Structuring
the Spatial Distribution
of Residential Moves

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ABSTRACT

In this study, the relationship between the number of residential moves and the distance of move is explored. The expected frequency decay curve is developed, illustrating a decreasing number of moves with an increasing distance from the present residential site. The distance of move is also shown to be a function of household type, as household income, age of head, and family size are all determinants of the distance of the move.

The most significant finding in the study emanates from an analysis of distance of move with "environment score." When households are mismatched with their environment (low environment score), they exhibit longer than average distances of moves. A logical structure of distance of move, related to environment score, is developed, and verified empirically. This may be utilized in a synthesis of the distribution of residential moves. The data source for the study was the 1963 Tri-State Transportation Commission's home interview survey, a random, one per cent sample of the region's households, including 56,000 interviews and 15,000 residential moves.

Introduction

A variety of future settlement patterns is conceivable for the New York metropolitan region. Since, on the average, 20 out of 100 families move each year, mobility is a powerful urban force in shaping the future. This study is directed towards a structuring of the distribution of residential moves by analytically viewing the distance of moves for various groupings

of households. A structuring of moves is essential to residential location modeling, currently an integral part of the urban transportation and metropolitan planning process.

Data Source

The primary data source describing the residential location patterns is the Tri-State Transportation Commission's home interview survey, a random, one per cent sample. Fifty-six thousand household interviews were made, including 15,000 records of residential moves. The survey recorded the socio-economic, housing, and travel characteristics in the New York region for 1963 as well as the residential location of the population in 1963 and in April, 1960.

All moves and mobility rates referred to in this study are for the time period under analysis, 1960-1963.

Distribution of Moves

The distribution of residential moves is analyzed in this study by cross-classification analyses to seek out regularities in behavioral patterns in order to synthesize and predict the future patterns of residential shifts in a metropolitan area.

One of the most common parameters in distributional models is distance. To illustrate, in an explanation of the spatial distribution of travel, two factors are commonly described, each reflecting opposing forces. One force represents the efforts of persons to satisfy their needs and desires. Much of this quest for fulfilling personal wants requires travel, and this travel persists until satisfaction is gained. The opposing force is a result of costs associated with travel—costs measured in time and money. The result of these two conflicting forces is that, in general, the travel effort is minimized subject to reaching a destination which will fulfill the purpose of the trip. The pattern of travel within an area is therefore highly dependent upon the spatial distribution, intensity, and type of activities from which and to which trips are made. It is upon these basic assumptions that synthetic trip-distribution models are built.

Minimization of Distance

As with travel, distance is an important factor to the distribution of residential moves. An average household makes over six non-walking trips per day. This time spent in going from one destination to the next is generally minimized in order to carry out the day's activities. Is there a

minimization principle in the distribution of residential moves? Since the average family moves about once in five years, there isn't this same necessity for minimization as in daily travel. Cost is associated with distance in a move, but certainly this is not primary to selecting a new residence.

Distance is minimized in residential moves, not because of a conscious effort to minimize *per se*, but because of other reasons. Most households are satisfied with their neighborhoods or environment and move within the neighborhood to adjust to changing household needs—to a larger apartment as the family size increases, for example. In addition, since similar household types (by virtue of race, occupation, persons per household, etc.) are clustered in neighborhoods and communities, a migrant could usually find more suitable housing accommodations within the same community and thus localize his move. The behavior of the migrant also depends on his experiences or his information about other portions of a metropolitan area, including the suitability of the locality and the availability of housing. The limited experiences of the migrant as well as his limited information sources also tend to have him focus more sharply on the housing vacancies near his present residence.

Another consideration in selecting a new residence is its relationship in time and cost from work. Most of the literature on residential location indicates that households find their residences relatively close to the head's worksite. Distance of the move is thus limited by the distance from work. Possibly more important than the time and cost separation of the new residence from the worksite is the change in work-trip time between the old and new residence. A household evaluates the utility of each possible new location. A time and/or cost change in the length of the work trip may also necessitate a substantial improvement in the dwelling unit or neighborhood to result in a higher total level of satisfaction in the new residential site.

