FACTORIAL ECOLOGY OF RESIDENTIAL MOBILITY, HAMILTON, ONTARIO

FACTORIAL ECOLOGY OF RESIDENTIAL MOBILITY AND MIGRATION, 1956-61, HAMILTON, ONTARIO

by

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ABSTRACT

This study investigates variables associated with residential mobility and migration at the ecological level. The aim of the study is to test the application of factor analysis to a more specific subject than the description of the whole urban structure.

Theoretical formulations about urban growth, urban ecology and mobility are examined, together with empirical research in these fields, to determine variables considered to be associated with changes in residence. The indicators of variables chosen for analysis are from census data and city reports, and each census tract of the chosen urban area is assigned a value for each indicator. The area selected for the study is the Hamilton Metropolitan Area, Ontario.

The results of the analysis reveal that most of the variation in the variables is accounted for by two factors: dwelling type and household composition, and economic status. These are the same factors which have been identified in factorial ecologies of general urban structure.

The remaining factors are more associated with mobility, and reveal that different origins of movers and migrants are associated with different characteristics and

geographical distributions. The hypotheses concerning the relationships with age, population growth and distance from the city centre are supported by the analysis, and the size and direction of movement is generally as expected. However, the hypothesis of increasing economic status with increasing distance migrated is not confirmed: migrants from abroad and different provinces tend to migrate to areas of lower economic status than migrants from Ontario or from the Hamilton metropolitan fringe.

This study recognises the limitations of a factorial ecology of residential mobility. Particular care should be exercised in the selection of variables and measures of these variables. Factorial ecology is a descriptive tool, and further analysis of apparent association between variables should be undertaken to determine their statistical significance.

The study emphasises the contribution of factorial ecology to the description of areal associations of more specific subjects such as residential mobility, and possibly for other social phenomena. As such, it provides a means for parsimonious description of aspects of urban social geography.

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INTRODUCTION

In migration[1] and mobility[2] research there has been a dichotomy between individual and ecological studies. Individual studies cannot hope to give more than an indication of associations of mobility or migration patterns and processes because of the time and cost of sampling large numbers of people. Ecological study has been limited by the lack of mobility and migration data, and by the difficulty of analysing the great complexity of relevant data for large numbers of areas where this information is available, (such as sub-areas of urban centres). In addition, movers, migrants and mobile areas appear to exhibit a combination of characteristics (Jansen, 1970, p.20), which also poses problems of analysis.

Although recent studies of residential mobility have determined some of the elements responsible for the

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1 Migration includes all changes of residence except those within the boundaries of one metropolitan or urban area, and generally involves a change of employment and uprooting of the household, with partial severance of family and friendship interaction. It includes international, inter-urban and rural-urban movements of migrants.

2 Mobility refers to changes of residence within the boundaries of one metropolitan urban area and is less likely to involve changes in the employment of the movers. It includes movement within the city and between city and suburban fringe.

selectivity of and motivation for residential mobility, many of these results have been from studies of individuals and households. In addition to characteristics of movers and their reasons for moving, the importance of individual decision-making and individual perception of the residential environment the process of searching and the availability of information have been recognised recently (Brown and Moore, 1970).

At the same time there has been research into aspects of human ecology in urban areas (urban ecology[3]) and extension of social area techniques[4] using factor analysis. The main factors appearing in North American studies have been labelled family status, socio-economic status and ethnic status (Rees, 1971).

Variables indicative of these three generalisations are also the variables upon which most studies of characteristics of movers have been focussed (Rees, 1970, p.347; Moore, 1972). In some studies (Schmid, 1960; Sweetser, 1960;

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3 Urban ecology is the study of areal units within an urban area, and their demographic, land use and behavioural characteristics

4 Social area techniques refer to the method used to differentiate areas of similar social characteristics within the city. Seven census variables are used to describe three concepts hypothesised as being basic to the process of urbanisation (social rank, urbanisation and segregation). These variables are combined to give an index for each urban sub-area (social area).

Pedersen, 1967; Rees, 1970) mobility has been labelled as a factor, but has had no variables clearly associated with it. Other studies have identified population growth as a factor (Murdie, 1969).

It may, therefore, be useful to explore the possibility of a factorial ecology[5] of urban residential mobility and migration as suggested by Rees (1970), Hill (1971,p58) and Bogue and Harris (1954, p.60). Variables selected will have already been found significant in describing characteristics of population and neighbourhoods which have the greatest propensity for changes of residence. The most significant variables associated with each factor will indicate combinations which are characteristic of mobile areas.

Although a critical analysis of previous research is beyond the scope of this present study, it should be recognised that many previous studies have limitations in their method of measuring mobility, in the variables selected as indicators of propensity to move, and in the methods used to test these associations. Apart from sampling errors, there are limitations particularly relevant to mobility and migration studies. The characteristics of the mobile population may not be as

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5 Factorial ecology, considered as a form of ecological factor analysis, provides parsimonious description of urban areal characteristics, and compares the resulting factors with a hypothesised factor structure. Large numbers of characteristics of urban sub-areas are reduced, by using factor analysis, to a few basic factors which describe characteristics with similar variations over the sub-areas. It also provides a measure of the association of each factor with each sub-area.

they were at the time of residence change. Many factors associated with residence change involve a change in personal circumstances, yet variables are recorded as static at one time. The interdependence between variables requires careful research design to isolate the variables truly relevant to residence changes.

Selecting relevant variables from both individual and ecological research[6] will test whether the same variables are relevant at both these levels of analysis. The results obtained cannot be applied to individual moving behaviour (Janson, 1969, p.313; Robinson, 1950) and will not explain causes or motivations for moving, but only determine fundamental patterns of variation in the data (Berry and Rees, 1969, p.458).

The results may also provide a basis for examination of patterns of urban growth[7] and changes in neighbourhood structure, as urban mobility and migration is the principal mechanism by which such growth and change occurs.

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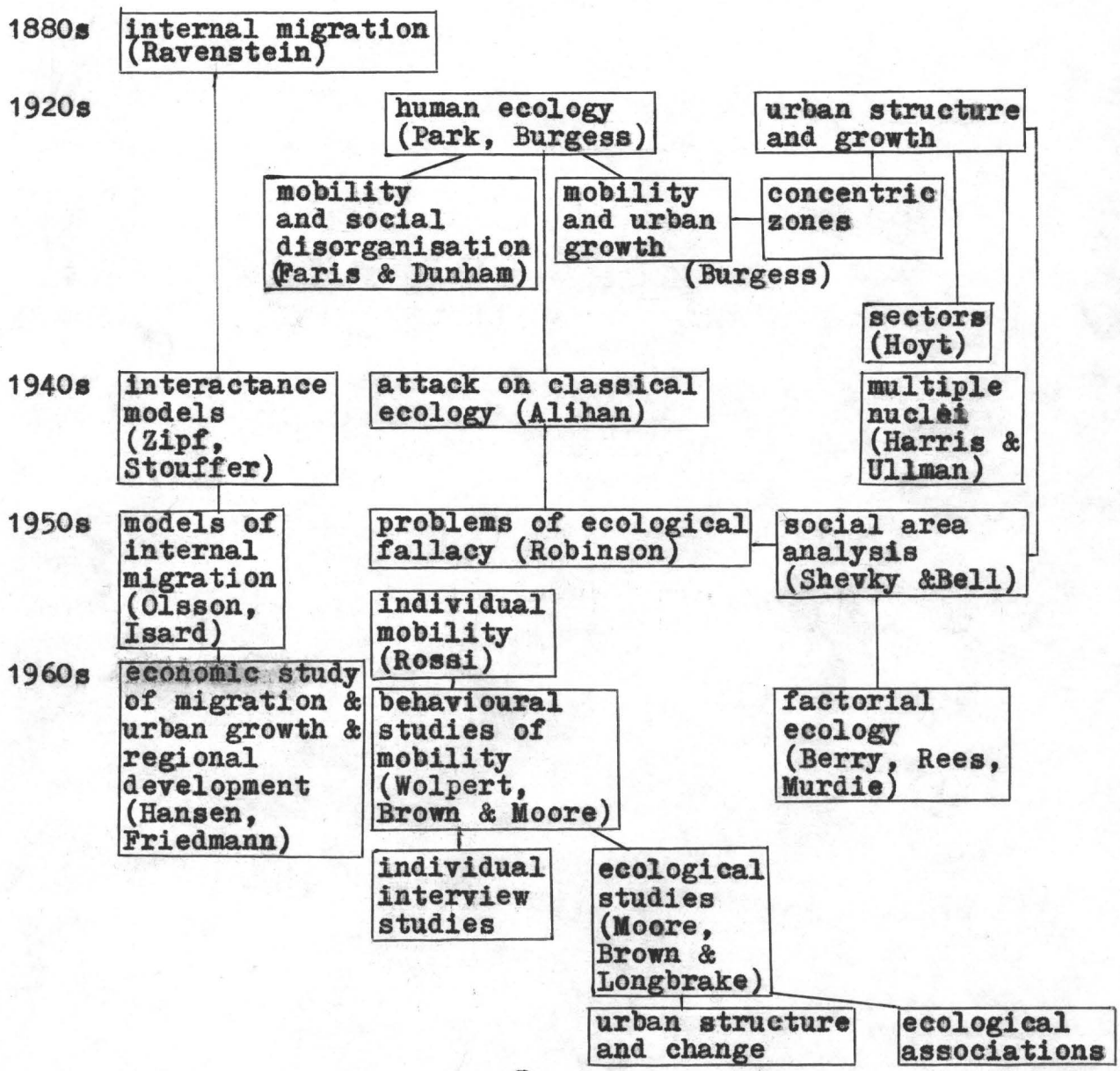
6 Dogan and Rokkan (1969) saw no reason why individual results should not be used in selection of variables for factor analytic study, provided there was no attempt to apply results obtained at one level to a different level of population aggregation.

7 Urban growth here refers to an increase in population size either by increase in numbers within an area or increase of spatial extent of the urban area.

THEORETICAL FRAMEWORK AND PREVIOUS EMPIRICAL RESEARCH

The following diagram illustrates the interrelation between research in the areas of migration, mobility, growth and ecology.

TABLE 1



Urban Growth

Mobility was included as an element in Burgess' concentric zone model of urban spatial growth and structure in 1923. This model incorporated Von Thunen's concentric rings of land uses with Park's ecological processes of invasion, dominance, succession and filtering. Migration into the central city was a centripetal force in which the migrants invaded the central area, and gradually over time succeeded the previous residents. These were then part of the centrifugal force of mobility, moving outwards towards the periphery as they moved upwards in social status and assimilated into the urban community. Their former residences filtered down to the new immigrants. A residential density gradient existed with highest densities at the centre of the city.

The recognition that city growth occurred along transport lines was made by Hurd (1924) in a study of urban land values. This was followed by Hoyt's formulation of the sector theory of urban growth and structure in 1939.

The proliferation of transport routes and greatly increased accessibility in the modern city led to specialised concentrations of urban activities in the form of multiple nuclei model of urban structure (Harris and Ullman, 1945).

These three forms of urban structure have appeared in composite ecological studies of urban variables by factor analysis (for example, Murdie, 1969).

Urban Ecology

Among the human ecology studies of urban structure and processes of the 1920s and 1930s, the effects of mobility and its association with social disorganisation, crime and mental illness were noted (Faris and Dunham, 1939). Mobility rates were correlated with numbers of population and housing variables (Quinn, 1950, pp.387-389). Many studies were concerned with problems of measuring mobility and evidence was gathered to support the hypothesis of a gradient of mobility rates from the city centre.

There was more emphasis at this stage on the areal associations of mobility than on the type of people moving. The results did not reveal consistent relationships, although lower mobility rates were gemerally associated with higher income classes, owners of dwellings, the very young and very old (Quinn, 1950, p.389).

During the 1940s and 1950s the ecological techniques came under attack for the reliance on the biological bases of classical human ecology (Alihan, 1937) and later for the application of areal associations to individuals (Robinson,

1950). The result was a swing away from ecological studies and more emphasis on methodology. The prime example is social area analysis, which classified characteristics of the internal structure of cities into three dimensions of social rank, familism (or urbanisation) and segregation. It was based on a carefully presented set of hypotheses concerning the processes at work in urban areas and used seven variables (Shevky and Bell, 1955, p.4). Three aspects of the increased mobility associated with increasing scale of society were noted:

1. redistribution of population in space involving migration differentials among different occupations,
2. alteration in age/sex and supporting/dependent proportions in the population and the relative stability of the working-age group,
3. diversity with isolation of sub-groups influenced by kinship and neighbourhood (Ibid., pp.14-16).

These aspects are similar to the relationship of mobility and migration noted above (p.4) to urban growth, population selectivity and neighbourhood structure and change.

Replication of the Shevky-Bell variables in other cities, the extension of the technique to include many more variables, and the adoption of factor analysis as a computing aid to delimit the basic factors, have isolated substantially the same three dimensions (Rees, 1971, p.230).

Examination of the spatial pattern of these factors (Anderson and Egeland, 1961) revealed that family status was radially distributed, economic status in sectors, and ethnic status in clusters within the city. This is quite consistent with earlier formulation of urban structure and thus factorial ecology provides a synthesis of previous models. However, comparative factorial ecologies have not always produced the same factors (Berry and Rees, 1969, pp.467-468).

Some factorial ecology studies have produced factors labelled mobility (Pedersen, 1967; Rees, 1970). A principal components anlysis of Winnipeg (Nicholson and Yeates, 1969) included variables of mobility and migration. The first component of higher socio-economic status had negative loadings for 'percent born outside Canada', 'percent immigrated 1946-61' and 'percent movers from the central city 1956-61'. The third component labelled stable residential Eastern European groups, had its highest positive loading on 'percent non-movers 1956-61'. This seems to indicate some support that the factor analysis technique may provide some areal associations of mobility and migration.

Although Murdie (1969) did not include any mobility variables in his factorial ecology of Toronto, a factor of recent growth appeared for both 1951 and 1961, with high loadings on length of occupancy and population change (Ibid., p.103).

Measures of mobility appeared as the ninth factor in Rees' study of Chicago (1970), but there were no significantly large factor loadings associated with it. The interpretation was based on study of the distribution of the factor scores, and indicated some relation to social status. It was suggested that the mobility pattern was related in a complex manner to each of the main social area factors, and careful research would be required to investigate this (Ibid., p.351).

In Copenhagen, population growth and mobility appeared as the third factor after family status and socio-economic status (Pedersen, 1967), and was concentrated in new suburbs and the central city. Age structure was considered a function of the processes of population growth and mobility.

At a different level of analysis, a principal components analysis of indicators of regional development and migration between state economic areas in the United States (Schwind, 1971) produced a fourth factor called socio-economic status and mobility.

Johnston (1971, p.318) suggests the existence of isolated mobility and urban growth factors may mean such areas are independent of other urban structure elements.

All these factorial ecologies are based on a large

number of urban structure and population variables. There has been no attempt to confine the analysis to variables considered significant from previous migration and mobility studies. Considering the indeterminate state of present knowledge, and following the suggestion of Rees (1970, p.351) and Hill (1971, p.58), this present study will examine the urban migration and mobility literature to determine relevant variables, and use these variables in a factor analytic study with measures of migration and mobility.

Migration and Mobility

Theories of migration and mobility exist at several different levels and generalisations applicable to migration from abroad or internal migration (either rural-urban or urban-urban) may not be valid to explain residential mobility within an urban area (Harvey, 1969, p.386).

Migration

Early work on internal migration (Ravenstein, 1885, p.198) concluded that most migration was over short distances, by stages, with each main stream having a counterstream, and dominated by more rural than urban migrants and more females than males.

Much research on internal migration has been concerned with labour mobility and has considered economic

variables such as employment opportunities, wage levels, regional income differentials (reviewed by Willis, 1968, pp.31-63), distance (Zipf, 1946) and intervening opportunities (Stouffer, 1940). The economic advantage to be gained from migration contributes to theories of migration and regional growth (Hansen, 1971; Schwind, 1971; Herrick, 1965). Lowry's models relating inter-metropolitan migration and urban growth (1966, pp.94-96) found that a large proportion of out-migration could be accounted for by the distance involved, amount of unemployment, wage levels, and the age of persons. In-migration depended on the size and composition of the metropolitan population, job availability, wage levels, growth and employment and labour force. In 1950, in-migrants to Chicago had higher labour participation rates than non-migrants, again emphasising the importance of employment to internal migrants (Freedman, 1950).

Mobility

Changes of residence within the city may not be so dependent on employment, as moves do not necessitate a change in job. Population growth will be accompanied by higher levels of mobility, as people move into new housing (Simmons, 1968). Their former residences will then become available for others to move, and so through chains of housing vacancies. Population growth and vacancy levels

will therefore influence mobility rates[8] in different areas. Declining areas of low or negative population growth may have many vacancies but low in-mobility, while new areas of high population may have few vacancies and high in-mobility (Brown and Longbrake, 1970). Here, other influences must be considered.

The function of distance is also significant within urban areas, where the majority of moves are over short distances (Simmons, 1968, p.405; Clark, 1970). This can be related to the activity and contact spaces of the individual (or household) (Horton and Reynolds, 1970; Brown and Holmes, 1970), and involves a directional bias towards the city centre (Moore, 1972). Actual moving behaviour seems to be related to a sectoral mental map extending outwards from the present place of residence towards the periphery (Adams, 1969; Johnston, 1972). Moves are more likely to occur within areas about which the potential mover has knowledge. Such knowledge is concentrated in one sector of the urban area and decreases with distance from the present residence.

Apart from the distance moved from origin to

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8 Mobility rate refers to the proportion of persons in a given area who have changed their place of residence in a given period of time. When referring to selectivity of movers, the rate is the proportion of movers who belong to a particular group (for example, age, occupation).

destination, distance from the city centre is of significance in explaining mobility rates of different areas. This was proposed in Burgess' model (see above, p.6), with in-migration concentrated at the centre. In London, migrants from outside the city were concentrated in the centre, exhibiting a distance decay effect (Johnston, 1969a). Movement within the city was over short distances and progressively outwards towards the periphery, resembling Burgess' waves of succession. A study of Montreal using Canadian census data for 1956-61 did not relate its findings to any previous research or mobility theory, but found that the geographic origins of immigrants determines their destination (Charbonneau and Légaré, 1967, p.265). Most foreign migrants went to the lower-income central city area, and Canadians from outside Quebec went to English-speaking suburbs west of Mount Royal. A distance decay function was found in Christchurch, with a mean moving distance of 2.4 miles (Clark, 1969).

Moore, (1966) has related this mobility distance decay function to the decrease in population density, in that greater population density provides greater potential personal contacts and information sources, as well as greater stress from the increased density and proximity of persons. Areas of higher density tend to have greater residential mobility. In Brisbane, Moore (1970, p.13; 1971, p.80) found that mobility rates were explained better by distance from the city centre than by five population and

housing variables, possibly because these variables themselves varied with distance from the city centre.

The behavioural and decision making models, and the concepts of stress, place utility and search, are useful as a framework for studying the mobility process, but do not provide additional guidelines for the selection of variables for an ecological study.

More relevant are studies dealing with the selectivity of migrants and movers, the motivations, or push and pull factors responsible, and the determinants of residential location.

Selectivity

The most consistent finding is the higher propensity to move of young adults, particularly those who are single, or married without children. (Simmons, 1968; Jansen, 1970; Willis, 1968). Canadian census data show that 67 percent of males over five years who moved between 1956 and 1961 were between 25-29 years, and 67 percent of females moving were 20-24 years (Whyte, 1967, p.3). The effects of marital status, increase in age, and number of children, can be seen in lower mobility for those over 35 years, married, with two or more children. Correspondingly, children 5-14 years tend to have lower mobility rates than pre-school children 5 years and under. There may be a slight increase

in mobility for older persons whose children have left home. Propensity to move is therefore selective of stage in life cycle.

Differentiation of moving on the basis of sex is not so well defined (Willis, 1968, p.32). The only consistent finding is that females move at an earlier age than males. Migration or mobility of married couples will show equal rates for both sexes, even though employment-related, longer distance migration may be attributed to the husband's motivations, and the migration of the remainder of the household is involuntary.

Other characteristics of movers and migrants are dependent on life cycle factors such as age. Of the indicators of socio-economic status (Duncan, 1961, p.116), income is most closely related to age. Income in turn will influence the type of housing and tenure selected; and depends on the type of occupation, which depends on educational level. Generally, more lower status persons move over shorter distances, and longer distance migration is dominated by persons with higher income and educational levels, and in professional occupations (Rose, 1970, pp.85-91). Freedman found in-migrants to Chicago were of higher status than non-migrants (1950, p.183). The unemployed, particularly those of higher status, move more than those employed. Self-employed persons tend to move least (Simmons, 1968, p.397).

Related to life cycle state and income are housing type and tenure. Fewer home-owners than tenants move because of the greater investment involved in owning a home. As single-detached dwelling are preferred by a majority of households (Lansing, 1966, p.43) and are considered more suitable than multiple dwellings for families with school-age children, occupants of single family dwellings tend to move less than multiple-dwelling occupants.

A distinction has been drawn between persons who move, and those who do not (movers and stayers) (Moore, 1969a, p.115; Willis, 1968, p.38-39). Most moves are made by a mobile section of the population who make frequent moves, whereas stayers rarely move at all. In addition, duration of residence is important, as the longer occupants have lived in the one dwelling, the less likely they are to move.

The role of ethnic status in migration and mobility, minority groups tending to move more frequently than the major ethnic group in the country, may be more related to their lower income and education levels, large families, or constraints on their finding suitable housing (Simmons, 1968, p.401).

Motivation

As suggested by the behavioural models, migration originates generally from changing circumstances of the

household, which lead to stress and a decrease in place utility of the present residence in comparison with the household's needs and aspirations (Wolpert, 1965). For intra-urban mobility, the most important change is in life cycle stage, with its associated space requirements (Brown and Moore, 1970). This is particularly apparent with increase in the number of children with increased demand for living space, but also decrease in space required after children leave home. Other life cycle stage changes which may induce moves are marriage and household formation, death of spouse, divorce or separation.

Other reasons for moving are changing social status related to increase or loss of income; or changing neighbourhood characteristics, such as deterioration of housing quality or social environment, or 'invasion' by groups foreign to the former characteristics of the neighbourhood in life style, culture, ethnicity or race (Moore, 1972, p.6).

Employment location does not appear to be a reason for intra-urban mobility, and households do not tend to move closer to workplaces (Lansing, 1966, p.2; Simmons, 1968, p.408). However, availability of employment may be a most important reason for in-migration from outside the urban area (Lowry, 1966, p.96; Willis, 1968, p.35).

A significant proportion, perhaps 30 percent, of

moves do not involve any choice (Simmons, 1968, p.403). These include the life cycle changes mentioned above (household formation or dissolution) and also displacement by destruction of dwelling, urban renewal or other pressures such as eviction.

The selectivity of the mobile population will depend on the amount of choice involved, as the greater the 'pull' or attracting force, the more selective the movement will be. Movement in response to strong 'push' forces such as from a disaster or depressed area, will be much less selective (Bogue, 1961, p.15).

Motivations are primarily related to changing space requirements associated with different life cycle stages (mobility), employment (migration) or are involuntary.

Residential Location

The choice of destination within the urban area of the moving household is dependent on the housing market and available vacancies. Vacancies will depend on external economic conditions, such as economic and spatial growth of the urban area, availability of finance, building activity and decisions of land developers.

