinct sector and east-west along another.
Apartments

Traditional land rent theory suggests that land prices show a decreasing gradient outwards from the point of maximum accessibility - the urban center - to compensate for increased transportation costs. Consequently, this concept holds that, because of their scale and high density, apartment buildings are not necessarily confined to areas of vacant land. Instead, they can compete for sites in the central city, where land values are highest.

Perhaps the most striking trend in new apartment construction during the study period has been its tendency to decentralize from the city center and seek a variety of locations within the urban complex. During 1961, apartment construction was confined primarily to three areas located near the urban center, and bounded by Wyandotte Street, Riverside Drive, Huron Line and Howard Avenue. Although not significant, the correlation between distance from the city center and new apartment construction was in the appropriate direction ($r = 0.2104$) to indicate that this type of building appeared to be related to centrality. In 1971, however, the emphasis shifted from the core area in favour of more diffuse locations, and centrality no longer appeared to be an important factor in attracting new apartments. Instead, the majority of new units constructed were located in the inner suburbs, with several new buildings being added in East Windsor's Forest Glade and Fontainbleu areas.
Table 4

SIMPLE CORRELATIONS BETWEEN APARTMENT CONSTRUCTION
AND SELECTED LOCATION VARIABLES - 1961 and 1971

<table>
<thead>
<tr>
<th>Variable</th>
<th>1961</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>-0.2104</td>
<td>0.2376</td>
</tr>
<tr>
<td>Existing Single Family</td>
<td>=0.2220</td>
<td>-0.1678</td>
</tr>
<tr>
<td>Existing Single Attached</td>
<td>---</td>
<td>0.0481</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>0.2487</td>
<td>0.1684</td>
</tr>
<tr>
<td>Before 1920</td>
<td>0.2989</td>
<td>-0.0343</td>
</tr>
<tr>
<td>Major Repair</td>
<td>0.8902*</td>
<td>-0.5239*</td>
</tr>
<tr>
<td>Value</td>
<td>-0.1375</td>
<td>0.0635</td>
</tr>
<tr>
<td>Park</td>
<td>-0.0689</td>
<td>0.1558</td>
</tr>
<tr>
<td>Non-movers</td>
<td>-0.1949</td>
<td>-0.1476</td>
</tr>
</tbody>
</table>

n=29                       n=41

--- Correlation Coefficients could not be computed
* Significant at .05 level
(Census Tracts 29 and 31). In this respect recent trends in the distribution of apartment construction would indicate that their location is shifting away from traditional patterns, as apartment construction does not show a consistent decline from the city center. In part, this could be contributed to the small scale of Windsor's apartment structures compared to the larger North American centers where massive highrises dominate.

The trend of apartments to more diffuse locations took the form of an extension along major transportation routes. In 1961, only Wyandotte Street appeared to be of any importance as a major thoroughfare, attracting high density development. In 1971, a linear pattern extended east-west along the same street stretching west past the University, and as far east as Lauzon Road. Another east-west route, Tecumseh Road, also experienced some apartment construction, particularly near the Ouellette Avenue intersection.

In the past, the location of apartments frequently took the form of redevelopment and was directly related to aging and obsolescence of homes in the core. In 1961, then, Windsor appeared to be typical in this respect, having an extremely high positive correlation between new apartment construction and areas of older housing ($r = 0.2959$) in need of major
repair ($r=0.8902$). In addition, apartments appeared to locate in those census tracts where apartments were most prevalent ($r=0.2489$), indicating that these developments were strongly associated with the type of building activity which had gone on in the past. Although the relationships were statistically insignificant, the direction of the coefficients did indicate that new multiple unit dwellings were generally found in areas where neighbourhood stability ($r=-0.1949$), median household values (0.1375) and locational amenities (-0.3689) were lower.

More recent work, however, has suggested that, as well as remaining a function of accessibility and centrality, the increased demand for rental accommodation by higher income groups has resulted in several other factors being introduced. In this respect, the choice of location is based on the ability of an area to attract new investment, and is a direct function of existing concentration of apartments, neighbourhood amenities, and an area's status on the socio-economic scale. Clearly, indications of this trend could be seen in examining the location of apartments in 1971. Where once directly associated with areas of older homes in need of major repair, a strong negative relationship now existed ($r=-0.5239$). Instead, apartments were spreading out throughout the urban complex, including some of the more attractive higher socio-economic areas in Riverside, East Windsor, and along Riverside Drive. No significant relationship existed
between apartment location and existing concentration of apartments, indicating that these developments are no longer following past trends. This is due in part to recent public policy which encourages the integration of high and medium density uses to "promote the creation of a varied and more interesting residential environment." In this respect, the situation in Windsor can no longer substantiate findings from another study which indicate that propinquity among similar uses is a result of the channelling effects of zoning.