Distance in all fields of human activity represents a barrier which requires energy to transverse. In residential mobility, the greater the distance of the move, the greater the change the household encounters— change in neighbors, school, living style, and time to work. The impact of distance in all fields of human activity will tend to vary with the types of energy converters which are available to man. To illustrate, distance limits travel at variance with the purpose of the trip. It also differs from area to area. In describing this constraint, it seems logical that the impact of distance would depend on the motivation for moving.

Distribution of Residential Moves

An analysis of the distribution of residential moves is made, by household type and reason for moving. The distribution is measured by, a)

the distance from the previous residence, and b) perceived change in work-trip time due to a change in residence.

The one- and two-person households put the greatest premium on reduced trip time to work of all moves were greater than 5 miles long. The median moving distance was 1.5 miles, with about 20 per cent of the moves less than 1 mile. The frequency distribution of moves is shown in Figure 1.

An analysis cross-classifying distance of move and household type, with household type structured by age of head, persons per household, and household income (Table 2) shows that the characteristic decay relationship of frequency of moves with distance (for all moves) is apparent for each of 24 household groups studied. The household groups making the greatest proportion of long moves includes the young families (head under 35 years, with moderate-high income) having two or more children. Also included as long-distance movers are the households with the head over 35 years old, with high income, and one or two children. Single-person households under 35 years old with low incomes, when moving, make an unusually high proportion of long moves with over 40 per cent of their moves a distance of 6 or more miles.

In general, in stratifying distance of move by income, high-income households make longer moves than middle-low income groups, with median distances of 2.90, 1.80, and 0.90 miles, respectively, for these groups.*
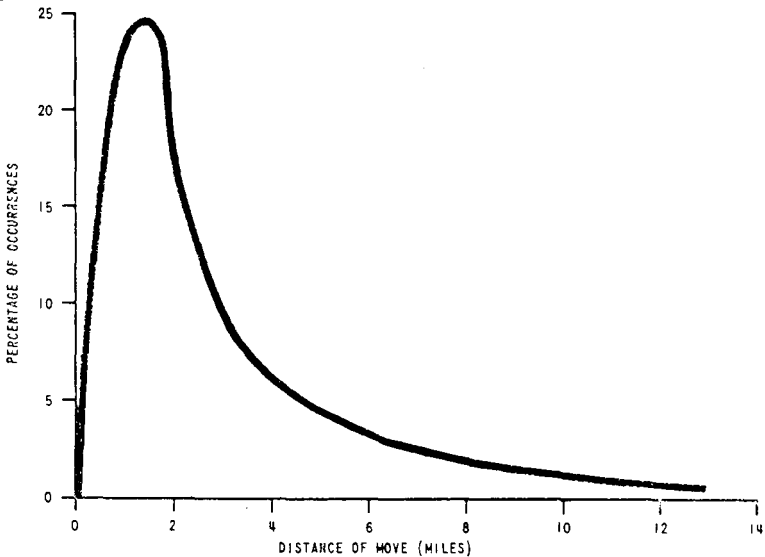

Figure 1. Frequency of moves versus distances of move.

*High incomes $10,000+; middle income $6-10,000; low income $0-6,000.

Distance of Move vs. Reason for Move

The reason for moving may be categorized four ways:

a. change in family composition,
b. desired change in residence type,
c. change in employment or to be nearer employment, and
d. other.

Each classification relates to the length of moves. A stated primary reason for moving is a change in family composition. This infers satisfaction with the neighborhood or environment. A desired change in residence type and/or environment may also be accompanied by a change in family composition, but this primarily denotes dissatisfaction with current housing and environment. The primary reason for moving will dictate the future location for the household. Satisfaction with the neighborhood is obviously correlated with length of move as it determines the suitability of housing vacancies in the neighborhood.