In residential location, dwelling characteristics are most important, especially cost (Berry and Rees, 1969,

p.461), as it is only with income and cost as a constraint that other preferences can operate. These other preferences concern space, dwelling-type and neighbourhood (Lansing, 1966, p.2). The availability of household amenities may encourage or discourage in-movement, or restrict some housing to lower-income households.

Moore (1966) introduced 28 additional variables into his analysis, but none contributed to the explanation of turnover rates except access to recreational space. Neighbourhood quality and amenities may influence residential location and consequently the amount of in-movement to an area. Few people are likely to move within a poor quality area unless they are without financial or initiative resources to move further away. Those who do move in, may not possess adequate knowledge of the poor amenities, or have the resources to locate elsewhere. Indicators of neighbourhood quality and facilities are the amount of land devoted to land uses other than residential (Brown and Longbrake, 1968; Kalbach, Myers and Walker, 1964); the amount of employment in the area as opposed to residential population could be a similar measure. Other neighbourhood quality indicators are the population growth of the area, whether declining, stable or growing; type of dwellings; density of population; presence of open space and recreation facilities; quality of the atmosphere - whether air pollution is an obvious problem or disadvantage; amount of traffic;

and accessibility, or proximity to main areas of employment. Environmental characteristics, such as climate, may be important for some types of migrants, for example, retired persons (Willis, 1968, p.37).

The residential location decision has provided an important assumption for areal ecological studies: that individuals tend to move into areas which are equivalent to their own status and life cycle stages. In-migrants or movers to an area could be characterised by the socio-economic level of their destination (Brown and Longbrake, 1968; Goldstein and Mayer, 1965). Freedman (1950) assumed that in-migrants to an area had common characteristics, and concentrated in areas where living arrangements were conducive to mobility. These studies noted differences between migrants into urban, suburban, and rural areas; into industrial and residential suburbs; and between in-migrants and intra-urban movers. Equally important is the fact that migrants and movers differ according to their origin, so there is a need to separate foreign immigration, internal migration and intra-metropolitan mobility.

The final relationship between neighbourhood area and mobility rate to be considered here, is urban change over time. Four types of association may be identified (Moore, 1972, p.33): High mobility and changing population characteristics; high mobility and stable population

characteristics; low mobility and changing population; low mobility and stable population. This typology and the associated circumstances of each type described by Moore, could form the framework for an extension of the present study to a dynamic study of changing population and housing characteristics and mobility over time[9]. This could be of considerable value for insight into urban growth processes of individual urban areas, and also background information for future urban planning decisions.

From this summary of the selectivity, motivations, resistances, areal association, direction, origin and destination or urban migrants and movers, it is apparent that the migrant, mover, or mobile area is a complex amalgam of characteristics, associations and influences. A factor analysis of these variables may reduce the complexity to a few basic dimensions or groupings of areas of similar migration or mobility, and associated characteristics.

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9 In the 1940s, Watson mapped the social regions of Hamilton, Ontario, according to their stability and class, but the basis of his classification was not revealed (Watson, 1948, p.488).

HYPOTHESES

From the theory and research findings reviewed above, the following hypotheses are presented regarding the results which could be expected from a factor analytic study of migration, mobility, population and housing.

1. Areas of relatively high mobility (compared to the metropolitan average) will be differentiated from areas with low mobility rates (high proportion of non-movers) primarily on the basis of household and dwelling characteristics. More mobile areas would have a relatively greater proportion of

a) young children and young adults,
b) single persons,
c) recent immigrants,
d) self-employed persons,
e) one-person households,
f) non-family households,
g) multiple-family households,
h) families without children,
i) multiple-dwelling structures,
j) tenant-occupied dwellings,
k) dwellings occupied for a short period of time,
l) newer dwellings,
m) very old dwellings,
n) poor quality dwellings,
o) dwellings where space is limited compared with household needs.

Areas of low mobility rates would have a relatively greater proportion of

a) school-age children,
b) middle-aged persons,
c) large families and households,
d) owner-occupied dwellings,
e) dwellings occupied for a long period of time,
f) large, uncrowded dwellings.

2. In-migration into the urban area will vary according to the size of centre, its population growth and employment opportunities, and will be constrained by the distance from sources of out-migration. The largest source of mobility should be from within the city, then from the suburban fringe, smaller migration from the same province, different provinces and from other countries. Areas of relatively high mobility will be differentiated according to the origin of movers, and the distance moved. The principal differences should appear for areas of relatively high foreign in-migration, and for areas of relatively high intra-urban mobility. The socio-economic status of in-migrants should vary with the distance migrated. Areas with a high proportion of migrants from outside the metropolitan area should have a higher proportion of persons

a) in professional occupations,
b) with higher wage and salary income,
c) with higher education levels,

and lower proportions of persons looking for work.

Areas with a high proportion of intra-urban movers should have a higher proportion of persons

a) in unskilled occupations,
b) with low incomes,
c) with little formal education,
d) looking for work.

Areas of relatively higher migration should be of higher economic status than areas of relatively high mobility.

3. Neighbourhood characteristics such as presence of ethnic groups, may attract foreign migrants rather than internal migrants. Quality of neighbourhood may be related to information availability, so the foreign migrants, because of lack of information and greater initial need for accessibility, move into the centre of the city. Intra-urban movers will tend to move towards the fringe and the newer areas. Internal migrants from outside the urban area with greater familiarity of the characteristics of various sectors, may tend to move into outer areas. This knowledge may direct mid-distance migrants away from areas with high traffic flow, few recreation facilities and high air pollution levels, so that foreign migrants and lower-status intra-urban movers will be concentrated in neighbourhoods of inferior quality.

VARIABLES

The number of persons who changed their place of residence between 1956 and 1961 are available for a Canadian census sample population for census tracts of the Metropolitan Area of Hamilton, Ontario. This includes the City of Hamilton, Town of Burlington and County of Wentworth. All other population, housing and neighbourhood variables are related to migration or mobility behaviour or mobile areas as discussed above. Measures for these variables are available from the 1961 Census by census tracts, and from City of Hamilton reports on transportation, open space and air quality.

Because the data give only generalised origins (for example, number of persons in tract 'i' who have moved from the city, 1956-61), the concern is mainly with destination areas, selectivity, and residential location, rather than with motivations at the origin.

The mobility data are from a 20 percent sample, and are therefore subject to some sampling error. The sample did not include people in institutions or boarding houses, and so may underestimate actual mobility. It did not include children under 5 years in 1961, as they were born between

1956 and 1961 (Stone, 1969, pp.327-331). The measure is only of mobile persons in each census tract; there is no measure of out-migration, or even in-migration, as the population moving could have theoretically all moved within the one tract, or all from other tracts.

The 1961 Census data may also be subject to inaccuracies. Because of this, data are not published for some categories where there are less than 100 instances in a single census tract. This limitiation particularly affects measure of crowding and age of dwelling. The number of dwellings requiring major repair was omitted from the analysis because of the incomplete nature of the published data. In Hamilton, amenities listed by the Census were present in 90 percent or more of dwellings, with little areal variation. These amenities do not provide a good measure of variation in dwelling quality, and were consequently omitted.

The community and locational variables (see Table 2) except population growth are estimates for each census tract based on data obtained from other sources. Population, area, and manufacturing, retail and service employment data were available for 105 transport zones used for the Hamilton Area Transportation Plan (Parker, 1963). These data are for 1961. The number of each employment category per 100 residential population was calculated. This gives

an indication of the proximity of other activities. The number of population per acre indicates residential density. These land use and density measures together indicate the quality of different urban sub-areas.

Dustfall data were obtained for each of 14 stations distributed over the City of Hamilton, for each of the six years 1956-61 (Hamilton Department of Municipal Laboratories). Tracts were assigned values using data averaged over these years, and isoline maps for each year from the annual reports.

Another measure of neighbourhood quality is the availability of open space. In 1961, Hamilton had 1,935 acres of parkland inside the City and 1,900 acres in the Royal Botanical Gardens (Parker, 1963, p.2). The City of Hamilton Planning Department Open Space Plan (1968) contains an isoline map of square feet of open space accessible per 100 population (1961) within one-quarter mile range. As this only covered the central city north of the Mountain Brow, an approximate measure was used - proportion of each census tract devoted to open space land use.

The presence of large volumes of traffic, the associated noise and danger to pedestrians, and the fact this indicates land use other than residential to generate such volumes, makes this a possible indicator of neighbourhood quality. The distance decay of influence may be quite sharp,

and it is assumed that the effect of traffic has disappeared by one-quarter mile. The percentage of each tract within this range of heavy traffic (main roads carrying 13,000 to 32,000 vehicles per day) in 1961 was calculated from maps of traffic volumes in the Hamilton Area Transportation Plan (Parker, 1963).

Population growth is intended to indicate the declining or growing nature of each area from 1956 to 1961 and to give an indication of building activity.

The location variable of accessibility is a neighbourhood quality measure to some extent. It indicates the functional distance of each tract from the city centre, in accordance with the theory of decreasing mobility rates from the centre. This information was obtained from an isoline map of travel-times (including delays) in the Hamilton Area Transportation Plan. As 65 percent of persons included in the 1961 survey (Parker, 1963, p.11) were travelling by car, travel-times for car were used.

All these variables can be fitted into one of the following spaces of residential relocation (Berry and Rees, 1969, p.463): social space (life cycle stage and socio-economic characteristics of the population); housing space (attributes of dwelling); community space (attributes of neighbourhood; locational space (attributes of area in relation to other areas of the city, such as accessibility). (See Table 2, pages 29-i to 29-vii, and pages 30 to 33.)

TABLE 2 Selection of Variables for Factor Analysis

Variables from previous research		Variables used for present study (see discussion under hypotheses and variables)	Definition of indicators used (numbers refer to list of definitions following)
Variables	Indicators significant for mobility and migration		
POPULATION			
Life Cycle Stage			
age	pre-school	young children	7
	school-age	school-age	8
	young adults	young adults	9,10
	middle-aged	middle-aged	11
	old	old	12
marital status	single	single	13
	married	married	14
	widowed	widowed	15
	divorced		
number of children	number of children at home	families without children	29
		large families	30
number of dependents	proportion of population who are children or elderly		
household type	full-family		
	other family		
	non-family	non-family households	25
	proportion of adult males married		
number of wage earners	none		
	one		
	more than one	females in labour force	22
new household formation	marriage		
household dissolution	divorce		
	separation		
	death of one or both spouses		

TABLE 2 continued

Variables from previous research		Variables used for present study	Definition
Variables	Indicators		
Socio-Economic Status			
income	high-income	high-income	24
	low-income	low-income	23
		average household income	42
occupation	managerial, professional, technical	managerial, professional, technical	19
	labourers	labourers	20
	skilled		
	unskilled		
	non-manual		
	manual		
	white collar		
	blue collar		
	farmers		
employment status	in labour force		
	unemployed	persons looking for work	21
	retired		
	self-employed	self-employed	18
education	above-average	higher education levels	16
	college education		
	elementary	little formal education	17
	number of school years completed		
social mobility	upward (e.g. promotion)		
	downward (e.g. loss of income)		
Other Characteristics			
ethnicity	race	relationship to mobility and migration probably depends on other characteristics of such groups	
	ethnic group		
	native-born		
	religion		
	language		
	degree of segregation		

TABLE 2 continued

Variables from previous research: Variables	Indicators	Variables used for present study	Definition
Other Characteristics continued			
sex	male female sex ratio	relationship to mobility inconclusive	
origin	birthplace previous residence (urban, rural, foreign)	see mobility variables	
duration of residence	number of years in same dwelling	dwelling occupied for short period of time	35
		dwelling occupied for long period of time	36
space requirements	size of household sharing of dwelling	large families and households	28
		small households	27
health	incidence of disease, mental illness, social problems, crime		
Behavioural Characteristics			
action space	information availability and knowledge about areas from sources other than personal contact	unobtainable from areal data but some of these indicators depend on other population characteristics (such as aspirations depend on income	
activity space	knowledge about areas from personal contact		
	location of friends and relatives who are visited		
	strength of social network		
	area and extent of activity space (sectoral in shape and limited in extent)		
place utility	matching needs to environment		
	satisfaction with housing		
	satisfaction with environment		
	amount of stress from present housing and environment		

TABLE 2 continued

Variables from previous research: Variables	Indicators	Variables used for present study	Definition
Behavioural Characteristics continued			
aspirations	activeness of individual or household		
	passiveness of individual or household		
	commitment to upward social mobility		
	life style preferences		
HOUSING			
type	single-detached	single-detached	32
	apartment	multiple-dwelling structures	31
quality	age of dwelling	newer dwellings	not obtained; see population growth
		very old dwellings	37
	marginal, in need of repair	poor-quality dwellings	census data insufficient
	value and cost of dwellings	value of owned dwelling	43
	amount of rent	average rent	41
	existence of amenities	insufficient variation in Hamilton sub-areas	
space and density	dwellings per acre		
	population per acre	residential population per acre	48
	households per dwellings	multiple-family households	26
	persons per dwelling	one-person households	27
		large families and households	28
	rooms per person	number of persons per room	40
		crowded dwellings	38
	size of lot		
	size of rooms	large dwellings rooms per dwelling	39
	number of bedrooms		

TABLE 2 continued

Variables from previous research		Variables used for present study	Definition
Variables	Indicators		
HOUSING continued			
tenure and occupancy	owner-occupied	owner-occupied	34
	tenant-occupied (rented)	tenant-occupied	33
	vacancies		
	occupied dwellings		
	government housing		
	dwellings removed from housing market e.g. fire, other destruction, urban renewal, conversion to other uses.		
NEIGHBOURHOOD			
land use	residential		
	industrial	manufacturing employment	45
	commercial	retail employment	46
		service employment	47
	open space	amount of open space (parks)	52
residential areas	inner city	relationship with mobility revealed in factor scores	
	urban		
	suburban		
	new suburban areas		
building activity	new housing completions	population growth used as surrogate measure	
	decisions of developers		
character	social composition		
	degree of group segregation		
	ethnic presence	migrants from abroad, 1956-61	6
	ghetto expansion		
	life style		
quality	declining area	population growth	44
	growing area		
	age of dwellings	old dwellings	37
	reputation as mobile or stable area	see mobility variables	

TABLE 2 continued

Variables from previous research Variables	Indicators	Variables used for present study	Definition
NEIGHBOURHOOD continued			
quality continued			
	presence of community institutions and amenities		
	existence of urban renewal schemes		
	availability of recreation facilities and land	open space	52
	existence of land uses other than residential	manufacturing, retail and service employment	45 46 47
	existence of noise, or danger: road and air traffic, crime, numbers of pedestrians	high levels of traffic flow	51
	quality of environment, existence of pollution of air, water	air pollution levels (dustfall)	50
URBAN AREA			
economic opportunity	population size size of labour market growth of labour market employment levels availability of housing finance	not applicable to urban sub-areas	
quality	reputation of city as a place to live climate		

TABLE 2 continued

Variables from previous research: Variables	Indicators	Variables used for present study	Definition
SPATIAL LOCATION			
accessibility to:	place of employment (distance, time, cost)		
	friends and relatives		
	ethnic communities		
	downtown (public transport time, proportion of people living at greater distance than 'x' from city centre)	travel-time from city centre by car (including delays)	49
	community institutions		
	retail and service facilities		
	socially-prestigious areas		
	familiar areas		
location	distance from city centre	travel-time from city centre	49
	sector of origin (distance of origin from city centre)	mobility data not in sufficient detail with respect to origin	
	sector of destination (angle off move with respect to city centre)		
	distance from origin to destination (mileage, cost, intervening opportunities such as vacancies or population size of intervening places)	see mobility variables for some indications of distance moved	
MOBILITY AND MIGRATION			
proportion of particular population group who have changed residence in previous given time period		movers and migrants from various origins	2-6
frequency of residence change within given time period		non-movers	1

TABLE 2 Variables used in Factor Analysis

Variable Number	Definition of Variable
1	Percent of census tract population in 1961, 5 years and over who did not move 1956-61
2	Percent of census tract population in 1961, 5 years and over who moved between 1956 and 1961 from the central city
3	Percent of census tract population in 1961, 5 years and over who moved between 1956 and 1961 from the fringe of the metropolitan area
4	Percent of census tract population in 1961, 5 years and over who moved between 1956 and 1961 within the same province (Ontario)
5	Percent of census tract population in 1961, 5 years and over who moved between 1956 and 1961 from a different province
6	Percent of census tract population 1961, 5 years and over who moved between 1956 and 1961 from abroad
7	Percent of total census tract population in 1961 aged 0-4 years
8	Percent of total census tract population in 1961 aged 5-14 years
9	Percent of total census tract population in 1961 aged 15-24 years
10	Percent of total census tract population in 1961 aged 25-34 years
11	Percent of total census tract population in 1961 aged 35-64 years
12	Percent of total census tract population in 1961 aged 65 years and over
13	Percent of census tract population in 1961, 15 years and over who were single
14	Percent of census tract population in 1961, 15 years and over who were married
15	Percent of census tract population in 1961, 15 years and over who were widowed

TABLE 2 continued

Variable Number	Definition of Variable
16	Percent of census tract population in 1961, not attending school, minus 0-4 year olds, whose highest level of education was elementary
17	Percent of census tract population in 1961, not attending school, minus 0-4 year olds, whose highest level of education was university, one or more years
18	Percent of census tract population in 1961, 15 years and over in labour force who were self-employed
19	Percent of census tract population in 1961, 15 years and over in labour force who were employed in managerial, professional or technical occupations
20	Percent of census tract population in 1961, 15 years and over in labour force who were employed as labourers
21	Percent of census tract population in 1961, 15 years and over in labour force looking for work
22	Percent of female census tract population in 1961, 15 years and over in the labour force
23	Percent of male census tract population in 1961, 15 years and over in labour force whose wage and salary income in 1961 was less than $2,000
24	Percent of male census tract population in 1961, 15 years and over in labour force whose wage and salary income in 1961 was $6,000 and over
25	Percent of total number of households in census tract 1961 which had 0 families (non-family households)
26	Percent of total number of households in census tract 1961 which had 2 or more families (multiple-family households)
27	Percent of total number of households in census tract 1961 with 1 person
28	Percent of total number of households in census tract 1961 with 6 or more persons

TABLE 2 continued

Variable Number	Definition of Variable
29	Percent of total number of families in census tract 1961 with 0 children
30	Percent of total number of families in census tract 1961 with 5 or more children
31	Percent of total number of dwellings in census tract 1961 which were apartments
32	Percent of total number of dwellings in census tract 1961 which were single-detached
33	Percent of total number of dwellings in census tract 1961 which were tenant-occupied
34	Percent of total number of dwellings in census tract 1961 which were owner-occupied
35	Percent of total number of dwellings in census tract 1961 which had been occupied less than 3 years
36	Percent of total number of dwellings in census tract 1961 which had been occupied more than 10 years
37	Percent of total number of dwellings in census tract 1961 which were constructed before 1920
38	Percent of total number of dwellings in census tract 1961 which were crowded, with more than one person per room
39	Average number of rooms per dwelling in census tract 1961
40	Average number of persons per room in census tract 1961
41	Value of average rent in census tract 1961
42	Value of average income of households in census tract 1961
43	Median value of owner-occupied dwellings in census tract 1961
44	Population growth 1956-61: population in census tract 1961 as a proportion of population in census tract 1956

TABLE 2 continued

Variable Number	Definition of Variable
45	Number of manufacturing workers per 100 residential population in census tract 1961
46	Number of retail workers per 100 residential population in census tract 1961
47	Number of service workers per 100 residential population in census tract 1961
48	Number of residential population per acre of census tract 1961
49	Travel-time by car (including delays) from intersection of King Street and James Street (in minutes)
50	Average number of tons per square mile of dustfall 1956-1961
51	Percent of residential area of census tract 1961 within ¼ mile of main roads carrying 13,000 to 32,000 vehicles per day in 1961
52	Percent of residential area of census tract 1961 devoted to open space land use in 1961

ANALYSIS

Studies of associates of migration and mobility have traditionally used correlation (Freeman, 1950) and regression techniques (Moore, 1966; Willis, 1968, p.60). Correlation only deals with two variables at a time. Regression methods have been limited until fairly recently by the volume of data and amount of computation required. Moore analysed seven variables in his study of Brisbane. It was not possible to consider very large numbers of variables together. As the review of previous research has shown, urban migration and mobility cannot be explained by a few variables, but depend on many forces, perhaps acting differently for migration over different distances or from different origins. Apart from reducing this complexity, factor analysis provides a measure for each case (census tract) for each factor, so the geographical distribution of factors can also be studied.

Meyer (1971, p.343) considers that where variables are of theoretical interest, correlation techniques are more suitable, whereas factor analysis is better suited to descriptive purposes. A possible compromise may be to use the output of the factor analysis as an input to regression analysis.

Most urban analyses using factor analysis have been concerned with testing the hypothesis that a great range of urban variables will reduce to family, economic and ethnic status as hypothesised by social area analysis (Shevky and Bell, 1955). A small number of studies have found a mobility, residential stability or population growth type of factor. Rees and Hill suggested that it may be worthwhile to do a study concentrating on migration data. This type of analysis will in no way suggest causal linkages between variables; it will simply describe patterns of areal co-variation (Rees, 1971, p.222).

Although it is hoped that the pattern being described will be the mobility pattern, there is no guarantee that this analysis will load significantly on mobility variables. The variables being used are similar to those already used in factorial ecologies which isolated the family and economic status factors. These may indeed be the dominant features, and mobility variables may not be sufficiently variable throughout the metropolitan area to have a separate factor or high factor loadings.

The other limitation is that the results will be applicable only to <u>areas</u> within the metropolitan area of Hamilton at this particular time. The results cannot be applied to individual past or potential moving behaviour.

The following steps were taken for the analysis:

1. Variables were chosen, converted to values for census tracts where necessary, and converted to ratio measures for ease of interpretation (Janson, 1969, p.323) (see Table 2).

2. Variables similar to those transformed to logarithms in other studies (Cox, 1969, p.353; Sweetser, 1960, p.420) were graphed to determine if they were non-linear. There is no requirement for a normal distribution of variables, or for linear relations between different variables (Janson, 1969, p.332-333). The variables of density, distance from city centre, household income and manufacturing employment were found to be approximately linear, so no transformations were done.

3. To reduce the number of data cards per census tract, percentages were rounded to two figures, land use to three figures, and persons per room to one figure. This rounding is particularly important for small values with little variation, so that insignificant variations will not be exaggerated (Ibid., p.334).

4. For tracts where occurrences of a variable were less than 100 and no value published, estimates were made, for value of average rent and value of owned dwellings to avoid gross distortion of the pattern.

5. Before the final analysis, variables were examined to determine if any should be removed because categories or concepts overlapped (Ibid., p.327) or were not strictly

relevant to a hypothesis regarding migration or mobility. Consequently, percent of population born in Canada, born outside Canada, immigrated 1946-61 and percent with high-school education level, dwellings constructed after 1945 and public transit travel-time were excluded.

With these refinements, the data were transferred to punched cards with two cards for each of 79 census tracts.

Before factor analysis can be undertaken, decision must be reached on the method of estimating communalities[10], the number of factors to be rotated, the type of rotation and method of its calculation, and the eigenvalue limit[11].

