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Stabilizing the Metropolis Through Penetrating Suburban Neighborhoods: An Analytical Systems Approach

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ABSTRACT

Concentrations of poor, generally minority group residents in core cities is a major problem confronting the nation for the present and proximate future. The following is a quantitative approach for effectively analyzing the consequences of this problem and recommending policies for its resolution.

At the core of the approach is a systems framework which models the urban-suburban relationship. Its purpose is to provide the methodology for demonstrating solutions through penetrating suburbs and dissolving ghettos with a limited disruption to the former and a significant improvement in the latter. Overall, the aim is to show the way for redressing the imbalanced growth characteristic of metropolitan regions today by equalizing the growth and decay rates within the suburban and inner city areas, thereby making cities more attractive.

Introduction

The problems of the cities will stand at the top of the list of domestic issues facing the nation during the decade of the 1970's. Crucial among these problems are those raised by massive concentrations of poor, minority group citizens in the central core of large American cities, caused by in-migration and internal growth of this group, combined with the flight of the middle class to the suburbs.

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There is no denying the adverse effects of the persistence of this concentration, including: the blighting of human lives, the spreading decay of urban neighborhoods, the erosion of the cities' tax base, the social pathologies of increased crime and collective violence. Professor Moynihan effectively summarized the critical aspects of these problems and the need for their resolution when he said:

> "The Negro lower class* must be dissolved. This is the work of a generation, but it is time it began to be understood as a clear national goal."[1]

Although there may be agreement with Professor Moynihan on this goal, there is sharp disagreement over what may be the optimal set of solutions to achieve it. One major line of solution which has been recently advanced is as follows. Within the city there is an acute shortage of developable land, skyrocketing building costs, a loss of jobs to surburban areas, run-down existing housing stocks, and an undesirable degree of population density. Thus, massive development of the core city by a combination of private and public means as a solution to the problems caused by concentration of minority poor seems to many both prohibitively expensive and socially undesirable. A widely suggested alternative, therefore, is substantial suburban penetration by minority groups. Its aim is to loosen the "suburban noose" surrounding the city, thus "dissolving the ghetto," with this to be combined with re-attracting middle class citizens to the city and rehabilitating the central city for those residents who choose to remain there. This "solution" is being widely discussed in the press and in government circles, and has already been extensively praised and widely condemned. In a recent symposium at the Urban Institute, Anthony Downs echoed a solution of this sort when he spoke of the "Enrichment-Plus-Dispersal" urban renewal alternative. Such a program, said Downs, combines:

> ". . . large-scale federal aid to deprived ghetto areas with policies aimed at encouraging Negroes to move into white suburban areas and whites there to accept them peacefully.[2]

It is the aim of this paper to demonstrate a conceptual framework and methodology for analysis of this "social desideratum" of dissolving urban ghettos by penetrating suburban areas for particular metropolitan regions throughout the nation. In contrast to many discussions of urban problems, which have been primarily descriptive, the present study proposes an empirical analysis which aims to give more definite answers to such urban

* By lower class Mr. Moynihan meant "the low income, marginally employed, poorly educated, disorganized slum dwellers who have piled up in our cities over the past quarter century."

policy questions as: 1) the general advisability of suburban penetration; and 2) the optimal course for such penetration, taking into account such factors as the prevention of an increment or "backwash" of inner city poverty. This is to be accomplished by conceptualizing the metropolitan region as an "environmental supersystem" constituted by two interacting systems, corresponding to areas known as the "inner city" and "suburbia." Each is considered an independent component of the larger system with its own characteristics; yet, at the same time, both are considered together so that occurrences in one subsystem have ramifications for the other, and thus for the metropolitan region as a whole.

This particular formulation is adopted because: 1) it fills a gap left by Professor Forrester's seminal *Urban Dynamics* model in that it speaks to the critical problems of central city–suburban relationships and the effects of city-oriented policies on the rest of the metropolitan region;[3] and 2) it permits on the policy level, a) deriving recommendations for, and constraints on, improving residents' quality of living in each of the systems of the metropolitan region and their respective subsystems, b) tracing the impacts of improvements or enrichment in one or the other; and c) indicating the means for gauging net social benefits to be derived by a particular metropolitan region from specific inner city improvement programs, and for suburban programmed penetrations by minority groups. The product envisioned is a decision tool, to be used by planners for approaching the problem of "depolarizing" metropolitan development by stabilizing and balancing growth in both the inner city and suburban components of the metropolitan region.

In the following section, the detailed nature of the problem of relieving urban ghetto pressures is discussed. This is followed by a discussion of the factors relevant to analyzing this problem and effectively solving it. A model capable of showing the solutions and derivative policy implications is then presented. In conclusion, the utility of the approach is indicated, as well as questions remaining to be answered.