It is not surprising that those households indicating that change in family composition was their primary reason for moving should have a relatively high proportion of short moves. Forced moves due to demolition, renovation, or dispossession also tend to be short as do moves due to a change in rent or income. When the prime reason for moving relates to neighborhood or employment, the move is usually longer. For those households desiring a new residence type or different neighborhood, the move is usually longer than average, although not unusually long. Its median distance is about 2 miles. These households probably move to the nearest community that satisfies their living style and housing needs. The longest moves are made to be nearer employment, with 55 per cent of these moves greater than 6 miles. Moves to be nearer family or friends, usually made by persons over 65, are also substantially longer than the average move.

Change In Work Trip Time
Due to Change In Residence

Each head of household was asked how he thought his journey to work time changed with his change of residence. For approximately one-half of the households, no change in the trip time to work took place; the remainder of the households were divided into longer trips (25.5 per cent) and shorter trips (22.9 per cent). (Appendix A, Table 6, details the distribution of moves by change in work trip time.)

The one- and two- person households put the greatest premium on

reduced trip time to work with substantially higher percentages of shorter trips. Longer trips predominate for the larger families size, especially for those with high incomes. Age affects the change of work-trip time. Those household groups under 35 tend to make shorter work trips due to a residential shift than groups over 35, even when the changes are stratified by persons per household and income. The highest ratios of longer to shorter trips are found in the high-income, large-family group; the lowest ratio in the under-35, one-person households.

Change In Work Trip Time
Stratified by Reason for Move

The section on distance of move and reasons for moving showed the relative attachment to the old residence in different motivations for moving.

For households moving to change residence type and/or neighborhood, the change to a longer work trip predominates over the shorter trip (ratio of longer/shorter of 2.0) (Appendix A, Table 6). However, for 45 households out of 100 of this group, there is no perceived change of work-trip time. For households moving because of a change in family composition, relative indifference to change in trip time exists, with approximately one-half of households having no change, and about equal proportions of the rest having longer and shorter work trips. The distribution of change in work-trip time by reason for moving is detailed in the Appendix.

Distance of Move vs. Environment Score

In this section, the distance of move is cross classified with environment scores. The environment scores are based upon the matchup of an individual household to the typical environment that the member of his household group would prefer. The better the matchup, the higher the environment score.*

Figure 2 indicates the relationship between environment score and distance of move. In general, the distance of move decreases as the environment score increased from extremely low scores to average (16.7)

*In simplified terms, a household is classified into a household group; one group may be the single person household. The individual's environment preference as measured by his present residence, is matched against the general preference of his group. If an individual is atypical in residential preference, he is then said to be poorly matched with the typical environment of his group. He thus received a low environment score.
Environment score is explained in more detail in Appendix B.
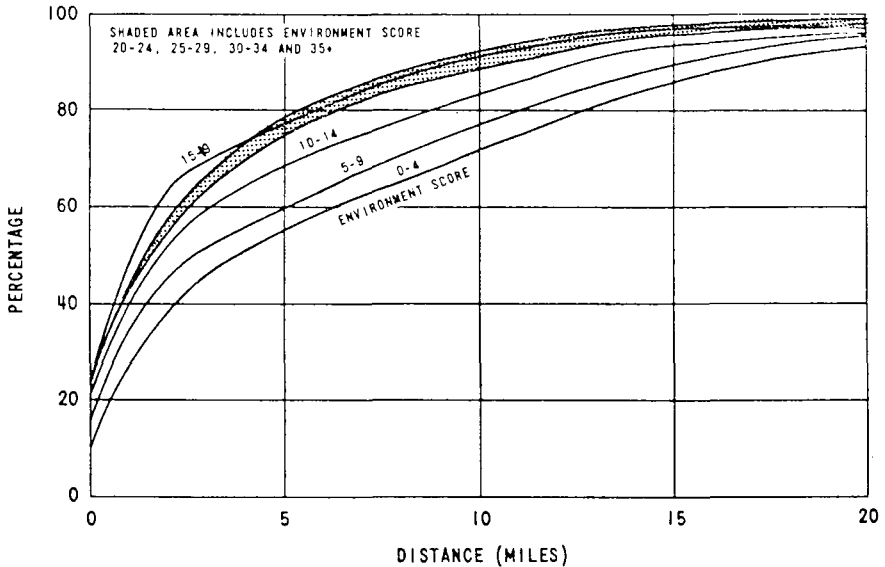
Figure 2. Cumulative distribution of frequency of moves by length of move stratified by environment score.