In addition to the increase in number of units added, a significant trend in the increasing choice of locations for apartment development was evident from 1961 to 1971. No longer concentrated in the core area in the form of redevelopment or merely a function of accessibility and centrality, apartment buildings are now seeking more diffuse locations, particularly in the form of an east-west extension along major thoroughfares.
Additions

Constructing an addition onto a home is a means of modifying one's residence to fit needs which cannot be accommodated within the existing stock. While total floor area and assessment value are almost always increased, the original function of the structure generally is not altered. Although there is no empirical documentation relating to spatial patterns of such, it is generally well known that occupants will add a room when they need more space but are satisfied, for any variety of reasons, with their present neighbourhood. In this respect, additions are associated with stable, single family neighbourhoods with families in the middle stages of the life cycle.

In 1961, these neighbourhoods were located primarily in the inner suburbs, and, as expected, additions were found in highly concentrated clusters within this area. Included in these areas are large pockets of veterans' homes built just after the Second World War. To be eligible for one, the prospective occupant was required to have served in the armed forces and have a minimum of two children. Consequently,

* Lewis Mumford has suggested that the stages of the life cycle are a major factor to be considered when attempting to understand the form of the city, and should be planned for. These stages are: (a) Phase I: Infancy, (b) Phase II: The School Child, (c) Phase III: Adolescence, (d) The Work Phase, (e) Maturity: Domestic Phase, (f) Maturity: Phase of Social Interaction, (g) Maturity, (h) Personal Phase, (i) Final Phase: Senescence.
Table 5

SIMPLE CORRELATIONS BETWEEN ADDITIONS
AND SELECTED LOCATION VARIABLES 1961 and 1971

<table>
<thead>
<tr>
<th>Variable</th>
<th>1961</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>0.6967*</td>
<td>0.3311*</td>
</tr>
<tr>
<td>Existing Single Family</td>
<td>0.8551*</td>
<td>0.4605*</td>
</tr>
<tr>
<td>Existing Single Attached</td>
<td>---</td>
<td>-0.2121</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>-0.7250*</td>
<td>-0.4370*</td>
</tr>
<tr>
<td>Before 1920</td>
<td>-0.6695*</td>
<td>-0.3298*</td>
</tr>
<tr>
<td>Major Repair</td>
<td>-0.7855*</td>
<td>-0.5239*</td>
</tr>
<tr>
<td>Value</td>
<td>-0.1940</td>
<td>0.5035*</td>
</tr>
<tr>
<td>Park</td>
<td>0.2369</td>
<td>0.1521</td>
</tr>
<tr>
<td>Non-movers</td>
<td>0.5495*</td>
<td>0.1217</td>
</tr>
</tbody>
</table>

n=29                       
n=41

* Correlation Coefficients could not be computed
  * Significant at .05 level
these homes, in 1961, were occupied largely by the same families who, by this time, had increased in size. It seems reasonable to assume that residents within these areas would be more likely to increase the size of their homes to meet the needs of a large family and to remain within the city limits than to look for larger accommodation elsewhere.

As expected, additions were far more prevalent in stable neighbourhoods \( (r=0.5495) \) where neighbourhood quality could be considered better than average, and were clearly negatively related to areas of older housing \( (r=-0.6695) \) or homes in need of major repair \( (r=-0.7855) \). Although not a significant relationship, the direction of the coefficient \( (r=0.2369) \) would indicate that these same neighbourhoods were not deficient in amenities as measured by park space. They were found to be highly correlated with areas where large concentrations of single family dwellings existed \( (r=0.8551) \) but no relationship emerged between the value of these and the fact that they were increased in size. In general, properties undergoing this type of structural change were set back from any major street.

By 1971, after peripheral areas had been annexed, addition activity within the inner suburban area was far less concentrated, and expansion took the form of a concentric pattern with isolated clusters appearing in more suburban locations (Figure 13). Again, addition activity was negatively related
to areas with older homes ($r = -0.3298$) and homes in need of major repair ($r = -0.5239$) and positively related to areas of primarily single family homes ($r = 0.4605$) although the associations were generally weaker than ten years prior. Of major significance is the association between higher status areas ($r = 0.5035$) and addition activity. Similar to 1961, residential properties being increased in size in 1971 were located in areas isolated from major transportation routes.

It appears then, that, although the number of properties affected from 1961 to 1971 decreased by one quarter, adjusting the size of a home to fit a family's demands remains an important structural modification. Primarily concentrated in more stable single family neighbourhoods within the inner suburban area in 1961, the pattern appeared to expand in a more diffuse concentric fashion into higher value suburban areas.
Alterations

Making alterations to a home is one primary means of home improvement. This type of building activity can include such things as moving a window, tearing down a wall, or can include any other form of remodeling which does not involve a change in function or does not result in an increase in floor space. Residential structures undergoing alterations result when their occupants wish to improve the condition of their home, but are generally not dissatisfied with their surroundings. Again, the spatial patterns of home improvement such as these have been excluded from previous studies.