The Problem and Its Components

It is clear, even to the inexperienced observer, that the question of improving the quality of living in metropolitan areas for all resident groups is inextricably knotted. For example, curing the social pathology of the concentration of the urban poor by improving the core city is beset by already noted difficulties which militate against genuine improvement. These may include: shortages of developable land, skyrocketing building costs, elongated rise times due to bureaucratic hold ups, delayed tenant removals, labor union disputes and strikes, and serious present housing shortages. Still, another set of difficulties, however, impede improving existing living conditions of

urban ghetto minority groups by settling them in suburbs which have substantial tracts of available and vacant land and which are inviting in terms of their attractiveness for family living.[4] These may include: the concentration of low skilled jobs in central cities and the consequent prohibitive expense of commutation from suburb to city, the negative attitudes of indigenous suburban residents fearing change and committed to preserving the status quo, and the general low density of suburban areas as enforced by outdated zoning regulations.

What is suggested then is a policy framework which includes the necessary components to identify new and more meaningful living standards for the poor, and generally minority group, residents presently concentrated in urban ghettos. Figure 1 provides an overview of this systematic approach.

Within this framework, the first stage is determining the parameters of the urban-suburban system which define a particular metropolitan region (level 3 in the diagram). These parameters—socio-economic, environmental, and cultural—control choice of residence and serve as common bases against which to evaluate "enrichment-dispersal" policy alternatives. The second is formulating an integrated model or system of equations which yields two sets of answers (level 4 in the diagram): first, the numerical response in terms of population shifts as each of the residence-determining factors shifts or is altered, and second, the resulting effects of those shifts on conditions in both suburban and core city areas. These two major elements are discussed in detail below.

AFFECTED POPULATION GROUPS

These comprise the following: first two main groups: a) current residents of the inner cities, divided by race and income, and b) current residents of the suburban areas surrounding the cities, assumed to be overwhelmingly middle class whites. In response to shifts in residence-determining parameters, the two groups will each break down in three obvious ways. Current residents of the city will either: remain in the core city, move into integrated suburbs, or move into racially homogeneous communities around the cities. Current residents of the suburbs will either: remain where they are, flee still further as their neighborhoods are penetrated by inner city residents, or move back into the city. It is these population shifts within both groups, in response to various stimuli, and the resulting pattern of additional shifts in economic and social parameters, that constitute the motor of the model, and lead to its payoffs.

FACTORS DETERMINING POPULATION SHIFTS

For each of the groups and subgroups described above, we hypothesize the

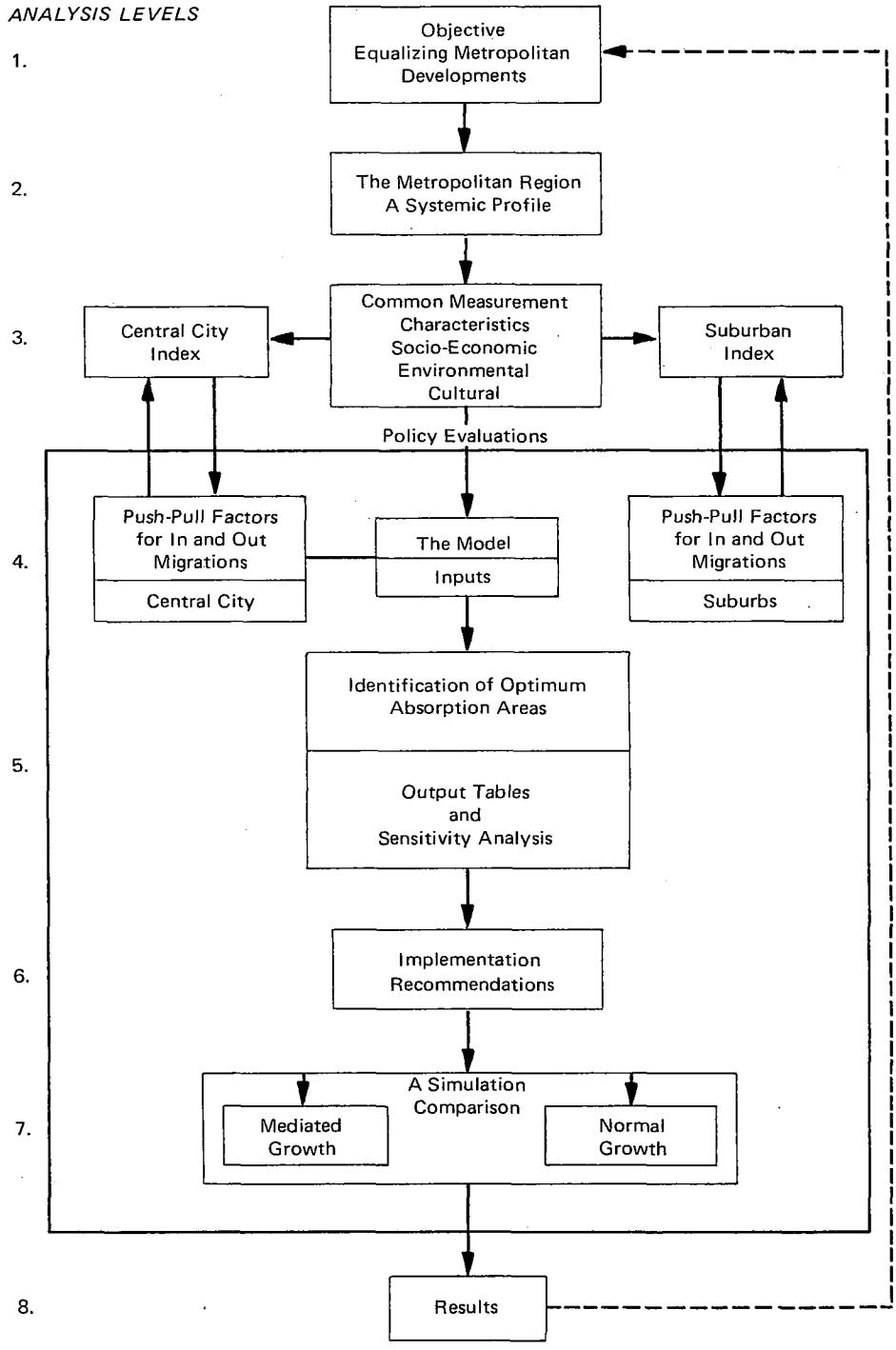
ANALYSIS LEVELS
1.
Objective
Equalizing Metropolitan
Developments
2.
The Metropolitan Region
A Systemic Profile
3.
Central City
Index
Common Measurement
Characteristics
Socio-Economic
Environmental
Cultural
Suburban
Index
Policy Evaluations
4.
Push-Pull Factors
for In and Out
Migrations
Central City
The Model
Inputs
Push-Pull Factors
for In and Out
Migrations
Suburbs
5.
Identification of Optimum
Absorption Areas
Output Tables
and
Sensitivity Analysis
6.
Implementation
Recommendations
7.
A Simulation
Comparison
Mediated
Growth
Normal
Growth
8.
Results