and slightly above-average scores. For above-average scores to relatively high scores, the frequency distribution of distances is very similar to that of average scores. In other words, the relationship stabilizes at average scores and above.

The median distance of move for households with low environment scores is about 4 miles with over 40 per cent of the moves 6 miles or longer. On the other hand, the median distance of move for households with above-average environment scores is slightly over 1 mile with only 20 per cent of moves six miles or more.

Another index of the relationship of environment scores to distance of move is through a measurement of intracounty moves. For all households approximately two-thirds of all moves are intracounty. For all household types, when the environment scores are relatively low, the propensity to make long intercounty moves is approximately 40-50 per 100 moves, while for above-average environment scores, this figure is reduced to 20-30 per 100 moves (Table 1).

Summary

In this study, the relationship between the number of residential moves and the distance of these moves is explored. The distance of move was also

shown to be a function of household type, with variables as household income, and age of head in conjunction with family size, determinants of the distance of move.

The most significant finding in the study emanates from an analysis of distance of move with environment score. When households are mismatched with their environment, they exhibit longer than average distances of moves. A logical structure of distance of move related to environment score is developed, and verified empirically. This may be utilized in a synthesis of the distribution of residential moves.

Appendix A which follows is a set of statistical tabulations of the data summarized in the text. Appendix B includes the derivation of the Environment Scores.

Appendix A

Table 1. Percentage of Households Making Intracounty Moves—Stratified by Environment Score.

Environment score	Household Type*					
	I	II	III	IV	V	VI
0-4	—	—	—	—	62.5	40.8
5-9	49.0	61.2	60.0	50.0	59.0	49.4
10-14	59.8	71.5	75.0	74.2	63.7	60.7
15-18	70.3	76.2	58.1	62.8	73.6	59.5
19-22	74.6	70.9	75.7	65.5	72.1	68.1
23-26	64.2	65.4	79.8	57.7	65.0	80.6
27-30	67.7	—	—	58.3	79.4	71.8
31-34	78.7	—	—	88.2	90.0	69.4
35-39	68.8	—	—	84.6	—	77.3
40-44	—	—	—	—	—	—
45-50	88.3	—	—	—	—	—
51+	75.0	—	—	—	—	—
Average	67.0	71.5	72.0	64.6	69.6	60.6

*Household Type
I 1 person H.H.
II 2 person H.H.
III 3 persons, $0-9999
IV 3 persons, $10,000+
V 4+ persons, $ 0-9999
VI 4+ persons, $10,000+

Table 2. Cumulative Distribution of Residential Moves by Household Type.