During 1961, alterations were almost four times as frequent as they were in 1971. Most appeared in concentrated clusters, particularly between Wyandotte Street and Giles Boulevard in the core area, and in various scattered clusters within the inner suburban area (Figure 14). As expected, when correlated with distance from the peak intersection, no significant relationship emerged. High positive correlations existing between areas of alteration activity and neighbourhood stability \( r=0.4994 \) locational amenities \( r=0.4004 \) and median value \( r=0.4753 \) would indicate that alteration activity was a function of each during that time. There was no indication that remodelling was related to areas of older housing, homes in need of major repair, or areas where either single family homes or apartment units dominated the type of
Table 6

SIMPLE CORRELATIONS BETWEEN ALTERATIONS
AND SELECTED LOCATION VARIABLES - 1961 and 1971

<table>
<thead>
<tr>
<th>Variable</th>
<th>1961</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>0.1640</td>
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<td>Existing Single Family</td>
<td>0.1656</td>
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<td>Existing Single Attached</td>
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<td>0.0342</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>-0.1240</td>
<td>0.0624</td>
</tr>
<tr>
<td>Before 1920</td>
<td>0.1822</td>
<td>0.0900</td>
</tr>
<tr>
<td>Major Repair</td>
<td>-0.4276</td>
<td>-0.8518*</td>
</tr>
<tr>
<td>Value</td>
<td>0.4753*</td>
<td>-0.1078</td>
</tr>
<tr>
<td>Park</td>
<td>0.4004*</td>
<td>0.0275</td>
</tr>
<tr>
<td>Non-movers</td>
<td>0.4994*</td>
<td>-0.0025</td>
</tr>
</tbody>
</table>

n=29, n=41

--- Correlation Coefficients could not be computed

* Significant at .05 level
housing mix. Similar to addition activity, those neighbourhoods which were subjected to large amounts of alteration activity generally did not abut major streets.

In 1971, alterations were fewer and patterns far less localized with activity generally remaining within the core and inner suburban area. That is, the area of alteration activity did not appear to expand in any direction over the ten year period, but remained confined to the same general area within the urban complex during 1971. A few scattered properties in the outer suburban area were subjected to alteration activity within the same year (Figure 15). Again, when tested for centrality, no relationship emerged. In 1971, obsolescence again was not a significant factor, although the correlation between alterations and homes in need of major repair showed a very strong negative correlation \( r = -0.8518 \). No association was apparent with value or type of residences, locational amenities, or nearness to transportation routes.

In general, alterations appear to have declined in importance as a means of structural modification. Any which have occurred have done so in a much less concentrated pattern and have been largely confined to the inner suburban area. No pattern of expansion is evident over the ten years under study.
Repairs

Since a vast majority of new units added to the existing stock are beyond the financial means of a large proportion of the urban population, those who desire to improve their housing must repair. Repairs can constitute an inexpensive replacement of some structural fixture, or can include extensive renovations. They are similar to alterations, but merely involve the restoration of an existing portion of the building and do not involve a change in it.

During 1961, repairs to existing dwellings were relatively few and appeared to be located in clusters. One of these was in an area generally bounded by Riverside Drive, Tecumseh Road, Howard Avenue and Pillette Road. The other cluster was located along Wyandotte Street between Lauzon Road and Jefferson Avenue (Figure 16). A few scattered properties in the core were affected. Repairs to existing structures appeared to be somewhat related to transportation routes, and exhibited an east-west linear pattern along Wyandotte Street and included older, prestige homes along Riverside Drive. There is some evidence of a north-south extension along Walker Road. During 1961, there was no relationship to age, condition or type of residential structures, and repair activity was clearly not a function of locational amenities, value, or stability.


<table>
<thead>
<tr>
<th>Variable</th>
<th>1961</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>-0.0207</td>
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<tr>
<td>Existing Single Family</td>
<td>-0.0471</td>
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</tr>
<tr>
<td>Existing Single Attached</td>
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<td>-0.0273</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>0.0624</td>
<td>0.0486</td>
</tr>
<tr>
<td>Before 1920</td>
<td>0.0289</td>
<td>0.3800*</td>
</tr>
<tr>
<td>Major Repair</td>
<td>0.1325</td>
<td>0.8894*</td>
</tr>
<tr>
<td>Value</td>
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<tr>
<td>Park</td>
<td>-0.0949</td>
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</tr>
<tr>
<td>Non-movers</td>
<td>0.1798</td>
<td>0.1180</td>
</tr>
</tbody>
</table>

n=29  
n=41

--- Correlation Coefficients could not be computed
* Significant at .05 level
By 1971, the number of properties undergoing repairs had almost tripled, and were concentrated in the core area between Wyandotte Street and Riverside Drive. A decreasing gradient was apparent throughout the inner and outer suburbs. Clearly, in 1971, repair activity was a function of age (r=0.3800) and condition (r=0.8594) of existing residential structures in the area. Consequently, and since many of the oldest homes are located along major transportation routes, construction of this type in the inner and outer suburbs exhibited a north-south axial pattern along Huron Line, Ouellette Avenue and Walker Road. Again, no relationship emerged between repairs and locational amenities, neighbourhood stability, or median household value.

