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New directions in migration research*

Perspectives from some North American regional science disciplines

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Abstract. This paper takes several surveys of the literature concerning migration research as its starting point and directs the reader toward a number of potentially fruitful lines for future research. Major sections include one on modeling migrant choice in which the pros and cons of using gross versus net migration measures are discussed. A second introduces and discusses the concept of a "spatial" choice set, which has the potential to be implemented with laboratory experimental techniques. The third involves a wide-ranging discussion of new directions in modeling the interrelationships between employment and migration.

In his *Introduction to Regional Science*, Walter Isard writes that "regional science as a discipline concerns the careful and patient study of social problems with regional or spatial dimensions, employing diverse combinations of analytical and empirical research" (1975, p. 2). Research concerned with human migration fits squarely within the boundaries of regional science as defined by Isard. Migration has a clear spatial dimension since by definition it involves movement over space. Just as clearly, migration is a social issue frequently accompanied by social problems that are of tremendous concern in virtually every country of the world. Because migration is studied from many different disciplinary perspectives, it surely qualifies as "employing diverse combinations of analytical and empirical research." In fact, to an extent not typical of many other research topics in the social sciences, migration research has been characterized by a useful sharing and borrowing of ideas from the many disciplines that make up regional science, such as economics, sociology, geography, anthropology, and psychology. Individuals from these disciplines share enough background and enjoy enough common interests in migration research that they are able to communicate meaningfully about various theoretical and applied topics and are able to legitimately identify potentially fruitful research directions that are of interest to regional scientists.

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Of necessity, the regional science perspective in migration research is multidisciplinary. The present paper reflects this perspective. It contains much that is of potential interest to those concerned with migration research. However, because the various major sections have been written by different individuals from distinct disciplinary perspectives, the sections are only loosely integrated. In this sense, the paper is an experiment in narrative style. Each section treats migration in a fundamental way, however, and this focus on migration is what holds the various parts together. Like regional science in general, it is a focus on a topic of mutual interest, in this case migration, that constitutes the common thread in this study.

1. Introduction

An explosion of migration research has occurred during the last 25 years. As noted above, important contributions to this research have been made by scholars in a number of disciplines. The research, both theoretical and applied, has concerned numerous less developed countries, as well as advanced industrial societies. It has dealt with internal migration and also with international migration. It has involved both the causes and consequences of migration for individuals, regions, and nations.

Over the past 15 years, a number of surveys of various aspects of migration research have appeared. Several of these take the economic perspective. For example, Greenwood (1975) surveys research concerned with internal migration, primarily but not exclusively concentrating on literature dealing with the United States. He points out that as of 1975 the vast migration literature was almost exclusively oriented toward the determinants rather than the consequences of migration. Shaw (1975) also takes an economic perspective, and Greenwood (1985) provides an update of his earlier survey article. More recently, Greenwood (1990) reviews and assesses fairly recent contributions based on micro and panel data. These types of data have allowed a number of important advances in migration research, but at the same time they have probably reinforced the inclination of researchers to focus on the determinants of migration. Micro and panel data are not conducive to studying the broad consequences of migration, but are certainly valuable for studying individual consequences.

Todaro (1976) surveys research dealing with migration in less developed countries, and Mazumdar (1987) specifically focuses on rural-to-urban migration in such countries. Greenwood and McDowell (1986) consider the labor market consequences of United States immigration. These are not the only papers that attempt to survey the economics literature dealing with migration, but they are representative.

Ritchie (1976) provides an overview of migration research from the sociologist's perspective. In addition to several studies discussed in Sect. 3 below, Clark (1986) does so from a geographer's perspective.