House-hold type*	Miles 0	1	2	3	4	5	6	7-8	9	10-14	15-19	20-29	30-90
1	13.22	31.95	42.14	42.10	52.61	57.57	59.22	65.28	71.35	83.74	88.97	94.20	100%
2	13.89	37.50	50.00	63.89	72.22	80.55	86.11	90.28	91.67	95.84	97.23	100.%	100
3	13.04	34.78	43.48	47.83	56.53	60.88	69.58	73.93	82.63	86.98	95.68	100	
4	23.98	51.76	64.92	70.18	74.27	80.41	84.50	87.42	88.59	94.73	97.36	98.82	100
5	12.67	38.55	52.30	61.46	68.20	73.59	78.44	82.75	84.10	94.08	96.51	98.67	100
6	10.70	28.84	44.19	51.17	55.36	59.55	64.20	73.04	77.23	87.00	90.72	96.77	100
7	23.97	53.31	66.53	74.17	77.06	82.23	84.09	87.40	89.05	94.63	97.11	99.18	100
8	12.40	36.20	49.87	57.21	61.77	68.35	71.39	77.97	80.00	87.59	91.89	97.46	100
9	12.09	41.76	57.14	62.63	63.73	64.83	68.13	79.12	80.22	87.91	92.31	96.71	100
10	23.52	53.50	65.60	72.19	76.09	79.99	83.35	88.05	90.20	95.31	97.33	98.94	100
11	15.25	33.64	45.45	52.32	57.85	61.89	65.03	71.01	72.65	82.52	88.95	95.08	100
12	10.62	27.43	35.84	42.48	46.02	51.77	53.98	64.60	65.93	75.22	82.30	93.36	100
13	25.58	53.59	64.70	72.91	76.72	79.99	82.17	86.25	88.97	94.28	96.32	98.91	100
14	18.71	40.00	51.61	59.35	63.22	68.38	69.67	82.57	85.79	90.95	95.47	100.%	100
15	15.58	35.06	57.14	68.83	70.13	72.73	76.63	85.72	87.02	88.32	92.22	97.41	100

16	25.94	52.72	68.76	75.59	79.50	84.10	86.47	91.07	92.46	96.23	92.62	98.74	100
17	22.91	49.56	61.23	68.06	72.91	76.87	79.29	84.80	85.02	92.51	94.93	98.67	100
18	15.45	33.93	43.02	53.32	60.59	66.35	69.38	77.56	79.08	88.17	92.41	97.26	100
19	28.61	58.48	68.86	75.15	77.67	82.70	84.90	89.62	91.51	91.17	98.11	98.74	100
20	18.52	44.45	59.26	63.53	70.37	75.50	76.64	84.33	85.75	90.02	94.29	98.56	100
21	12.92	32.11	45.76	53.14	57.94	63.48	68.28	73.82	75.67	85.26	90.06	95.96	100
22	27.31	57.20	69.64	76.32	80.42	85.43	88.03	90.91	91.97	95.31	97.59	98.96	100
23	17.38	40.00	51.19	57.74	62.50	68.33	71.54	76.90	79.52	87.50	92.52	97.14	100
24	15.08	35.87	47.30	52.54	56.35	60.79	63.64	69.68	71.58	81.74	89.68	96.19	100

*Household type	Age	Persons	Income	% Total household
1	35**	1	$0-$5999	2.1%
2	35	1	$6-$9999	0.5
3	35	1	$10,000+	0.1
4	35	2	$0-$5999	1.8
5	35	2	$6-$9999	1.5
6	35	2	$10,000+	0.9
7	35	3	$0-$5999	2.4
8	35	3	$6-$9999	1.7
9	35	3	$10,000+	0.5
10	35	4	$0-$5999	4.0
11	35	4	$6-$9999	3.7
12	35	4	$10,000+	1.5

*Household type	Age	Persons	Income	% Total household
13	35+	1	$0-$5999	10.4%
14	35+	1	$6-$9999	1.8
15	35+	1	$10,000+	0.7
16	35+	2	$0-$5999	12.7
17	35+	2	$6-$9999	7.4
18	35+	2	$10,000+	4.6
19	35+	3	$0-$5999	4.4
20	35+	3	$6-$9999	5.6
21	35+	3	$10,000+	4.1
22	35+	4	$0-$5999	6.8
23	35+	4	$6-$9999	11.6
24	35+	4	$10,000+	9.2

Table 3. Cumulative Frequency of Moves (in %) Versus Distance of Move.

