#453-77

INSTITUTE FOR RESEARCH ON POVERTY DISCUSSION PAPERS

WHITE FLIGHT AND CENTRAL-CITY LOSS: APPLICATION OF AN ANALYTIC MIGRATION FRAMEWORK

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November 1977

Presented at the session on Statistics and Modeling in Urban Social Problems at the Annual Meetings of the American Statistical Association, Chicago, Illinois. August, 1977. This research is supported by grant No. 1 R01 HD-1-666-01, "Migration and Redistribution: SMSA Determinants," from the Center for Population Research of the National Institute of Child Health and Human Development, U.S. Department of Health, Education and Welfare, and in part by the Institute for Research on Poverty, University of Wisconsin, Madison.

ABSTRACT

This paper utilizes an analytic migration framework to assess the aggregate impact of selected community-level factors on white population losses experienced in central cities of large metropolitan areas. The framework parameterizes analytically distinct components of local and long distance migration streams which contribute directly to central-city population change. Each parameter can be specified as a function of community-level attributes which are relevant to the explanation of specific in- and out-movement streams.

In this application, previously advanced racial and nonracial attributes of central cities and their surrounding suburbs are used to estimate framework parameters based on 1970 census data for white movement streams associated with the central cities of large SMSAs. These estimates are then used to ascertain the impact that the central-city racial composition exerts on net white out-migration from selected cities. The data demonstrate that the aggregate impact of racially linked "white flight" has been minimal.

1. INTRODUCTION

The task of specifying causal relationships between the attributes of a geographically delimited community and aggregate population change which takes place within its boundaries is fraught with a good deal of complexity. Aside from encountering the usual dilemma of having to select the most appropriate of many possible attributes as independent variables, the analyst is faced with a dependent variable which represents the composite of three very different demographic processes -- fertility, mortality, and net migration. In the analysis of central city population change, the latter component is clearly the most important of the three and, from an analytic standpoint, the most difficult to deal with.

The net migration that large central cities experience results both from streams of local movers changing residences between the city and its suburbs, and from streams of migrants arriving from and departing for places outside the immediate locale. The size of each stream is influenced by different sets of community attributes. Moreover, studies of individual movement behavior tell us that mover participation in a given stream is not strictly determined by a cost-benefit calculus which compares destination with origin community attributes. Rather, the decision to move and the choice of destination can be viewed as separate events -- each motivated by different sets of attributes (Brown and Moore, 1970; Speare, Goldstein and Frey, 1975). Given the complex of relationships among aggregate streams, movers' motivations, and community attributes which are associated with the city's net movement level, there is good reason that no investigation has yet uncovered specific community determinants of central city "white flight" -- or net out-movement of whites -- which has been affecting large American cities since the 1950s (Taeuber, 1972).

This paper represents a beginning step toward the causal analysis of white city population change as an application of the analytic migration framework we have advanced elsewhere (Frey, 1977a). The framework parameterizes analytically distinct components of local and long-distance movement streams which contribute directly to the size of the central city's population. Because each framework parameter can be specified as a function of community attributes relevant to the explanation of a particular stream, the framework can be used to estimate the aggregate impact of selected community attributes on central city population change.

In this application of the framework, we examine the effect that the central city's racial composition exerts on white city loss through the selective destination choices of white intrametropolitan movers and white in-migrants to the metropolitan area. We are able to control the analysis for other community attributes such as the city crime rate, per capita tax levels, and educational expenditures, which have been shown to influence the city-suburb destination choices of whites but are not related directly to race (Frey, 1977b). The study is based on aggregate-level data for 1965-70 movement streams in 39 large SMSAs (Standard Metropolitan Statistical Areas) reported in the 1970 U.S. Census (U.S. Bureau of the Census, 1973) and focuses on white population change in three of these SMSAs: Cleveland, Dayton, and Dallas. The sections of this paper that follow represent: a brief description of the analytic migration framework and its use in a causal analysis of city or suburb population change; (in 2); application of the framework to city white population change, 1965-70, in selected SMSAs; in (3); and a discussion of the framework's further use in the study of central city "white flight" (in 4).

2. Analytic Migration Framework

The framework was developed in order to analyze population change in both the city and suburbs of a metropolitan area through community determinants of movement streams that contribute directly to such change.[1] Because each contributing stream responds to different sets of community attributes, the framework can be used to assess the net-migration consequences of city, suburb, and metropolitan attributes which influence movement levels in one or more streams. The core of the framework consists of a series of stream-specific parameters which can be linked to two demographic accounting equations. Through this linkage, relationships can be specified between community attributes, stream movement levels, and aggregate population change in cities and suburbs.

2.1. The Framework Parameters

Each of the framework parameters are associated with one of the following movement streams:

I. Intrametropolitan City-to-Suburb or Suburb-to-City Mobility Streams

II. In-migration Streams to Cities or Suburbs from outside the SMSA[2]

III. Out-migration Streams from Cities or Suburbs to places outside the SMSA

The framework is based on the assumption that city and suburban population change are linked to population change at the metropolitan level and that the streams listed above represent all avenues whereby the city or suburb population is affected by movement within and from outside the metropolitan area. It is important to distinguish between intrametropolitan residential mobility streams streams (I) and migratory streams which cross metropolitan boundaries (II and III) because each differs in geographic scope, frequency of occurrence, and its response to community attributes. The former type of movement occurs more frequently as local residents repeatedly adjust dwelling units, neighborhoods, and communities according to life-cycle changes in residential preferences and constraints (Simmons, 1968). Migratory movement is motivated largely by economic and job-related considerations as well as other features that characterize the metropolitan area as a whole (Morrison, 1973). With one exception, the framework parameters associated with each stream represent rates which are applied to various "at risk" populations of residents and movers. These are listed in Figure 1.

Beginning with the intrametropolitan city-to-suburb stream (stream IA), the rate at which a city resident will move to the suburbs during an interval is defined as the product of the parameters i_c and $p_{c \to s}$. The separation of parameters is prompted by research which indicates that residential mobility results from two major stages of decision-making -- the decision to move (made by a resident) and the choice of destination (made by the mover), and that each stage is influenced by different causal factors. This has been demonstrated empirically in a national survey of moving behavior (Butler et al., 1969). Studies of individual mobility decision-making have found that the resident's decision to move is linked to factors associated with the household's life-cycle stage -- housing disequilibria that accompany changes in family size (Rossi, 1955), and general dissatisfaction with the dwelling unit, neighborhood or community as the needs of the family change (Speare, 1974). The choice of destination, however, more closely approximates a cost-benefit analysis wherein the mover evaluates the relative attributes of the origin, and various prospective destination sites (Speare, Goldstein and Frey, 1975).