Traditionally, research on the determinants and consequences of migration has addressed several questions:

a) Who migrates? Such characteristics as age, education, race, income, and marital status have been extensively studied for some time (Ravenstein 1885; Thomas 1938).

b) Why do these people migrate? This question has led to numerous studies of the determinants of migration, where in certain cases the determinants have been inferred from descriptive studies (Ravenstein 1885) and in other cases formal models of the migration decision process have been estimated (Greenwood 1975). A limited number of attempts has been made to study the determinants of migration in a laboratory experimental setting. A wide range of determinants has been studied, such as wage differentials, job opportunities, unemployment rates, the provision of local public services, and location-specific amenities.

c) Where are the migrants coming from and where are they going? This question has led not only to detailed descriptions and analyses of the spatial patterns of migration flows, but also to a focus on how place characteristics have influenced those flows. Because many public agencies are concerned with future population levels, and because migration is an important mechanism through which population is redistributed geographically, the issue of where migrants are coming from and where they are going has led to interest in forecasting the migration component of population change (Greenwood and Hunt 1991).

d) When do they migrate? To a more limited extent, the timing of migration flows has been studied. For example, over long periods of time migration has been off the farm and into the city. Moreover, national business conditions affect different regions differently, thus triggering migration. Just as cohort effects have been found to be of some importance in other areas of demographic research, they may also be of importance in migration, but this issue has been studied very little.[1]

e) What consequences result from migration? The answer to this question has been addressed at two levels. The first deals with the migrants themselves, where the emphasis has been on the benefits to migrating, perhaps measured in terms of earnings gains, or generally on how fast the migrants assimilate in the receiving region. Although migrant outcomes seem to fit in a discussion of the consequences of migration, this literature has typically been discussed in the context of the determinants of migration, presumbly because rational individuals act on their expectations regarding various outcomes. The other deals with migration's impact on others in the origin and the destination. Do migrants depress local wages in receiving areas and displace local residents from jobs? To the extent that migrants are young and well-educated, does migration deprive source regions of

[1] Two aspects of the cohort effect seem particularly relevant – volume and timing. The volume of internal migration almost certainly changes as large cohorts, such as that of the baby boom, mature through those age classes with high migration propensities (Greenwood 1988). However, the timing of migration may also be affected by cohort size, but this potentially important issue has been almost completely ignored.

critically needed human capital that ensures these regions of long periods of stagnation?

Many studies have focused specifically neither on the determinants nor the consequences of migration, but rather have been aimed primarily at describing migration flows. Such a description of migration phenomena can provide a useful background for a discussion of the determinants and consequences of migration because if theories and empirical analyses of migration are any good, they ought to provide explanations of observed migration behavior.

Whereas the studies cited above and others survey a considerable body of literature, they do not to an equivalent extent assess that literature and point toward potentially productive avenues for future migration research. They tell us what we know about various migration phenomena, but they are less effective at telling where the greatest opportunities for future research lie. This is the niche filled by the present paper. It takes the various surveys cited above and others as a starting point and concentrates on the most fruitful areas for future research.

Although extremely valuable and insightful research of a purely theoretical nature has been focused on various migration phenomena, most migration research is empirically oriented. Empirical applications must involve data and may employ any one of a number of migration measures. In general, when aggregate migration data are used, one or the other (or perhaps both) of two types of measures are employed – measures of gross migration and measures of net migration. While sociologists, for example, often eschew measures of net migration, economists frequently use them. In Sect. 2 we discuss the underlying rationale for the use of net migration versus gross migration measures.

As noted above, most analytical migration research focuses on migration's determinants. This orientation is due partly to the greater ease of studying determinants and partly to the increased use of data (i.e., micro and panel data) that lend themselves to such studies. In Sect. 3 we discuss the "spatial choice set" as a possible new direction in studying the determinants of migration. Such a notion might be empirically implemented in a laboratory experimental setting. A major thrust toward the use of laboratory experimental techniques to study the determinants of migration would provide migration research with a new direction.

Section 4 is more wide ranging. It treats the relationship between employment and migration. Not only does it stress the importance of studying the consequences of migration, but it also emphasizes the need to better understand location patterns of U.S. immigrants. Section 4 also discusses research areas where migration has not typically been taken into account, but where migration research might be fruitfully applied.

2. New directions: modeling migrant choice

A convincing model of migration must be justified in terms of individual decision-making. When all the factors that could influence the migration decision are considered, along with the ways that differences across individuals could reflect in aggregate measures, it becomes clear that any useful model must necessarily

be simplified. Students of migration have tended to view migration in differing ways, implicity simplifying the migration process along different dimensions.