Reason (code) for move*	Distance (miles)												
	0	1	2	3	4	5	6	7-8	9	10-14	15-19	20-29	30-90
+	22.15	40.62	52.18	56.26	64.42	70.25	73.75	80.46	81.92	90.37	94.45	97.66	100%
0	21.91	45.55	58.06	645	67.47	73.10	76.06	80.98	83.00	90.81	94.35	98.04	100
1	25.39	54.36	68.02	74.54	78.83	83.53	85.46	89.55	90.73	95.29	97.42	99.28	100
2	17.65	41.99	55.53	64.61	70.52	75.83	80.03	85.26	87.57	94.60	97.26	99.06	100
3	5.46	17.32	26.74	32.58	35.97	40.68	45.01	54.99	58.94	75.14	83.05	92.64	100
4	7.66	18.66	28.23	34.45	37.80	39.71	40.67	45.93	49.28	60.28	67.46	83.73	100
5	26.04	60.76	75.00	80.90	84.02	86.45	88.19	92.70	93.39	97.21	97.90	99.64	100
6	16.52	38.96	49.26	55.93	60.00	64.81	67.62	74.43	76.50	84.13	90.50	95.98	100
7	12.86	33.54	48.55	57.38	62.93	68.98	72.38	78.43	80.20	87.77	92.94	97.48	100
8	22.40	59.01	70.21	76.77	79.50	84.14	87.69	93.15	94.52	97.25	98.34	99.71	100
9	9.88	32.72	41.36	46.30	49.39	54.95	59.89	69.15	71.62	86.43	90.75	96.92	100

*Reasons for move
1. Change in Size of Residence
2. Change in Marital Status and/or Family Size
3. To be nearer Employment or "More Convenient"
4. Change in Place of Employment
5. Change in Income or Rent
6. To Change Residence Type (Apartment to House, etc.)
7. To Change Neighborhood Type or Schools
8. Forced to Move Due to Renovation, Demolition, Dispossession, etc.
9. To Be Nearer Family or Friends
0. Other Miscellaneous Reasons
+ Unknown

Table 4. Cumulative Distribution of Shorter Work Trips (in minutes) vs. Reason for Moving.

Reason (code) for move*	Minutes									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-50	50+
+	11.9	33.3	57.1	66.6	66.6	85.7	90.4	90.4	90.4	100%
0	19.7	39.4	55.2	67.2	70.7	82.3	84.1	86.6	90.4	100
1	18.1	40.8	59.1	71.7	75.7	86.6	88.7	91.5	96.5	100
2	14.0	37.9	53.6	67.7	73.4	86.2	87.5	90.6	92.9	100
3	13.7	34.4	51.7	55.1	58.6	58.6	58.6	68.9	86.2	100
4	10.2	28.2	43.5	56.4	61.5	71.7	71.7	76.9	89.7	100
5	9.3	37.2	58.1	76.7	86.0	93.0	93.2	93.0	95.3	100
6	16.4	36.4	52.2	62.2	66.0	81.3	83.5	87.0	92.9	100
7	6.8	25.9	41.2	58.0	64.8	78.1	81.0	84.2	91.4	100
8	13.1	45.1	59.7	74.3	79.2	86.5	89.0	91.4	93.9	100
9	9.7	31.7	41.4	53.6	63.4	78.0	78.0	80.4	87.8	100
All households	15.3	37.0	53.7	66.4	71.0	83.2	85.3	88.4	93.4	100%

*Reason for move
1. Change in Size of Residence
2. Change in Marital Status and/or Family Size
3. To be Nearer Employment or "More Convenient"
4. Change in Place of Employment
5. Change in Income or Rent
6. To Change Residence Type (Apartment to House, etc.)
7. To Change Neighborhood Type or Schools
8. Forced to Move Due to Renovation, Demolition, Dispossession, etc.
9. To Be Nearer Family or Friends
0. Other Miscellaneous Reasons
+ Unknown

Table 5. Cumulative Distribution of Longer Work Trips (in minutes) vs. Reason for Moving.