Figure 1

existence of a functional relationship, in the form of a linear econometric equation, composed of various classes of factors which explains why each main group has chosen to live where it does. If this explanation is correct, then if one or more of those parameters is altered, there will be a measurable marginal shift of population.

Suburban Main Group

Why have such a substantial number of predominantly middle class citizens chosen to flee the cities for the suburbs?[5] The possible explanatory factors, both positive and negative, can be grouped as follows:

a. *Economic Factors*
   1. Lower housing costs in suburban areas for middle class housing
   2. Higher taxes imposed by central city governments
   3. Availability of commuting facilities
   4. Location of employment in suburbs
   5. High costs of city private schools

b. *Environmental Factors*
   1. Air, noise pollution
   2. Desire for safe, open spaces for children

c. *Social Factors*
   1. Services provided by city—schools, recreation, etc. —versus those provided by suburbs
   2. Social conditions—crime, drug addiction, etc.—in city versus those in suburban areas
   3. Feelings of discrimination by suburban residents against minority groups

d. *Cultural Factor*
   Desire for "cultural dominance" among suburban residents

The five factors listed under the economic heading are straightforward, and data is readily available to test by econometric methods the sensitivity of middle class residence choice to the influence of those factors. The other factors deserve some explanation.

Environmental Factors

One reason for middle class flight to the suburbs is clearly the environmental factor of pollution. This factor can be visualized as directly related to population density, and inversely related to city expenditures for its control. To include noneconomic factors like this and the others discussed below in a set of econometric equations, some numerical proxy must be developed, e.g., an index of air pollution.[6] A further numerical factor is to be

developed to reflect the desire of middle class families for recreational space. Intuitively, this factor can be related to amount of space, both private and public, available to each family in the suburbs as opposed to the city.

Social Factors

1. Migration by middle class citizens can be taken as a function of city services, schools, public housing, recreation, health care, and so on, in relation to those available in the suburbs. The quality of these services will also be measured by a complex proxy measure, with the measure assumed to be a direct function of dollar expenditures on such facilities, minus, of course, their normal decay rate.[7]
2. Social conditions in both areas will be represented by a complex proxy indicator—for example, incidence of narcotics addiction times crime rate.[8]
3. Discrimination will be represented by some complex factor, if this is necessary, given the inclusion of the cultural factor discussed below. Some recent quality of life and urban migration studies suggest that economic and social factors of the sort stated above are sufficient in themselves to statistically explain migration of the middle class to the suburbs without even introducing the factor of racial discrimination.[9]

The Cultural Factor

A unique feature of the model presented here is the inclusion, in mathematical form, of the cultural factor in choice of residence called *cultural dominance.* This factor, as described by Anthony Downs,[10] reflects the fact that suburban residents, for their part, will not significantly object to living in an integrated neighborhood *provided* that they are in a large enough majority that their cultural patterns or way of life remain dominant. This concept is reflected in the model as a ratio of middle class whites to blacks in the suburbs. Below a critical value of this ratio no substantial outflow of whites will occur as minority group persons move in. Above this ratio sharp losses of white population will occur.*