Figure 1: Movement Streams and Associated Framework Parameters

IA - INTRAMETROPOLITAN CITY-TO-SUBURB MOBILITY

i_c MOBILITY INCIDENCE RATE OF CITY RESIDENTS
The rate at which city residents* move anywhere within the SMSA during an interval

$p_{c \to s}$ SUBURB DESTINATION PROPENSITY RATE OF CITY MOVERS
The rate at which city-origin movers relocate to a suburb destination during an interval

IB - INTRAMETROPOLITAN SUBURB-TO-CITY MOBILITY

i_s MOBILITY INCIDENCE RATE OF SUBURB RESIDENTS
The rate at which suburb residents* move anywhere within the SMSA during an interval

$p_{s \to c}$ CITY DESTINATION PROPENSITY RATE OF SUBURB MOVERS
The rate at which suburb-origin movers relocate to a city destination during an interval

IIA - IN-MIGRATION TO THE CITY FROM OUTSIDE THE SMSA

M_o MIGRATION INTO THE SMSA
Total number of migrants into the SMSA during an interval

$p_{o \to c}$ CITY DESTINATION PROPENSITY RATE OF IN-MIGRANTS
The rate at which SMSA In-Migrants relocate to a city destination during an interval

IIB - IN-MIGRATION TO THE SUBURBS FROM OUTSIDE THE SMSA

M_o MIGRATION INTO THE SMSA
Total number of migrants into the SMSA during an interval

$p_{o \to s}$ SUBURB DESTINATION PROPENSITY RATE OF IN-MIGRANTS
The rate at which SMSA In-Migrants relocate to a suburb destination during an interval

IIIA - OUT-MIGRATION FROM THE CITY TO OUTSIDE THE SMSA

$m_{c \to o}$ OUT-MIGRATION INCIDENCE RATE OF CITY RESIDENTS
The rate at which city residents migrate out of the SMSA during an interval

IIIB - OUT-MIGRATION FROM THE SUBURBS TO OUTSIDE THE SMSA

$m_{s \to o}$ OUT-MIGRATION INCIDENCE RATE OF SUBURB RESIDENTS
The rate at which suburb residents migrate out of the SMSA during an interval

*The mobility incidence rates are applied to residents who do not out-migrate from the SMSA during the interval.

Therefore, the i_c parameter denotes the rate at which a city resident will move anywhere within the SMSA, and the $p_{c \to s}$ parameter denotes the rate at which a city-origin mover will relocate in the suburbs. As will be demonstrated below, this distinction permits the analyst to causally relate different sets of community attributes to each stage of the mobility process. In a similar manner, the rate at which a suburban resident will move to the city (stream IB) is defined as the product of framework parameters i_s and $p_{s \to c}$. Hence:

Rate of City-to-Suburb Mobility for City Residents = $i_c \, p_{c \to s}$

Rate of Suburb-to-City Mobility for Suburb Residents = $i_s \, p_{s \to c}$

In-migration to the central city or suburbs from outside the SMSA (streams IIA and IIB) is also seen to be the product of two framework parameters. For each stream, the number of in-migrants rather than the rate of in-migration is specified. In-migrants to the central city are defined as the product of parameters M_o and $p_{o \to c}$. M_o denotes the number of in-migrants to the SMSA as a whole,[3] and $p_{o \to c}$ denotes the rate at which SMSA in-migrants locate in the central city. This separation of parameters is justified on the basis of findings that long-distance migrants are initially attracted to metropolitan-wide economic or labor market attributes (Lansing and Mueller, 1967; Saben, 1964). The choice of city or suburb residential location within the metropolitan area then becomes a secondary decision for SMSA in-migrants which is made on the basis of different sets of factors. Hence:

Number of SMSA In-migrants to the City = $M_o \, p_{o \to c}$

Number of SMSA In-migrants to the Suburbs = $M_o \, p_{o \to s}$

where $p_{o \to s} = 1.0 - p_{o \to c}$

Finally only one framework parameter is associated with out-migration streams from metropolitan cities and suburbs (streams IIIA and IIIB). These are denoted as follows:

Rate of SMSA Out-migration for City residents = $m_{o \to c}$

Rate of SMSA Out-migration for Suburb residents = $m_{o \to s}$

In sum, the redistribution of movers and in-migrants across an SMSA's city and suburbs might be viewed as an allocation of three "pools" of movers: city residential movers, suburb residential movers, and SMSA in-migrants. The sizes of the first two pools are determined by the mobility incidence parameters, i_c and i_s, respectively. The size of the third pool is specified by component M_o. The city-suburb allocation of movers in each pool is then determined by destination propensity rates of movers: $p_{c \to s}$ for city movers, $p_{s \to c}$ for suburb movers, and $p_{o \to c}$, $p_{o \to s}$ for SMSA in-migrants. Total out-movement from cities and suburbs represents: first, SMSA out-migration which is determined by the $m_{o \to c}$ and $m_{o \to s}$ parameters and second, the out-residential mobility resulting from the intrametropolitan allocation process just described. This parameterization of stream movement enables the investigator to evaluate the effects of different community attributes on analytically distinct stages of mobility processes which contribute to city and suburb demographic change.

2.2. The Demographic Accounting Equations

The framework parameters are linked to two demographic accounting equations which allow their effects to be translated into aggregate changes in city and suburb population sizes during an interval.[4] If one begins with P_c^t, the city population at time t, and P_s^t, the suburb population at time t, it is possible to compute the city and suburb populations of age n and over at time t+n using the following relationships.

$$P_{c*}^{t+n} = sP_c^t - sP_c^t m_{c\to o} - s(P_c^t - P_c^t m_{c\to o}) i_c p_{c\to s} + s(P_s^t - P_s^t m_{s\to o}) i_s p_{s\to c} + sM_o p_{o\to c} \quad (1)$$

$$P_{s*}^{t+n} = sP_s^t - sP_s^t m_{s\to o} - s(P_s^t - P_s^t m_{s\to o}) i_s p_{s\to c} + s(P_c^t - P_c^t m_{c\to o}) i_c p_{c\to s} + sM_o p_{o\to s} \quad (2)$$

where:

P_{c*}^{t+n} = city population age n and over at time t+n

P_{s*}^{t+n} = suburb population age n and over at time t+n

P_c^t = city population at time t

P_s^t = suburb population at time t

s = survival rate specific to each mover, migrant, or nonmover population

$m_{c\to o}$ = out-migration incidence rate of city residents between t and t+n

$m_{s\to o}$ = out-migration incidence rate of suburb residents between t and t+n

i_c = mobility incidence rate of city residents between t and t+n

i_s = mobility incidence rate of suburb residents between t and t+n

$p_{c\to s}$ = suburb destination propensity rate of city-origin movers between t and t+n

$p_{s\to c}$ = city destination propensity rate of suburb-origin movers between t and t+n

M_o = number of in-migrants to the SMSA between t and t+n who were alive at time t

$p_{o\to c}$ = city destination propensity rate of SMSA in-migrants between t and t+n

$p_{o\to s}$ = suburb destination propensity rate of SMSA in-migrants between t and t+n

For simplicity of exposition, we have not designated separate survival rates (s) for residential movers, migrants, and nonmovers, although we assume that each will survive at different rates over the interval.