Reason (code) for move*	Minutes									
	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-50	50+
+	22.2	33.3	50.0	55.5	63.8	86.1	88.8	88.8	94.4	100%
0	14.8	33.4	50.6	66.5	68.8	86.0	87.9	91.6	93.4	100
1	21.3	45.3	64.4	77.0	80.0	91.6	91.9	94.2	96.3	100
2	21.3	39.1	60.8	72.8	76.0	88.7	89.8	94.2	96.7	100
3	4.5	13.5	24.6	34.1	37.7	59.0	62.0	68.3	79.6	100
4	3.0	18.1	36.3	42.4	46.9	56.0	56.0	62.1	74.2	100
5	20.4	38.6	65.9	77.2	77.2	90.9	90.9	93.1	95.4	100
6	17.6	45.6	63.2	75.6	77.5	89.8	91.3	92.8	94.3	100
7	15.4	37.3	58.4	76.0	78.8	91.5	93.6	95.7	97.8	100
8	23.8	47.6	60.3	73.0	76.1	87.3	88.8	88.8	92.0	100
9	12.5	41.6	50.0	66.6	66.6	87.5	87.5	87.5	95.8	100
All households	16.0	35.6	53.1	65.4	68.3	82.9	84.3	87.6	91.9	100%

*Reason for move
1. Change in Size of Residence
2. Change in Marital Status and/or Family Size
3. To Be Nearer Employment or "Move Convenient"
4. Change in Place of Employment
5. Change in Income or Rent
6. To Change Residence Type (Apartment to House, etc.)
7. To Change Neighborhood Type or Schools
8. Forced to Move Due to Renovation, Demolition, Dispossession, etc.
9. To Be Nearer Family or Friends
0. Other Miscellaneous Reasons
+ Unknown

Table 6. Change In Work Trip Time Due to Change In Residence, Stratified by Reason for Move.

Reason (code) for move *	No change	Longer trip	Shorter trip	Totals
1	54.45	25.83	17.77	100%
2	48.43	26.77	24.80	100
3	18.36	5.54	76.10	100
4	45.60	20.20	34.20	100
5	69.04	15.30	15.66	100
6	45.35	34.47	20.18	100
7	46.03	35.77	16.20	100
8	59.38	22.97	17.65	100
9	49.12	25.79	15.09	100
0	62.62	21.27	16.11	100
+	65.33	18.67	16.00	100%
Totals	**51.61**	**25.49**	**22.90**	**100%**

*Reasons for move
1. Change in Size of Residence
2. Change in Marital Status and/or Family Size
3. To be Nearer Employment or "More Convenient"
4. Change in Place of Employment
5. Change in Income or Rent
6. To Change Residence Type (Apartment to House, etc.)
7. To Change Neighborhood Type or Schools
8. Forced to Move Due to Renovation, Demolition, Dispossession, etc.
9. To Be Nearer Family or Friends
0. Other Miscellaneous Reasons
+ Unknown

Appendix B

Derivation of Environment Scores

It is the purpose of this section to describe the technique of comparing individual households to "household groups" by viewing the individuals environment preference (measured by the characteristics of his present residence), as compared against the group generalized preference. This process is defined as *developing* environment scores.

Household Types

Households were classified into six household types, based on the previous literature on residential location as well as governed by the dominant features of each household group. For illustration, the fact that a person was a member of a one person household seems to dominate his age and income characteristics. Similarly, the two person households would have less dependency on income and age when composing their preferences for living style and residential choice as compared to the family oriented household groups. The most difficult decision was the selection of a new income stratification. It was decided to structure household income into two groups—under $10,000 and $10,000 and over—to reflect freedom of choosing residential style, especially when considering a centrally oriented worksite.

The stratification of household types, is as follows:

1. One person households
2. Two person households
3. Three person households; 0-$10,000 household income
4. Three person households; $10,000 and over household income
5. Four person households; 0-$10,000 household income
6. Four person households; $10,000 and over household income

Environment

A structure of environments was created through the use of census tracts as the basic unit of residential areas, with census data and supplementary land use data keyed to census tracts as the data sources. The major grouping of the 34 variables used is seen in Table B1.

Table B1. Major Groupings of Variables.