City Main Group

With certain modifications—i.e., costs of private schools may not be relevant—the same set of economic factors explain why minority groups remain largely in the city although the direction of these factors may be

* Thus, the cultural dominance factor is a step-function. Above a certain level of the ratio, small increases do not affect the basic stability in the suburban system. But after a critical level is reached, the system becomes violently unstable due to sharp movements of middle class whites from the affected areas, leading possibly to the creation of new, all-minority group suburbs.

naturally different for this group than for the middle class. Thus, for example, the middle class moves to the suburbs because the cost of middle class housing is, in many instances, *less expensive* there. Conversely, for the poor minority group member, the only housing *available* in the suburbs, often because of building and zoning restrictions, is usually much *more expensive* than the inferior housing available in the core city. The same is true for the environmental factor and the social factors—i.e., the central city dweller would tend to flee pollution and poor schools, just like his middle class counterpart, if there were no other barriers.

The form of the cultural dominance ratio is, however, different for the core minority group. Here, it is taken in reverse, as that per cent of the group who place an overriding importance on their own cultural dominance. The concept is that the percent of the group who have this feeling will not move to an integrated suburb in which they are less than a certain per cent of the population, and thus will move only to all-minority suburbs or will remain in the city.

A listing of the variables determining place of residence described above is contained in Table 1.

In addition, any change in the residence-determining factors will be superimposed on a constant pattern of growth and change within the urban-suburban system. This dynamic characteristic is represented by a series of trend factors. As this is a population based model, four critical trend factors are included: The normal growth of the inner city by birth, inflow of immigrants from other parts of the country to the city, the normal growth of suburban population, and the trend of movement from the city by middle class residents. These trend variables are also shown in Table 1. At a latter stage, other relevant trend variables, such as the rate of growth of income of the various population groups, will be incorporated in the model.

The Model and Its Policy

THE THEORETICAL COMPONENT

The above relationships must now be combined into a system of equations to form a base statement of a model. The suggested general form of the two basic econometric equations is shown in Table 2. Equations 1 and 2 show the proportion of middle class citizens who choose to live in the suburbs and the proportion of minority group members who choose to live in the suburbs, as functions of ratios of the various variables discussed above. In the model as finally developed, these variables are further to be time dated, producing a dynamic process of adjustment.

Table 1. Listing of Variables

Residence Determining Variables

Tr_c	= Tax receipts—city government
E_c	= Expenditures—city government
S_c	= Dollar amount of services provided by city government
McH_c	= Index of cost of middle class housing city
SH_c	= Index of cost of slum housing city
Soc_c	= Index of social and environmental conditions—city
In_c	= Income—city
Emp_c	= Index of employment opportunities—city
$Trans_{s\text{-}c}$	= Index of availability of suburban commuting facilities
Psc_c	= Index of costs of private schools—city
$Dens_c$	= Index of population density—city
Pop_c	= Total city population
$Popmc_c$	= Number of middle class citizens—city
$Popmin_c$	= Number of minority citizens—city
Cul_{mc}	= Index of desire for "cultural dominance," middle class
Cul_{min}	= Index of desire for "cultural dominance," minority group

City variables repeat for suburban areas with subscript "s."

Additional Suburban Variables

Mgh_s	= Costs of minority group housing—suburbs
$Popmc_f$	= Percent of middle class citizen who flee suburbs, but do not return to city
Dis_s	= Index of discrimination—suburbs

Trend Variables

Pop_{ic}:	Natural rate of increase of inner city population
Pop-IM_c:	Inflow of immigrants to inner city
Pop-Mc_s:	Growth of suburban middle class population
Pop-Mc_c:	Rate of decline of middle class city residents (migration-normal birth rate)

Table 3 gives definitional and behavioral equations for the explanatory variables in the system that are to be considered in an analytical manner in our initial formulation. All other variables appearing in the two basic equations in Table 2 are assumed given and constant.

The incorporation of the variables into the above formal statement provides the planner with the ability to first consider the conditions descriptive of suburbs at static time points, i.e., before and after programmed migrations. Second, the planner may trace the dynamics of change, i.e., what processes transpire to change the present conditions of urban and suburban areas, and the time path of these changes.

Table 2. Model for Suburban Penetration and Urban Stabilization

Basic Equations

$$1.\ \frac{Popmc_s}{Popmc_{Total}} = f\left(\frac{Tr_c}{Tr_s}, \frac{S_s}{S_c}, \frac{So_s}{So_c}, \frac{McH_c}{McH_s}, Trans_{s\text{-}u}, \frac{Empl_s}{Emp_c}, Psc_c, Cul_{mc}\right)$$

$$2.\ \frac{Popmin_s}{Popmin_{Total}} = f\left(\frac{Tr_c}{Tr_s}, \frac{S_s}{S_c}, \frac{So_s}{So_c}, \frac{SH_c}{MgH_s}, Trans_{s\text{-}c}, \frac{Empl_s}{Emp_c}, \frac{1}{Cul_{min}}, \frac{1}{Dis_s}\right)$$

Within the above rubric a model of the form indicated further provides specific answers to a set of derivative problems related directly to the penetration-enrichment proposal.