To summarize, the location of repairs changed from a few isolated clusters in 1961 to more diffuse locations throughout most areas of the city, decreasing in density from the city center outwards, and more frequent along major transportation routes. While previously repairs had not necessarily been related to aging and obsolescence, there was a definite indication that this was so in 1971. No relationship to residential value or type, stability, or locational amenities was evident in either year.
Single Family Detached Homes

By far, the most important contribution to the building inventory has been by way of new, single detached homes. The majority of residents still occupy, and still prefer to occupy this type of shelter over and above all other types. Traditional land rent theory would indicate that, because of their low density, their positioning within the urban sphere is subject to locational constraints which do not apply to higher density accommodation.

During both years, no new single detached homes were added to the central city. Instead, new building here was taking place in the form of commercial and multiple residential uses - those higher density uses which can compete for the rising land prices in this sector.

During 1961, the construction of single family homes was taking place in the inner suburbs, primarily in the form of infilling on serviced lots in existing residential neighbourhoods, and was strongly associated with areas abundant in park space \((r=0.3725)\). The construction of new single family homes was clearly low or non-existent in areas of older, deteriorated housing which are found primarily in and around the core and in a few isolated areas of Sandwich East and Sandwich West. Single family construction appeared to be following existing trends in development. That is, the proportion of single family homes already existing in
<table>
<thead>
<tr>
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<th>1971</th>
</tr>
</thead>
<tbody>
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<td>Distance</td>
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<td>0.4212*</td>
</tr>
<tr>
<td>Existing Single Family</td>
<td>0.3588*</td>
<td>0.0519</td>
</tr>
<tr>
<td>Existing Single Attached</td>
<td>0.0537</td>
<td>0.5165*</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>-0.3829*</td>
<td>-0.2006</td>
</tr>
<tr>
<td>Before 1925</td>
<td>-0.4841*</td>
<td>-0.3094*</td>
</tr>
<tr>
<td>Major Repair</td>
<td>---</td>
<td>-0.5239*</td>
</tr>
<tr>
<td>Value</td>
<td>-0.0229</td>
<td>0.3208*</td>
</tr>
<tr>
<td>Park</td>
<td>0.3725*</td>
<td>-0.1426</td>
</tr>
<tr>
<td>Non-movers</td>
<td>0.1245</td>
<td>-0.0334</td>
</tr>
</tbody>
</table>

\[n=29 \quad n=41\]

--- Correlation Coefficients could not be computed

* Significant at .05 level
an area evolved as an important factor in the location of new homes \( (r=0.3355) \). No relationship emerged when correlated with stability or value of a neighbourhood. The correlation between single family construction and distance from the center of the city was significantly positive \( (r=0.3913) \).

By 1971, the strength of the distance relationship increased \( (r=0.4212) \) with the movement of single family construction away from inner suburban locations to more peripheral areas. Evidence strongly suggests that, concurrent with other recent studies, the recent trend in single family construction has been attracted to higher income areas \( (r=0.3288) \). Again, the relationship with age and condition was significantly negative \( (r=0.3094, r=-0.5239, \) respectively) while no association with locational amenities emerged. Although legislation now specifies that 5% of the land in all subdivisions must be dedicated to the municipality for park purposes, the outer suburban area, where the majority of new homes was built during 1971, remains extremely deficient in this regard. In 1971, the relationship between new single family homes and existing structures of the same type was insignificant, and, although single family homes appeared to be following existing trends, the low correlation coefficient can be accounted for by the fact that most new building of this type was taking place on large tracts of vacant land.
Despite the fact that several lots still exist for development purposes, several factors introduced during the 1961-1971 decade have influenced the movement of single family homes to the outer suburbs. Amalgamation of Sandwich East, Sandwich West, Sandwich South and Riverside in 1966 increased the availability of serviced land for development. Prior to this time, municipal water and sewers had followed haphazard residential developments. Of particular importance to development of large tracts of land in East Windsor has been the completion of the Little River Sewage Treatment Plant. Secondly, planning controls introduced by the Province of Ontario necessitated the need for an Official Plan to control land use and direct growth in designated areas. Hence, large tracts of land on the fringe designated for "planned development" are indeed an incentive for the developer. Thirdly, the high cost of assembling land and the lengthy and expensive process of obtaining public approval for private land development has made it advantageous for the land developer to increase the scale of his projects and seek large tracts of land which are available only on the urban fringe.