Given appropriate information on births occurring to the various nonmover, mover stream, and migrant stream populations between t and t+n, and associated survival rates for those births, the following equations can be specified:

$$P_c^{t+n} = P_{c*}^{t+n} + s_b B_c \qquad (3)$$

$$P_s^{t+n} = P_{s*}^{t+n} + s_b B_s \qquad (4)$$

where:

P_c^{t+n} = city population at time t+n

P_s^{t+n} = suburb population at time t+n

B_c = number of births occuring to city nonmovers, suburb-to-city movers and SMSA in-migrants to the city between t and t+n

B_s = number of births occuring to suburb nonmovers, city-to-suburb movers and SMSA in-migrants to the suburbs between t and t+n

s_b = rate at which babies born between t and t+n survive to time t+n

However, the application below will disregard births during the interval and will be restricted to the simpler problem of estimating the size of the city population age n and over at time t+n.

Relationships (1) and (2) have been fully expanded so that each term on the right-hand side represents the contribution of a different movement stream. The first term in each equation is equivalent to the t+n population under the assumption that no movement takes place over the course of the interval. From this, the out-migrant stream and stream of movers to the opposite SMSA part are subtracted. The last two terms represent the addition of in-movers from the opposite SMSA part and in-migrants from outside the SMSA, respectively.

It should also be observed that a definite movement stream hierarchy is assumed in relationships (1) and (2). The total city and suburb population at time t (P_c^t and P_s^t) comprise the respective resident populations "at risk" for SMSA out-migration rates $m_{c \to o}$ and $m_{s \to o}$. Residential movement within the SMSA during an interval is assumed to be conditional on not out-migrating during the interval. Hence, the resident populations "at risk" for the mobility incidence rates, i_c and i_s, are represented as $(P_c^t - P_c^t m_{c \to o})$ and $(P_s^t - P_s^t m_{s \to o})$, respectively. This assumption is based on the contention that a residential move is not substitutable for a migratory move, should the opportunity for the latter arise.

2.3. Causal Analysis of Aggregate Population Change

By employing equations (1) and (2), the migration framework can be used to relate community attributes to aggregate population change in central cities and suburbs. The key mechanisms for the analysis are the framework parameters which are assumed to be causally related to various attributes. More specifically, each framework parameter can be expressed as a function of a number of community attributes which serve as independent variables. For example:

$$i_c = f\ (X_j)$$

where X_j denotes one of k community attributes which are related to the residential mobility incidence rate of city residents.

The other framework parameters can be specified as functions of the same or different attributes, and in an analysis of population subgroups disaggregated by age, race, etc., different functional relationships can be specified for each subgroup-specific framework parameter. The form of the functions specified and the techniques used to estimate them are matters which the analyst will need to decide upon. In the "white flight" application below, additive relationships are estimated from linear regression analyses of framework parameters in a cross-section of metropolitan areas.

After the framework parameters have been specified as functions of relevant community attributes,[5] the equations above can be used to assess the aggregate impact of an attribute (or combination of attributes) on population change in an individual city or suburb during an interval t, t+n.

If, for example, the framework parameter $p_{c \to s}$ was specified as follows:

$$p_{c \to s} = u + a_1 y_1 + a_2 y_2 \ \ldots . + a_j y_j \ \ldots . + a_k y_k$$

where: y_j = one of k community attributes which is related to the suburb destination propensity rate of city-origin movers between t and t+n

u = constant term

the aggregate impact for city or suburb population change of any value

Y_j for attribute y_j can be assessed. According to equation (1) any value Z of framework parameter $p_{c \to s}$ changes the size of the city population age n and over at t+n by:

$$- s(P_c^t - P_c^t m_{o \to c}) i_c Z$$

Hence, the functional relationship specified above indicates that value Y_j for attribute y_j will change the city population size by:

$$- s(P_c^t - P_c^t m_{c \to o}) i_c (a_j Y_j)$$

Using equations (2) and (4), it can be demonstrated that the suburb population size age n and over at t+n will be changed by:

$$+ s(P_c^t - P_c^t m_{c \to o}) i_c (a_j Y_j)$$

In this example, it was assumed that attribute y_j affects only one framework parameter ($p_{c \to s}$). In most actual applications, it is likely that a given community attribute will be related to several framework parameters. In these instances, the overall levels and directions of their effects on city or suburb population size will represent the net of their effects through each related parameter.

3. Application to Central City "White Flight"

We now turn our attention to applying the analytic framework to the analysis of central city white flight. More specifically, we are interested in ascertaining the extent to which the city's racial composition influences aggregate white loss due to the selective suburban relocation of residential (intrametropolitan) movers, and the suburban destination choices of in-migrants to the metropolitan area.

The motivation for this investigation draws from an earlier study we had undertaken to assess the relative importance of both racial and non-racial influences on recent white city-to-suburb movement in large SMSAs (Frey, 1977b). Based on a cross-sectional analysis of movement streams in 39 SMSAs during the 1965-70 period, our findings indicated that racial influences did not predominate. Significant racial desegregation in central city schools and the occurrence of racial disturbances during the period contributed little to the explanation of city-to-suburb white flight, while ecological features of the SMSA and city-suburb fiscal disparities proved to be important determinants. One racial factor -- the percent of the central city population which was Black -- did influence white out-movement, particularly in non-Southern cities, and prevented us from dismissing racial factors completely as flight determinants.

Although this study provided insights into the causes of recent white flight via the city-to-suburb stream and into the fairly minimal role that racial influences seem to play in its explanation, the investigation was limited in two respects. First, it focused on only one of the streams leading to white net out-movement and did not deal with racial viz. non-racial influences on white streams leading into the central city. Second, the study did not attempt to show what each stream determinant implied for aggregate changes in the city's white population. It is possible to address each of these issues using the analytic framework. In the analysis below we shall estimate the incremental change to the city's white population that can be attributed to the racial factor, percent city Black, as it affects the destination choices of white movers in the various streams.

This analysis represents a somewhat restricted application of the framework in the sense that community attributes will only be assessed as determinants of the destination propensity parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$. In terms of the problem at hand, this means that we are concerned with evaluating the racial influence on city-suburb choices of white city-origin movers, suburb-origin movers, and in-migrants to the SMSA, and the impact this influence exerts on aggregate central city white population loss. This focus on the destination propensity parameters only can be justified on the basis of our earlier finding that the racial factor, percent city Black, influences white city-to-suburb movement primarily through the city-suburb destination choices of city-origin movers, and only minimally through the mobility incidence of city residents (denoted by framework parameter i_c) (Frey, 1977b). It is also consistent with the above cited studies of residential mobility motivations which indicate that the decision to move is affected less by "white flight" considerations than by the family's need to make housing adjustments coincident with changes in its size and composition.

Similarly, the framework parameters M_o, $m_{o \to c}$, and $m_{o \to s}$ for whites are not likely to be influenced by the central city's racial composition because migration into and out of the SMSA generally responds to metropolitan-wide labor market "pushes" and "pulls." To the extent that white in-migrant behavior is affected by the Black composition of the central core, it will be through the $p_{o \to c}$ framework parameter. In the analysis that follows, therefore, parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ will be estimated as functions of community attributes, while the parameters i_c, i_s, M_o, $m_{o \to c}$, and $m_{o \to s}$ will be treated as "given" and assigned their actual values.