The discussion in this section begins by considering the division between those models of migration that focus on gross migration flows and those expressed in terms of net flows or population growth. The net-migration model focuses attention on the equilibrium-seeking tendency of the population system. It attempts to abstract from the processes that induce migration flows that cancel one another. The gross-migration model, in contrast, centers on the individual migrant's choice process; as such it attempts to directly identify the determinants of migratory behavior.

While its behavioral focus is clearly an advantage to the latter structure, the way in which migrant preferences are generally included in the model fails to allow for how those preferences are shaped by the dynamics of population redistribution. Models must recognize the way in which migration at any one time is a function of past patterns. The value of separately identifying steady-state and non-steady-state migration patterns is also stressed. Whereas the former indicate exchanges of populations that need not alter location-specific populations or the relations between populations, the latter are by their nature disruptive, putting in motion forces that will lead to new migration patterns. Ultimately, both kinds of migration interact, and a full treatment would recognize the extent of this interaction.

2.1 Gross migration: the model of migration propensity

Sjaastad (1962) urged that migration be viewed as an investment decision. The gains in utility accruing from a change in location, summed and appropriately discounted over the length of residency, must be weighed against the costs associated with moving. In any application attempting to explain the size of movements among locations, indicators of the relative utilities available across locations are necessary. Obvious factors include wage rates and other measures of employment opportunity, as well as environmental factors that may influence location desirability. This formulation implies that not only present but also future utilities at locations matter. Assuming that migrants form expectations about the future at location j on the basis of a set of location characteristics captured in a vector Y_j, we let the expected return from a move depend on this term. Personal characteristics X_i may also influence the evaluation of location desirability and moving costs. Let Q_{ijk} be the present value of the utility to be gained from person i choosing to make a move from location j to location k, defined as

$$Q_{ijk} = f(X_i;\ Y_j,\ Y_k) + e_{ijk}\ , \tag{1}$$

where e_{ijk} is random (or unobservable) variation across individuals. The probability that an individual with characteristics X in location j migrates to k is then represented as

$$P_{jk}(X) = Pr(Q_{ijk} > Q_{ijh}\ ,\quad \text{for all}\quad h \neq k,\ X_i = X)\ .$$

Q_{ijk} represents the evaluation of a move from j to k, while Q_{ijh} is a move to some alternative location h. Q_{ijk} and Q_{ijh} are taken as random variables across all people i living in j for whom $X_i = X$. If the e_{ijk} are assumed independent across i, j, and k, we can write

$$P_{jk}(X) = F(X;\ Y_j,\ Y_k;\ Y_h, \quad \text{for all} \quad h \neq k, j)\ . \tag{2}$$

Even in this simple structure, the size of each stream depends on the attributes of all locations, with the exact shape of the dependence resting on the distribution of e_{ijk}. Whatever this distribution, the theory assures us that dF/dY_k will be of opposite sign from dF/dY_j and dF/dY_h (i.e., numbers of migrants will increase with a more desirable destination and will decline as the origin or alternative destinations grow more desirable).

In practice, fitting a model of the form given in (2) requires specifying a restrictive functional form. One common specification is the multinomial logit model, which is consistent with migrant optimization if e_{ijk} is Weibull distributed (Mueller 1982). Spatial interaction models following the form of (2), may also be interpreted as approximating migrant optimization.

2.2 Net migration models

A focus on net migration appears particularly appropriate if concern centers on the stable population structure. The economic theory of spatial population distribution is based on an equilibrium with equal desirability across areas (Roback 1982; Blomquist et al. 1988; Greenwood et al. 1991 a). If differences in desirability exist, net migration should be toward areas with greater overall desirability. In the simplest model, greater population leads to higher land rents and lower wages. As long as differences in natural increase do not overwhelm net migration, the system tends toward a steady state population distribution.