1. The squared multiple correlation of one variable with all the others is a lower limit for the communalities, and was selected as being the most suitable communality estimate (Harman, 1967, p.90). Harman also states that the accuracy of communality estimates is not so crucial with large matrices.
2. The number of factors to be rotated was specified to be controlled by the lower limit on the eigenvalue.

---

10 Communality is the amount of variance of the variable accounted for by the common factors together (Cattell, 1965, p.198). It is the sum of the squared factor loadings for each variable on all factors.

11 Eigenvalue is the amount of variation accounted for by a factor pattern and is the sum of the squared loadings for each factor on all the variables (Rummell, 1967, p.466).

3. Orthogonal rotation (according to the varimax criterion[12]) was specified, in order to better compare the resulting factors with existing mobility theories. The existence of uncorrelated factors may contribute more to the theoretical basis of this study (Cox, 1969, p.352). It is recognised that it may be unrealistic to attempt to isolate orthogonal, uncorrelated factors (King, 1969, p.187) because many of the variables themselves are considerably inter-related. However, many studies (Murdie, 1969; Sweetser, 1960) have used orthogonal rotation of factors to ensure they are uncorrelated.

4. Specification of the eigenvalue determines the number of factors which will be produced. The lower limit for the eigenvalue, beyond which factor loadings will not be calculated, was estimated as 1.66, but this was reduced to the more conventional value of 1.00. As a result, eight factors with eigenvalues of more than 1.oo were produced, and these together accounted for 84 percent of the total variance. Theoretically, factoring should be stopped when the sum of communalities equals the sum of eigenvalues. (Harman, 1967, p.143). This point is reached after the sixth factor, which accounts for 3.5 percent of the total variance. The first six factors account for 79 percent of the variance.

---

12 The varimax criterion maximises the fourth power of the loadings, and maximises the scatter among the loadings (Cattell, 1965, p.210).

The analysis was carried out using the Biomedical X-series factor analysis programme, BMDX72 (Dixon, 1970, pp.70-103).

The final communalities calculated give an indication of the amount of variance of each variable, which is accounted for by all the factors. Forty variables had communalities of over 80 percent and of these, 90 percent of 18 variables was accounted for by the factors. The variables least well explained by the factors were:

migrants from same province	75 percent
percent self-employed	74
average rent	73
traffic-volume	68
migrants from different provinces	68
dwellings occupied less than 3 years	62
persons aged 15-24 years	56
percent of tract open space	26

The approximate nature of the open space and traffic-volume variables, the relatively small percentage of migrants from outside the metropolitan area (except abroad) and which may be associated with variables not included in this analysis, and the possibly overlapping nature of the 'occupied less than 3 years' variable with the mobility variables may partially explain why these variables are not as well represented by the factors.

It is of interest to note there is a definite decrease in explanation of mobility and migration variables with increase in distance moved (except for migrants from abroad). This indicates that other influences not included, such as economic opportunities in Hamilton, may be affecting such migration.

The variables with factor loadings greater than 0.3 (Cox, 1969, p.352), are listed in Table 3. The factor loadings and distribution of factor scores will be described, and then these results will be interpreted according to their contribution to migration and mobility.

TABLE 3 Results of Factor Analysis: Factor Loadings

Factor 1 Dwelling Type and Household Composition - 1 35.1 percent of total variance		Factor 2 Economic Status 17.9 percent of total variance	
Apartments	-.94	Managerial, professional, technical occupations	.95
Non-family households	-.94	University education	.93
Single-detached dwellings	.93	Males earning $6,000+	.88
One-person households	-.92	Average household income	.88
Married	.89	Elementary education	-.88
Tenant-occupied	-.86	Value of owned dwelling	.86
Single marital status	-.85	Average rent	.76
Owner-occupied	.85	Labourers	-.71
Females in labour force	-.80	Persons looking for work	-.56
Persons 5-14 years	.79	6+ persons per household	-.55
Persons 65 years and over	-.76	Males earning less than $2,000	-.55
No-children households	-.75	Crowded dwellings	-.50
Widowed	-.75	*Migrated within same province, 1956-61	.48
Dwellings constructed before 1920	-.68	2+ families per household	-.47
*Migrated from abroad, 1956-61	-.61	Dwellings constructed before 1920	-.47
Children 0-4 years	.58	Dustfall	-.46
Distance from city centre	.58	Traffic-volume	-.40
Males earning less than $2,000	-.57	Persons per room	-.37
Residential density	-.55	Dwellings occupied more than 10 years	-.37
Traffic-volume	-.51	5+ children per household	-.36
Service employment	-.45	Self-employed	.33
Persons looking for work	-.43		
Persons 15-24 years	-.41		
Dwellings occupied less than 3 years	-.40		
Persons per room	.39		
Population growth	.38		
Persons 35-64 years	.38		

* mobility and migration variables

TABLE 3 continued

Factor 3 Mobility and Life Cycle Stage 11.6 percent of total variance		Factor 4 Mobility and Fringe Characteristics 6.7 percent of total variance	
*Non-movers	-.93	*Movers from fringe	-.89
Persons 25-34 years	.88	Distance from city centre	-.68
Population growth	.74	Self-employed	-.67
Persons 35-64 years	-.71	*Movers from city	.65
Dwellings occupied less than 3 years	.65	*Migrants from same province	-.63
Dwellings occupied more than 10 years	-.62	Dustfall	.54
*Movers from city	.61	Residential density	.50
Children 0-4 years	.61	Rooms per dwelling	-.40
Persons 15-24 years	-.50	Females in labour force	.39
*Migrants from different provinces	.47	Traffic-volume	.32
Single marital status	-.39	Labourers	.31
No-children households	-.39	2+ families per household	.30
Persons per room	.34		
*Migrants from abroad	.32		
Married	.32		
Persons 65+ years	-.31		
*Migrants from same province	.30		

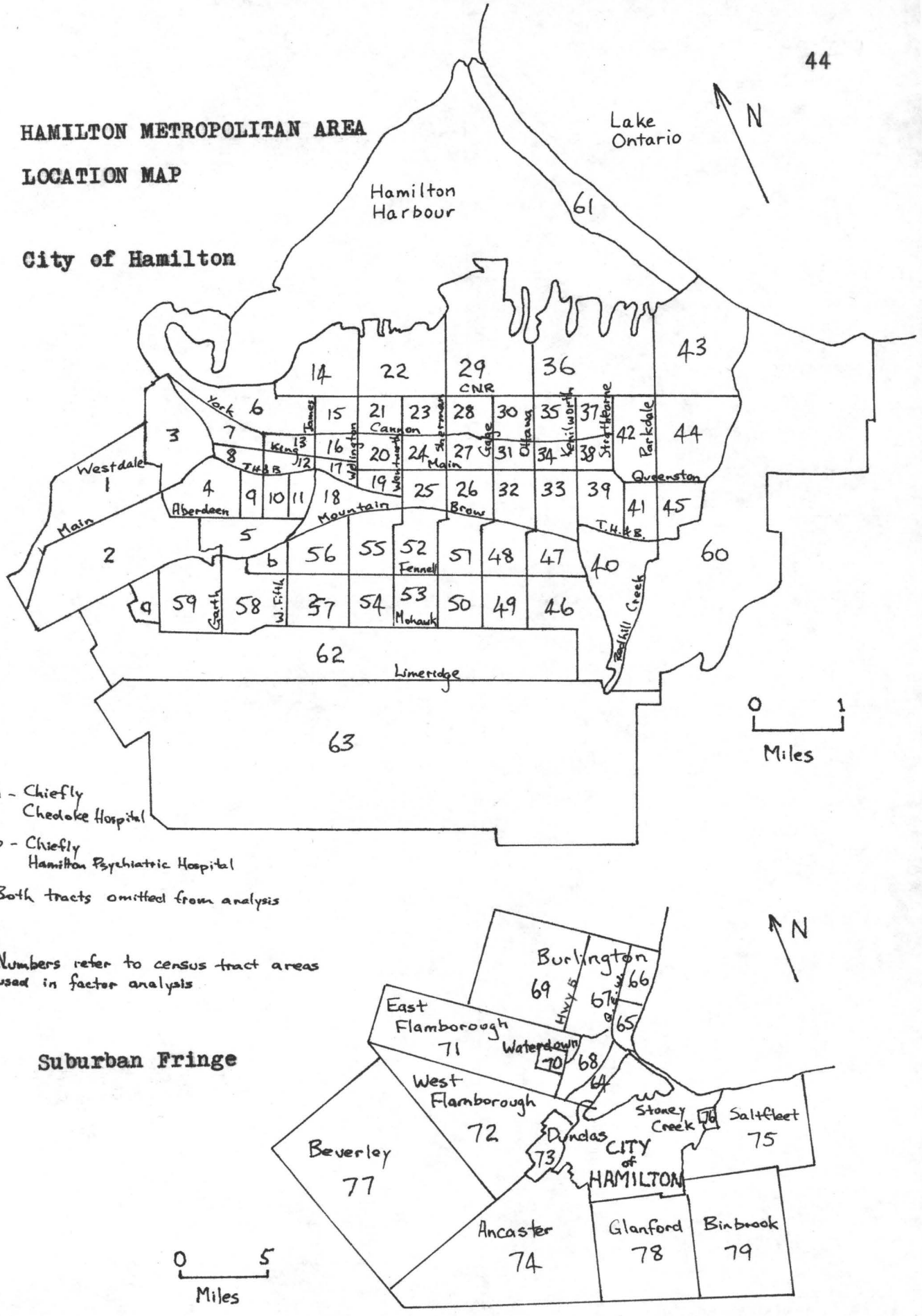
TABLE 3 continued

Factor 5 Dwelling Type and Household Composition - 2 4.3 percent of total variance	
Rooms per dwelling	-.70
2+ families per household	-.68
6+ persons per household	-.44
Dwellings constructed before 1920	-.42
Labourers	-.41
*Migrants from abroad	-.38
Males earning less than $2,000	-.34
Persons looking for work	-.30

Factor 6 Retail and Service Employment 3.5 percent of total variance	
Retail employment	-.82
Service employment	+.76
Persons 15-24 years	.35
Owner-occupied dwellings	.32
*Movers from city	-.29

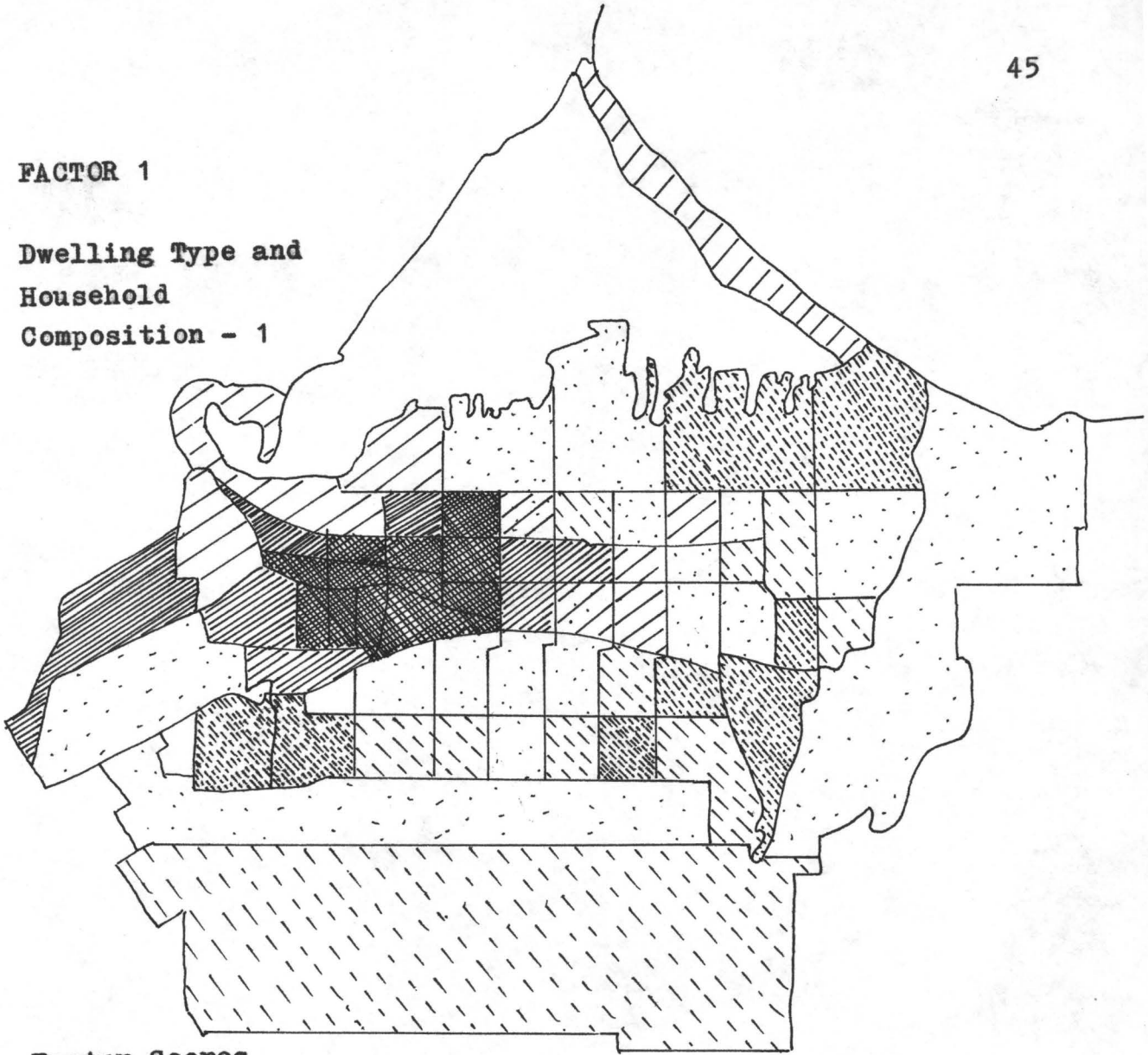
Factor 7 Crowding and Children 2.6 percent of total variance	
5+ children per household	-.72
Crowded dwellings	-.67
Persons per room	-.58
6+ persons per household	-.56
Persons 5-14 years	-.49
No-children households	.47
Persons 65+ years	.43
Widowed	.37
Dwellings occupied more than 10 years	.33
Persons 35-64 years	.33
Children 0-4 years	-.31

Factor 8 Manufacturing Employment and Migrants from Different Provinces 2.3 percent of total variance	
Manufacturing employment	-.79
*Migrants from different provinces	-.63
Dustfall	-.48
Labourers	-.26


HAMILTON METROPOLITAN AREA
LOCATION MAP
City of Hamilton
Lake Ontario
N
Hamilton Harbour
61
14
22
29
CNR
36
43
York
6
James
15
21
Cannon
23
Sherman
28
Gage
30
35
Kenilworth
37
Strathcona
42
Parkdale
44
3
7
King
13
16
Wellington
20
Wentworth
24
Main
27
31
Ottawa
34
38
8
T.H.&B.
12
17
19
25
26
Brow
32
33
39
Queenston
41
45
Westdale
1
4
Aberdeen
9
10
11
18
Mountain
Main
2
5
T.H.&B.
60
b
56
55
52
Fennell
51
48
47
40
a
59
Garth
58
W.J.Fitz
57
54
53
Mohawk
50
49
46
Redhill Creek
62
Limeridge
63
0
1
Miles
a - Chiefly
Chedoke Hospital
b - Chiefly
Hamilton Psychiatric Hospital
Both tracts omitted from analysis
Numbers refer to census tract areas
used in factor analysis
Suburban Fringe
N
Burlington
69
Hwy 6
67
66
65
East
Flamborough
71
Waterdown
70
68
64
West
Flamborough
72
Dundas
73
Stoney
Creek
76
Saltfleet
75
Beverley
77
CITY
of
HAMILTON
Ancaster
74
Glanford
78
Binbrook
79
0
5
Miles

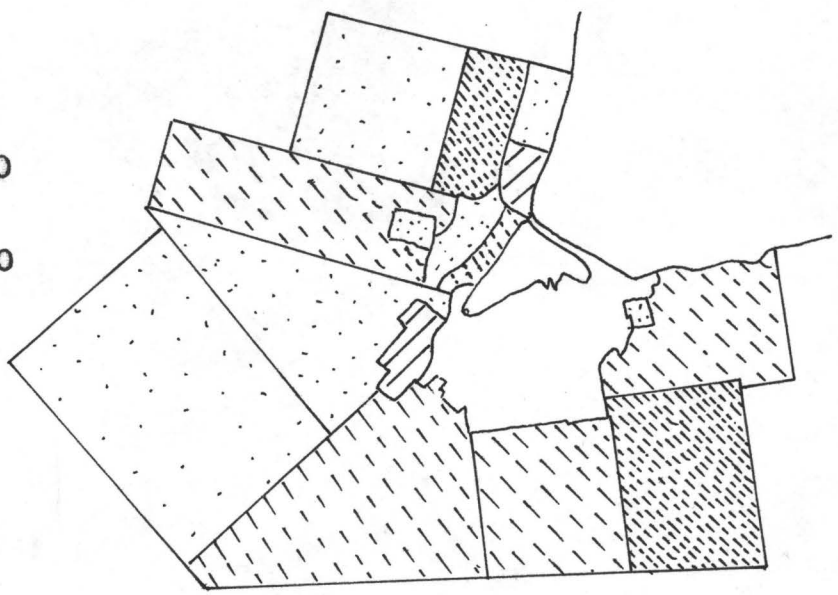
FACTOR 1

Dwelling Type and Household Composition - 1



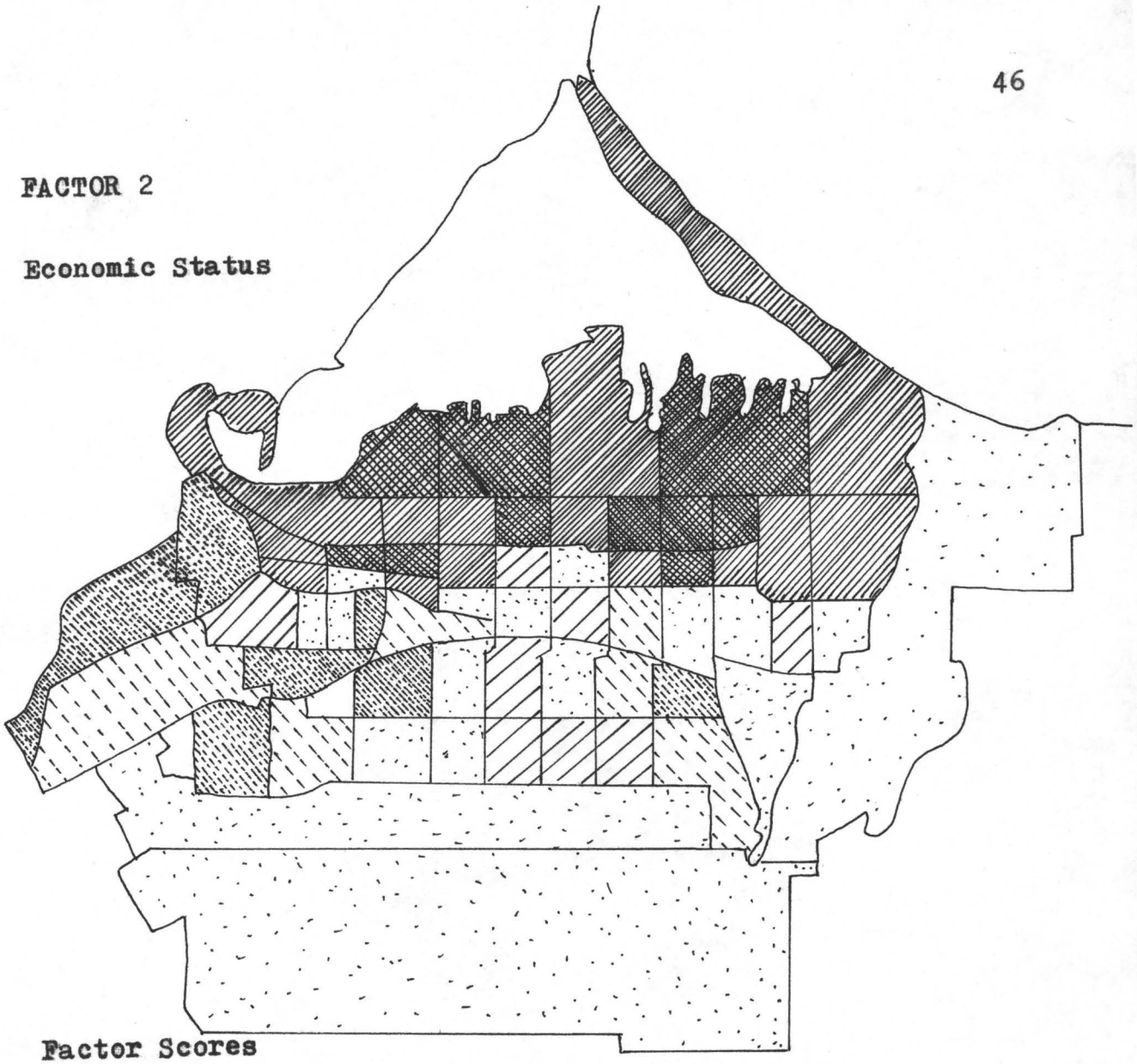
Factor Scores

- Over +1.00
- +0.51 to +1.00
- 0.00 to +0.50
- -0.01 to -0.50
- -0.51 to -1.00
- Over -1.00
- Omitted from analysis