One: Given the wide variety of methods available for penetrating suburbia and the resulting payoffs, can we in general favor this approach over letting the current condition continue, or spending resources to build up the city itself?

Two: If the answer is yes, which of the methods available for penetrating suburbia is most desirable in absolute terms? Should we, for example, encourage the development of all minority suburbs?

Three: With a given sum of money, how should it be spent in penetrating suburbia?

Four: From the given suburbs around a particular city, in which does penetration have the greatest chance of success?

Five: What rate of suburban penetration is necessary to arrest the dynamic decay process of the city without unduly prompting an increased backwash of poverty.

The total impact of the model may thus be said to take meaningful data descriptive of the present situations in a target inner city and suburban areas and to convert it into a format from which urban policy makers may derive the necessary information to effectively plan for: 1) improved socio-

economic development in the ghettos; 2) effective penetration of suburbs, preventing undesired conditions from obtaining as a result of contemplated changes associated with in-migration from ghetto areas; 3) prompting socio-economic improvements in urban ghettos which are perceptible while preventing a backwash of increased poverty;[11] and 4) an overall equalizing of metropolitan development.[12]

To preliminarily test the operation of the proposed model, a simulation experiment is proposed. The mechanics of this procedure is outlined here, in accordance with space considerations as a four stage program, encompassing: an input editor, a simulator, a sorter, and an output editor.[13]

The input editor accepts the data which describes the two areas, and tabulates in the form of input tables, in which the simulator then induces changes. The simulator then provides the capabilities for: 1) inserting modifications into the presently modeled ghetto and suburban areas; 2) identifying "abnormal" situations in the present description of reality; and 3) indicating either the improvement or deterioration of the present situations as a result of projected changes from in and out migrations.

Table 3. Equation Explanation

Independent Variables

1. $Tr_c = f(In_c)$
2. $In_c = f\left(\frac{Popmc_c}{Popmin_c}\right)$
3. $Tr_c = E_c = S_c$

   (Balance equation. If receipts fall below costs of services, tax rates are assumed to rise to balance city budget. If surplus arises, then spending on services rises to eliminate surplus.)
4. $E_c = f\left(\frac{Popmc_c}{Popmin_c}\right)$
5. $So_c = f\left(\frac{I}{Dens_c}\right)$, S_c
6. $Dens_c = \frac{Pop_c}{\text{Area of city in sq. miles}}$
7. $Pop\text{-}Im_c = f(So_c)$
8. $Popmc_f = f(Cul_{mc})$

Equations repeat for suburban variables

The sorter subsequently translates the simulator records and orders them chronologically or on other criteria.

The output editor tabulates and reports in the form of output tables results specified by the user.

The results of these efforts may be said to be arranged first, in the form of "social output" tables indicating various relative payoffs and recommendations for programmed migrations of the urban poor from the inner city ghettos into the suburbs. In addition, new zoning and subdivision recommendations may be formulated to: 1) prevent exclusionary use of zoning, and 2) promote qualitative design standards for the community development.

EXAMPLE OF SOLUTION

Space does not permit the discussion of the solution of even the model base statement described above for all of the possible problems associated with suburban penetration indicated in the previous section. To illustrate the general nature of the solution, however, we present the following example based on a set of initial conditions and sample functional relationships as given in Table 4.

Assume that the relative cost of minority housing in suburban areas is decreased by means of a series of spot relaxations of zoning restrictions. The general pattern of adjustment is shown in Fig. 2. If we proceed through the processes of changes indicated in Fig. 2, the following can be seen.

Assume SH_c/Mgh_s is decreased by an amount which will cause out-migration of 50,000 existing inner city residents to the suburbs. (In addition, the suburbs may experience an inflow from other areas equal to some fraction of the outflow from the central city: we ignore this possibility for the moment.) (Stage 2–Fig. 2.)

As a result of these shifts in population conditions in both city and suburban areas are altered. (Stage 4–Fig. 2.) Looking first at the City:

1. Population drop in the central city area decreases population density, causing the index of social conditions to improve by 5 per cent.
2. A decrease in minority group population causes $5 million drop in city revenues through decreased taxes, but a greater drop in city expenditures–by $10 million. As a result of improved fiscal position, city government can spend about 4 per cent more on remaining residents, also increasing So_c by a like amount.

In the suburban area:

1. Rising population density leads to a decline in the social index of 25 per cent.

2. A rising number of minority immigrants lowers the cultural dominance ratio to 4:1—still above critical level.
3. Rising number of minority immigrants increase local revenues by $2.5 million, but expenditures rise by $10 million, resulting in a 38 per cent increase in taxes, an increase which even in this example points up the need for a program of revenue sharing to assist integrated suburban communities.