Ignoring differences in population composition across locations, we can write the basic net migration model as

$$NM_j = G(Y_j;\ Y_k \quad \text{for all} \quad h \neq j)\ . \tag{3}$$

This model is consistent with movement toward equilibrium if G is taken to increase in its first argument and to decrease in its other arguments (where Y_j is scaled to positively affect desirability); $NM_j = 0$ when $Y_j = Y_h$ for all h.

The focus on net migration ignores gross movements. How is such a model explained in behavioral terms? Topel (1986) presents a rigorous model that predicts that in a given age category two-way migration will not occur. Rather, a location will experience either in-migration or out-migration. Such behavioral structures have assumed away the heterogeneity that causes two-way migration. One argument for focusing on net migration is that it is "free" from the noise of the back-and-forth gross flows.

2.3 Inconsistency between the two structures

Models specified in (2) and (3) are mutually inconsistent. This inconsistency has been emphasized by those arguing against the use of net migration (Lieberson

1980; Rogers 1990). In contrast to the net migration model, (2) provides no assurance that net movement will be toward the more desirable area, or that net migration will approach zero as areas become similarly desirable. For example, consider a simple system with just two locations, 1 and 2, for which $Y_1 = Y_2$. The formulation in (2) implies that $P_{12} = P_{21}$. The system will tend toward a steady state population distribution – in this case, equal numbers in the two locations. Hence, if populations are unequal, the model implies that redistribution toward the less populous area continues even when desirability is the same. Conversely, a steady state population distribution with differing populations is only attained when areas are of differing desirability.

One natural way to make the two approaches consistent is to alter (2) so that the number of arrivals is proportional to the population at the location. In fact, many studies do take population as an independent variable; those that test for its impact find that it is a very strong predictor of numbers of migrants coming to the area. Since population is itself largely a function of migration, a strong positive association between population size and number of arriving migrants will be unavoidable if any stable location characteristics are unmeasured. The case for taking population to have this kind of direct influence on migration is weak at best.[2]

Consider a simple model that distinguishes two classes of population, one of individuals who have migrated at some time and the other of those who have not.[3] For simplicity, consider a two-location system, where movements between the locations are determined by relative desirability. Labeling the movement propensity for these two populations as p_{jk} and q_{jk}, we have

$p_{jk} = p(Y_j, Y_k)$ (for those having lived in a single place), and

$q_{jk} = q(Y_j, Y_k)$ (for those having lived in both places).

If we scale Y so that utility is increasing in it, p and q will be decreasing in the first argument and increasing in the second. We also expect $p_{jk} < q_{jk}$; that is, residents who have moved once are more likely to do so again.

The overall migration propensity for a location is merely a weighted average of the two propensities

$$P_{jk} = {}_{j}s_j \, p_{jk} + {}_{k}s_j \, q_{jk} \ , \tag{4}$$

where ${}_{j}s_j$ is the proportion of the population in j who have never migrated and ${}_{k}s_j$ is the proportion who have lived in k at some time. A change in the desirabili-

[2] See Mueser (1989). An early discussion of bias caused by the use of destination population to predict migration is given in Greenwood and Sweetland (1972). Schultz's (1982) review of the issue is particularly insightful. In recognition of the problems of including population in these kinds of models, Fields (1979), Schultz (1982), and Shaw (1986) fit models of migration streams without including destination population or any obvious proxy for it.

[3] The recognition that migrants' choices differ by migration history has gained recent prominence, but is not new. See, for example, Eldridge (1965) and Vanderkamp (1971). Analyses of formal models that distinguish migrants by place of birth include Philipov and Rogers (1981), and Rogers and Belanger (1989).

ty of a location then affects the overall propensity P_{jk} both by altering p_{jk} and q_{jk} and indirectly by changing the weights as population redistributes. In the long run both forces operate in the same direction. Hence, if location j becomes more desirable, we expect p_{jk} and q_{jk} to decline immediately. Moreover, ${}_jS_j$ ultimately increases, causing further declines in the likelihood that individuals in j will migrate out.[4] Predictions that fail to take into account the way in which heterogeneity is influenced by migration will underestimate the extent of redistribution. Although this model is simple, the conclusion is fairly general. For example, Rogers and Belanger (1989) show that multiregional life table projections that ignore place of birth generally suggest much lower levels of redistribution than do projections that consider place of birth.