Socio-economic
Description of housing unit and structure
Condition and age of housing
Index of living space
Index of mobility
Composition of Labor Force at residence
Auto ownership
Journey to work
Accessibility indices
Value of property
Physical description of environment
Budgetary savings in locational choice
    (Annual salary - annual rent - annual
    transportation costs)

Matchup of Household and Environment

The matchup of household and environment was made by utilizing the spatial distribution of household types, leading to a distribution of factor scores per household type. The statistical technique used for matching household types and environments (factor scores) into environment scores was multiple discriminant analysis. For the purpose of describing this technique as employed in this study, a two-group—two-variate case is illustrated. For the measurements on each individual observation, the discriminant function orients a line in space so that the projections of the different groups onto the line would be separated as widely as possible when compared to the projections of the within-group points from each other. The discriminant function transforms the individual test scores to a single discriminant score, and that score is the individual's location on the projected line. The point b, on Figure B1 indicates the division of the one-dimensional discriminant space into two regions, one indicating the probable membership in group A and the other indicating the probability of being classified as group B. Points to the left of point c indicate a 100 per cent probability of being classified in group B. Points between c and d have a probability of being in group A; points to the right of point d indicate a 100 per cent probability of being classified in group B. Points between c and d have a probability of being in group A *and* a probability of being in group B, the sum of the probabilities equaling 100. The measurement of the probability in A and B is made through relative density of the discriminant score distribution or the relative ordinate of the distribution for each point.
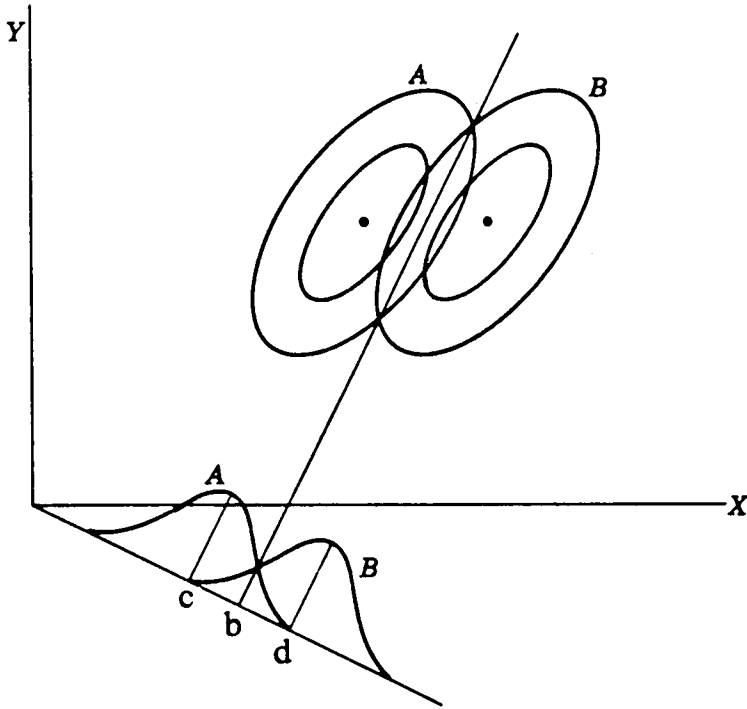
Figure B1. Geometric interpretation of discriminant analysis. (*Source:* W. Cooley and P. Lohnes, *Multivariate Procedures for the Behaviorial Sciences*, p. 117.)

The matchup of household and environment as viewed in this study utilizes the same concepts as expressed in the illustrative example but is involved with five variables (factor scores) per observation and a division into six regions or groups. Each observation, therefore, becomes associated with being classified into each of the six household groups (on basis of his environment). The sum of the probabilities of being associated with each group is standardized to 100 per cent. This probability of association of an observation with a household group (by environment preference) is referred to as *environment scores*. The distribution of environment scores per preclassified household group permits a "matchup" of household and environment. Those observations having a relatively low environment score for their associated household group are said to be poorly matched with their envrionment; those having relatively high scores are well-matched with their environment.