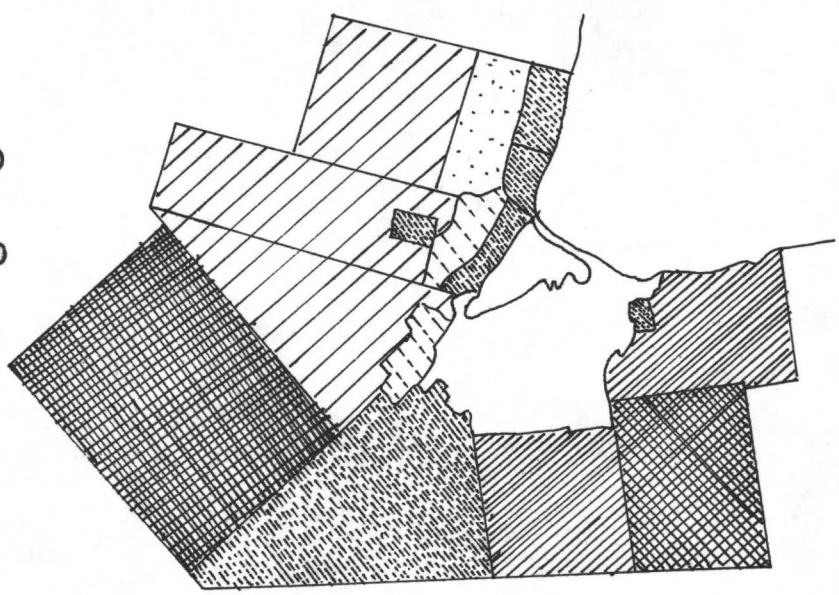
FACTOR 2

Economic Status



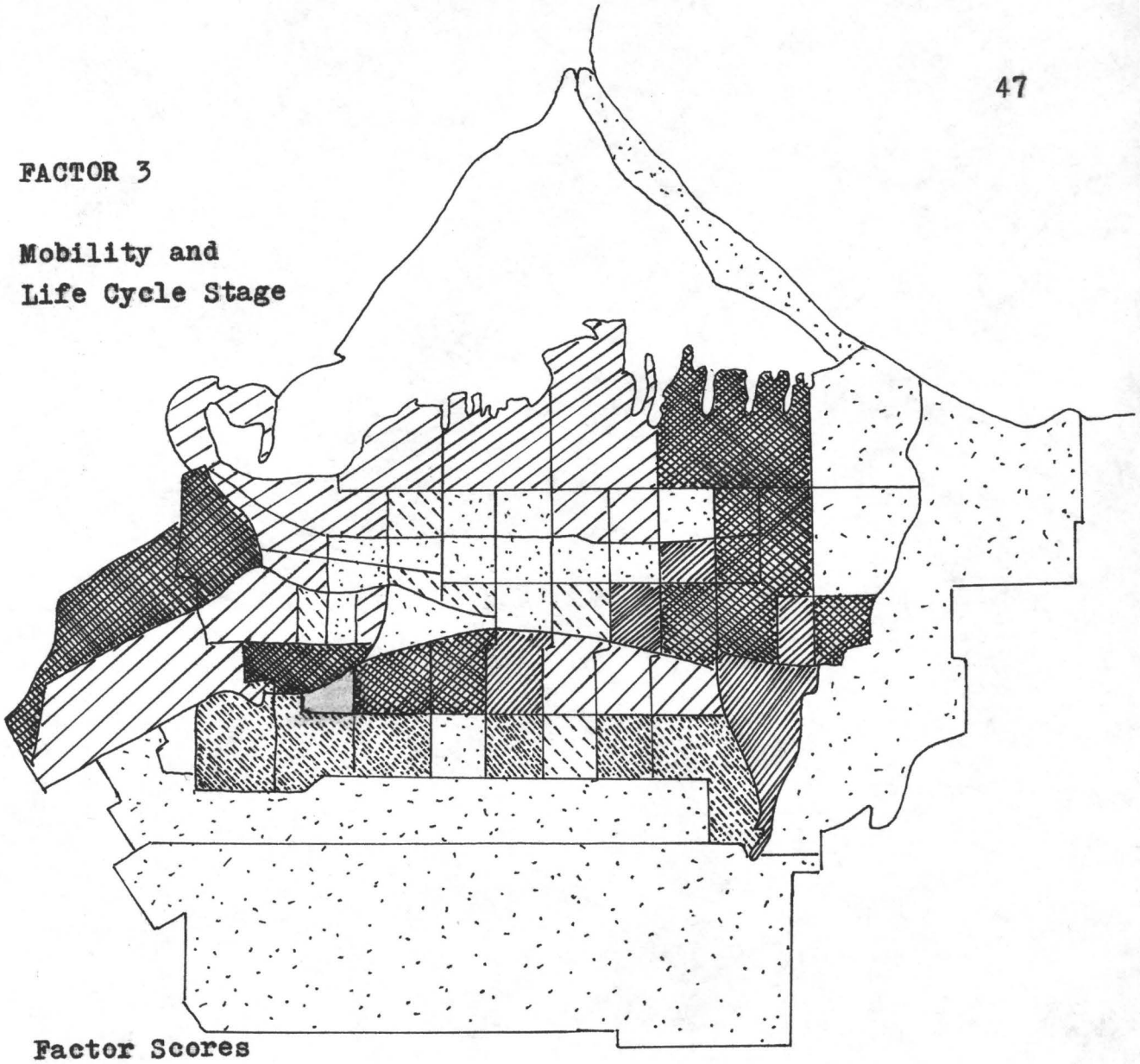
Factor Scores

- Over +1.00
- +0.51 to +1.00
- 0.00 to +0.50
- -0.01 to -0.50
- -0.51 to -1.00
- Over -1.00
- Omitted from analysis



FACTOR 3

Mobility and
Life Cycle Stage



Factor Scores

Over +1.00

+0.51 to +1.00

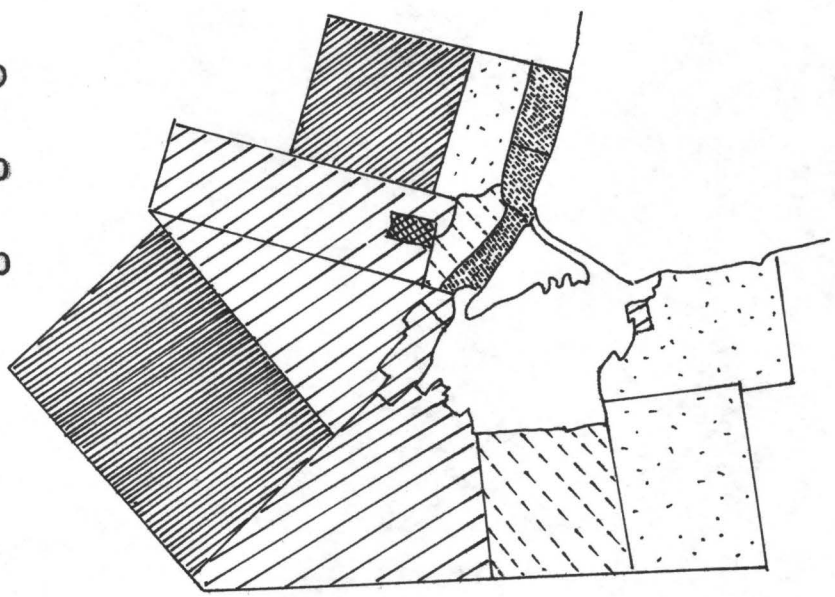
0.00 to +0.50

-0.01 to -0.50

-0.51 to -1.00

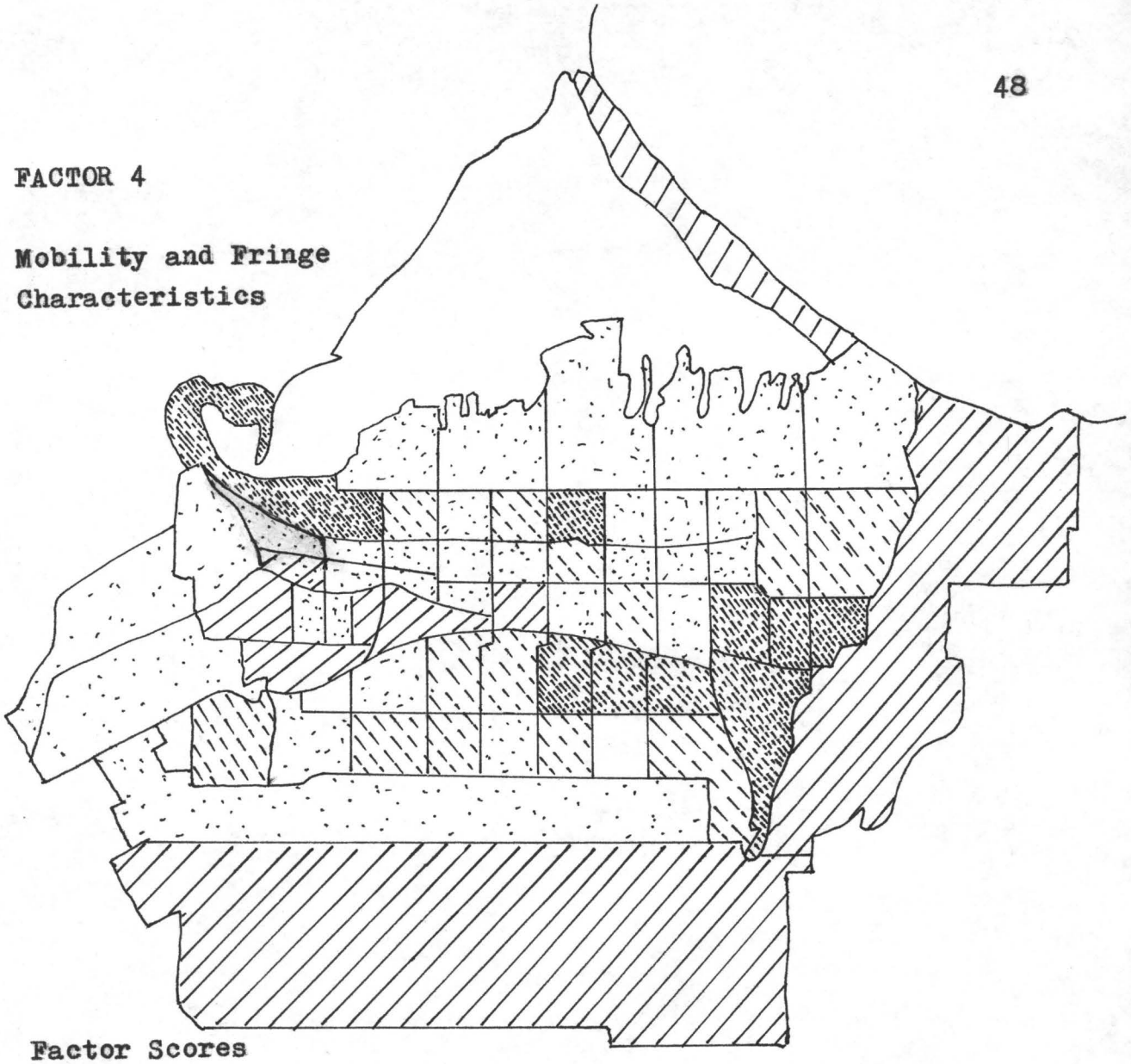
Over -1.00

Omitted from analysis



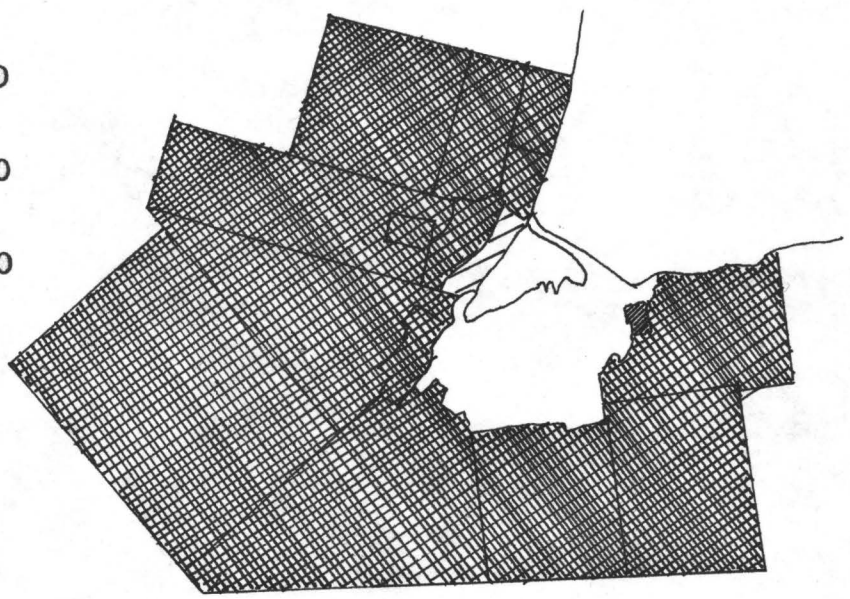
FACTOR 4

Mobility and Fringe Characteristics



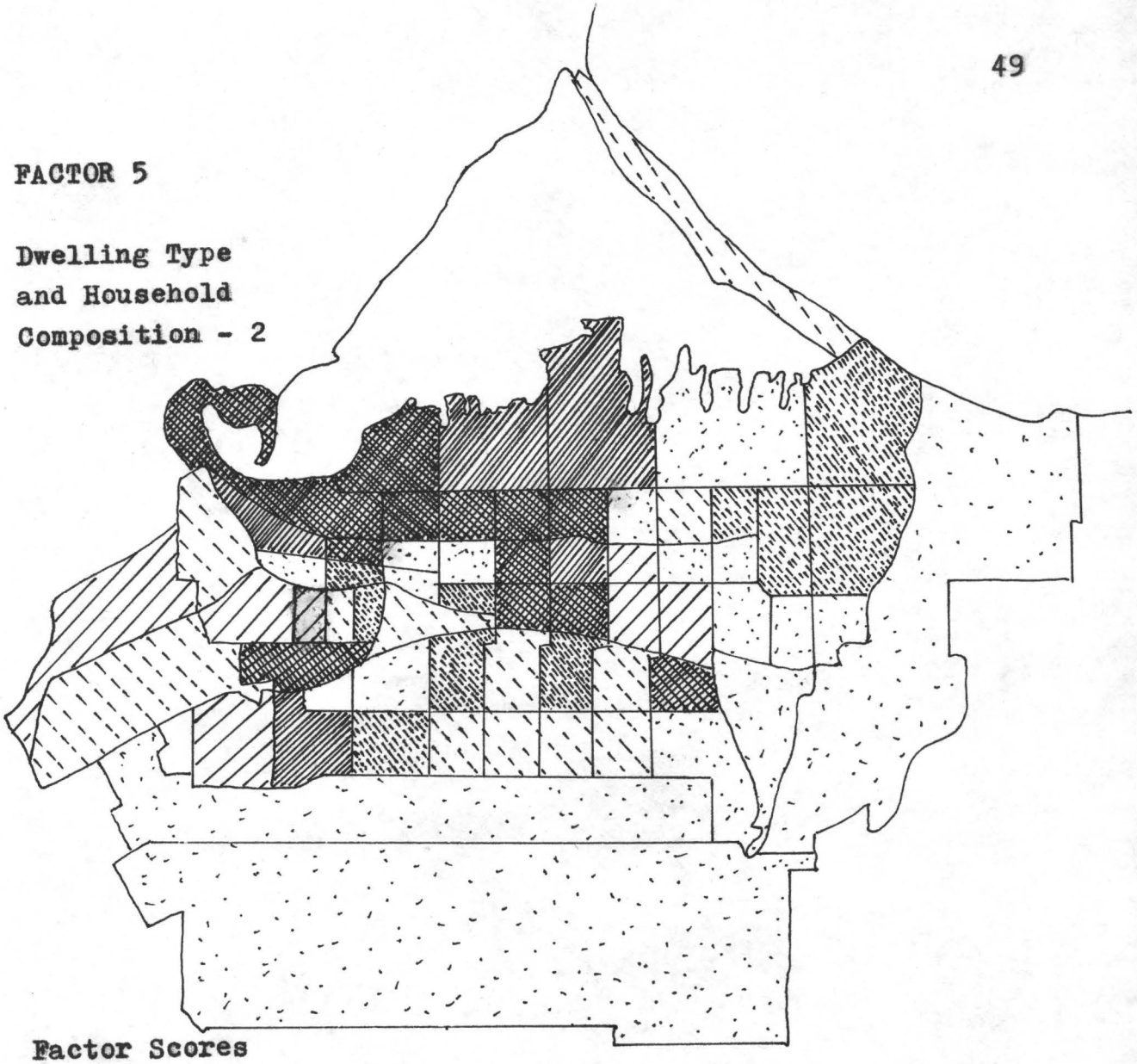
Factor Scores

- Over +1.00
- +0.51 to +1.00
- 0.00 to +0.50
- -0.01 to -0.50
- -0.51 to -1.00
- Over -1.00
- Omitted from analysis