In actual data, the difficulty of accounting for all classes of population must be recognized. If omitted classes are like those in the simple model above, migration propensities will underestimate the redistribution. In part, such a systematic bias in the application of the gross flow model may explain its inconsistency with the net-migration model. The net-migration model and the standard spatial population distribution model from which (3) derives, assume that net migration will occur toward the more desirable location indefinitely. If length of time in a location reduces individual likelihood of departure, as the simple model above implies, and if the longest-term residents (and their descendants) refuse to leave the location when it is more desirable, redistribution does in fact continue indefinitely toward the more desirable location. Hence, in the long run, the net-migration model is correct, although at any one point in the process, population composition will influence net migration levels.[5]

2.4 Recognizing the dynamic of migration

Migration, by its very structure, will alter the distribution of preferences and thus migrant choices across locations. Because of its static, timeless nature, the formalization in (2) may be misleading. We must recognize that the migration we observe at any one time is the result of a dynamic process and, as such, a function of past migration.

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[4] Letting ${}_kN_j$ be the population of individuals in j who have ever lived in k and ${}_jN_j$ be the number who have never lived outside j, the equation of motion is written

$$N^t = M^{t-1}N^{t-1} ,$$

where $N^t = [{}_1N_1^t \; {}_2N_1^t \; {}_1N_2^t \; {}_2N_2^t]'$, and

$$M^{t-1} = \begin{matrix} (1-p_{12}+r) & b & 0 & 0 \\ 0 & (1-q_{12}-d) & q_{21} & p_{21} \\ p_{12} & q_{12} & (1-q_{21}-d) & 0 \\ 0 & 0 & b & (1-p_{21}+r) \end{matrix} .$$

The birth rate is b and the death rate d, so that the rate of natural increase is $r = b-d$. The steady-state values are defined by $N^t = (1+r)N^{t-1}$.

[5] Mueser and White (1989b) examine how the migration history of a county influences net migration by age.

The issue is further illustrated by Sjaastad's (1962) discussion of migration, where he stresses the importance of age, since the expected gain from a move increases with the number of years to be spent in the new location. In fact, migration rates are highest in early adulthood, as would be predicted. Yet in most data, declines in gross migration propensities are quite sharp after the peak age. Sjaastad observed that the extent of this decline was not consistent with normal discounting, since the benefits of moving should decline only gradually with age. He suggested that the costs of moving must increase with age.

Even in the absence of changes in moving costs, however, the pattern is exactly what we expect given the dynamic character of migration. If a move is worthwhile, it will be most beneficial if made as early as possible. Unless expected benefits across locations change, those individuals who have chosen not to move will be limited to those who gain little by moving and so will be unlikely to move later. Those who gain from moving have been removed from the risk set.[6]

This example underscores the point that if we take seriously the existence of heterogenity in preferences across individuals, we must recognize some kind of time dimension in our specification. We cannot apply the static model, assuming that the choice criteria for those remaining in a location in a particular period will correspond with the criteria used by those in the location in the previous period.

What does this imply about models of the form in (2)? It suggests the value of disaggregating, first by migrant characteristics such as age, but equally important by individual migration history. If these populations can be identified, much of the impact of migration history can be captured. Far too little past research has attempted to capture migration history.

Concern for the dynamic underlying migration cannot be limited to identifying migration propensities for various subpopulations, however finely they are classified. The dynamics underlying migration decisions must be investigated, especially those causing individuals' evaluations of locations to change over time. Such changes give the migration process its complex character. If we simply follow individuals and assume that their preferences are unchanging, we predict that no migration will occur after the initial period. All those individuals for whom movement was worthwhile will have moved, and those who had chosen to move would be living in their most preferred destination, precluding the need for later mobility. Stated differently, since migration is a continuous flow occurring over time, it derives from a process in which individuals' choice criteria change continuously.