One further restriction will be the focus only on movement-induced changes to the size of the white city population, thus disregarding the effects of fertility and mortality on aggregate change. The analysis concentrates on the city-suburb residence patterns of white individuals who are alive at both the beginning and end of the movement interval n, and will utilize equation (1) to examine how these patterns affect the size of the city's white population age n and over at t+n.

3.1 The Data

The data for the investigation are taken from the U. S. Census subject report Mobility in Metropolitan Areas (U.S. Bureau of the Census, 1973) which classifies 1970 residents of cities and suburbs of the 65 largest SMSAs according to their 1965 residence locations, and from which it is possible to compute white (nonBlack) population and framework parameters for the 1965-70 interval that are necessary to pursue this analysis. These data will be used for two purposes: (a) to specify framework parameters $p_{c\to s}$, $p_{s\to o}$, and $p_{o\to c}$ as functions of community attributes; and (b) to calculate the increment to white city population change in selected SMSAs that can be attributed to the community attribute, percent city Black.

Specification of the destination propensity rates as functions of community attributes will be accomplished in cross-sectional multiple regression analyses, using as cases, the 39 SMSAs which were examined in the earlier study. These represent a subset of the 65 largest SMSAs in 1970 which had a mononuclear city and were not excluded according to the following criteria: large proportions of the male labor force in the armed forces, where insufficient migration or community attribute information was unavailable; or where extensive boundary changes took place between 1965-70.[6] For each SMSA, the destination propensity parameters for the white (nonBlack) population are computed as follows:

$$p_{c\to s} = \frac{\text{(1965-70 city-to-suburb movers)}}{\text{(1965-70 city-to-suburb movers + 1965-70 within-city movers)}}$$

$$p_{s\to c} = \frac{\text{(1965-70 suburb-to-city movers)}}{\text{(1965-70 suburb-to-city movers + 1965-70 within-suburb movers)}}$$

$$p_{o\to c} = \frac{\text{(1965-70 SMSA in-migrants to the city)}}{\text{(1965-70 SMSA in-migrants to the city + 1965-70 SMSA in-migrants to the suburbs)}}$$

where 1965-70 mobility status is determined from respondent's answers to the 1970 Census question on residence 5 years ago

These parameters for the 39 SMSAs are regressed on several community attributes (presented below) in order to estimate the functional relationships used in the analysis.

In order to calculate incremental white population change in selected SMSAs that is associated with different values of $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ using equation (1), it is necessary to obtain actual values for the remaining framework and population parameters in that equation. These can also be computed from the 1970 Census subject report, although for this purpose it is useful to rearrange the terms of equation (1):

$$P^{t+n}_{c*} = s(P^t_c - P_c m^t_{c\to o}) - s(P^t_c - P^t_c m_{c\to o}) i_c p_{c\to s} + s(P^t_s - P^t_s m_{s\to o}) i_s p_{s\to c} + sM_o p_{o\to c} \qquad (1a)$$

where t=1965, n=5, and s represents the appropriate survival rate for each mover, migrant, or nonmover group.[7]

The values for the following expressions can then be obtained for selected SMSAs from the Census:

$s(P^t_c - P^t_c m_{c\to o})$ = 1965-70 nonmobile city population
+1965-70 city-to-suburb movers
+1965-70 within city movers

$$s(P_c^t - P_c^t m_{c-o})i_c = \text{1965-70 city-to-suburb movers + 1965-70 within-city movers}$$

$$s(P_s^t - P_s^t m_{s-o})i_s = \text{1965-70 suburb-to-city movers + 1965-70 within-suburb movers}$$

$$sM_o = \text{1965-70 SMSA in-migrants to the city}$$
$$+ \text{ 1965-70 SMSA in-migrants to the suburbs}$$

In the remainder of this section, we present the results of our analyses in, first, specifying the destination propensity parameters as functions of community attributes, and second, determining the aggregate impact of racially-induced flight on the white populations of selected central cities.

3.2. <u>Specifying Framework Parameters as Functions of Community Attributes</u>

The community attributes that are used to estimate destination propensity parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ constitute those racial and nonracial attributes which proved to be the most important determinants of white city-to-suburb movement in our earlier study (Frey, 1977b). These attributes, their abbreviations, and a brief description of each are listed below.[8]

Percent City Black (BLK): Percent of the city population which is Black

City Share of SMSA Population (CIT): Percent of SMSA population which resides in the city

Suburb/City Educational Expenditures Per Capita (EDX): Ratio of Suburb Educational Expenditures Per Capita to City Educational Expenditures Per Capita (x 100)

Suburb/City Tax Revenues Per Capita (TAX): Ratio of Suburb Tax Revenues Per Capita to City Tax Revenues Per Capita (x 100)

City Crime Rate (CRM): Number of Serious Crimes Reported Per 10000 City Population

Postwar Suburban Development (PSD): Percent of 1970 suburb year-round housing units built after 1950

City-Suburb Commuters (CMT): Percent of city workers that report a suburb workplace

Central City Age (CTA): The number of years between the census year when the city first attained a population of 50,000 and the year 1970

Southern Region (SRG): A dummy variable which indicates a city's location in the Southern Region as defined by the Census Bureau; Southern Region cities = 1, Other cities = 0.

Southern Region and Percent City Black (SxB): An interaction term which denotes the Percent City Black (BLK) for Southern cities and a 0 value for all other cities

The sole racial factor, Percent City Black, is intended to serve as a measure of the degree to which whites experience contact with Blacks in the central city. In preliminary analyses, we attempted to refine this concept by including, as well, an index of central city racial segregation at the block level. However, this index added little to the explanation and was deleted for reasons of parsimony. The City Share of the SMSA population can be viewed as an indicator of the relative number of potential destinations for movers that exists in the city viz. the suburbs. Central cities which make up a large share of the total metropolitan population lose fewer movers to, and gain more movers from their suburbs, than is the case for cities which comprise a smaller proportion of the SMSA population at the beginning of the movement interval. The two fiscal variables, Suburb/City Educational Expenditures Per Capita and Suburb/City Tax Revenues Per Capita, measure expenditure and tax-level disparities between the central city and its suburbs. It is expected that the former will be positively related, and the latter negatively related to movers' suburban relocations. The City Crime rate, often cited as a central city "push," is expected to be associated with the suburban destination choices of movers.

The variable, Postwar Suburban Development, is not intended as a measure of suburban housing construction per se but is viewed as a broad ecological indicator of recent suburban growth which has characterized many newer, low density SMSAs of the West and South during the 1960s. In the previous study, this factor was highly associated with the suburban destination selectivity of white city movers. The percent of city workers that commute to the suburbs (CMT) serves as an indicator of recent employment decentralization. To the extent that movers choose destinations on the basis of workplace location, it is expected to be positively related to suburbanward relocation.

Finally, we incorporate two structural features of the SMSA into the analysis: central city age and location in the Southern region. All other factors being equal, old cities -- by virtue of their aging housing stock and high density levels -- are expected to be less attractive as destinations for movers than are their suburbs. In the previous study, Southern Region interacted with Percent City Black in a manner which suggests that the "white flight" impact of a city's racial composition is most pronounced in nonSouthern SMSAs. In the present analysis we include an interaction term (SxB) in order to capture this effect.