While there are serviced areas closer to the inner suburbs which have been left undeveloped (census tract 39, for example), difficulty in contacting the several various owners has made land assembly almost impossible. Instead, several new lots recently created in the Fontainbleu and
Forest Glade areas of East Windsor have concentrated massive developments of single-family homes in this sector. In addition, several clusters can be seen in the existing residential neighbourhoods of the former Town of Riverside and the former Sandwich West Township (Figure 19). Filling the void between these concentrations, a few new homes were scattered throughout.

Proximity to major transportation routes did not appear to be a significant factor at the census tract level in either year, but construction of the E.C. Row Expressway at the southern extremity of the City may have influenced the direction of development to peripheral locations in 1971.

In general, the most important contribution to Windsor's existing spatial structure has been in terms of the number of single family homes added in recent years. A distinct concentric variation is evident over the period under study, with most recent developments taking place at peripheral locations on large tracts of land, and in higher income areas.
Duplexes, Row and Semi-detached

At present, 20-25% of new housing production is directed 18 at the upper two-fifths of the income distribution, and, with the pressure of rising costs during the last decade, trends in new housing units have taken the form of greater proportions of the less-costly duplex and single attached dwellings, such as semi-detached and row type units. Most are rental accommodation, although the increasing popularity of the condominium (a form of home ownership in a multiple family dwelling) is apparent. Since these types of homes are similar, they will be treated together for discussion purposes in this section.

During 1961, none were added to Windsor's housing stock, while, in 1971, one new duplex unit was added in the inner suburbs (Figure 20) and was clearly related to an area of older housing (r=0.24). All other location variables were insignificant.

One new subdivision, consisting of approximately fifty semi-detached units, was located in Census Tract 39 in the outer suburbs (Figure 21). Over four hundred new townhouse (row) units were added in Windsor's east side Forest Glade and Fontainbleu developments in the outer

* For a comparison of prices of various housing types in Windsor, see Appendix B.
### Table 9

**SIMPLE CORRELATIONS BETWEEN DUPLEXES AND SELECTED LOCATION VARIABLES - 1971**

<table>
<thead>
<tr>
<th>Variable</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>-0.1371</td>
</tr>
<tr>
<td>Existing Single Family</td>
<td>-0.2939*</td>
</tr>
<tr>
<td>Existing Single Attached</td>
<td>0.1587</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>0.2762*</td>
</tr>
<tr>
<td>Before 1920</td>
<td>0.2414*</td>
</tr>
<tr>
<td>Major Repair</td>
<td>---</td>
</tr>
<tr>
<td>Value</td>
<td>0.0200</td>
</tr>
<tr>
<td>Park</td>
<td>-0.1310</td>
</tr>
<tr>
<td>Non-movers</td>
<td>-0.0386</td>
</tr>
</tbody>
</table>

\[ n=41 \]

--- Correlation Coefficients could not be computed

* Significant at .05 level
Table 10

SIMPLE CORRELATIONS BETWEEN ROW HOUSES
AND SELECTED LOCATION VARIABLES - 1971

<table>
<thead>
<tr>
<th>Variable</th>
<th>1971</th>
</tr>
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<tbody>
<tr>
<td>Distance</td>
<td>0.4310*</td>
</tr>
<tr>
<td>Existing Single Family</td>
<td>0.0340</td>
</tr>
<tr>
<td>Existing Single Attached</td>
<td>0.4366*</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>-0.1598</td>
</tr>
<tr>
<td>Before 1920</td>
<td>---</td>
</tr>
<tr>
<td>Major Repair</td>
<td>---</td>
</tr>
<tr>
<td>Value</td>
<td>0.3122*</td>
</tr>
<tr>
<td>Park</td>
<td>-0.1569</td>
</tr>
<tr>
<td>Non-movers</td>
<td>-0.0526</td>
</tr>
</tbody>
</table>

n=41

--- Correlation Coefficients could not be computed
* Significant at .05 level
Table 11

SIMPLE CORRELATIONS BETWEEN SEMI-DETACHED DWELLINGS AND SELECTED LOCATION VARIABLES - 1971

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Distance</td>
<td>0.3580*</td>
</tr>
<tr>
<td>Existing Single Family</td>
<td>0.0470</td>
</tr>
<tr>
<td>Existing Single Attached</td>
<td>0.5228*</td>
</tr>
<tr>
<td>Existing Apartments</td>
<td>-0.1060</td>
</tr>
<tr>
<td>Before 1920</td>
<td>---</td>
</tr>
<tr>
<td>Major Repair</td>
<td>---</td>
</tr>
<tr>
<td>Value</td>
<td>0.2739*</td>
</tr>
<tr>
<td>Park</td>
<td>-0.1290</td>
</tr>
<tr>
<td>Non-movers</td>
<td>0.0456</td>
</tr>
</tbody>
</table>

n=41

Correlation Coefficients could not be computed
* Significant at .05 level
suburban location (Figure 22). Both types of construction correlated highly with distance from the center of the city ($r=0.3580$, $r=0.4310$, respectively).