FACTOR 5

Dwelling Type
and Household
Composition - 2



Factor Scores

Over +1.00

+0.51 to +1.00

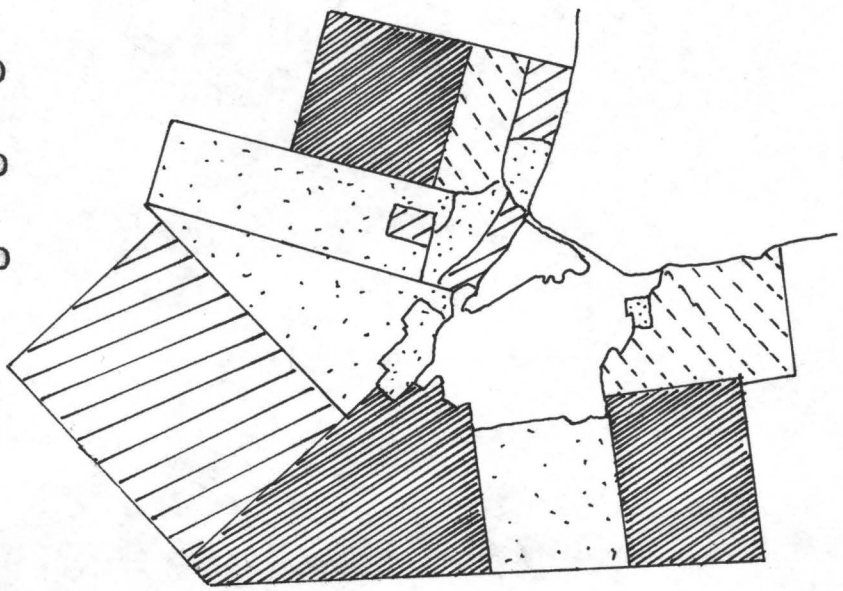
0.00 to +0.50

-0.01 to -0.50

-0.51 to -1.00

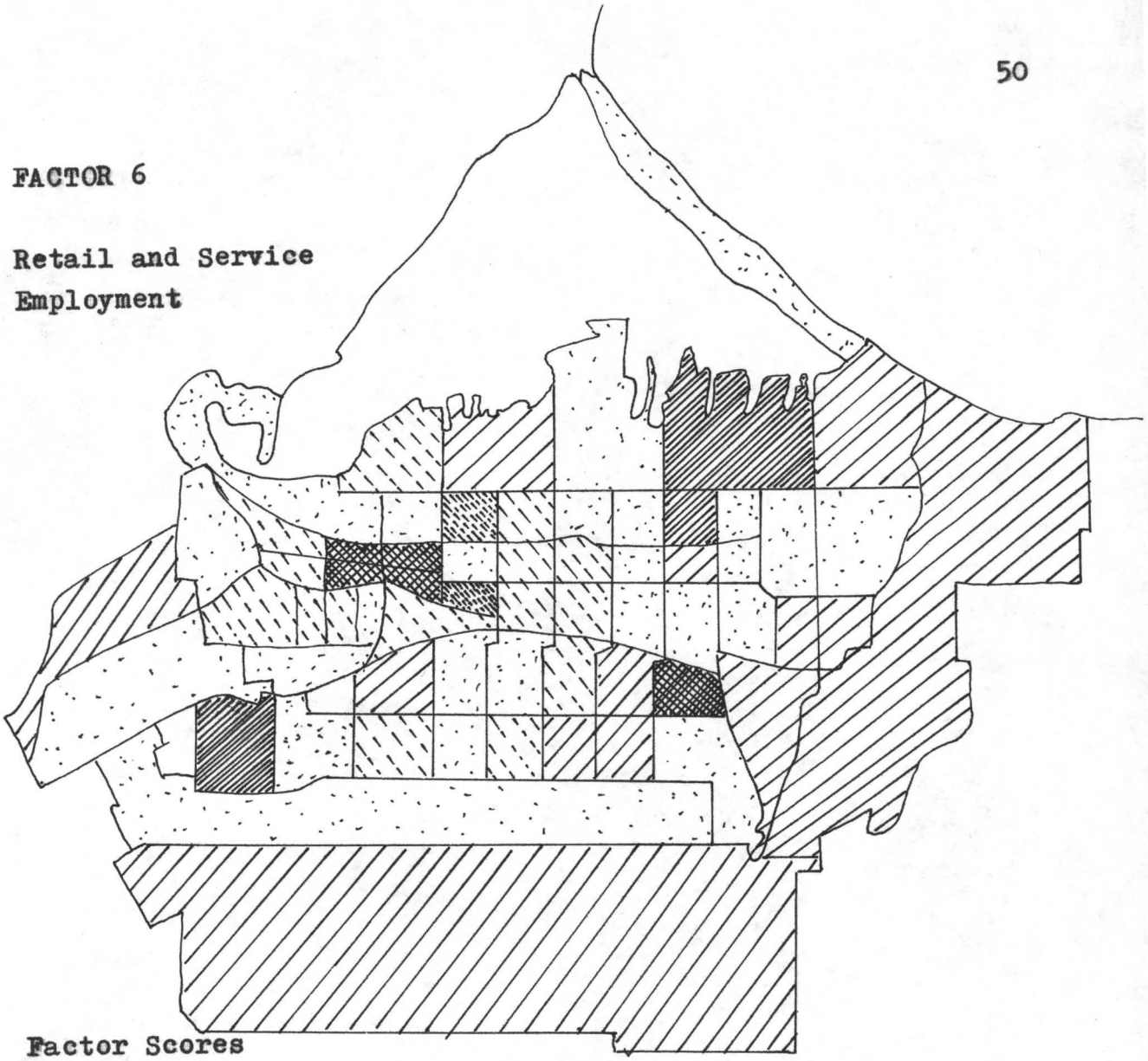
Over -1.00

Omitted from analysis



FACTOR 6

Retail and Service Employment



Factor Scores

Over +1.00

+0.51 to +1.00

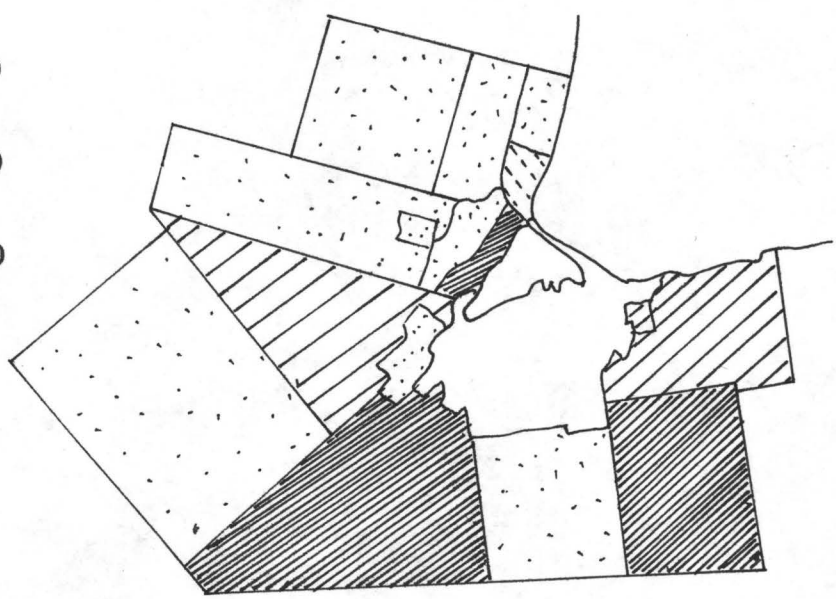
0.00 to +0.50

-0.01 to -0.50

-0.51 to -1.00

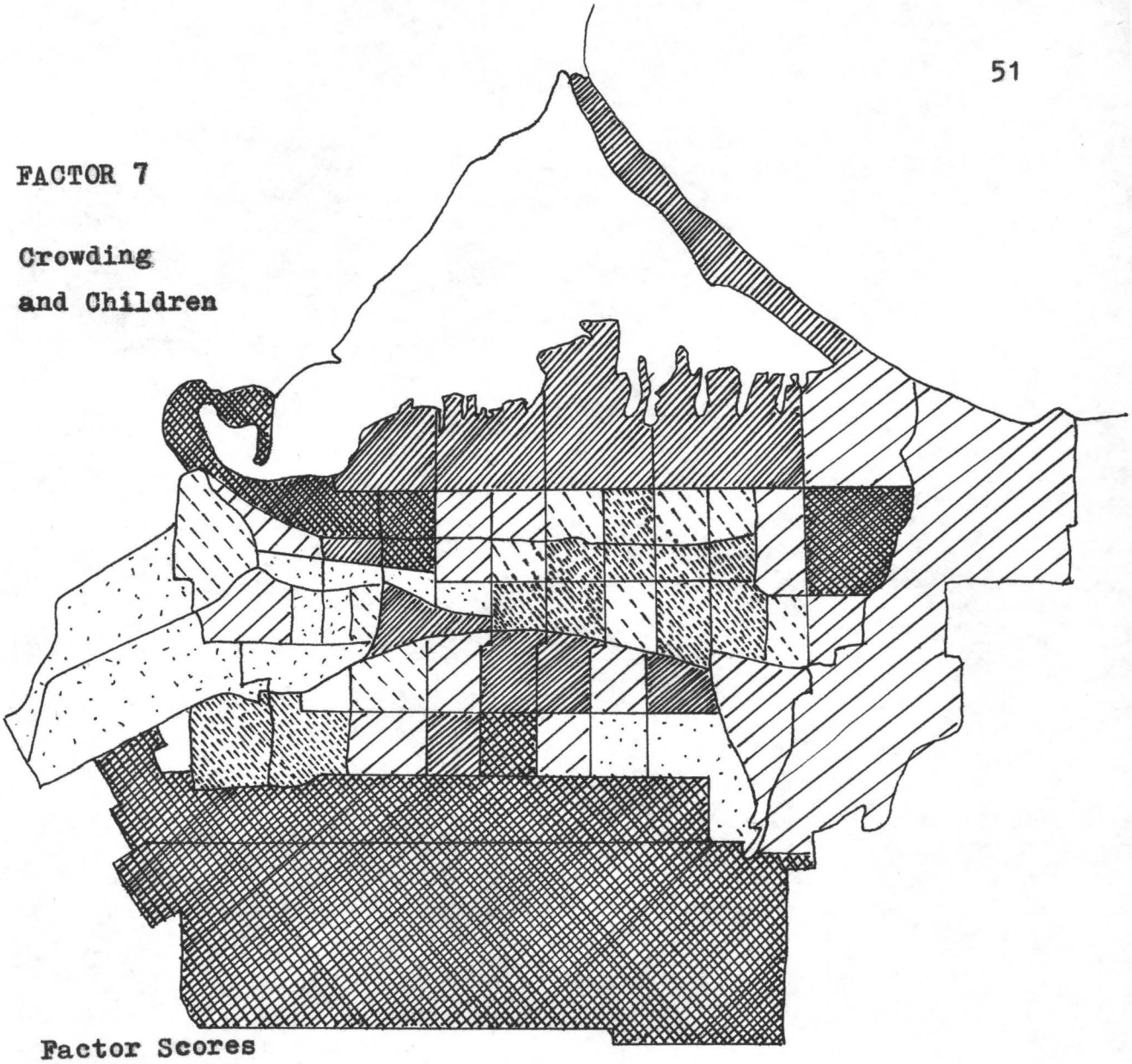
Over -1.00

Omitted from analysis



FACTOR 7

Crowding
and Children



Factor Scores

- Over +1.00
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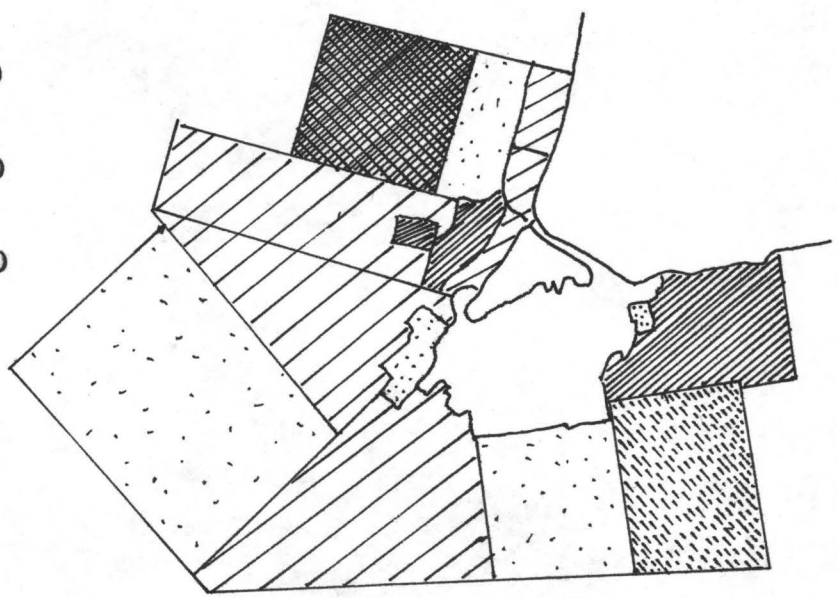
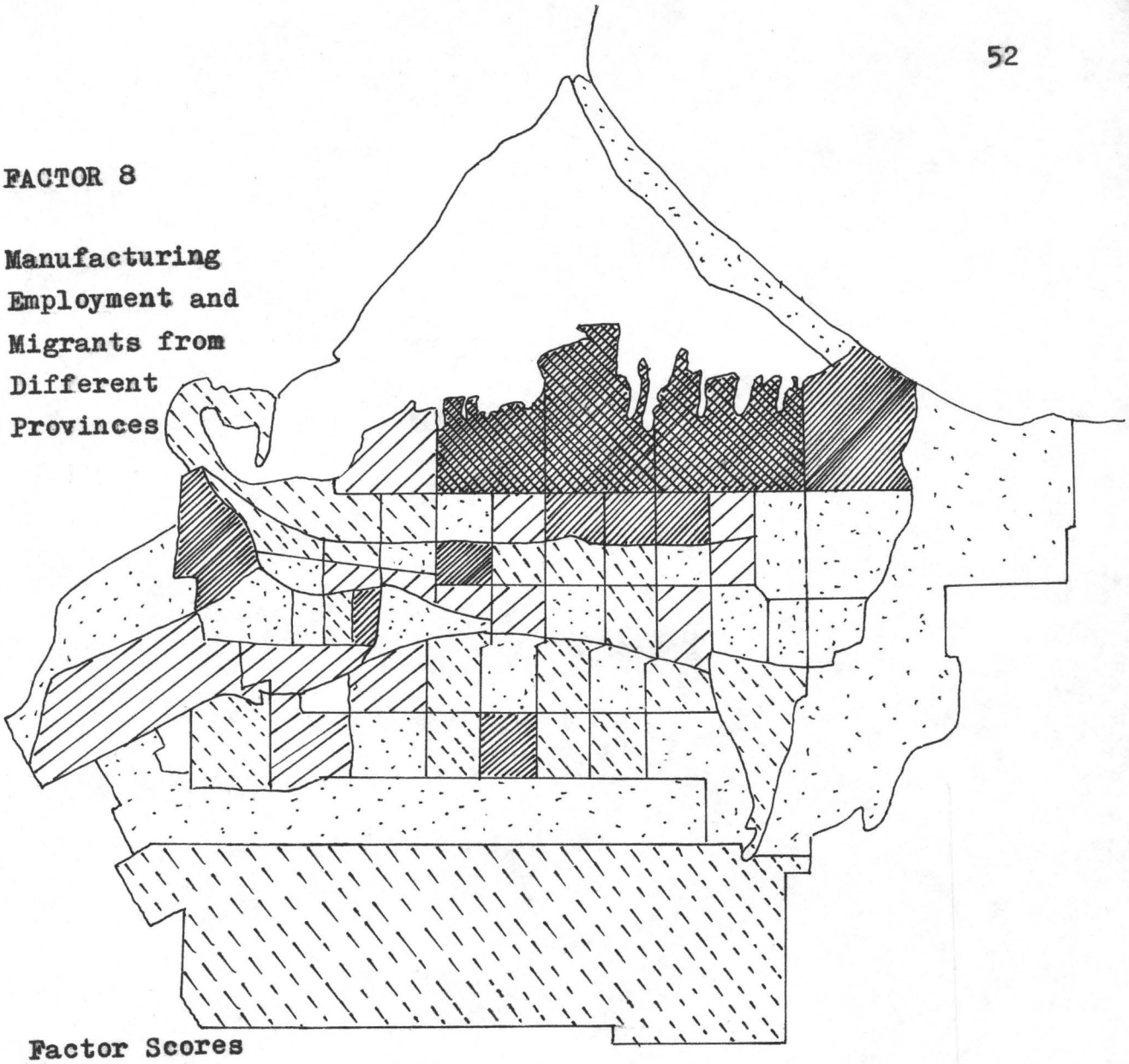
- Over -1.00
- Omitted from analysis



FACTOR 8

Manufacturing Employment and Migrants from Different Provinces



Factor Scores

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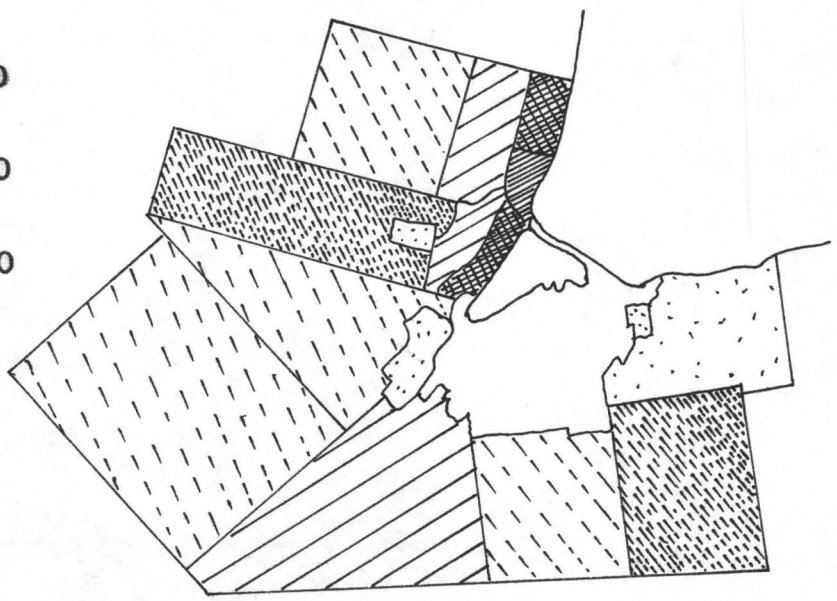
- 0.00 to +0.50
- -0.01 to -0.50
- -0.51 to -1.00
- Over -1.00
- Omitted from analysis



RESULTS

FACTOR 1. Dwelling Type and Household Composition

(35.1 percent of total variance)

High negative loadings occur for areas with high proportions of apartments, non-family, single-person and no-children households, tenants, single and widowed persons, females in labour force and the elderly. These areas also have high proportions of dwellings built before 1920 and of persons who migrated from abroad between 1956 and 1961. Areas are concentrated in the south-central part of the city, and exhibit a general distance decay from James Street South and tracts 11, 12 and 18. Similar density gradients for population density and multiple-occupancy structures were found in Hamilton by Mercer (1968). This concentration may be partially explained by the high proportion of elderly and widows living in apartment areas in tract 11 and high proportion of young, and perhaps older, single females living in tract 18 who may be employed at St. Joseph's Hospital (tract 18). This factor also loads on service employment, to which the hospital, and financial institutions concentrated in tract 12 would contribute.

The converse of this factor is the high positive loadings of areas of single-detached, owned dwellings,

characterised by married persons, children 0-4 and 5-14 years and positively related to distance from the city centre. Highest factor scores are in areas of high population growth between 1956 and 1961 - west and east Mountain and east Hamilton.

FACTOR 2. Economic Status

(17.9 percent of total variance)

This factor has high positive loadings for managerial, professional, technical occupations, university education, and high wages, household income, dwelling and rental values. There is also an association with migrants from the same province. In Hamilton Metropolitan Area, these areas are east-north Mountain, West Burlington, Westdale, south of Aberdeen Avenue, East Burlington, west of James Street South, Stoney Creek, Ancaster and West Mountain.

Areas of negative factor scores are concentrated north of Main Street and in the rural areas of Glanford, Binbrook and Beverley. These areas are characterised by high proportions of persons with elementary education, labourer occupation, persons looking for work and low male wages; households with 6 or more persons, 2 or more families, and 5 or more children; crowded dwellings built before 1920, occupied more than 10 years and with higher than average number of persons per room; and high levels of dustfall, and traffic-volume. There is a weak negative loading of

migrants from abroad.

Whereas factor 1 is spatially concentric, factor 2 is arranged linearly, roughly from south-west to north-east across Hamilton city. This compares with the concentric familism and zonal economic status arrangement described for other North American cities (Anderson and Egeland, 1961; Murdie, 1969). The appearance of these factors, isolated in other studies of much wider ranges of variables, indicates that household composition and economic status characteristics account for the major part of variation within urban areas. In the present study, these factors together account for 53 percent of the total variance.

FACTOR 3. Mobility and Life Cycle Stage

(11.6 percent of total variance)

Factors 3 and 4 are more relevant to the study of mobility. For factor 3, the highest loading is -0.925 for non-movers. Associated with this negative loading are persons 35-64, 15-24 and 65 and over years, of single marital status, dwellings occupied for more than 10 years, and households without children. These areas are concentrated in east Hamilton (between Ottawa Street and Parkdale Avenue), west Hamilton, Mountain Brow, south of Aberdeen Avenue and Waterdown.

The positive loadings include movers and migrants

from all origins except the fringe of the metropolitan area. Highest loadings are for persons 25-34 years, population growth 1956-61 and dwellings occupied less than 3 years. High positive scores occur between Fennell Avenue and Mohawk Road on the Mountian, and along the Burlington lakeshore, and testify to a high proportion of mobile persons in new residential areas. These are also areas with high proportions of children 0-4 years and married persons.

The spatial arrangement resembles theories of urban growth, and Hamilton exhibits successive 'waves' of factor scores for this mobility factor. In the city centre, this is of medium strength, as this area actually experienced population loss between 1956 and 1961, though it has the greatest concentration of migrants from abroad. Surrounding this is a 'trough' of non-mover areas, with a high 'wave'of new areas of high factor scores on the south Mountain and Burlington lakeshore, tapering off to medium strength in south and east Hamilton and north Burlington. This is surrounded in the west of the metropolitan area by non-mover areas from Ancaster to Waterdown and north of highway 5, and in Stoney Creek to the east.

This is one stage of a dynamic pattern, which will show the classic Burgess 'waves' of urban growth, as the population ages and newer residential areas are developed further from the city centre. High positive scores would

be expected to appear for 1966-71 in the areas south of Mohawk Road on the Mountain, and north of the Queen Elizabeth Way in Burlington. This also illustrates the outward direction of urban growth.

FACTOR 4. Mobility and Fringe Characteristics

(6.7 percent of total variance)

This factor associates movers from the fringe areas with distance from the city centre (that is, these movers move within the fringe rather than to the city) and with self-employed persons, reflecting the rural land use of much of the fringe, despite its suburban towns. Associated with this pattern are areas of migrants from the same province. Such peripheral concentrations may be due to movement from Toronto, which may view Burlington as a more suitable and closer destination. In Hill's sample of migrants within the Toronto region (1971), in the Hamilton Metropolitan Area, only Burlington and Waterdown had an excess of in-migrants from Toronto over out-migrants to Toronto. Hamilton city lost 531 households to Toronto and gained 528 from Toronto in this sample (Ibid., p.11). Migrants from other Ontario towns may also have more knowledge of Hamilton city and be more discriminating in their choice of destination, than migrants from abroad, who may have no knowledge of the city or residential opportunities in its environs.

The city of Hamilton is characterised by almost wholly positive scores, except for six tracts immediately below the Mountain Brow (11, 5, 4, 25, 18 and 8) and the tracts closest to the fringe (61, 63, 60). The highest positive scores occur in the east Mountain, Redhill Creek, tract 28, and north west city (tracts 6 and 15). With these are associated the variables of movers from the city, high levels of dustfall, residential density, and traffic-volume, females in the labour force and labourers, and households with 2 or more families. However, the areas to the south-east do not generally possess these characteristics, except for movers from the city. The tracts with the highest proportion of movers within the city are 17 in the centre, and 46, 47, 49, 50, 53, 59 and 60 on the Mountain, and these have much lower pollution, traffic-volumes and density than north Hamilton.

The fairly small percentage of the total variance of this factor may mean separate variations such as high dustfall in north Hamilton and high proportion of city movers on the Mountain are included together. The same 'wave-like' progression also appears for this factor, in contrast to the gradient effect of factors 1 and 2. It also demonstrates that different variables are associated with areas of fringe movers and same-province migrants than with city movers, migrants from different provinces and migrants from abroad.

FACTOR 5. Dwelling Type and Household Composition-2

(4.3 percent of total variance)

This is another housing and occupants measure with high negative loadings for large, old dwellings with many occupants, two or more families per household, and also includes high proportions of labourers, males earning less than $2,000 per annum and persons looking for work. This factor is associated with migrants from abroad, and indicates the type of housing areas chosen as destinations by these migrants.

The spatial distribution shows the great contrasts between the large old dwellings between Wentworth Street and Gage Avenue and south of Aberdeen Avenue, compared with the small dwellings and small households of the apartment areas around James Street South, and the very small, newer houses north of Queenston Road.

FACTOR 6. Retail and Service Employment

(3.5 percent of total variance)

This factor shows these concentrations of employment with high negative factor loadings[13]. Weakly associated

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13 The high negative score for tract 47 seems inexplicable except as inaccuracies resulting from assignment of employment values, the very small population of the area (932 in 1961) and the almost wholly owner-occupied and professional, managerial nature of the dwellings and occupations.

with these same areas are movers from the city. The greatest concentration occurs in the four tracts around King and James Streets, and between Ottawa and Kenilworth Streets.

This factor does not reveal anything that could not be gained from a land use map or separate plotting of city movers.

Although this should theoretically be the final factor considered, as factors 7 and 8 account for little of the total variance (2.6 and 2.3 percent respectively), and they appear after the equality of sums of communalities and eigenvalues is reached, they do show quite definite factor score patterns.

Factor 7 describes areas of crowding and children - large numbers of children and persons per household, large number of crowded dwellings and persons per room, children 5-14 and to a weaker extent children 0-4, and has virtually no association with any mobility or migration variables. The positive loadings associate areas of no children households, persons 65 and over, widowed, dwellings occupied more than ten years and persons 35 to 64 years.

This family-type factor is distributed in north, south and east of Hamilton city and in the fringe areas, and is

separated by a band of non-family areas below the Mountain, through the lower central city from Dundas to Parkdale Avenue.

Factor 8 describes manufacturing employment and migration from different provinces, and associates high proportions of manufacturing employment, dustfall and (weakly) labourers, with this migration. In Hamilton, migrants from different provinces, though only two percent of the metropolitan area population in 1961, were concentrated in tracts 53, 29, 66, 58, 19 and 20, 20 percent of the metropolitan total. Although there are also fairly large number of migrants in Ancaster, Saltfleet, Dundas and Burlington, the association with this factor may indicate that Hamilton attracts manufacturing employment from different provinces.

This pattern of mobility and migration variables in Hamilton 1956-61 shows the dominant pattern, of housing type and household composition, particularly life cycle stage variables, (factors 1, 3, 5 and 7). The other main patterns are of economic status, mobility and employment.

These results will be interpreted in more detail with respect to mobility and migration variables, and the hypotheses regarding their associations.

INTERPRETATION

The hypothesis regarding mobile areas (see above,p.23) is fairly well confirmed by the results of factor 3. Areas of high mobility do have a higher proportion of young adults (25-34 years) and young children (0-4), dwellings occupied for a short period of time, and with higher than average number of persons per room (and therefore, limited space). However, the association is with married rather than single persons, who are more associated with non-movers.

Otherwise, the non-mover areas also support the hypothesised characteristics of low-mobility areas with middle-aged persons and dwellings occupied for a long time. But rather than large families and households, the non-mover areas also include households without children, and persons 15-24, 65 years and over, and single marital status. It was expected these areas would be characteristic of mobile areas.

The fact that migrants from abroad are concentrated in areas of negative loadings for apartments in factor 1 would seem to support the association of mobile areas with areas of apartment dwellers and tenants, and with single and widowed marital status and those with fewer family

commitments - non-family households, single-person (one person) households, and households without children. However, migrants from abroad are individually not necessarily any of these categories, and it may be erroneous to associate their areas of concentration with old areas of high residential density and traffic volume, when many other variables may influence this concentration. Factor 5 associates foreign migrants with large, old dwellings and multiple-family households surrounding the city centre. But it is nevertheless interesting to observe the concentration of foreign migrants not far from the city centre, as described in Burgess' model of city growth in 1923.

Other mobility variables are weakly associated with factor 1 - movers from the fringe and non-movers with low positive loadings. The only contribution of this factor to mobility study is its city/suburbs dimension, association of areas of migrants from abroad with the city, and its population and housing characteristics.

As far as hypothesis 2 is concerned, the actual size of movement from different origins does support this relation with distance, except for migration from abroad. For 1956-61, the proportion of the Hamilton Metropolitan Area population 5 years and over from each source was:

city	30.5 percent
fringe	6.4
same province	6.1
different province	2.1
abroad	5.4
total movers and migrants	50.5
non-movers	49.5

Source: Census of Canada 1961, Catalogue 95-541.

Destination areas were differentiated according to each of these origins, with the principal differences for non-mover areas, mobile areas (except the fringe) and fringe-mover areas.

There was no support for the hypothesis of increasing economic status with increasing distance moved. Areas of foreign and different-province migration tended to be associated with lower economic status areas. Higher economic status areas were associated with city movers into new areas and with fringe movers and to some extent same province migrants.

The areas of concentration of city movers in the central city were associated in factor 4 with areas of high dustfall and residential desnity, and to a lesser degree with females in the labour force, traffic volume, labourers and multiple family households. This is more an association with poorer quality areas than with lower economic status, although the two may coincide. In factor 2 migrants from

abroad are more associated with low status areas, but this is a very weak loading (-0.26).

Hypothesis 2 is generally not confirmed by this study. The reason may lie in the particular character of Hamilton as a manufacturing city, with 56 percent of its labour force employed in manufacturing in 1961 (Parker, 1963, p.20). Consequently, long distance movers are more likely to be attracted by such industry, and if unskilled, will have lower economic status, and be compelled to live in the more central and northern areas of the city. Because of its proximity to Toronto, Hamilton may be in a functional shadow of the larger city, where the concentration of financial and government activities is located. Longer-distance migrants of higher status are therefore more likely to find employment equivalent to their qualifications in Toronto. The reputation of Hamilton as a steel city therefore attracts more unskilled and production workers from other provinces and abroad.

The destinations of foreign migrants is into the city, but not into the most central area (tracts 12 and 17). City movers do move outwards to the newer areas on the periphery, but tracts in the city centre have up to 60 percent of their total population moving within the city. The hypothesis is supported that migrants from the same province will move into outer areas, but is even more pronounced for

fringe movers, who move within the fringe, not into the city. Even though the mobility factors were spatially distributed in 'waves' of mobile and non-mobile areas, Burgess' succession of urban growth is only partially supported because foreign migrants enter a zone slightly away from the city centre, the city centre itself exhibits high intra-urban mobility, and mid-distance in-movement is in the outer areas, rather than the centre.