We now proceed to specify the framework parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ as functions of the community attributes just presented in separate regression analyses. Each parameter is regressed on all of the attributes for the 39 SMSAs that form the basis of this investigation. The resulting equations appear as follows:

$$p_{c \to s} = +.3164 + .0024\ BLK - .0076\ CIT + .0008\ EDX - .0012\ TAX + .0003\ CRM + .0038\ PSD + .0024\ CMT + .0006\ CTA + .0411\ SRG - .0006\ SxB \quad (5)$$

$R^2 = .92$

$$p_{s \to c} = +.0671 - .0004\ BLK + .0059\ CIT + .0003\ EDX - .0007\ TAX - .0008\ CRM - .0013\ PSD + .0027\ CMT - .0012\ CTA - .0492\ SRG + .0019\ SxB \quad (6)$$

$R^2 = .84$

$$p_{o \to c} = +.0249 - .0038\ BLK + .0113\ CIT + .0004\ EDX - .0012\ TAX + .0001\ CRM - .0018\ PSD + .0036\ CMT - .0007\ CTA - .0606\ SRG + .0029\ SxB \quad (7)$$

$R^2 = .93$

It is difficult to evaluate the relative importance of each attribute from the unstandardized coefficients presented here. It is, nevertheless, apparent that the percent city Black increases the suburb propensity of city movers and decreases the city propensity of suburb movers and SMSA in-migrants. Each of these effects is greatly moderated in Southern cities. The effects for each of the remaining factors lie in expected directions for the $p_{c \to s}$ parameter. However, in the equations for $p_{s \to c}$ and $p_{o \to c}$, unexpected effects are evident for the fiscal disparity variables and for CMT.

3.3. The Aggregate Impact on White City Loss

We now proceed to ascertain the aggregate impact on white city loss which can be attributed to the city's racial composition as it affects the destination choices of white residential movers and SMSA in-migrants. This aggregate impact will be assessed in three SMSAs: Cleveland, Dayton, and Dallas. Each of these had a fairly sizeable percentage of Blacks in the central city at the beginning of the migration interval: 33% for Cleveland, 26% for Dayton, and 22 % for Dallas. Yet there are significant demographic differences among the three. Both Cleveland and Dallas were among the largest 16 SMSAs in 1970, the former with a total population over 2 million and the latter greater than 1.5 million. In contrast, Dayton ranked 39th among SMSAs and contained a central city population that was less than one-third of that in either Cleveland or Dayton. With regard to white central city loss, however, Cleveland and Dayton -- two older, Northern SMSAs -- are most similar. During the 1960s, the central cities of Cleveland and Dayton registered net migration rates for whites of -23.9 and -20.6, respectively. The corresponding rate for Dallas -- a newer Southern SMSA -- was a positive 8.0.

Presented in Table 1 are the 1965-70 population and framework parameters for Cleveland, Dayton, and Dallas which are necessary to estimate P_{c*}^{1970} for each city using equation (1a). The values for parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ are estimated from equations (5),(6), and (7) based on actual values for the community attributes shown in Table 2. The values for the remaining framework and population parameters were computed from actual mobility and population data for the SMSAs reported in the 1970 census.

Table 1: Population and Framework Parameters for the 1965-70 Interval[a] Used as Inputs to Equation (1a).
Equation (1a)

SMSAs	$s(P_c^{1965} - P_c^{1965}\ m_{c\to o})$	$s(P_c^{1965} - P_c^{1965}\ m_{c\to o})i$	$p_{c\to s}$	$s(P_s^{1965} - P_s^{1965}\ m_{s\to o})i_c$	$p_{s\to c}$	sM_o	$p_{o\to c}$
Cleveland	435015	195720	.422	261724	.101	141307	.228
Dayton	167571	89756	.507	120206	.080	101326	.189
Dallas	445161	204591	.342	158816	.214	261200	.453

[a] Framework parameters $p_{c\to o}$, $p_{s\to c}$, and $p_{o\to c}$ are estimated from equations (5) (6) and (7) in the text based on actual community attributes (in Table 2). The other population and framework parameters are computed from the 1970 Census subject report Mobility in Metropolitan Areas (U. S. Bureau of the Census, 1973).

Table 2: Community Attributes used to Estimate Framework Parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ for 1965-70 Interval in Cleveland, Dayton, and Dallas SMSAs

Community Attributes[a]	Cleveland	Dayton	Dallas
BLK	33.1	26.0	22.3
CIT	41.0	32.1	57.0
EDX	92.9	103.6	109.9
TAX	77.7	54.2	50.7
CRM	59.3	66.1	59.7
PSD	58.8	62.4	71.3
CMT	23.9	21.7	10.9
CTA	100.0	80.0	60.0
SRG	0.0	0.0	1.0
SxB	0.0	0.0	22.3

[a]Full definitions of these attributes appear in the text.

We might make note of variation across SMSAs on the three destination propensity rates. In each case, Dallas and Dayton represent the extremes. Dallas displays the lowest value of the three SMSAs for $p_{c \to s}$ and the highest values for $p_{s \to c}$ and $p_{o \to c}$. The Dayton pattern is the reverse. A large part of this variation can be explained by differences in the share of each SMSA's population which resides in the central city. As shown in Table 2, the Dallas central city comprises 57 percent of the SMSA population, while the Dayton share of its SMSA is only 32 percent. If one interprets the City Share of the SMSA Population (CIT) as a measure of the available destinations in the city viz. the suburbs, its relevance to the parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ is apparent. The importance of this factor is made explicit in equations (5), (6), and (7).

Despite these variations in rates, we are interested in the additional impact exerted by the central city's racial composition on white population change in each of the three cities. To assess this impact, the following strategy will be taken: First, we compute hypothetical values for Percent City Black that would result from assumed increases or decreases in the existing Black population. Second, we compute parameters $p_{c \to s}$, $p_{s \to c}$, $p_{o \to c}$ from the actual and hypothetical values of BLK using equations (5), (6), and (7). Third, we compute 1970 white city population figures (P_{c*}^{1970}) based on actual and hypothetical values of $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ using demographic accounting equation (1a). The latter figures will allow us to compare the aggregate changes to each city's white population which would have resulted from different racial mixes in the city at the beginning of the movement interval.

The results of this analysis appear in Table 3. For each of the three SMSAs, BLK values are computed on the basis of the actual number or an assumed number of city Blacks where: A = the actual number of Blacks, B = a 50 percent increase in the actual number, C = a 25 percent increase in the actual number, D = a 25 percent decrease in the actual number, and E = a 50 percent decrease in the actual number.[9] The corresponding values of BLK are shown in Column (1). These are then used to estimate the destination propensity parameters in columns (2) through (4). The final three columns display results of the computations using the demographic accounting equation (1a): the white city population age 5 and over (column 5), the difference from the actual total (column 6), and the percent difference from the actual total (column 7).

As our review of equations (5), (6), and (7) suggested, an increase in the Percent City Black is associated with a net decrease in the white population. Yet the level of impact resulting from drastic changes in city racial composition is not substantial in any of the three cities. This effect is extremely small in Dallas -- resulting in part from the lesser influence of Percent City Black in Southern SMSAs.