Both semi-detached and row type units located in higher income areas ($r=0.2739$, $r=0.3122$, respectively) and areas where large concentrations of single attached units had been added previously ($r=0.5228$, $r=0.4366$, respectively). The latter is primarily a result of the channelling effects of zoning in these areas, more than any other location factor. This supports previous findings that suggest that new developments follow existing trends, but refutes observations that single attached dwellings such as these locate in higher density areas close to the core.
Homogeneous Areas of Building Activity - 1961 and 1971

Designed to illustrate the city's changing ecological structure as summarized by new building activity from 1961 to 1971, the city's census tracts were grouped on the basis of similar building activity for both years. Five homogeneous areas (Figure 23 and Figure 24) emerged for each year, as follows:

(a) **Group I (Conversions)**

These areas were characterized by a high degree of conversion activity, some alterations, a few repairs and no new construction. In 1961, areas of this type were found in older neighbourhoods close to the core and along the riverfront, and in the Drouillard Road area. In 1971, the conversion area could be seen in the central city census tract, and along the riverfront, with some indication of expansion southwards.

(b) **Group II (Minimal Development)**

Building activity in this category appeared to be very minimal, with some repairs, a few additions and alterations, and a new single family dwelling scattered here or there on an infilling basis. In 1961, one census tract falling into this group was located within the central city, while the others were found at the southern periphery of the core area. In 1971, expansion of this area took the form of a concentric band around the core. No development, at all,
occurred in census tracts 21, 28 and 40.

(c) Group III (Apartments)

Census tracts in this group were characterized primarily by new apartment construction. A great deal of addition and alteration activity was also apparent with a few new homes located in the 1971 grouping. In 1961, apartments appeared to seek a central location in the core along the riverfront, and in the older neighbourhoods of Sandwich. In 1971, apartment location began to decentralize, impinging upon more stable lower density residential neighbourhoods in the inner suburbs. Three census tracts in the outer suburbs fell into this classification.

(d) Group IV (Additions)

This category was comprised of areas with a large number of additions and new single family homes. A few alterations and repairs were also apparent. In 1961, these neighbourhoods were found throughout the inner suburbs while in 1971, the area expanded to the periphery of the inner suburbs and into the outer suburbs.

(e) Group V (Single Family Homes)

This category was comprised of those census tracts having the greatest number of single family homes added. In 1961, they were located in East Windsor, Riverside and old Sandwich. In 1971, single family construction expanded
to peripheral locations in East Windsor, the former Township of Sandwich West, and the former Town of Riverside.

On the basis of map interpretation, the five stages of residential development theorized by Hoover and Vernon as continually acting to restructure the form of the city can be applied to these groups in the following manner:

<table>
<thead>
<tr>
<th>Hoover and Vernon</th>
<th>Windsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>Group V</td>
</tr>
<tr>
<td>(New Single Family Homes)</td>
<td>(New Single Family Homes)</td>
</tr>
<tr>
<td>Stage II</td>
<td>Group III</td>
</tr>
<tr>
<td>(Transition Stage - Apartments)</td>
<td>(Apartments)</td>
</tr>
<tr>
<td>Stage III G</td>
<td>Group I</td>
</tr>
<tr>
<td>(Downgrading and Conversion Stage)</td>
<td>(Conversions)</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Group II</td>
</tr>
<tr>
<td>(Thinning-out Process)</td>
<td>(Minimal Development)</td>
</tr>
<tr>
<td>Stage V</td>
<td></td>
</tr>
<tr>
<td>(Replacement Stage)</td>
<td><strong>evident in the core, more so in 1971 than 1961</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Group IV is characterized by more stable residential neighbourhoods in the inner suburbs, expanding into the outer suburbs. Hoover and Vernon did not emphasize such a neighbourhood.</strong></td>
</tr>
</tbody>
</table>

The traditional theory of concentric expansion whereby change occurs by outward movement and expansion of inner
zones upon the outer in a process of invasion and succession is over-simplified. Nevertheless, an examination, in the aggregate, of new construction and major modifications to the existing stock reveals an apparent relationship between homogeneous areas of new construction and the process of succession as explained by this theory. For example, the area of greatest amounts of conversion activity, located in the core in 1961, was beginning to impinge on inner suburban areas in 1971 with the increased pressure for space in this area. At the other extreme, single family homes are found in increasing proportions in peripheral locations farthest from the city center. Furthermore, the stages through which neighbourhoods evolve and the areas affected appear to be altering Windsor's spatial structure in the same manner as Hoover and Vernon would suggest.
References


2. Ibid., p. 183.


4. Ibid., p. 174.


11. 1971 census information indicates that 67% of all occupied dwellings are single detached.