CONCLUSION

The main findings of this ecological study of mobility and migration in Hamilton are:

1. Most of the variation within the metropolitan area is related to housing and its associated occupants, and economic status, similar to factorial ecologies of other cities.

2. Mobile and stable areas account for the next largest proportion of the total variance, but there is a clear distinction between areas of

a) non-movers,
b) migrants from abroad and different provinces,
c) movers from the city and
d) movers from the fringe and migrants from the same province.

3. The most apparent areal association with mobility apart from population growth, is age and marital status for city movers as opposed to non movers. This confirms the finding of individual studies of intra-urban mobility, that life cycle stage is the most significant determinant.

4. Another association is that of neighbourhood quality and distance and mobility. Distance is positively related to fringe mobility and same-province migration; low neighbourhood quality (measured by dustfall, density and traffic volume) is related to city mobility. These quality

measures may also be inversely related to distance, but this may indicate that the 'image' of different areas may affect mobility.

5. The results of this study do not lend any support to the hypothesis that status of migrants increases with distance moved. Only two economic associations with mobility appear - high economic status areas and areas of same province migration (factor 2); areas of foreign migrants with areas of large dwellings and households and low occupation levels and wages; and different province migration with industrial areas. Therefore, there is a tendency for longest distance migrants to move to lower status areas, and mid-distance migrants to move to higher status areas.

Population growth, life cycle stage, distance from city centre, neighbourhood environment and status of area of destination would appear to be associated with residential mobility from different origins, at the ecological level of analysis.

The value of this ecological approach is that, with careful selection of variables, the social geography of a city at one period of time, and the changing social geography can be described. The use of factor analysis allows a greater number of variables to be included. This is also the value of a factorial ecology or residential change: that large numbers of variables can be assessed at one time, to reveal

the strongest association.

Interest lies more in the variables which occur together under one factor, rather than in the factors themselves, when factorial ecology is used for a limited subject such as residential change. There is a danger of neglecting the factors which account for the greatest amount of the variation in the urban pattern, to concentrate on minor factors which may contain the variables of interest, but whose internal associations may be much more tenuous. In this study, the housing and economic status factors accounted for 53 percent of the total variance, whereas the factors with mobility associations accounted for only 28 percent.

The factorial ecology method should therefore only be used to isolate the most relevant variables, and correlation or regression analysis should be undertaken to determine the actual degree of significance of these associations, after disregarding unimportant variables. From this study, relevant variables could be:

Non-movers	City movers	Same province
35-64 years	25-34 years	value of dwelling
dwellings occupied more than 10 years	population growth 0-4 years	
single marital status	persons per room	Fringe
no children	married	Distance from city centre
65 years and over		

Migrants from different provinces	Migrants from abroad
25-34 years	rooms per dwelling
population growth	constructed before 1920
0-4 years	2+ families per household
persons per room	6+ persons per household
married	labourers
manufacturing employment	males earning less than $2,000
dustfall or air pollution	persons looking for work
labourers	

Of further value to the study of geographical distribution of phenomena would be the use of Q-mode factor analysis which would group the areas, rather than variables, of similar variation.

Another significant extension of this study would be to repeat the analysis for 1966-71 data to determine if the same patterns exist. The change in areas over time and their mobility characteristics could then be compared with Moore's typology, to determine if Hamilton's mobility and neighbourhood patterns bear any resemblance to such a schema.

Despite the support of this study's findings for previous research results, some limitations must be considered. This study does not attempt to identify causes for residential change, but only to describe some areal associations of mobile and non-mobile areas within one particular city. These areal associations cannot be applied to individual movers or migrants. The variables selected do not cover all

possible associations with mobility, and variables concerned with individual perception and behaviour, and other environmental influences may be important omissions. The characteristics of the areas are as in 1961, and not necessarily when residential changes occurred.

The need is apparent for very careful selection of measures of each variable, particularly where different data sources are used. The allocation of measures to sub-areas requires particular care and extreme accuracy, or results will be suspect. An example from this study are the measures of open space availability and possibly the air pollution measure of dustfall. Alternative measures should be investigated where these exist. Preliminary investigation of interrelated variables should be done to avoid duplication of variables, and in the case of causal analysis, of erroneous conclusions. Examination of the correlation matrix before the factor analysis is completed should indicate variables which are not related to the subject of interest, and these can be removed. For this study, this would have revealed variables highly correlated with mobility variables, but would not have produced the geographical distribution of similar variations provided by factor scores.

Apart from affirming the importance of age and distance from city centre, and questioning the role of economic status, this type of study does not contribute additional knowledge

to the theory of mobility and migration. Factorial ecology is essentially a descriptive tool, useful for continuing assessment of the social geography of the city. It may also prove useful for other specialised topics, such as social problems, crime and mental illness, and aid in the allocation of treatment facilities, or further research investigations.

This study has illustrated the value of factor analysis in determining major patterns in urban areas, and has confirmed the findings of individual studies with respect to life cycle stage, but not with respect to socio-economic status. Mobility at the ecological level is not generally related to the three factors of family, economic and ethnic status, but to more specific variables of life cycle stage, population growth, environmental quality and distance from the city centre.

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APPENDIX 1. DATA INPUT

Variable Census Tract	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	59	29	03	05	01	04	06	14	15	10	42	12	25	65	09	22	17	14
2	53	31	03	06	03	04	11	18	13	14	37	07	20	74	06	31	07	09
3	60	30	02	04	02	03	06	14	15	11	43	11	24	67	09	34	09	12
4	58	25	02	05	02	08	11	17	15	13	34	11	23	66	09	43	03	06
5	60	19	05	07	02	08	08	15	14	11	39	13	27	63	10	22	18	15
6	50	37	01	02	01	08	12	19	13	15	32	08	25	67	07	66	02	06
7	56	28	01	04	01	10	10	17	14	14	33	12	23	67	09	54	03	05
8	56	30	02	03	03	06	11	17	14	14	33	11	24	64	10	51	03	06
9	37	43	01	07	03	09	10	16	14	16	33	11	24	64	11	40	07	07
10	43	38	02	06	02	09	09	12	15	15	35	14	27	60	11	36	07	07
11	42	38	02	08	03	08	03	06	12	13	45	21	34	49	15	24	13	08
12	35	48	02	03	03	07	06	09	18	14	38	15	33	55	10	41	05	08
13	44	40	03	04	00	09	09	14	11	15	38	13	28	58	12	62	01	10
14	55	32	01	02	03	08	12	21	13	14	32	08	24	69	07	64	01	05
15	40	44	01	02	02	10	11	18	14	16	33	08	26	65	08	67	01	08
16	36	49	00	03	01	09	11	19	10	10	34	13	26	64	10	64	01	08
17	31	55	00	06	03	06	09	15	13	16	34	12	29	59	10	54	02	08
18	40	40	03	09	02	08	09	13	19	16	32	11	32	57	09	41	07	07
19	41	38	01	05	04	11	09	11	14	17	35	14	28	60	10	40	05	06
20	43	37	00	05	04	10	10	16	14	15	35	10	27	64	08	52	02	06
21	48	31	01	05	02	12	11	15	16	16	33	09	28	64	07	55	03	05
22	51	39	03	02	02	04	14	22	12	16	30	07	23	69	07	62	01	06
23	45	34	00	04	02	14	12	18	13	15	34	09	22	70	08	63	01	07
24	49	34	01	05	01	10	10	15	14	16	32	12	24	65	10	48	04	07
25	49	29	04	04	03	10	09	13	15	15	35	14	25	63	11	39	07	10
26	44	36	01	06	03	10	10	16	12	15	33	15	21	66	12	41	05	08
27	44	39	02	04	01	09	09	11	14	16	38	12	23	68	09	43	03	08
28	55	32	00	01	03	09	10	18	11	14	36	10	22	70	08	63	02	07
29	51	27	00	04	07	11	06	22	12	16	31	07	24	68	07	62	01	07
30	58	30	00	04	03	04	10	16	14	14	35	11	20	71	09	60	01	04
31	55	31	01	05	01	08	10	16	12	15	35	12	19	73	08	55	03	05
32	57	33	01	03	01	05	08	13	14	13	37	14	24	66	10	39	06	09
33	64	26	02	02	03	04	08	15	14	12	41	10	21	70	08	54	05	09
34	53	37	02	01	01	06	08	16	13	11	37	15	20	69	10	53	01	05
35	45	42	01	04	03	05	12	19	14	13	30	12	18	71	10	57	01	04
36	50	38	04	03	01	05	12	22	13	14	33	07	23	71	06	63	01	05
37	70	22	00	02	01	04	08	18	12	10	35	11	19	72	09	53	01	05
38	61	30	01	04	01	02	10	18	14	12	37	09	21	71	07	54	01	05
39	65	27	01	03	01	03	08	16	13	11	44	09	20	73	07	43	03	06
40	55	37	01	03	00	04	12	24	11	15	34	04	17	78	04	38	03	07

DATA INPUT

Variable / Census Tract	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1	40	02	01	30	10	28	16	02	11	06	44	01	24	75	27	73	31	40
2	23	03	03	35	10	18	09	03	06	09	36	03	17	82	18	82	32	25
3	28	03	02	36	11	19	16	02	13	07	44	01	17	82	20	80	26	35
4	12	05	04	34	16	08	17	07	11	15	35	05	29	66	31	69	27	44
5	37	03	03	32	11	23	19	05	11	13	41	03	21	77	20	80	23	43
6	06	12	12	31	25	02	10	15	05	26	33	07	26	40	42	58	25	34
7	11	06	04	34	18	06	14	09	09	17	38	04	27	51	38	62	28	37
8	08	07	07	36	19	04	22	07	15	16	37	04	45	41	52	48	32	35
9	16	05	05	40	14	09	22	07	16	13	37	03	49	43	44	56	38	33
10	17	04	04	42	16	09	33	03	23	08	46	02	64	26	60	40	43	26
11	28	02	03	51	10	17	55	01	44	02	65	01	91	07	78	00	40	24
12	13	04	06	52	17	05	39	05	31	10	53	02	75	15	79	00	44	26
13	08	13	12	33	27	02	26	11	20	10	41	04	49	24	63	00	38	24
14	05	11	09	36	17	03	11	09	06	23	29	07	14	66	32	68	27	41
15	06	11	10	33	26	02	15	13	06	25	31	06	37	34	52	48	42	24
16	07	10	09	36	28	02	29	07	21	18	37	07	57	17	77	00	40	18
17	10	06	09	37	15	04	27	06	18	17	37	05	53	21	62	00	27	25
18	29	04	03	52	15	07	36	06	18	12	44	03	55	24	61	39	47	27
19	25	05	05	44	13	07	33	02	23	07	44	02	75	20	59	39	41	24
20	07	09	08	37	20	04	28	03	16	15	36	04	51	33	53	47	38	30
21	17	09	05	43	17	04	17	11	11	18	37	03	34	47	37	63	29	36
22	05	10	06	27	14	03	09	10	06	25	27	06	15	69	31	69	28	35
23	06	11	07	33	17	02	13	16	08	24	34	05	27	59	34	66	30	35
24	11	07	03	36	13	06	23	14	14	18	39	03	41	54	42	58	34	35
25	17	06	03	36	11	11	23	11	14	14	42	02	36	62	35	65	27	40
26	15	04	03	33	11	10	15	13	09	16	40	02	32	66	27	73	34	38
27	15	07	03	40	12	09	22	11	16	13	48	01	52	47	47	53	34	30
28	08	13	06	33	16	04	09	18	04	25	38	03	09	81	15	85	12	45
29	06	12	06	29	16	04	10	11	05	27	30	08	18	77	28	72	30	41
30	06	09	04	31	14	06	13	06	09	13	39	03	28	64	25	75	23	40
31	08	08	05	34	13	06	14	06	10	10	40	02	33	64	24	77	28	38
32	19	06	03	36	12	14	16	06	10	10	45	02	35	65	29	71	16	40
33	19	05	02	31	11	18	09	09	05	11	42	02	10	89	10	90	18	48
34	08	08	04	31	13	08	16	06	11	11	43	03	17	83	21	79	25	44
35	06	08	06	29	17	06	16	04	11	14	33	05	30	69	38	62	40	35
36	06	12	06	27	16	05	10	07	07	23	30	08	00	90	00	84	00	40
37	07	07	03	29	12	07	11	04	07	12	36	04	13	86	20	80	23	46
38	09	07	03	28	09	11	11	07	07	12	41	02	00	94	00	93	11	51
39	14	06	02	33	08	16	08	06	05	09	45	01	15	83	15	85	24	36
40	14	05	02	31	06	14	04	06	02	16	23	04	00	95	00	01	16	18

DATA INPUT

Variable / Census Tract	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1	00	00	59	5	93	89	17	112	002	006	014	16	12	24	70	50
2	11	07	51	7	86	65	14	124	054	004	005	12	15	15	40	40
3	00	00	52	6	85	67	15	097	002	001	005	07	08	30	25	10
4	68	10	55	7	71	55	11	101	013	003	003	20	08	23	00	00
5	50	00	69	5	94	99	17	102	001	001	001	20	10	20	00	03
6	89	19	56	8	60	52	10	100	043	005	007	09	05	38	50	50
7	84	13	54	7	62	51	10	101	005	002	002	28	05	37	99	40
8	89	00	49	6	67	48	11	093	009	005	004	31	05	32	99	00
9	77	00	52	7	77	64	13	109	002	003	003	38	07	24	40	00
10	75	10	46	6	74	57	14	100	002	003	002	43	05	25	40	00
11	57	00	39	5	77	62	12	098	001	001	004	27	03	25	99	00
12	72	00	45	7	67	51	10	072	030	033	050	29	02	32	99	00
13	97	18	51	7	56	45	10	081	038	032	056	29	02	34	90	00
14	81	15	56	7	61	52	10	098	003	002	006	26	07	43	50	10
15	95	17	56	7	59	52	11	095	037	007	010	25	04	37	80	00
16	86	17	44	8	51	42	10	090	073	096	113	22	02	33	90	00
17	94	00	47	7	61	43	10	099	057	128	156	20	03	30	99	00
18	60	09	48	6	80	61	12	100	005	002	051	20	06	24	99	00
19	74	06	44	6	74	54	14	099	000	002	007	40	07	27	70	00
20	84	13	49	7	66	55	12	098	015	012	023	42	06	34	60	00
21	94	16	53	7	64	55	10	093	013	005	029	44	07	40	99	00
22	73	19	59	8	63	51	10	094	185	002	003	07	10	55	60	00
23	77	19	56	7	62	54	11	098	035	003	006	37	11	45	99	10
24	65	00	57	6	70	65	13	095	024	010	013	36	08	30	99	00
25	53	00	61	6	78	67	15	100	000	003	004	26	10	26	80	10
26	62	00	62	6	74	70	14	101	009	002	008	23	11	27	80	10
27	32	08	55	6	74	71	15	099	004	004	011	41	11	32	99	10
28	66	11	60	7	67	62	12	102	048	004	005	30	11	47	99	20
29	56	15	59	7	63	57	10	089	538	002	005	04	13	65	50	00
30	62	13	52	7	64	52	10	095	023	005	003	35	12	48	99	00
31	56	09	55	6	71	56	12	097	002	008	004	36	11	34	99	00
32	17	00	56	6	77	76	16	098	001	000	007	13	13	26	30	50
33	00	00	60	6	85	69	15	095	000	000	002	24	14	26	50	10
34	38	00	52	6	66	52	10	097	003	012	012	30	14	35	99	00
35	59	12	50	7	71	45	10	112	001	060	009	29	13	45	99	00
36	32	21	52	8	64	55	10	077	296	005	005	02	15	60	99	05
37	30	10	49	7	70	52	10	099	003	002	002	29	15	45	99	00
38	13	00	54	6	68	57	12	096	001	005	005	29	44	35	80	00
39	00	00	52	6	86	69	15	096	001	002	003	21	14	29	90	05
40	00	00	53	7	90	66	14	105	001	001	001	07	15	26	00	60

DATA INPUT

Variable 1 / Census Tract	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
41	63	30	01	03	02	03	12	21	12	14	36	05	18	77	05	45	03	05
42	66	28	02	02	01	02	11	20	16	12	36	06	22	72	05	50	01	05
43	46	44	01	05	02	02	15	24	11	20	30	04	16	79	04	56	01	04
44	46	42	02	03	02	05	16	28	12	15	26	03	18	78	04	43	01	04
45	61	31	01	02	02	03	11	20	13	14	38	04	20	74	05	41	03	08
46	24	57	03	08	03	04	08	22	11	23	24	02	12	85	02	22	06	06
47	43	54	00	03	00	00	13	25	10	12	36	04	17	79	04	12	22	23
48	50	39	03	05	01	02	12	24	11	15	34	03	18	77	05	28	06	08
49	36	52	03	03	03	03	17	23	09	21	28	03	13	84	03	33	03	04
50	42	51	01	02	02	01	12	24	09	15	27	12	17	71	11	41	03	05
51	57	33	01	05	01	04	12	20	13	16	34	06	18	76	06	34	05	05
52	60	32	00	02	02	03	10	21	14	12	35	09	22	70	08	40	03	05
53	20	57	01	05	07	11	19	31	09	18	22	01	15	82	03	32	03	02
54	47	43	02	03	01	03	14	26	12	17	30	04	16	80	04	31	04	04
55	66	26	01	03	00	04	10	21	12	11	39	08	20	72	07	35	04	06
56	62	27	02	06	02	00	08	20	13	10	40	09	22	71	07	33	10	09
57	40	44	03	07	03	03	15	22	11	18	30	03	15	80	03	32	04	05
58	13	63	04	09	05	08	20	32	08	25	23	02	10	86	03	26	07	08
59	25	60	02	08	01	04	17	21	08	20	30	05	13	80	06	22	09	07
60	43	38	07	06	02	04	14	20	13	16	32	05	17	78	03	37	04	12
61	48	33	06	03	02	08	13	22	14	13	31	06	20	73	04	39	02	06
62	45	35	01	09	01	09	14	25	12	15	30	03	21	75	03	42	04	09
63	49	36	03	06	01	05	14	26	11	14	31	04	17	78	04	38	04	11
64	61	12	08	13	03	02	10	22	11	11	39	06	18	77	05	20	15	15
65	44	11	20	15	03	08	11	21	13	15	33	07	19	75	05	26	11	10
66	32	17	19	22	05	05	16	24	10	17	30	03	16	80	03	19	15	12
67	30	30	18	16	02	05	19	24	09	20	25	02	14	83	03	30	05	07
68	51	16	16	10	02	05	13	22	12	15	32	06	21	74	04	31	09	13
69	59	02	22	11	00	05	12	23	14	14	31	06	23	72	03	42	08	25
70	69	04	12	10	01	01	09	22	14	10	36	08	24	69	06	29	09	06
71	56	11	21	08	00	04	14	25	11	13	30	07	18	78	04	39	04	12
72	51	20	20	06	01	02	14	23	12	14	30	06	22	73	05	39	05	15
73	51	15	20	09	02	03	12	20	12	13	34	09	21	71	08	31	08	10
74	53	21	14	07	03	03	14	24	10	14	33	05	19	77	04	28	12	16
75	46	29	15	06	01	03	15	24	12	15	30	04	18	78	04	42	03	12
76	52	23	12	09	01	02	12	21	12	14	35	06	18	77	05	27	08	12
77	64	06	17	07	02	02	12	23	14	12	31	09	23	72	05	51	03	26
78	50	19	19	08	01	04	15	24	11	16	28	05	15	78	05	38	03	18
79	51	25	16	07	01	00	14	23	12	16	29	07	16	79	05	43	03	23

DATA INPUT

Variable / Census Tract	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
41	13	07	02	33	10	17	06	06	04	15	30	03	00	92	00	91	00	25
42	07	06	03	31	11	09	06	05	04	16	28	04	00	95	10	90	21	46
43	06	07	04	27	10	08	05	04	04	19	22	06	00	94	19	81	16	19
44	07	06	04	30	12	07	05	03	04	25	18	11	14	69	56	44	44	14
45	18	06	04	30	08	17	07	06	03	13	31	04	00	88	00	88	00	00
46	22	03	02	30	06	24	03	03	02	13	23	04	18	81	20	80	41	00
47	50	03	00	21	05	42	02	01	01	12	22	04	00	99	00	99	00	00
48	22	03	02	32	07	25	04	04	03	13	22	04	00	93	00	92	33	00
49	14	05	05	29	07	19	02	02	01	12	20	02	00	90	12	88	28	00
50	13	05	02	29	08	16	03	03	02	19	23	06	16	84	17	83	35	00
51	18	04	02	35	09	14	10	04	07	12	33	04	31	68	33	67	37	18
52	16	04	03	37	12	10	10	05	07	16	30	06	17	81	24	76	25	38
53	09	04	04	27	09	10	02	02	01	25	10	11	00	80	57	43	41	00
54	15	04	02	31	07	16	03	04	03	15	22	04	15	84	18	82	35	00
55	15	04	03	35	10	12	09	03	06	12	32	03	10	88	13	87	21	38
56	27	03	02	33	08	21	10	04	06	13	36	03	10	88	12	88	28	43
57	17	04	02	32	06	16	03	04	01	14	23	04	11	89	40	86	32	10
58	23	02	02	31	05	21	02	03	01	14	20	04	00	99	00	97	80	00
59	28	02	02	32	05	28	03	02	02	10	21	02	00	98	00	96	15	00
60	18	04	04	25	09	16	07	04	06	12	28	05	18	80	37	63	42	14
61	12	04	05	29	13	11	11	03	07	16	26	06	24	72	42	58	39	29
62	17	05	04	32	14	12	05	04	03	19	23	10	00	85	22	78	40	00
63	17	04	03	24	09	14	05	03	03	19	22	08	00	89	15	85	28	19
64	44	02	02	25	07	42	05	02	04	11	31	03	05	94	09	91	22	19
65	30	03	02	30	10	28	10	03	07	12	31	03	30	67	28	72	40	22
66	36	03	01	23	07	39	04	02	03	14	21	05	00	95	10	90	40	15
67	18	04	02	23	06	23	03	03	02	18	15	04	00	92	11	89	35	07
68	15	04	02	21	12	06	06	04	05	23	27	07	00	84	17	83	00	32
69	15	04	02	21	12	06	06	04	05	23	27	07	00	84	17	83	00	32
70	25	03	02	26	15	18	13	02	08	15	29	05	00	84	00	86	00	37
71	16	04	01	24	10	12	07	04	05	18	27	08	00	89	18	82	21	30
72	21	04	02	26	10	14	08	02	05	19	27	07	06	89	19	81	32	25
73	26	04	03	31	11	19	12	03	09	13	30	04	20	74	23	77	28	28
74	32	03	01	22	09	31	05	02	04	16	25	06	03	94	11	89	24	21
75	13	05	03	26	10	13	05	02	04	18	24	07	04	90	15	85	32	18
76	29	02	02	27	08	31	07	02	06	11	30	03	19	79	17	83	27	16
77	10	04	02	25	13	04	10	03	07	20	30	08	00	90	12	88	24	47
78	14	04	01	24	11	10	05	03	04	18	26	06	00	89	16	84	34	24
79	11	05	02	17	09	08	06	05	05	17	31	06	00	89	00	88	15	34