One source of change derives from the new information that accrues after a move. For newly arrived migrants, opportunities may not turn out as expected. Here we need to understand the way in which information is gathered. A search model of the kind used to analyze labor markets and only recently applied to migration (McCall and McCall 1987) is relevant for understanding such moves. Alternatively, information gathering concerning alternative locations may be important, with migration occurring in response to newly ascertained opportunities

[6] This selection effect was pointed out by Becker (1975, p. 73).

(Polachek and Horvath 1977). Several points made below in our discussion of spatial choice sets may also be relevant here.

Even for long-time residents, personal circumstances may change in such a way as to induce mobility. The association between geographic mobility and other changes in personal circumstance such as marriage, divorce, or job loss is well documented. Most obviously, those entering adulthood experience changes in the relative evaluations of alternative locations, increasing the value of employment opportunity.

Whereas the formulation underlying (1) implies that only a single move occurs, and that locations can be classified according to relative average desirability, once we recognize the possibility of systematic changes in the evaluations that individuals place on locations, it is clear that this formulation is inadequate. Patterns of expected utilities across locations for different periods of the life cycle may induce multiple moves even in the absence of uncertainty. Particular locations may provide opportunities that extend only through a short period, after which a move to another location is appropriate. The prototype might be the individual who leaves home to attend college, then moves to a major metropolitan area to obtain a job, and then migrates at retirement, either returning to the home town or moving on to a retirement area. In this view, areas are not merely ranked by relative desirability, but rather they may be viewed as providing specialized services for specific subpopulations.

The case of the college town further illustrates the difficulty of tying migration propensities to location desirability. Such a town attracts disproportionate numbers of individuals in the age range 17–19. It also loses a disproportionate share of individuals in the age range 21–24 (White 1977). It may be intuitive to interpret the high level of in-migration in terms of desirability in the sense that the college provides opportunities not available at home. Yet to describe the college town as undesirable for those aged 21–24 is hardly meaningful. The high rate of departure in these ages is a direct result of the institutions that draw individuals at younger ages, creating a population of residents who have ties outside the location and who recognize that their stay is likely to be temporary.

2.5 Non-steady-state migration

A view of migration as a response to differences in location desirability is most appropriate if migration causes a redistribution of population rather than an exchange that leaves relative populations unchanged. Sjaastad's own discussion is clearly in terms of the success of migration in redistributing individuals to more desirable locations. In contrast, as suggested by Plane (1984a), many of the factors determining the size of migration propensities reflect steady-state, equilibrium phenomena-processes that induce migration even in the absence of population redistribution.

Student movements of the kind discussed above, into and out of a college town, may be interpreted as a steady-state phenomenon, since such patterns may continue indefinitely without the characteristics of the locations changing. Similarly, the random exchange of migrants between locations, reflecting idiosyncratic matches between particular individuals and particular jobs, need not in-

duce changes in the locations. In contrast, where migration patterns cause changes in the relative populations of various locations (or in the population composition of those locations), migration should set in motion processes that further change the locations. Ultimately, such changes will alter the migration patterns, in general tending toward a new steady state.

In analyses focusing on net migration, the implicit concern is with movements reflecting disequilibrium. How is it possible to maintain the focus of the Sjaastad approach on migrant response to relative location desirability without relying on the strong assumptions of the net-migration model? Since net migration reflects a movement from an equilibrium position, we might ask to what degree gross flows contribute to net migration. More generally, we can examine the way in which migration propensities change over time. If we observe a change in the characteristics of location j, we can see that this will identify the behavioral response as reflected in changes in the propensities. In particular, using (4), we can express the elasticity of the overall migration propensity as the weighted sum of the elasticities of the component propensities,

$$\mathrm{d}\ln P_{jk}/\mathrm{d}Y_j = {}_jR_j(\mathrm{d}\ln p_{jk}/\mathrm{d}Y_j) + {}_kR_j(\mathrm{d}\ln q_{jk}/\mathrm{d}Y_j) \ ,$$

where ${}_jR_j = {}_js_jp_{jk}/P_{jk}$ and ${}_kR_j = {}_ks_jq_{jk}/P_{jk}$, and s are the shares of the two kinds of population as defined in (4).