18. Michael Dennis and Susan Fish, Programs in Search of a Policy: Low Income Housing in Canada (Toronto; Hakkert, 1972) p. 18.

19. Ibid., p. 36.


Chapter 6

CONCLUSIONS AND IMPLICATIONS FOR FURTHER STUDY

The major process under which the internal structure of the city is altered takes place in its physical stock in terms of new construction and major modifications to existing buildings. The primary purpose of this study has been to evaluate existing theories of urban growth and spatial patterning for an understanding into processes and patterns of residential structural change and to describe variations in type of building activity throughout the city in terms of selected locational characteristics. An examination of new construction has resulted in a number of conclusions as to the nature and location of new development and neighbourhood characteristics.

The level of aggregate construction was much higher in 1971 than it was in 1961, and a total of 15,679 new residential units were added during the period under study. In response to rising costs and the demand created by an increase in the number of non-family households, a trend was generally seen in a steady decrease in the proportion of single family units in favour of more rental accommodation.
The process by which change occurs takes place in varying degrees for each type of activity and within different subareas of the city. Although deviations are apparent, type of building activity is distributed concentrically with intensity of use decreasing from the center outwards. For example, conversion activity accompanied by increasing density, high mobility, older homes, obsolescence, and large numbers of multiple dwellings is the construction type characteristic of the core area; additions and alterations associated with neighbourhood stability and better than average quality neighbourhoods generally take place in single family neighbourhoods within the inner suburbs; and the largest numbers of new single family dwellings, associated with high status areas are located at peripheral locations.

Furthermore, study of aggregate patterns of location over time strongly substantiates the process of invasion and succession which classical theorists suggest. Concentric expansion is clearly illustrated by trends in additions and single family construction; the trend in conversion activity reveals a concentric-sector combination; and apartment location is clearly related to the sector theory with new units decentralizing throughout the city primarily along major transportation routes.
Development is not solely a function of distance and accessibility, but rather a combination of location factors which act to accelerate some forms of construction and hinder others. Single family and medium density developments, for example, are clearly attracted to higher value areas, while conversion activity is found in older, lower quality neighbourhoods where high density uses are frequent. Between these two extremes, major modifications such as additions and alterations are accompanied by stable single family neighbourhoods.

The present study has been a modest attempt to illustrate recent trends in building activity and suggests a need for more extensive research in many directions.

To assess the impact of new construction on existing housing stock, it would be advantageous to include a wider set of site factors such as land costs, value of existing structures, value and amount of floor space added, density, and presence of vacant land. The study could include one area within the city or could cover the entire metropolitan area to determine how the relationship of new construction to site factors differs throughout various subareas of the city and over time. Furthermore, if buildings go through successive functional changes over time, it would be interesting to note the extent to which the rate of change of
certain selected structures throughout the urban complex is affected by the locational variables employed in the present study.

Secondly, changing patterns in building activity cannot be properly understood without an understanding of changing market factors, on both the supply- and demand side, and the role of the developer in this.

Furthermore, would the study area continue to evolve as shown, if the city, as a whole, was studied for an extended period of time, or would the same regularities be apparent if several shorter successive time spans were included in the analysis?

It has been suggested that interurban housing stock variations and socio-economic differences within cities are a direct function of each city's position in the urban hierarchy. The present study could be extended to include several cities of varying size in an attempt to investigate the relationship of city size and age to patterns of new construction.

Finally, the present study has dealt solely with residential development. To gain a more complete understanding of the processes that work in conjunction with city expansion and growth, it would be worthwhile to identify patterns of
commercial, institutional, and industrial developments
and relate each to location factors such as those employed
in the present study.
### APPENDIX A