DATA INPUT

Variable / Census Tract	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
41	00	00	51	7	84	65	14	102	001	000	002	19	15	28	70	00
42	00	14	49	8	75	61	10	095	011	005	004	17	15	30	50	00
43	00	22	48	8	66	60	11	111	031	003	005	05	18	28	30	20
44	00	25	47	9	72	57	11	119	008	004	004	18	16	28	40	30
45	00	00	51	7	85	62	15	105	000	000	000	20	16	27	50	70
46	00	10	51	8	00	68	15	394	000	001	001	13	15	22	00	40
47	00	00	66	7	99	95	21	202	000	004	004	05	13	23	20	05
48	00	12	54	8	85	75	16	334	001	003	002	20	12	23	30	02
49	00	12	49	8	85	63	14	174	000	003	002	20	14	20	00	05
50	00	17	49	8	72	61	15	152	000	001	002	19	13	18	00	10
51	00	12	46	8	94	60	13	113	000	001	001	30	12	22	10	00
52	31	13	52	7	80	60	11	103	001	003	020	24	11	21	20	15
53	00	31	49	9	62	54	15	291	000	001	001	28	12	16	00	02
54	00	13	50	8	81	62	15	161	000	001	002	21	11	14	00	15
55	10	08	51	7	81	60	13	099	001	003	003	23	10	18	30	30
56	25	00	57	6	85	78	15	095	001	004	003	16	07	16	20	25
57	00	12	50	8	93	65	15	184	001	004	003	19	10	12	00	05
58	00	00	59	7	85	75	17	484	000	001	004	08	11	13	00	02
59	00	00	55	7	74	71	16	309	000	001	001	11	12	12	00	05
60	11	00	52	7	82	66	16	098	002	008	003	01	18	24	10	15
61	41	12	52	7	66	52	12	105	000	003	003	10	22	21	99	10
62	00	15	53	8	81	64	12	090	012	005	009	02	12	10	00	05
63	11	14	54	8	66	63	14	204	002	003	002	01	15	08	00	02
64	07	00	61	6	96	95	20	127	007	007	003	03	20	20	30	25
65	16	06	53	6	94	72	16	134	007	004	010	08	22	15	10	05
66	05	06	61	6	99	87	18	219	002	002	002	02	30	10	00	02
67	00	14	53	8	83	61	16	236	019	001	002	01	27	07	00	10
68	13	10	56	7	66	68	15	132	004	001	002	01	22	10	80	10
69	47	20	66	7	92	62	12	135	003	001	000	00	30	05	00	10
70	50	00	62	6	95	86	14	105	000	010	003	09	22	06	00	00
71	34	44	61	7	68	61	14	125	003	002	001	00	30	05	00	15
72	33	11	58	7	57	59	14	332	001	001	991	00	22	05	00	10
73	38	07	56	6	74	67	15	119	013	005	005	04	16	10	10	20
74	24	08	61	6	62	79	17	146	001	002	003	01	18	08	00	10
75	13	16	53	8	61	59	13	133	004	003	003	01	28	15	10	00
76	12	00	55	6	87	74	17	134	003	006	005	09	20	19	00	20
77	63	10	65	6	44	55	10	110	002	000	000	00	40	05	00	00
78	26	13	52	7	54	61	14	156	002	001	002	00	20	05	00	00
79	43	00	64	6	44	53	13	137	001	001	001	00	23	05	00	00

APPENDIX 2 Factor Analysis Results

VARIABLE	MEAN	ST.DEV.	ESTIMATED COMMONALITY
1	49.113924	11.248917	.997892
2	32.924051	12.534846	.998347
3	4.810127	6.449162	.993084
4	5.531646	3.551220	.986631
5	2.012658	1.363383	.912958
6	5.556962	3.221510	.972100
7	11.379747	3.102124	.921347
8	19.455696	4.576410	.990675
9	12.481013	1.986240	.880058
10	14.594937	2.826246	.972643
11	33.481013	4.448742	.958421
12	8.240506	3.994275	.988760
13	21.075949	4.706167	.996230
14	71.329114	7.270808	.996763
15	6.835443	2.825844	.989431
16	41.772152	13.125576	.983592
17	5.063291	4.348126	.982138
18	8.658228	4.875070	.920112
19	16.759494	9.737866	.976361
20	5.582278	2.862703	.966300
21	3.759494	2.461057	.948540
22	31.696203	6.501192	.961872
23	12.050633	4.898714	.958381
24	13.253165	9.314269	.978599
25	12.265823	9.645922	.994909
26	5.468354	3.744519	.960914
27	8.303797	7.197497	.994572
28	15.341772	5.086145	.984795
29	32.367089	9.295956	.987460
30	4.417722	2.279269	.960584
31	20.151899	21.086567	.990779
32	71.708861	23.804843	.993711
33	26.784810	20.191818	.979519
34	70.544304	23.669085	.991039
35	28.556962	12.870904	.826242
36	26.518987	14.402511	.952112
37	35.202532	32.670609	.976356
38	8.658228	7.607159	.907122
39	53.936709	5.630370	.958672
40	6.873418	.882408	.933596
41	74.379747	12.989447	.922212
42	62.797468	11.652423	.966822
43	13.316456	2.594592	.962941
44	128.000000	66.540522	.911519
45	21.822785	71.453008	.886532
46	7.493671	19.013405	.943941
47	9.911392	22.974451	.956426
48	17.670886	12.832972	.929717
49	13.468354	7.274535	.930027
50	24.898734	13.233209	.957059
51	44.645570	40.092533	.861996
52	10.670886	15.600560	.567075

CORRELATION MATRIX

	1	2	3	4	5
1	.99789				
2	-.70214	.99835			
3	.02752	-.63963	.99368		
4	-.29134	-.36745	.67789	.98663	
5	-.43311	.20861	-.11783	.18395	.91296
6	-.35166	.20108	-.30709	-.06768	.35741
7	-.46491	.27375	.25806	.19325	.09282
8	-.09342	-.04945	.36221	.19947	-.01326
9	.47836	-.33889	-.14791	-.17849	-.14431
10	-.76916	.53363	.02316	.25038	.36734
11	.58530	-.27936	-.27338	-.23956	-.25044
12	.19826	-.04828	-.29881	-.27486	-.04530
13	.18946	-.12139	-.22593	-.20573	-.00615
14	-.14577	.02827	.31824	.25630	-.01207
15	.12038	.09375	-.42523	-.33611	.01386
16	.19043	.05826	-.34099	-.55104	-.03494
17	-.02951	-.20079	.27795	.51672	.02365
18	.14660	-.45947	.63037	.36090	-.23274
19	-.03802	-.18585	.29793	.53390	-.00170
20	.08670	.14095	-.38281	-.51006	.01780
21	-.17497	.31151	-.40114	-.39445	.12701
22	-.13381	.31483	-.52153	-.24558	.14797
23	.03572	.03556	-.26022	-.33320	-.02313
24	-.06586	-.12282	.31605	.53464	.02599
25	-.07543	.10217	-.27926	-.12956	.09528
26	.10007	.06386	-.37267	-.40847	-.00118
27	-.09497	.09973	-.22053	-.08063	.06623
28	-.08338	-.00441	.08408	-.15002	.08626
29	.28575	-.10945	-.30677	-.24172	-.07017
30	-.12989	-.03702	.25491	.03557	.07666
31	-.22930	.25498	-.34747	-.13994	.15378
32	.25507	-.25628	.32491	.16003	-.12511
33	-.35809	.32209	-.28977	-.14660	.24134
34	.34588	-.33454	.28054	.15468	-.16152
35	-.62100	.38567	-.05354	.20240	.41311
36	.64235	-.49567	-.07636	-.27793	-.09893
37	-.02877	-.02488	-.15382	-.19299	.08629
38	-.18996	.12248	.02505	-.11136	.05758
39	.26934	-.48091	.40817	.23831	-.09175
40	-.33951	.45001	-.15071	-.19918	.01201
41	.03883	-.04793	-.01612	.35410	.00624
42	-.11579	-.24438	.21717	.42988	-.02001
43	-.13347	-.06311	.28942	.45459	.04234
44	-.64306	.40021	-.15661	.37225	.29338
45	-.01258	.03424	-.12875	-.13897	.31219
46	-.24189	.28419	-.16536	-.08141	.01558
47	-.27573	.30293	-.19013	-.06871	.00618
48	-.02540	.31290	-.64007	-.43103	.13873
49	.17935	-.57240	.77638	.49644	-.11694
50	.10481	.27031	-.63357	-.56192	.16635
51	.10075	-.14992	-.47770	-.41926	.01298
52	.18921	-.03566	-.07772	-.12107	-.18545

CORRELATION MATRIX

VARIABLE	6	7	8	9	10
6	.97210				
7	-.18051	.92135			
8	-.41658	.75075	.99068		
9	.20404	-.47738	-.47858	.88006	
10	.20111	.61439	.22757	-.40106	.97264
11	-.05829	-.79933	-.66077	.39859	-.70215
12	.37703	-.77210	-.85893	.41508	-.44553
13	.45466	-.72913	-.73381	.55563	-.42755
14	-.48467	.76629	.82537	-.52422	.40212
15	.41016	-.72842	-.81597	.36833	-.36482
16	.37567	-.18708	-.19013	.27915	-.11761
17	-.21489	-.11681	-.06203	-.07779	-.15542
18	-.30364	.04430	.15131	-.04106	-.19721
19	-.28788	-.05423	-.01678	-.08011	-.10327
20	.43982	-.15226	-.15752	.15078	-.03703
21	.54265	-.14238	-.27131	.10527	.03742
22	.50279	-.51103	-.76102	.35201	-.02144
23	.56118	-.31428	-.37905	.34136	-.22537
24	-.48501	.16790	.26584	-.34831	.01369
25	.50223	-.66066	-.84182	.35793	-.22220
26	.56795	-.24508	-.32384	.24168	-.00850
27	.42555	-.63226	-.80917	.28828	-.21131
28	.24018	.36789	.51373	-.12435	.17564
29	.32059	-.82515	-.94302	.48955	-.44223
30	-.00241	.52668	.71037	-.20071	.09427
31	.56776	-.53929	-.80277	.32852	-.04542
32	-.63314	.45360	.69910	-.32184	.02147
33	.61384	-.28543	-.51754	.21743	.03103
34	-.54577	.33711	.53041	-.13327	.01445
35	.41943	.17573	-.12930	-.09787	.44049
36	.16197	-.60190	-.47746	.61231	-.59981
37	.61163	-.35560	-.50885	.36773	-.12545
38	.22079	.39782	.44534	-.08741	.23618
39	-.13374	.08214	.23200	-.00297	-.16035
40	-.05606	.59386	.61132	-.37445	.41614
41	-.27688	-.03990	.02013	-.00966	.02624
42	-.33200	.00074	.10922	-.11428	-.10763
43	-.34039	.19195	.21552	-.32098	.09988
44	-.10652	.65973	.41895	-.55379	.67218
45	.20556	-.15661	.05839	-.03065	.04986
46	.11999	-.13907	-.18267	-.05831	-.11266
47	.22153	-.21161	-.28592	.02623	-.06157
48	.53292	-.37845	-.61146	.32467	-.04755
49	-.47245	.35846	.56731	-.15598	.00186
50	.40162	-.35977	-.37901	.26234	-.10806
51	.47235	-.51349	-.63468	.37873	-.24070
52	-.17436	-.00056	.08132	.00145	-.06325

CORRELATION MATRIX

	11	12	13	14	15	16	17
11	.95842						
12	.58791	.98876					
13	.54812	.74651	.99623				
14	-.55986	-.87595	-.95766	.99676			
15	.53362	.94857	.71048	-.87029	.98943		
16	.00827	.29059	.34814	-.35601	.32423	.98359	
17	.28207	.00428	.01417	.01555	-.04505	-.78823	.98214
18	.04965	-.09251	-.01729	.10413	-.22004	-.31960	.50122
19	.25485	-.09936	-.07289	.11141	-.14402	-.84189	.94294
20	.01397	.21408	.29739	-.29882	.28776	.89923	-.64261
21	.00719	.28897	.46982	-.47266	.37399	.72974	-.51612
22	.39653	.61950	.68504	-.72745	.64764	.13635	-.07596
23	.13535	.46982	.64769	-.63902	.50258	.74192	-.42509
24	.09170	-.37279	-.44735	.46389	-.38466	-.84999	.80493
25	.47739	.83919	.84116	-.90065	.80732	.19774	.02130
26	.10482	.31810	.33043	-.36597	.39024	.69215	-.43020
27	.47064	.81039	.79679	-.85547	.76709	.12763	.05673
28	-.54620	-.34425	-.06912	.15986	-.26810	.55292	-.48099
29	-.75954	-.90085	-.75367	.82959	-.82420	.21410	-.07142
30	-.61685	-.48716	-.19303	.31420	-.46691	.23592	-.31058
31	.34224	.75958	.73743	-.81539	.75648	.19041	-.03283
32	-.23376	-.67424	-.78130	.81914	-.69160	-.34841	.15166
33	.06996	.52586	.64588	-.67402	.53615	.28444	-.18865
34	-.14083	-.55441	-.68957	.71509	-.57368	-.30572	.19038
35	-.32850	.05222	.02935	-.08514	.09596	-.09964	-.05562
36	.49288	.59172	.50406	-.52136	.50299	.50256	-.18273
37	.10896	.60962	.70741	-.72815	.60999	.60762	-.27941
38	-.51635	-.32595	-.08485	.16733	-.27043	.41446	-.47337
39	-.02436	-.15038	-.16674	.22256	-.21500	-.14644	.40183
40	-.61460	-.59871	-.39591	.45419	-.48662	.20890	-.48908
41	.22021	-.22887	-.24816	.25400	-.23334	-.67949	.60836
42	.23067	-.20691	-.23888	.27378	-.23580	-.75062	.83984
43	.03663	-.33155	-.44297	.44023	-.33378	-.83623	.75164
44	-.59000	-.53746	-.64547	.61465	-.49255	-.49414	.22847
45	-.07043	-.01485	.16314	-.12120	.04227	.38259	-.22733
46	.05051	.27021	.28370	-.31038	.28334	.28146	-.18027
47	.09738	.30592	.44507	-.43553	.32185	.27224	-.15279
48	.29407	.56057	.41288	-.52315	.62884	.34404	-.27327
49	-.31288	-.49413	-.49799	.59188	-.62985	-.28567	.13443
50	.23930	.35993	.36964	-.41005	.43736	.70203	-.42813
51	.40335	.60962	.56465	-.62319	.60738	.58499	-.32132
52	.12608	-.15158	-.13516	.16271	-.15887	-.15195	.10407

CORRELATION MATRIX

	18	19	20	21	22	23	24
18	.92011						
19	.45303	.97636					
20	-.34842	-.71512	.96630				
21	-.35316	-.58822	.77896	.94854			
22	-.44788	-.06557	.09987	.30948	.96187		
23	-.18662	-.51844	.72376	.84856	.34790	.95838	
24	.32747	.87167	-.69750	-.65615	-.34212	-.69936	.97860
25	-.13463	-.06837	.15775	.39967	.77430	.52363	-.38090
26	-.24535	-.49825	.74805	.55495	.22816	.56062	-.56254
27	-.09529	-.02528	.07966	.33132	.75327	.45299	-.32321
28	-.00919	-.54786	.58227	.43068	-.36128	.38624	-.46922
29	-.05462	-.00963	.15615	.20117	.68474	.37431	-.27353
30	.12724	-.33217	.18820	.18270	-.46546	.17491	-.25143
31	-.24218	-.08854	.17416	.45034	.80789	.52319	-.37233
32	.23831	.21716	-.32822	-.63562	-.75029	-.70162	.50657
33	-.26684	-.25404	.24772	.57608	.65912	.61383	-.49406
34	.21985	.25583	-.27777	-.62961	-.63170	-.64277	.48245
35	-.21208	-.01815	-.13557	.16254	.35061	.11464	-.08257
36	.01242	-.28887	.37318	.18225	.16396	.40466	-.44912
37	-.06210	-.39944	.56637	.71527	.41998	.82583	-.66082
38	-.21787	-.49645	.42783	.35576	-.17089	.33521	-.42868
39	.61995	.31867	-.08677	-.28516	-.55217	-.17001	.29709
40	-.34100	-.44672	.23256	.22194	-.22357	.02819	-.22535
41	-.02202	.64505	-.54422	-.51445	.00533	-.55478	.68670
42	.37002	.84131	-.58638	-.63476	-.23894	-.58153	.83916
43	.36645	.82001	-.67241	-.64849	-.30661	-.69525	.88789
44	.04612	.27328	-.39952	-.32388	-.28688	-.49266	.43283
45	-.11560	-.27084	.48500	.29772	-.05810	.26114	-.25685
46	-.07879	-.20092	.21229	.46615	.16697	.41363	-.24352
47	-.07033	-.13895	.21191	.47692	.34943	.45034	-.27836
48	-.55389	-.32319	.35671	.38026	.67293	.38612	-.43573
49	.52804	.17445	-.34879	-.54646	-.71343	-.47484	.34241
50	-.49597	-.49704	.78368	.59485	.31780	.52338	-.50311
51	-.36913	-.37008	.56346	.50041	.51747	.54019	-.50350
52	-.01212	.16007	-.09756	-.08390	-.08278	-.16804	.19672

CORRELATION MATRIX

	25	26	27	28	29	30
25	.99491					
26	.17931	.96091				
27	.98400	.08503	.99457			
28	-.33976	.48424	-.39126	.98480		
29	.82531	.30033	.80769	-.49267	.98746	
30	-.38240	-.06528	-.37827	.76830	-.63057	.96058
31	.92176	.22397	.90229	-.31105	.74002	-.38812
32	-.87893	-.32652	-.84517	.07993	-.63634	.19650
33	.76300	.20890	.74791	.01021	.46338	.00393
34	-.80741	-.19877	-.80683	-.00007	-.49282	.00143
35	.25324	-.07784	.26456	-.07541	.01820	.03436
36	.33564	.43427	.27636	.03010	.58469	-.20235
37	.65481	.55999	.58104	.27517	.47711	.00367
38	-.22833	.12136	-.22896	.69228	-.44673	.68564
39	-.39532	.17899	-.43579	.24252	-.17983	.08700
40	-.44787	-.01675	-.42989	.55537	-.66789	.60670
41	-.20280	-.34636	-.18295	-.50246	-.07316	-.41291
42	-.28399	-.31396	-.27074	-.37327	-.09967	-.29654
43	-.34662	-.44564	-.31621	-.42314	-.24248	-.27412
44	-.42801	-.34932	-.39380	-.01724	-.54484	.09907
45	.01281	.29831	-.01318	.42392	-.02246	.27339
46	.35907	.06676	.34983	.03840	.15832	.06500
47	.44389	.13759	.43078	.03691	.24405	.01100
48	.56776	.40291	.50384	-.20018	.53848	-.44363
49	-.57166	-.39362	-.51965	.12868	-.48280	.33291
50	.29912	.61157	.23858	.22891	.36445	-.11249
51	.57088	.54169	.52459	-.03310	.63653	-.30743
52	-.23975	.03142	-.24949	-.04914	-.06077	-.05990

CORRELATION MATRIX

	31	32	33	34	35	36	37
31	.99078						
32	-.94477	.99371					
33	.86059	-.90463	.97952				
34	-.84446	.91529	-.93988	.99104			
35	.42676	-.38962	.52920	-.42273	.82624		
36	.18860	-.17041	.06312	-.04597	-.28977	.95211	
37	.64010	-.76480	.61554	-.63102	.12985	.47975	.97636
38	-.13986	-.03390	.20776	-.13118	.13684	-.15235	.11810
39	-.48391	.46445	-.53691	.54179	-.35404	.24610	-.01979
40	-.31935	.17888	.00133	.01746	.09659	-.49008	-.21123
41	-.15337	.30142	-.31027	.35214	-.07513	-.29437	-.56023
42	-.32390	.45421	-.48542	.50439	-.17191	-.17660	-.51757
43	-.30154	.43907	-.41935	.44913	-.01725	-.47104	-.61936
44	-.34258	.36463	-.27727	.29426	.33203	-.60511	-.42844
45	-.00145	-.03851	.02963	-.07115	-.08748	.17902	.19125
46	.35882	-.43785	.42929	-.58253	.11909	.00008	.36927
47	.45444	-.55759	.51588	-.67137	.16427	.00084	.41638
48	.63685	-.59659	.51503	-.45757	.19339	.26119	.46612
49	.64302	-.65771	.57764	-.58085	.26545	-.07932	.44382
50	-.32622	.35836	-.27921	.29085	-.07313	.41464	-.44756
51	.55359	-.56973	.47043	-.50499	.02521	.46638	.55030
52	-.18473	.18046	-.19986	.20086	-.22031	-.10490	-.27578

CORRELATION MATRIX

	38	39	40	41	42	43	44
38	.90712						
39	-.20046	-.95867					
40	.72306	-.33709	.93360				
41	-.40192	.10043	-.16353	.92221			
42	-.47432	.53386	-.39030	.71143	.96682		
43	-.44069	.35682	-.25107	.64041	.84389	.96294	
44	.02485	.10092	.26835	.25992	.26296	.45625	.91152
45	.25707	.05533	.16353	-.22928	-.19654	-.31607	-.15847
46	-.01991	-.28557	.08477	-.24856	-.36231	-.30545	-.14832
47	-.01184	-.31452	.04055	-.25954	-.34531	-.31611	-.17306
48	-.02467	-.40964	-.13619	-.09353	-.33156	-.34414	-.27189
49	.06293	.45085	.01135	.08181	.26476	.28277	.19547
50	.17184	-.21053	.06806	-.26104	-.40986	-.55952	-.39731
51	.04122	-.29305	-.21437	-.33395	-.43273	-.52776	-.48039
52	-.10402	.06530	.02022	.27292	.21840	.21450	.01601

	45	46	47	48	49	50	51	52
45	.88653							
46	.08308	.94394						
47	.09489	.90095	.95643					
48	.16004	.13934	.17623	.92972				
49	.08170	-.30767	-.39619	-.66370	.93003			
50	.56198	.18262	.16565	.48583	-.52038	.95706		
51	.17347	.32313	.35894	.60864	-.49439	.71092	.86200	
52	.10148	-.17112	-.16688	-.18722	.04306	-.04500	-.13777	.56708