One finding which may appear surprising at first glance is the greater demographic impact which BLK exerts on Dayton's city population than on Cleveland's city population. Since the actual 1965 Percent City Black is

Table 3: The Effects of Actual and Hypothetical Values of Percent City Black on Migration Framework Parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ during the 1965-70 Interval, and on the 1970 City White Population Age 5 and over, in Cleveland, Dayton, and Dallas SMSAs.

Assumed Number of City Blacks:	BLK Value[a] (1)	1965-70 Parameter Values[b] $p_{c \to s}$ (2)	$p_{s \to c}$ (3)	$p_{o \to c}$ (4)	1970 City White Population Age 5 and Over: Population Size[c] (5)	Difference from (A) (6)	Pct Difference from (A) (7)
Cleveland SMSA							
A. Actual Number	33.1	.422	.101	.228	411153	--	--
B. Increase by 50%	42.6	.445	.098	.192	400701	-10452	-2.5
C. Increase by 25%	38.2	.435	.099	.209	405528	- 5625	-1.4
D. Decrease by 25%	27.1	.408	.104	.251	417794	+ 6641	+1.6
E. Decrease by 50%	19.8	.391	.106	.279	425751	+14598	+3.5
Dayton SMSA							
A. Actual Number	26.0	.507	.080	.189	150777	--	--
B. Increase by 50%	34.5	.528	.076	.157	145304	- 5473	-3.6
C. Increase by 25%	30.5	.518	.078	.172	147874	- 2903	-1.9
D. Decrease by 25%	20.8	.495	.082	.209	154084	+ 3307	+2.2
E. Decrease by 50%	14.9	.481	.084	.231	157884	+ 7107	+4.7
Dallas SMSA							
A. Actual Number	22.3	.342	.214	.453	527378	--	--
B. Increase by 50%	30.1	.356	.225	.446	524619	- 2759	-0.5
C. Increase by 25%	26.4	.349	.220	.449	525925	- 1453	-0.3
D. Decrease by 25%	17.7	.334	.207	.457	529001	+ 1623	+0.3
E. Decrease by 50%	12.5	.324	.199	.461	530828	+ 3450	+0.7

[a] BLK is computed for each assumed number of city Blacks in 1965 as:
$$\frac{\text{(assumed number of 1965 city Blacks)}}{\text{(assumed number of 1965 city Blacks + actual number of 1965 city whites)}} \times 100$$

[b] Computed from equations (5), (6), and (7) based on column (1) value of BLK and the actual values of CIT, EDX, TAX, CRM, PSD, CMT, CTA, SRG, and SxB which appear in Table 2.

[c] Computed from equation (1a), based on values of $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ in columns (2), (3), and (4) and on actual values for the other framework parameters which appear in Table 1.

higher in Cleveland (33.1 percent as opposed to 26 percent in Dayton), its effect on white city loss might be expected to be greater. The explanation for this discrepancy lies with the fact that movement-induced demographic change in central cities depends on all framework parameters and the sizes of resident populations at the beginning of the interval. Although BLK exerts as great of an impact on the destination propensity parameters in Cleveland as in Dayton, the latter SMSA has larger pools of residential movers and SMSA in-migrants to be distributed between its cities and suburbs. Hence, the BLK effects on Dayton's $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ parameters are magnified.

Table 4 provides further insights into the influence that Percent City Black exerts on stream-specific components of white city loss. Here, the total impact of BLK on aggregate white population change is decomposed into that which can be attributed to each of the three destination propensity parameters, $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$. In a somewhat surprising finding, the data for Cleveland and Dayton indicate that racial influences on the destination choices of white SMSA in-migrants contribute to greater city losses than do racial influences on white intrametropolitan movers. This is not the case in Dallas where the impact of race through all three destination propensity parameters is small. The change figures in this table also point up the relatively small aggregate impact on the cities' white population which can be attributed to racial influences on the destination choices of suburb-origin movers.

Table 4: Percent Differences from Actual 1970 City White Population Age 5 And Over that can be attributed to Framework Parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ Assuming Hypothetical Values for Percent City Black. Cleveland, Dayton, and Dallas SMSAs.

Blk Value	Percent Diff. from Actual 1970 City White Population Age 5 and Over that can be attributed to:			
	$p_{c \to s}$ [a]	$p_{s \to c}$ [b]	$p_{o \to c}$ [c]	Total[d]
Cleveland SMSA				
42.6%	-1.1	-0.2	-1.2	-2.5
38.2%	-0.6	-0.1	-0.7	-1.4
27.1%	+0.7	+0.1	+0.8	+1.6
19.8%	+1.5	+0.3	+1.7	+3.5
Dayton SMSA				
34.5%	-1.2	-0.3	-2.1	-3.6
30.5%	-0.6	-0.1	-1.2	-1.9
20.8%	+0.7	+0.2	+1.3	+2.2
14.9%	+1.6	+0.3	+2.8	+4.7
Dallas SMSA				
30.1%	-0.5	+0.3	-0.3	-0.5
26.4%	-0.3	+0.2	-0.2	-0.3
17.7%	+0.3	-0.2	+0.2	+0.3
12.5%	+0.7	-0.4	+0.4	+0.7

[a] Assumes hypothetical parameter values for $p_{c \to s}$ shown in Table 3 and values for other framework parameters shown in Table 1.

[b] Assumes hypothetical parameter values for $p_{s \to c}$ shown in Table 3 and values for other framework parameters shown in Table 1.

[c] Assumes hypothetical parameter values for $p_{o \to c}$ shown in Table 3 and values for other framework parameters shown in Table 1.

[d] Assumes hypothetical parameter values for $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ shown in Table 3 (same as column 7 of Table 3).

Finally, we present Table 5 which examines the aggregate white city loss that can be linked to the City Crime Rate's influence on the destination choices of local movers and in-migrants. This analysis is undertaken to serve as a point of comparison to the examination above. According to the figures presented in column (7), crime rates both 25 and 50 percent lower than actual values are associated with only slight changes in the white city populations for each of the three SMSAs. Moreover, the effects on white movers' destination selections of a 25 percent decrease in the crime rate coupled with a 25 percent decrease in the number of city Blacks would have resulted in only a 3.3 percent increase in Dayton's city population, a 2.4 increase in Cleveland's city population, and an 0.7 increase in the central city population of the Dallas SMSA. Clearly, the aggregate "flight" impact of both the central city racial composition and the city crime rate -- as transmitted through the destination choices of local movers and in-migrants -- is slight over a five-year migration interval.