Table 4. Information For Example: Initial Conditions, Assumed Trends, and Functional Relationships.

Initial Conditions

City:
Population—One million
Area—Ten square miles
Population Distribution:
400,000 middle class—per capita income $2000
600,000 minority poor—per capita income $1000
City tax rate: 10% of income
Outlay per citizen:
$200 per minority group member
$ 50 per middle class group member

Suburbs:
Population—200,000 all middle class
Area—50 square miles
Income per capita—$2000
Tax rate: 5% of income

Population Trends:
Natural rate of increase of minority group—2% per year
Natural rate of increase of middle class—1% per year
Rate of immigration to city, minority poor—10,000 per year
Net loss of middle class from city to suburbs—5000 per year

Functional Relationships:

1. City middle class will fall by 1% for every 10% fall in So_c, or rise in Tr_c. Inversely, city middle class will rise by 1% for every 10% fall in So_s or rise in Tr_s. Similar relationships hold for suburban middle class.
2. So_s, So_c, directly inversely proportional to Den_s, $Dens_c$, directly proportional to E_s, E_c.
3. Cul_s critical ratio is 2:1. If the ratio of white middle class to minority poor in suburbs falls below this value, suburban whites will leave.
4. Migration from other areas into the city by minority poor will rise by 1000 for every 5% improvement in So_c.

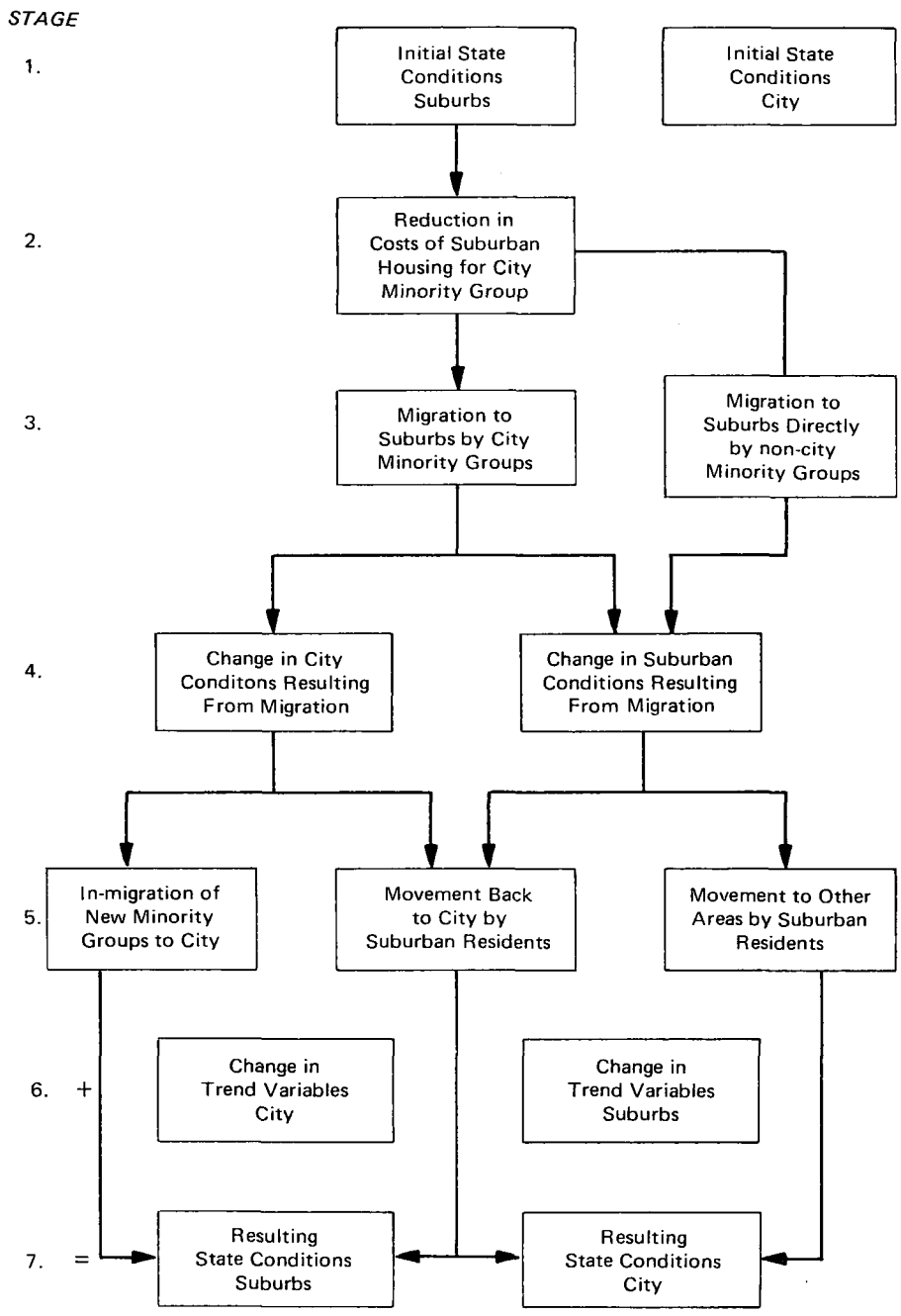
STAGE
1.
Initial State Conditions Suburbs
Initial State Conditions City
2.
Reduction in Costs of Suburban Housing for City Minority Group
3.
Migration to Suburbs by City Minority Groups
Migration to Suburbs Directly by non-city Minority Groups
4.
Change in City Conditons Resulting From Migration
Change in Suburban Conditions Resulting From Migration
5.
In-migration of New Minority Groups to City
Movement Back to City by Suburban Residents
Movement to Other Areas by Suburban Residents
6. +
Change in Trend Variables City
Change in Trend Variables Suburbs
7. =
Resulting State Conditions Suburbs
Resulting State Conditions City