FACTOR MATRIX BEFORE ROTATION

VARIABLE	FACTOR 1	2	3	4
1	.04547	-.30953	.86730	.14471
2	.18003	-.34175	-.68084	.44258
3	-.51348	.10798	.15377	-.72071
4	-.45645	.27077	-.27864	-.55294
5	.06046	-.13662	-.40636	-.03719
6	.61100	-.19776	-.25380	-.11930
7	-.62835	-.56235	-.29333	-.04857
8	-.77400	-.53219	.07398	-.09862
9	.45327	.25836	.38192	-.01463
10	-.24808	-.43142	-.63064	.06832
11	.41426	.69662	.33612	.22146
12	.80399	.44282	.08326	-.05676
13	.82597	.28941	.09958	-.27839
14	-.88938	-.32614	-.03847	.18103
15	.82421	.34673	.00959	.04975
16	.63448	-.58888	.42328	.04706
17	-.37094	.74470	-.19220	-.19510
18	-.36499	.31845	.24383	-.60981
19	-.45304	.74115	-.23736	-.12925
20	.57712	-.57703	.34641	.12601
21	.69683	-.48998	-.02885	-.07100
22	.73579	.27109	-.37156	.19592
23	.77678	-.32086	.15514	-.26320
24	-.70263	.54665	-.21856	.05371
25	.84377	.36356	-.23816	-.19732
26	.54222	-.30035	.31846	.15687
27	.78715	.38916	-.27751	-.22116
28	-.00943	-.81358	.28218	-.26051
29	.75895	.57391	.10251	.04853
30	-.24377	-.70787	.10946	-.42652
31	.83089	.26094	-.40069	-.11808
32	-.86986	-.06096	.35089	.22751
33	.75659	-.07494	-.45276	-.26040
34	-.78267	.05911	.42878	.29878
35	.16950	-.12091	-.68081	-.15951
36	.50404	.19352	.68476	-.05461
37	.79338	-.14299	.08858	-.37558
38	.02090	-.76522	.00830	-.15543
39	-.40881	.17304	.48832	-.27735
40	-.21642	-.80177	-.20142	.16566
41	-.42724	.53738	-.20812	.33140
42	-.56860	.63812	-.01410	.06415
43	-.66566	.52991	-.26494	.05895
44	-.58785	-.15602	-.56838	.05282
45	.18870	-.34497	.19822	-.03544
46	.41875	-.13852	-.22507	-.24151
47	.49891	-.08807	-.27829	-.27118
48	.69735	.05754	-.17680	.39328
49	-.70124	-.01965	.33189	-.38088
50	.63882	-.28110	.21453	.39812
51	.77734	-.00112	.11482	.18340
52	-.19274	.10050	.12008	.26442

FACTOR MATRIX BEFORE ROTATION

VARIABLE	FACTOR 5	6	7	8
1	-.20910	.08373	.15939	.00841
2	-.03360	-.25185	-.13643	.07826
3	-.02931	.20951	-.10663	-.06133
4	.20175	.11033	.03057	-.16916
5	.48844	.06611	.12052	-.48145
6	.51289	.12793	.10217	.14178
7	.00938	.07984	-.10899	.18818
8	-.10960	-.09149	.14707	.00169
9	.01617	.28054	.23362	.11183
10	.31127	.18247	-.18649	.00718
11	-.12788	-.18723	.10137	-.03167
12	.01218	.05751	-.17701	-.02231
13	.00672	-.07575	.25814	.03623
14	-.02308	.03715	-.11688	-.02175
15	.05989	-.00983	-.13871	-.00262
16	.03132	-.01234	-.13145	-.03517
17	.21801	-.26345	.17834	.08713
18	.02683	-.15802	-.16734	.15660
19	.13351	-.22917	.17824	.07322
20	.22614	-.17989	-.03630	.00137
21	.07250	-.25613	.03315	.12107
22	-.01990	.17025	.16115	.03679
23	.04961	-.13797	.09362	.17791
24	.08035	-.25097	.07720	-.05320
25	-.04731	.06642	.01095	-.05963
26	.48450	-.11881	-.13740	.26218
27	-.12318	.08220	.00742	-.10163
28	.24734	-.14632	.14121	.13246
29	.01978	.07878	-.10237	-.05069
30	-.10893	-.06839	.29976	.00528
31	.00103	.08738	.04827	.02845
32	.00999	-.00559	-.08754	-.13494
33	-.07906	.08394	.20640	.07641
34	.17675	.11090	-.10596	-.02389
35	.13058	.26245	.01934	-.02199
36	.14118	.16306	-.10552	-.13585
37	.21923	-.01013	-.11609	.15172
38	-.04858	.12840	.37413	.06919
39	.52490	-.19927	-.18768	.20950
40	-.24789	-.07172	.23523	.05235
41	.09194	-.09402	.29011	.01397
42	.30325	-.22990	.15496	.09983
43	.18570	-.17337	.01369	.12450
44	.22402	.01860	-.22913	.01447
45	.33972	-.30355	.22480	-.55142
46	-.36329	-.54368	-.26683	-.13819
47	-.31166	-.51976	-.18124	-.06154
48	.08719	.22817	-.06267	.14715
49	-.05949	.21736	-.09125	-.16575
50	.26957	-.20834	.08013	-.24955
51	.06978	-.05091	-.12295	-.09375
52	-.04365	-.15361	.19521	.25821

ROTATED FACTOR MATRIX

VARIABLE	FACTOR 1	2	3	4	5
1	.15492	-.08388	-.92531	-.04837	-.01013
2	-.08347	-.07546	.61099	.64899	.08596
3	.22619	.16439	.02115	-.88635	.01717
4	.02390	.48247	.30119	-.62740	.05407
5	-.15297	.04805	.47406	.00527	.03628
6	-.60704	-.25970	.32209	.13171	-.37948
7	.58224	-.06607	.60516	-.10483	.00783
8	.78704	-.01314	.19361	-.18997	.07029
9	-.40953	-.14344	-.49884	-.00967	-.05949
10	.16152	-.05461	.87221	.07346	-.00495
11	-.38356	.26895	-.70706	.22788	.00207
12	-.76393	-.12899	-.30676	.04476	-.08753
13	-.85391	-.09941	-.38746	-.00001	-.13012
14	.88884	.12855	.32149	-.06867	.11850
15	-.74477	-.14693	-.22782	.19546	-.12012
16	-.15149	-.87496	-.19376	.16800	-.25553
17	-.07609	.92521	-.06358	-.19214	-.13520
18	.12526	.33347	-.17465	-.66651	-.27963
19	-.00280	.95095	-.03603	-.15997	-.02722
20	-.11920	-.71364	-.12377	.30488	-.41120
21	-.43040	-.55730	.07083	.27656	-.30243
22	-.79509	-.02032	.03500	.38850	.16964
23	-.57215	-.54498	-.14632	.06574	-.33633
24	.35297	.87758	.05681	-.08117	.07544
25	-.94148	-.06617	-.08217	.02769	.07238
26	-.19848	-.47438	-.08355	.30187	-.67733
27	-.91842	-.02930	-.06815	-.01515	.16595
28	.25973	-.55016	.10941	-.10163	-.44169
29	-.74560	-.00772	-.38654	.10991	-.03386
30	.30077	-.35482	.12415	-.29958	-.01818
31	-.94324	-.06491	.09296	.14870	.06209
32	.93186	.20271	-.10580	-.12348	.05306
33	-.85610	-.21743	.21475	.09570	.09174
34	.84515	.22118	-.16183	-.08476	-.09018
35	-.39510	.00267	.64465	-.02848	.16539
36	-.26272	-.36808	-.62072	-.14724	-.23331
37	-.67926	-.47089	-.03160	-.11294	-.41919
38	.11181	-.50446	.18862	-.00172	.03056
39	.36949	.25144	-.19070	-.48119	-.89943
40	.39329	-.36864	.34320	.28310	.20687
41	.15989	.76311	-.04592	.23687	.13895
42	.24872	.87737	-.11667	-.05166	-.19570
43	.30090	.85483	.15648	-.06264	-.05874
44	.38963	.29967	.74348	-.03212	.01960
45	.03395	-.24953	-.08255	.06420	-.14226
46	-.31895	-.19770	.06545	.03615	.05415
47	-.45027	-.15071	.07894	.05683	.01233
48	-.55529	-.27060	.05171	.49651	-.01902
49	.58205	.08813	-.08156	-.67505	.10060
50	-.22811	-.46091	-.18634	.53970	-.21506
51	-.51302	-.40168	-.19462	.31858	-.12738
52	.20455	.22926	-.19909	.26411	-.08469

EIGENVALUES

18.25233	9.31764	6.02401	3.50040	2.25847

CUMULATIVE PROPORTION OF TOTAL VARIANCE

.35101	.53019	.64604	.71335	.75679

ROTATED FACTOR MATRIX

VARIABLE	FACTOR 6	FACTOR 7	FACTOR 8	FINAL COMMUNALITY
1	.20202	.10818	.07110	.947240
2	-.28474	-.00761	.04732	.897917
3	.02496	-.08700	.07444	.878281
4	.06486	-.05074	-.14170	.747472
5	.15672	.01480	-.63366	.678091
6	.23342	-.09995	-.18852	.801049
7	.01426	-.30456	.19905	.853213
8	-.05359	-.48838	-.00027	.939510
9	.34640	.02782	.05295	.564330
10	.12940	-.02972	-.04678	.815055
11	-.05555	.32735	-.00608	.881603
12	-.05047	.42583	.00813	.887929
13	-.06596	-.07590	-.10454	.927140
14	.06729	-.09274	.07649	.947656
15	-.06400	.37317	-.02971	.825047
16	-.08688	-.03626	-.14816	.950375
17	-.01605	.04325	-.01838	.923505
18	-.19175	-.00161	.16604	.744164
19	-.01037	.04767	.02742	.935065
20	-.08644	-.10330	-.26026	.886730
21	-.26949	-.25366	-.11123	.818142
22	.13295	.12792	.02175	.848017
23	-.17050	-.25937	-.04533	.861604
24	-.04964	.08968	-.02568	.921405
25	-.09434	.19036	-.03800	.950107
26	.09813	.07658	-.09956	.846713
27	-.12331	.19183	-.02253	.929286
28	-.03563	-.55502	-.18092	.929568
29	.03212	.46695	-.01454	.937894
30	-.11569	-.71782	-.10164	.860837
31	-.04555	.11460	.00415	.943742
32	.12595	.07200	-.03868	.961259
33	-.09849	-.23665	.00612	.909610
34	.32306	.18825	.00421	.944532
35	.11215	-.07814	-.02361	.619084
36	.18290	.33361	-.16985	.839499
37	-.09339	-.00660	-.04589	.883470
38	.11430	-.67203	-.07513	.773836
39	.08235	.10643	-.04909	.906790
40	-.11210	-.58109	.02869	.882344
41	.19500	.04794	-.01884	.726107
42	.13026	.09592	-.03483	.913604
43	.04641	.11388	.09775	.877810
44	.01064	.04651	.03046	.798996
45	-.11771	-.16383	-.78869	.757318
46	-.81887	-.00205	-.03103	.821386
47	-.75700	-.05794	-.00985	.811572
48	.21717	.26790	.10352	.760778
49	.11638	-.03694	.00097	.833920
50	-.02061	.08478	-.48174	.876399
51	-.07958	.26732	-.15662	.682446
52	.06045	-.13610	.16948	.261867

EIGENVALUES

1.83299	1.34327	1.19220

CUMULATIVE PROPORTION OF TOTAL VARIANCE

.79204	.81787	.84079

FACTOR SCORE COEFFICIENTS

VARIABLE	FACTOR 1	2	3	4
1	.27103	-.35253	-1.12452	.40090
2	.32520	-.43401	-.76761	.54061
3	.11506	-.31027	-.35447	-.22459
4	.02722	-.10515	-.22961	-.11683
5	.01456	-.03631	-.00615	-.01877
6	-.04167	-.09166	-.09233	.08531
7	-.00317	-.04664	.04109	-.02871
8	-.04826	.03731	-.12902	-.10970
9	-.01400	-.03492	.02158	-.09572
10	-.02086	.06227	.17189	.01282
11	-.00644	.09812	-.14070	.07092
12	.05745	-.05901	-.12617	-.07735
13	-.24396	.04679	-.58096	.21087
14	.08238	-.16954	-.12251	.14838
15	-.12245	-.04088	.00298	.06654
16	.04036	-.30796	.16539	-.27570
17	-.01120	.28383	.02823	.03102
18	-.01469	-.02544	.00245	-.13532
19	-.07765	.16370	-.07063	.02499
20	.01341	-.00562	-.00464	.12673
21	-.00286	.00571	-.00834	-.00388
22	-.02535	.04118	.15886	.06635
23	-.03392	.02841	-.09601	.02000
24	.04685	.03783	.14330	.00244
25	-.02421	-.01262	.11377	-.10125
26	-.00648	.06017	-.13849	.21121
27	-.06540	-.10297	.01567	-.26995
28	.10006	-.05077	.13865	-.08233
29	-.01315	-.00760	.08803	-.06942
30	-.02036	.05805	-.02968	-.01379
31	-.14004	-.03549	-.01706	-.17191
32	.18504	-.23401	.05531	-.32046
33	-.16316	.01955	-.09886	-.03246
34	.02286	.04138	-.20689	.01100
35	-.03304	.00287	.08258	-.02655
36	-.02972	-.03260	.00014	-.03577
37	.02873	-.15569	.13518	-.04205
38	-.02408	-.00055	-.00256	.07707
39	.02178	.02461	.10775	-.19407
40	.02223	-.04664	.00332	-.03318
41	-.00856	.07350	-.01858	.13106
42	-.02489	.05867	-.02239	.01705
43	.03275	.15696	.03905	.06412
44	-.01389	.00915	.02533	.00654
45	.04797	-.02514	-.02472	-.04349
46	-.01536	.07109	-.07371	.11630
47	.04310	-.02094	.04012	-.12231
48	.00248	-.08745	.03131	-.02982
49	.03057	.01500	-.11368	.01133
50	.01861	.09269	-.12761	.16205
51	.00073	-.06099	.02683	-.02823
52	.01061	-.00131	-.01906	.01035

FACTOR SCORE COEFFICIENTS

VARIABLE	FACTOR 5	6	7	8
1	.89722	-.56628	-.07070	1.95555
2	.88375	-.97071	.19891	2.20058
3	.58087	-.37983	.14280	1.03047
4	.41398	-.21935	.05024	.47658
5	.20566	-.02468	.09336	-.15248
6	.04278	.05589	-.08072	.34440
7	-.07487	-.00832	.00915	.19547
8	.47700	.17898	-.50917	-.50959
9	-.01221	.04999	.05044	.01582
10	-.04455	.31285	-.15721	-.29969
11	-.03765	-.02273	-.13617	-.01095
12	.02195	-.23018	.08827	.52812
13	.35844	.40044	-.93758	.01231
14	.08735	.07683	-.21598	.40777
15	.00700	.27129	-.11344	-.23906
16	-.02596	-.23762	.38355	-.11763
17	-.46874	-.14157	.00520	-.13682
18	-.01283	-.05518	-.01137	.15438
19	-.02010	.00445	-.22761	.07983
20	-.21409	-.02314	-.05424	-.18785
21	-.00977	-.07874	-.04435	.08370
22	-.02337	.04234	.09513	.01250
23	-.01633	.02421	-.22489	.03105
24	-.02958	-.15818	.17758	-.21972
25	.02250	-.20048	.33651	.03399
26	-.17937	.10201	-.14565	.30154
27	.24706	.02201	.08288	-.15711
28	-.46316	-.21266	.11498	-.02514
29	-.04513	-.01091	.27538	-.48608
30	-.00040	.12212	-.29998	-.04151
31	.43936	.08273	.00698	-.30236
32	.43400	-.19054	.50525	-.67481
33	.22870	.32776	-.39930	-.04447
34	.14344	.51518	-.18336	-.05592
35	-.06120	.02924	.02900	.00199
36	-.02218	.18899	.00176	-.20432
37	-.31514	-.17798	.26442	.10095
38	.03421	.09422	-.14515	.03053
39	-.25819	-.06864	.18188	-.06677
40	.11854	-.07796	-.09301	-.00159
41	-.00934	.07748	-.08526	-.04199
42	.03668	.03513	-.06446	.07960
43	-.22047	-.03256	.02155	-.06367
44	.06270	.06690	-.04938	.05743
45	.03603	-.16343	.07742	-.26831
46	.00296	-.25019	-.14119	-.01833
47	-.00349	-.39896	.21334	-.13050
48	.07192	.04327	.13947	.21891
49	-.05336	.01704	-.04390	.04990
50	.05989	.11003	-.13616	-.42230
51	.05069	.02923	.07908	-.03249
52	-.00092	-.03038	-.00522	.05141

FACTOR SCORES

CASE								
1	-.61575	2.36102	-1.58315	.45592	-.39509	-.23396	.21439	.07417
2	.17936	.66903	-.34420	.40473	.84889	.17135	.18648	-.16658
3	-.26299	1.10334	-1.39392	.47864	.85161	.05278	.61647	-.53583
4	-.52961	-.48618	-.39770	-.19330	-.05884	.82016	-.02641	.29303
5	-.80445	2.29399	-1.10636	-.26518	-2.15173	.41881	.00571	-.11072
6	-.37615	-.83309	-.39982	1.10229	-2.53664	.08514	-2.19231	.90505
7	-.56333	-.90438	-.23347	.31402	-.79684	.79809	-.08026	.83034
8	-1.01531	-.85490	-.07903	-.01707	.04608	.55523	.21591	.21997
9	-1.29137	.07531	.96187	.04794	-.25976	.83165	.41066	.00236
10	-2.05917	.26563	.45607	.04052	.63881	.99239	.30867	.65634
11	-3.57570	1.37024	-.17545	-.29312	2.34393	.29024	.80191	-.62991
12	-2.53247	.06186	.48257	.14117	1.34865	-1.35190	.38506	-.44457
13	-1.61218	-1.06374	.08557	.24147	-1.33221	-1.98185	-.67280	.86708
14	-.01258	-1.27257	-.19109	.48591	-1.03284	.50937	-.71146	-.24176
15	-.88476	-.93538	.52830	.73268	-2.35662	.28287	-1.48088	.56486
16	-1.56621	-1.07520	.17576	.16983	.23529	-4.24165	-1.18690	.35692
17	-1.36493	-.56598	.65461	.01128	.24161	-5.36269	.47460	-.43479
18	-2.23112	.57475	.22349	-.05009	.55150	.73927	-.72656	.31817
19	-2.26767	.28036	.68308	.14842	1.01943	1.33172	.13173	-.04359
20	-1.41085	-.66936	.49263	.00998	.31111	.41487	-.33902	-.60467
21	-1.05314	-.70616	.21690	.42869	-1.13179	1.10864	-.27468	.00718
22	.45938	-1.27645	-.29462	.35933	-.82116	-.21085	-.70800	-1.34747
23	-.31728	-1.17615	.44977	.63203	-2.21013	.94244	-.17321	-.04026
24	-.82086	-.41602	.32161	.14905	-1.32232	.61646	.92206	.56184
25	-.91520	.33048	.26230	-.17616	-1.44797	.95934	1.19174	-.35549
26	-.42293	-.02270	.58120	.01259	-1.53398	.53701	1.60043	.07482
27	-.97445	.04048	.47055	.57010	-.75111	.76343	1.19551	.69597
28	.56778	-.95465	-.44841	1.18291	-2.56766	.22212	.67154	-.59153
29	.29939	-.78397	-.29162	.01803	-.68541	.31846	-.79055	-6.29541
30	.08840	-1.33913	-.28194	.27731	.40388	.47424	1.34391	-.72489
31	-.04488	-.94952	.01869	.24419	-.07229	.40765	1.63043	.54142
32	-.40895	.67024	-.99609	.71239	-.33900	.26872	.55720	.54052
33	.47697	.13577	-1.04051	.39855	-.36004	.27511	1.61765	-.26102
34	.25957	-1.27785	-.54969	.12130	.46404	-.45428	2.20814	.18440
35	-.06897	-1.35332	.29431	.15588	.84891	-.87074	.87123	-.54919
36	1.03977	-1.29306	-1.06112	.43358	.07099	-.74834	-.57629	-2.64784
37	.43397	-1.11935	-1.13437	.31432	1.39318	.45612	.72384	-.46013
38	.86028	-.96635	-1.24636	.36930	.37958	.06561	2.13943	-.31239
39	.47197	.21193	-1.34479	1.10802	.47992	.25345	1.20275	.05065

FACTOR SCORES

CASE								
40	1.24755	-.25907	-.51420	1.22515	.06822	-.15348	-.17562	.64623
41	1.18119	-.18087	-.84628	1.09866	.46644	-.07931	.66613	.12691
42	.79235	-.88735	-1.58942	.61289	1.45953	.46209	-.34709	.38020
43	1.19441	-.98069	.46351	.41272	1.02304	-.05515	-.34993	-.61319
44	.27883	-.64376	.35257	.57793	1.19819	.49219	-2.92741	.37284
45	.99620	.36777	-1.08636	1.34534	.30676	-.24247	-.02829	.57577
46	.84970	.82663	2.58149	.88820	.40705	.41702	.08942	.04997
47	1.24053	3.24097	-.38623	1.32011	-1.91227	-2.04629	-.67057	.65009
48	.93261	.86829	-.06125	1.03414	.67326	-.13830	-.49755	.45117
49	1.31516	-.04114	1.52869	1.20903	.74245	-.18537	.46374	.51315
50	.76544	-.16892	.54414	.84040	.68879	-.44132	-.13922	.56230
51	.01349	.32427	-.26748	1.04317	1.40031	.86600	-.80567	.78415
52	.10078	-.20495	-.83793	.53246	.89292	.41394	-.53040	.27969
53	.39972	-.53771	2.59649	.48006	.83845	.72942	-2.48924	-.68038
54	.81789	.24247	.49903	.94357	.93194	.23414	-.71456	.80081
55	.43038	.07130	-1.31601	.75467	1.04474	.34967	-.11912	.81413
56	.31271	1.03633	-1.11042	.22540	.01324	-.34946	.53480	-.07424
57	.69944	.31909	1.03659	.69498	1.06250	.51630	-.29392	.29804
58	1.15227	.69559	4.15200	.03044	-.82135	.12359	1.89250	-.36738
59	1.14030	1.02400	2.02793	.78796	-.26894	-.75977	1.37159	.79831
60	.42643	.32439	.41674	-.13634	.37869	-.41982	-.08499	.37793
61	-.03495	-.60145	.14916	-.38397	.65198	.33555	-.52618	.34775
62	.24483	.27137	.11992	-.13979	.27902	.31982	-2.36325	.26431
63	.83958	.03133	.13626	-.15852	.20326	-.19480	-1.09309	.69430
64	.52730	2.56628	-.87559	-.44562	-.41916	-.59484	-.13310	-1.19623
65	-.45418	1.31022	.39124	-1.54244	.41765	.65042	-.34062	-.93384
66	.42532	2.02596	1.38073	-1.99063	-.42243	.20709	-.00541	-1.98940
67	1.01985	.21856	1.59697	-1.21565	.63615	.02896	.06371	-.48240
68	.33268	.62160	-.12497	-1.39084	.11588	.34244	-.66799	-.20625
69	.30254	-.15575	-.89390	-2.74510	-.88284	.43801	-1.32882	.84201
70	.17978	1.02261	-1.75220	-1.11865	-.18909	.01669	-.64906	.02156
71	.71466	-.45334	-.42312	-2.07912	.03174	.01354	-.46508	1.07585
72	.39508	-.33901	-.14511	-2.03697	.22530	-.17709	-.44934	.62468
73	-.20504	.51988	-.22034	-1.49650	.28341	.06903	.00330	.16342
74	.66899	1.11724	-.11009	-1.22527	-.52399	-.50720	-.28726	-.20285
75	.82115	-.60580	.15207	-1.18291	.70562	-.14296	-.52244	.38874
76	.37837	1.18682	-.24634	-.53309	.39993	-.25026	.11414	.12599
77	.46234	-1.30185	-.95723	-3.33994	-.15847	.12143	.22414	.64931
78	.75301	-.72886	.57242	-1.97237	.34148	.03157	.22201	.91762
79	1.19537	-1.10953	.30094	-2.48058	-.60334	-.94749	1.67167	1.20190