Table 5: The Effects of Actual and Hypothetical Central City Crime Rates on Migration Framework Parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ during the 1965-70 Interval, and on the 1970 City White Population Age 5 and over, in Cleveland, Dayton, and Dallas SMSAs

Assumed Central City Crime Rate:	CRM Value[a] (1)	1965-70 Parameter Values[b] $p_{c \to s}$ (2)	$p_{s \to c}$ (3)	$p_{o \to c}$ (4)	1970 City White Population Age 5 and Over: Population Size[c] (5)	Difference from (A) (6)	Pct Difference from (A) (7)
Cleveland SMSA							
A. Actual	59.3	.422	.101	.228	411153	--	--
B. Decrease by 25%	44.5	.418	.113	.226	414585	+ 3432	+0.8
C. Decrease by 50%	29.7	.414	.124	.224	418016	+ 6863	+1.7
D. Decrease by 25% <u>and</u> Decrease City Blacks by 25% (BLK=27.1)	44.5	.404	.115	.249	421225	+10072	+2.4
Dayton SMSA							
A. Actual	66.1	.507	.080	.189	150777	--	--
B. Decrease by 25%	49.6	.503	.092	.187	152449	+ 1672	+1.1
C. Decrease by 50%	33.1	.498	.104	.185	154120	+ 3343	+2.2
D. Decrease by 25% <u>and</u> Decrease City Blacks by 25% (BLK=20.8)	49.6	.491	.094	.206	155755	+ 4978	+3.3
Dallas SMSA							
A. Actual	59.7	.342	.214	.453	527378	--	--
B. Decrease by 25%	44.8	.337	.225	.450	529469	+ 2086	+0.4
C. Decrease by 50%	29.8	.333	.236	.448	531551	+ 4173	+0.8
D. Decrease by 25% <u>and</u> Decrease City Blacks by 25% (BLK=17.7)	44.8	.329	.218	.454	531088	+ 3710	+0.7

[a] CRM is computed for each assumed central city crime rate.

[b] Computed from equations (5), (6), and (7) based on assumed values of CRM and BLK and the actual values of CIT, EDX, TAX, PSD, CMT, CTA, SRG, and SxB which appear in Table 2.

[c] Computed from equation (1a), based on values of $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ in columns (2), (3), and (4) and on actual values for the other framework parameters which appear in Table 1.

4. Further Use of the Framework in "White Flight" Research

The investigation undertaken here represents an initial step toward a causal analysis of white central city population change utilizing the analytic migration framework. This framework, which we have described in more detail elsewhere (Frey, 1977a), allows the researcher to identify city, suburb, and metropolitan determinants of movement streams which contribute directly to population change in the central city. Using the framework in conjunction with readily available census data, it is possible to calculate incremental changes in a city's population associated with specific community attributes that serve as determinants of one or more movement streams. In this manner, the framework can be employed to establish causal relationships between community attributes, stream movement levels, and aggregate population change in the central city, over the course of a migration interval.

In the present application, we focused our attention on one causal attribute -- city racial composition -- as it affects white central city change through the selective destination choices of white intrametropolitan movers, and white in-migrants to the metropolitan area. Based on aggregate movement data from selected large SMSAs, our findings indicate that such effects were minimal over the 1965-70 interval. Hence, not only does the city's racial composition play a relatively minor role in explaining white movement from the city to the suburbs (Frey, 1977b), but the total impact of its influence on aggregate white city loss seems also to be exceedingly small, at least in the short-run.

Although restricted in its focus to one causal attribute and three framework parameters, this application of the analytic framework serves to illustrate its utility in an investigation of central city "white flight" determinants. In future reports, we plan to extend the causal analysis of white population loss beyond this restrictive focus in order to incorporate a greater number of community attributes as causal factors, and to provide a more refined assessment of "flight" consequences for central city change. These more extended analyses will include:

1. Specification of <u>all</u> Framework Parameters as Functions of Community Attributes -- In the present analysis, we specify the destination propensity parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ as functions of community attributes while treating the remaining framework parameters (i_c, i_s, M_o, $m_{o \to c}$, and $m_{o \to s}$) as "given." This strategy makes sense for evaluating city racial composition as a causal attribute leading to white city loss, because the effects of a city's racial composition on white movement streams are transmitted primarily through the selective destination choices of movers and in-migrants. This strategy is less prudent when other community attributes are being evaluated as flight determinants. For example, the proportion of household-owned dwelling units in a central city not only influences the destination selections of movers and in-migrants, but affects as well the incidence of mobility among central city residents (i_c). Likewise, metropolitan-wide labor market attributes will largely influence parameters M_o, $m_{o \to c}$, and $m_{o \to s}$. In an analysis which attempts to evaluate the relative effects of a wide variety of causal attributes on white city loss, it is necessary to specify each framework parameter as a function of relevant attributes.

2. Disaggregation into Population Subgroups -- The present analysis focuses exclusively on the total population of whites. Therefore, all

population and framework components that were estimated or obtained for use in the demographic accounting equation (1a) refer to the total white population. In a more extensive causal analysis of white population loss, it is desirable to disaggregate the total population into analytically relevant subpopulations (e.g., by income class). This disaggregation allows the framework components of each subgroup to be specified, separately, as functions of community attributes. For example, destination choices of high income white residential movers represent a response to different community attributes than those of low income white movers. A disaggregated analysis would allow the framework parameters $p_{c \to s}$, $p_{s \to c}$, and $p_{o \to c}$ to be specified differently for each income class of the white population. Another reason to disaggregate the analysis would be to identify the determinants of central city compositional change in addition to those of aggregate population change. The disaggregated analysis employs the demographic accounting equation (1) separately for each subgroup in order to ascertain the overall impact of various community attributes for changes in the white city population's composition (e.g., in terms of income class distribution) in addition to changes in its size.

3. Compute Short-term Projections for White City Populations -- The present causal analysis is restricted in its focus to movement-induced white city loss over the single interval 1965-70. It is possible to modify demographic accounting equations (1) through (4) in order to produce short-term projections over a number of intervals for the white city population.[10] These projections will be based on assumed future changes in community attributes that serve as determinants of one or more move-

ment streams. Likewise, alternative sets of projections can be produced that are predicated on alternative sets of assumptions regarding future changes in relevant community attributes. This extension of the study will provide insights into the maximum and minimum impacts that future changes in city, suburb, or metropolitan conditions are likely to effect on the size of the white city population.

These extensions to the analysis of white city loss will be based on both published data in the 1970 U.S. census Mobility in Metropolitan Areas subject report, and on special migration tabulations prepared by the Census Bureau. Use in this analysis of the analytic framework -- which confronts the problematic net migration component by ascertaining the determinants of each contributing stream -- should yield a more valid assessment of "white flight" causes than has heretofore been offered.

APPENDIX

Detailed Definitions of Community Attributes and Tables A1, A2, and A3

Detailed Definition of Community Attributes

Presented below are detailed descriptions and sources for the community attributes of 39 SMSAs used to estimate text equations (5), (6), and (7):

Percent City Black (BLK): Percent of total 1965 population which was black.
Source: U.S. Bureau of the Census, 1973. County and City Data Book, 1972. Washington, D.C.: U.S. Government Printing Office. (1965 totals were averaged from 1960 and 1970 totals.)

City Share of SMSA Population (CIT): Percent of 1965 SMSA population which resides in the city.
Source: U. S. Bureau of the Census, 1973. County and City Data Book, 1972. Washington, D. C.: U.S. Government Printing Office. (1965 totals were averaged from 1960 and 1970 totals.)

Suburb/City Educational Expenditures Per Capita (EDX): Ratio of 1970 Suburban Educational Expenditures Per Capita to 1970 Central City Educational Expenditures Per Capita (x 100).
Source: Advisory Commission on Intergovernmental Relations, 1973. City Financial Emergencies: The Intergovernmental Dimension. Washington, D.C.: U.S. Government Printing Office. Appendix B.