Figure 2

As a result of the above, another round of population shifts is set in motion. (Stage 5–Fig. 2.)

First, in response to the improved conditions in the central city, the normal rate of immigration from rural areas like the South or Puerto Rico will accelerate by about 1800 persons.

Second, in response to the improved conditions in the central city and the less favorable (from the point of view of the middle class) conditions in the suburbs, there will be a marginal shift of suburban residents back to the city. So_c is improved by 9 per cent, So_s is worsened by 25 per cent, a total of 34 per cent, leading to 3.4 per cent reverse flow. Tr_s is up by 38 per cent leading to an additional 3.8 per cent reverse flow.

This process will, of course, require some period of time. While it is taking place, normal trend variables will also have been at work. (Stage 6–Fig. 2.) Within the central city, minority group populations will have been rising at its normal rate, and immigration from other areas will have continued. This, in turn, will have increased population density, leading to a deterioration in social conditions. At the same time, rising numbers of residents whose claims for city services–welfare, health, police, etc.–exceed their contributions to tax revenues will lead to steadily rising taxes, further driving the middle class from the city. Similarly, trend changes are taking place in the suburbs. Thus, the trend effects of these growth and decay processes[14] are *superimposed* on the induced or mediated *marginal* changes to produce a final set of conditions in both suburban and urban areas.

Looking first at the city: (Stage 7–Fig. 2.)

1. An outflow of minority citizens from the central or core city will have been counterbalanced by an inflow of minority citizens from normal birth and accelerated immigration, and by an inflow of middle class citizens from the suburbs. As a result, depending on the relative size of these movements, city population may be either up or down, density may be either up or down and, therefore, social conditions may have either improved or deteriorated.
2. From the point of view of revenues, the city has lost some low tax payers, but gained others by birth and immigration, and has reattracted other high tax payers from the suburbs. Thus, if the outflow of low tax payers is just balanced by birth and normal and accelerated immigration, then revenues will be up slightly. Similar adjustments will occur in the suburbs.

Thus, at the end of this first round, there results a vector of changed conditions in both city and suburban areas. By devising some criteria of multidimensional ranking, it may or may not be possible to say that the conditions in either or both are "better."

Secondly, the system will not be in equilibrium at the end of this first iteration. These altered conditions will produce additional population shifts

and resulting adjustments. For example, if the socio-racial mix in the suburbs falls in the above process below the critical cultural dominance ratio, heavy loss of white, middle class citizens will occur, with those either moving back to the city, or completely out of the area. This movement will set up another whole chain of reactions. Eventually, as a result of the combination of trend factors and permanent or recurring shifts in policy variables, the model will trace a dynamic growth path which must be evaluated for desirability in the same way that economists are now devoting considerable attention to optimal or "turnpike" growth for the economic sector alone.[15] Table 5, for example, shows the resulting equilibrium distribution of population and change in social indicators for both suburban and urban areas for the example given, before any allowance for population trend factors, and then equilibrium positions when the effects of one year of population trends are imposed on this first solution.

Conclusion—A Testament of Faith

This paper has attempted to define a general framework for equalizing or balancing of growth rates in metropolitan regions. Specifically, the orientation was to provide urban policy planners with a quantitative means for objectively locating new suburban galaxies to absorb parts of the urban poor population presently residing in urban ghettos with: 1) a limited disruption to the present suburban community, and 2) a significant improvement in the urban ghetto community.

To demonstrate the approach, a system perspective was adopted, where the effect on suburban areas of shifts or urban groups was defined in terms of a set of area descriptors. These descriptors were formulated to be as realistic as possible. However, the structure of the base statement of the model is still relatively simple and as yet nonestimated: many of the variables and interrelationships are still to be developed and formalized.

The general advantages to urban policy planning and evaluation from such an approach are re-emphasized below, followed by a discussion of work remaining to be done. Possible productive outputs of the model may be said to involve the following:

1. A plan for effectively penetrating suburbs.
2. A plan for correspondingly improving inner city areas from which there has been planned out-migration in order to prevent negative feedback of increased poverty.