So long as ${}_jR_j$ and ${}_kR_j$ change little enough between periods, variation in the migration propensity between periods may be taken as an indicator of the relative value placed on this characteristic by migrants, with different classes of migrants weighted by their contribution to observed migration.

2.6 Steady-state migration

Patterns of migration reflecting spatial equilibrium may have a different character than those that tend toward a steady state. In large part, variations in gross rates of in- and out-migration across locations reflect equilibrium patterns. In equilibrium, given no differences in rates of natural increase, in- and out-migration at each location must be equal. As a result, these two measures are jointly determined in the equilibrium system (Mueser and White 1989a; Schachter and Althaus 1989). Any attempt to identify the separate determinants of in- and out-migration at a location must take their interaction into account.

Migration patterns reflecting local area specialization by life cycle provide a case where steady-state migration may involve systematic differences in net migration. Those areas that attract disproportionate numbers of the elderly will have lower rates of natural increase than do areas with younger age structures. As a result, relative population will only be maintained if net migration is toward such areas, and out of younger areas. Net migration of the elderly is then part of a steady-state pattern that maintains a stable population distribution.

The interaction between steady state and non-steady-state mobility structures is illustrated by considering the migration experiences of such areas as Florida and Arizona. For these states, population growth by migration has been great, producing a major redistribution of U.S. population. In the terminology used

here, such patterns are non-steady-state. Yet, part of the reason for the growth in these states is the increased importance of retirement specialization across locations; the elderly are overrepresented in flows to these areas. The present redistribution may ultimately yield to a stable pattern of elderly migration to such areas, transforming these states to a new role in the steady-state spatial exchange system.[7]

2.7 Summary and conclusions

The foregoing discussion has focused on the choice model underlying much migration work. We have suggested that the simplest model based on this structure is misleading in important ways, due to its failure to incorporate the dynamic character of migration. In contrast, the net migration structure takes advantage of the tendency of the population system to move toward equilibrium, focusing attention on those aspects of location that cause migrant flows to depart from their equilibrium levels. For this reason net migration may successfully identify how migrants value location characteristics.

On the other hand, an analysis of net flows can only tell part of the story. We have suggested that one way to tie net migration to migration propensity measures is to focus on changes in migration patterns. If net migration identifies deviations from an equilibrium population exchange, net migration can be decomposed into components due to changes in various migration propensities. Yet steady state patterns of migration are of interest in their own right. To understand such patterns of stable population exchange, we must focus on the specialized functions that locations provide for different populations. Such patterns are superimposed over and interact with movements that induce changes in relative populations.

3. New directions: the spatial context

One of the most talked about events of 1989 among American geographers was the appearance of *Geography in America.* Edited by Gaile and Willmott, the book was a joint venture of the eclectic "specialty groups" of the Association of American Geographers (AAG) in an attempt to provide a current snapshot of research streams within the discipline. In a sense, it updates James and Jones (1954) *American geography: inventory and prospect.* Of most relevance to this paper is the chapter on population geography authored by a team of writers from the AAG's Population Specialty Group. The chapter consists of six essays on population "themes" of particular recent emphasis within the field: (1) residential mobility, (2) urban housing and households, (3) counterurbanization, (4) internal migration, (5) international migration, and (6) population and development. As can be seen from this list, recent population geography research has been dominated by studies of migration, with perhaps unfortunate neglect of the geographic dimensions of fertility, mortality, and other population topics.

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[7] Mueser et al. (1988) examine shifts in life cycle specialization for United States counties, 1950–1980.

The organization of McHugh's section on internal migration is indicative of the bifurcation of the small body of migration specialists into (a) those who take macro-level approaches and (b) those who pursue behavioral studies. The macro-scale research tradition in geography has evolved from a focus on description and analysis of place-to-place migration, with much recent explanatory modeling focusing on place attributes and assigning a central role to the impact of distance on the volume of movement. The tradition of description and analysis of the structure of place-to-place migration is carried on in the recent work of such geographers as Kontuly (e.g., Kontuly et al. 1986) on counterurbanization, Rogers and Watkins (1988) on the movement patterns of the elderly, Plane (1984a) on temporal change in the demographic "efficiency" of interstate movement, and McHugh (1989a) on channels of Hispanic population redistribution in the United States.