Suburb/City Tax Revenues Per Capita (TAX): Ratio of 1970 Suburban Tax Revenues Per Capita to 1970 Central City Tax Revenues Per Capita (x 100).
Source: Advisory Commission on Intergovernmental Relations, 1973. Financial Emergencies: The Intergovernmental Dimension. Washington, D.C.: U.S. Government Printing Office. Appendix B.

Crime Rate (CRM): Number of Serious Crimes reported in 1970 per 1000 central city population, 1970. Serious crimes include murder, rape, robbery, aggravated assault, burglary, larceny, and auto theft.
Source: U.S. Bureau of the Census, 1973. County and City Data Book, 1972. Washington, D.C.: U.S. Government Printing Office.

Postwar Suburban Development (PSD): Percent of 1970 suburban year-round units in structures built since 1950.
Source: U.S. Bureau of the Census, 1973. County and City Data Book, 1972. Washington, D.C.: U.S. Government Printing Office.

City-Suburb Commuters (CMT): Percent of 1970 central city residents reporting a place of work, that report a suburban workplace.
Source: U.S. Bureau of the Census, 1973. Census of Population: 1970. Vol. 1 Characteristics of the Population. Washington, D.C.: U.S. Government Printing Office.

Central City Age (CTA): The number of years between the census year when the city first attained a population of 50,000 and the year 1970.
Source: U.S. Bureau of the Cknsus, 1973. Census of Population: 1970. Vol. 1 Characteristics of the Population. Washington, D.C.: U.S. Government Printing Office.

Southern Region (SRG): A dummy variable which indicates a city's location in the Southern Region as defined by the Census Bureau; Southern Region cities = 1, Other cities = 0. U.S
Source: U.S. Bureau of the Census, 1973. County and City Data Book, 1972. Washington, D.C.: U.S. Government Printing Office.

NOTES

[1]This section summarizes a more detailed description of the framework and its underlying rationale which appears in Frey, 1977.

[2]SMSA refers to Standard Metropolitan Statistical Area. In accordance with U.S. census procedures, the metropolitan area is assumed to be equivalent to the SMSA and a distinction is made within the SMSA between city (i.e., the central city) and suburbs (i.e., the part of the SMSA which lies outside the central city).

[3]Unlike the other movement streams which contribute to city-suburb redistribution in an SMSA, the "at risk" population that would be appropriate for an SMSA In-migration rate includes the total population that resides outside the boundaries of the metropolitan area. It may indeed be possible to estimate this "at risk" population and apply to it, an In-migration rate. However, this approach would not be consistent with previous research which suggests that the total in-migrants to a metropolitan area represents the sum of migrants participating in a number of inter-metropolitan or inter-labor market streams, each influenced by specific attributes associated with origin and destination areas (Lowry, 1966, Greenwood and Sweetland, 1972). Since data on place-place streams leading to particular SMSAs from all other labor market areas are generally unavailable, we have chosen to denote the total number of in-migrants to the SMSA as a separate parameter, M_o. We plan in a future paper, to address the issue of how the parameter M_o can be estimated on the basis of SMSA specific attributes in a manner consistent with the research on place-to-place stream determinants, using the concepts of population potential and intervening opportunities (as in Zipf, 1946; Stouffer, 1940). In the analysis below, the M_o parameter will not be estimated as a function of community attributes, but will be assigned its actual value.

[4]The approach taken here follows in principle more general formal models of spatial demographic change which incorporate the migration component (Rees and Wilson, 1977; Rogers, 1975; Wilson, 1974, Chapter 7). However, the demographic accounting equations, framework parameters, and assumptions regarding the hierarchy of movement streams are tailored to the specific case of city-suburb redistribution in a metropolitan area, and to the particular data source (described below).

[5]Each framework parameter is most responsive to a specific geographic class or classes of community attributes. The residential mobility incidence rate for a community's residents is influenced largely by attributes which pertain to that community only. Hence, the framework parameter i_c is related to city-specific attributes, and the parameter i_s is related to suburb-specific attributes. In contrast, the destination propensity rates $p_{c \to s}$, $p_{s \to c}$, $p_{o \to c}$, and $p_{o \to s}$ represent the outcomes of movers' comparisons of city and suburb attributes. Each of these framework parameters can relate to city attributes and suburb attributes, as well as to SMSA attributes which characterize the internal structure of the metropolitan area. The parameters which represent migration into and out of the SMSA (M_o, $m_{o \to c}$, $m_{o \to s}$) are most responsive to SMSA attributes which reflect the labor market or environmental conditions of the metropolitan area as a whole.

[6]The SMSAs with mononuclear cities which were excluded include: Washington, DC-Md-Va; San Diego, Calif; San Antonio, Texas; Honolulu, Hawaii; Miami, Fla; Salt Lake City, Utah; and Jacksonville, Fla.

[7]Two points of clarification might be made about the notation and designation of survival rates:

First, the survival rate (s) associated with each term of equation (1a) represents that survival rate which is appropriate for the specific mover, migrant, or nonmover population for which it is a coefficient. Therefore, although we do not designate each survival rate with a separate symbol, the value of each s is different. [This was also the case in equation (1).]

Second, it is assumed that the survival rates of all city-origin intrametropolitan movers (i.e., within-city movers, and city-to-suburb movers) are the same, and that the survival rates of all suburb-origin intrametropolitan movers (i.e., within-suburb movers, and suburb-to-city movers) is the same.

Hence, the survival rate (s) in the second term of equation (1a):

$$-s(P_c^t - P_c^t m_{c\to o})i_c p_{c\to s}$$

is not affected by the value of $p_{c\to s}$ and is equivalent to s in the expression:

$$-s(P_c^t - P_c^t m_{c\to o})i_c$$

Similarly, the survival rate (s) in the third term of equation (1a):

$$+s(P_s^t - P_s^t m_{s\to o})i_s p_{s\to c}$$

is not affected by the value of $p_{s\to c}$ and is equivalent to s in the expression:

$$+s(P_s^t - P_s^t m_{s\to o})i_s$$

[8] Detailed definitions and sources for these attributes appear in the Appendix. It will be observed that some of these attributes are based on 1970 measures. Although this introduces a potential simultaneity bias into our estimates, we are bound by the constraints of available data. To the extent that such bias exists, it would operate to overestimate the effects of EDX, TAX, and PSD. A more extensive discussion of the rationale underlying the inclusion of these attributes in the analysis can be found in Frey (1977b).

[9] The assumption of different numbers of city Blacks is employed merely as a convenient device to arrive at hypothetical values for the city racial composition (BLK). It is not the intent to assume actual changes in the aggregate number of city blacks, or the consequences such changes would imply for the metropolitan housing market.

[10] Equations (1) through (4) can be disaggregated into n-year age groups and modified in order to produce cohort-component projections for the central city population over one or more n-year intervals (Shryock and Siegel, 1973) where, given the available migration data, n=5. For this purpose, framework parameters will be specified, separately, for each n-year age group.

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