**SUMMARY STATISTICS - DEPENDENT VARIABLES**

<table>
<thead>
<tr>
<th>MEAN</th>
<th>VARIANCE</th>
<th>STD DEV</th>
<th>STD ERR</th>
<th>MEDIAN</th>
<th>RANGE</th>
<th>MINIMUM</th>
<th>MAXIMUM</th>
<th>MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONV 1961</td>
<td>0.020</td>
<td>0.002</td>
<td>0.039</td>
<td>0.008</td>
<td>0.0</td>
<td>0.144</td>
<td>0.0</td>
<td>0.144</td>
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<tr>
<td>CONV 1971</td>
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<td>0.002</td>
<td>0.042</td>
<td>0.007</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.168</td>
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<td>1.789</td>
<td>1.337</td>
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<td>0.0</td>
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<tr>
<td>APT 1971</td>
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<td>10.996</td>
<td>3.316</td>
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<td>0.0</td>
<td>14.460</td>
<td>0.0</td>
<td>14.460</td>
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<tr>
<td>ADD 1961</td>
<td>0.327</td>
<td>0.055</td>
<td>0.234</td>
<td>0.047</td>
<td>0.279</td>
<td>0.301</td>
<td>0.0</td>
<td>0.301</td>
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<tr>
<td>ADD 1971</td>
<td>0.052</td>
<td>0.008</td>
<td>0.087</td>
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<td>0.066</td>
<td>0.301</td>
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<tr>
<td>ALT 1961</td>
<td>0.267</td>
<td>0.027</td>
<td>0.164</td>
<td>0.033</td>
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<td>0.815</td>
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<td>0.002</td>
<td>0.050</td>
<td>0.008</td>
<td>0.0</td>
<td>0.185</td>
<td>0.0</td>
<td>0.185</td>
</tr>
<tr>
<td>REP 1961</td>
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<td>0.002</td>
<td>0.049</td>
<td>0.010</td>
<td>0.0</td>
<td>0.174</td>
<td>0.0</td>
<td>0.174</td>
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<td>REP 1971</td>
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<td>0.082</td>
<td>0.013</td>
<td>0.0</td>
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<td>0.0</td>
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<td>0.116</td>
<td>0.341</td>
<td>0.068</td>
<td>0.0</td>
<td>1.681</td>
<td>0.0</td>
<td>1.681</td>
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<td>SIDET 1971</td>
<td>1.674</td>
<td>65.202</td>
<td>8.075</td>
<td>1.261</td>
<td>0.067</td>
<td>51.304</td>
<td>0.0</td>
<td>51.304</td>
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<td>ROW 1971</td>
<td>0.927</td>
<td>17.625</td>
<td>4.198</td>
<td>0.656</td>
<td>0.0</td>
<td>21.956</td>
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<td>SEMI 1971</td>
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<td>2.591</td>
<td>0.405</td>
<td>0.0</td>
<td>16.522</td>
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<td>16.522</td>
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<td>0.000</td>
<td>0.013</td>
<td>0.002</td>
<td>0.0</td>
<td>0.081</td>
<td>0.0</td>
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### SUMMARY STATISTICS - INDEPENDENT VARIABLES

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<thead>
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<th>Variable</th>
<th>Mean</th>
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<th>Std Dev</th>
<th>Std Err</th>
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<tr>
<td>SIDET 71</td>
<td>67.268</td>
<td>484.401</td>
<td>22.009</td>
<td>3.437</td>
<td>74.000</td>
<td>78.000</td>
<td>19.000</td>
<td>97.000</td>
<td>78.000</td>
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<tr>
<td>SINAT 71</td>
<td>5.902</td>
<td>26.440</td>
<td>5.142</td>
<td>0.803</td>
<td>4.188</td>
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<td>APTS 61</td>
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<td>13.268</td>
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<td>60.880</td>
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<td>25.122</td>
<td>432.310</td>
<td>29.792</td>
<td>3.247</td>
<td>17.750</td>
<td>69.000</td>
<td>1.000</td>
<td>70.000</td>
<td>2.000</td>
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<td>BEF 1920</td>
<td>36.057</td>
<td>789.387</td>
<td>28.096</td>
<td>5.407</td>
<td>33.437</td>
<td>92.240</td>
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<td>4.999</td>
<td>7.80</td>
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<td>PARK</td>
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<td>3.367</td>
<td>0.526</td>
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<td>11.000</td>
<td>1.000</td>
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<tr>
<td>NON MOV</td>
<td>56.750</td>
<td>133.474</td>
<td>11.553</td>
<td>1.827</td>
<td>57.500</td>
<td>67.000</td>
<td>7.000</td>
<td>74.000</td>
<td>54.000</td>
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</table>

--- Could not be computed
APPENDIX B

Average Prices of Various Types of Housing Accommodation in Windsor

<table>
<thead>
<tr>
<th>Type of Housing</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Single Family Homes Sold by Builders</td>
<td>$29,100*</td>
</tr>
<tr>
<td>New Stacked Row Housing</td>
<td>$17,000-$21,000*</td>
</tr>
<tr>
<td>New Alcan Factory Built Homes</td>
<td>$23,000*</td>
</tr>
<tr>
<td>Used Single Family Homes</td>
<td>$21,926*</td>
</tr>
<tr>
<td>New Apartments (2-3 bedrooms)</td>
<td>$180-$222 (Mo.)**</td>
</tr>
<tr>
<td>Old Converted Houses or Duplexes</td>
<td>$140-$150 (Mo.)**</td>
</tr>
</tbody>
</table>

* Based on 1971 figures
** Based on 1973 figures

Source: Ontario Welfare Council, A Study of Housing Policies In Ontario, Community Study No. 5: Windsor (Toronto; Ontario Welfare Council, October, 1973.)
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