Table 5. Equilibrium Solutions to Example

	Population Distribution (1000's)				*% Change in Social Indexes*	
	City		*Suburbs*			
	Middle class	*Minority*	*Middle class*	*Minority*	*City*	*Suburbs*
Initial state	400	600	200	0	—	—
After 50,000 initial shift of minority to suburbs	428	552	172	50	+12%	-11%
+ effect of one year trend	421	573	179	50	+10%	-14%

3. A policy program predicated on the problems and priorities peculiar to particular metropolitan areas, and the complementary pattern of resource allocation.
4. Specification of governmental and private participation in the two-pronged program of penetration and renewal:
   a. the role of the public sector
   b. the role of the private sector
5. Forecasting expected gains:
   a. "Prefacto" identification of problems and opportunities in planned integration
   b. Limiting disruption to the target suburban environment
   c. Setting a base from which allocation of public resources may be optimized
   d. Persuading target suburban populations of the invalidity of their fear of change

As for tasks remaining, they may be said to include the following:

One—Introduction of additional important variables and relationships between variables and their testing. For example, is it true that integration of the suburbs within controlled limits will *reduce* discriminatory feelings by residents over a period of time? Do minority group birth rates drop in response to economic improvement? And so on.

Two—Testing of assumed empirical relationships, especially those identified as critical. For example, as assumed in the illustration above, does the re-attraction of the middle class make the city actually better off from the point of view of reduced city deficits?[16]

Three—Solution of the whole family of decision problems described earlier.

Of course, no model, however sophisticated, can possibly mirror the complex reality of urban life, nor can it, because of the statistical problems involved in the quantification of the inherently nonquantifiable, provide exact numerical answers. Still, a model can illustrate the interrelationships between variables in the urban-suburban complex in a manner beyond that possible with verbal discussion. Moreover, exact solutions are not really necessary. What we are searching for is "acceptability"—an indication of the general direction in which policy should go. Thus, if a model of this form is tested through a "sensitivity analysis," it should indicate the general direction of optimal policy movement in a manner which is generally invariant over wide ranges of the underlying variables.

REFERENCES

1. *The New York Times,* March 11, 1970.
2. Cf. William Gorham, *et al.,* "Urban Processes," The Urban Institute, Washington, D.C., 1970, p. 66.
3. For an excellent critique of Urban Dynamics, see Harvey Garn, "An Urban Systems Model, A Critique of Urban Dynamics," The Urban Institute Working Paper No. 113-25, Washington, D.C., August, 1969.
4. See Nathan Glazer, ed., "Cities in Trouble," A New York Times Book, Quadrangle Books, Chicago, 1970, Introduction.
5. A recent attempt has been made to statistically test for the explanatory significance of some of those variables. See David F. Bradford and Harry H. Kelejian, "An Econometric Model of the Flight to the Suburbs," Research Memorandum No. 116, *Econometric Research Program,* Princeton University, October, 1970.
6. For an example of the type of study which can serve to provide such numerical proxies for the variables of this model, see Martin V. Jones and Michael J. Flax, "The Quality of Life in Metropolitan Washington (D.C.): Some Statistical Benchmarks," Working Paper 136-1, The Urban Institute, Washington, D.C., March, 1970.
7. Cf. Bernstein *et al.,* "The Rehabilitation of Urban Neighborhoods: A Linear Programming Approach," Proc. Amer. Stat. Assoc., 1970, which develops a discussion of how community functions may be measured in terms of expenditures on facilities or modified by growth and decay rates of those facilities.
8. Cf. *op. cit.,* note 8.
9. Cf. Bradford and Kelejian, *op. cit.,* On the other hand, see the remarks of Robert C. Weaver, "Class, Race, and Urban Renewal," in Alfred Erpage and Warren R. Seyfried, Eds, "Urban Analysis: Readings in Housing and Urban Development," Scott Foresman, Glenview, Illinois, 1970, pp. 347 ff.
10. Anthony Downs, *op. cit.*
11. For a discussion of the negative feedback effects associated with ghetto enrichment programs see John Kain, "Housing Segregators, Negro Employment and Metropolitan Decentralization," *Quart. J. Econ.,* May, 1960.
12. It is interesting to note that the present aim is equivalent with the aim of the Comprehensive Housing Legislation of 1949. See William Wheaton, ed., "Urban Housing," The Free Press, Glencoe, Illinois, 1966.
13. See Fromm and Taubman, "Policy Simulations with an Econometric Model, The Brookings Institution, Washington, D.C., 1968.
14. J. W. Forrester, "Urban Dynamics," The MIT Press, Cambridge, Mass., 1968. For an extended discussion of the use of growth and decay rates in urban analysis, see Bernstein, *et al.,* "Urban Rehabilitation," *op. cit.*
15. For a review of this literature which has enormous possibilities for application to combined economic-social development, see R. M. Solow, Growth Theory and Exposition, Oxford University Press, Oxford, 1970.
16. See remarks by Downs, *op. cit.*