The development of cross-sectional spatial interaction models for migration analysis has been carried out contemporaneously with their application to such complementary research areas as intraurban mobility, intraurban travel demand forecasting, and interregional commodity flow analysis. A recent research direction has been in modeling temporal change within an entire system of place-to-place migration flows.[8] In addition to the proclivity to focus on place-to-place migration streams rather than aggregate net or gross in- and out-migration, notions of interregional complementarity (Plane 1984b) and systems of competing regions (Fotheringham 1986, 1987) have been of concern in the migration research of those geographers who still exhibit the view of P. Vidal de la Blache that geography is the science of places and not of individuals.

By contrast, the "behavioral revolution" that swept geography shortly after the "quantitative revolution" has left its mark in a second subset of migration work that, McHugh notes, is focused on the behavior of individuals and households, rather than on streams of aggregate movement, and on decision-making processes. As further noted by McHugh, the core concepts applied to interregional migration have been quite similar to those used to address intraurban mobility, and interest has developed in the adoption of psychological theory, methodology, and measurement. A major concept within the behavioral geography school of migration research has been that of "place ties," (i.e., the network of social and economic linkages between households and a community that typically increase with increasing duration of residence and that serve to mitigate against a migration decision).[9] Finally, McHugh identifies the role of situational and contextual factors in affecting migration decisions as an area needing more research. Thus, much of the behavioral research on migration carried out by geographers is in the spirit of the "man-land" tradition of geographic inquiry, with a focus on how the surrounding environment influences the choices made by individuals.[10]

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[8] See Plane (1987) and the review of recent literature contained therein.

[9] See, for example, Roseman and Oldakowski (1984), McHugh (1984), and White (1987).

[10] Clark (1986) and Plane and Rogerson (1990) provide additional perspectives on the current state of migration research from the geographer's perspective.

3.1 An organizing construct for future geographic research: the spatial choice set

Here we examine a single organizing construct related to patterns of place-to-place migration streams that has the potential to advance both the micro and macro schools of geographic inquiry distinguished by McHugh. The concept is that of the spatial choice set. The choice set is an idea around which a lively literature has sprung up in psychology (e.g., Tversky 1972; Payne 1982), in marketing (e.g., Landau et al. 1982; Black 1984; Johnson and Meyer 1984; Spiggle and Sewall 1987; Gensch 1987; Attaway 1989), and in urban travel demand analysis (e.g., Ansah 1977; Burnett and Hanson 1982; Richardson 1982; Borgers and Timmermans 1987; Kondo and Kitamura 1987; Swait and Ben-Akiva 1987a, b; Rust 1987), but has rarely been given explicit consideration in migration research.

Most conceptualizations of the migration decision process, as well as spatial interaction models designed to replicate the aggregate patterns of place-to-place flows, begin from the perspective of potential migrants located in a set of origin regions (1, 2, ..., n) who choose either to remain in the region of current residence, j, or who move to a destination region, k, chosen from among all potential regions (1, 2, ..., n). In reality, however, the preponderance of migration decisions are probably made based on consideration of only a restricted subset of all potential destinations. Both constraints and preferences, each as mediated by the individual's personal characteristics and societal roles, interact to define the set or sets of candidate destinations from among which the final selection is made.

We may easily adapt to the migration context the constrained probabilistic choice modeling framework espoused in, for example, Burnett and Hanson (1982). However the only similar previous application to migration seems to be a paper by Smith and Slater (1981). The difference between the standard choice model that implicitly underlies most current econometric and spatial interaction models of migration and a spatial choice set model may be seen by comparing (5), (6a), and (6b) to (7), viz:

$$M_{jk} = \sum_{i=1}^{N_j} P_{ij}(k): \text{ for all } j,\ k;\ j,\ k = 1,\ 2,\ \ldots,\ r \tag{5}$$

$$M_{jk} = \sum_{i=1}^{N_j} \text{Prob}\,(U_{ijk} + e_{ik} > U_{ijn} + e_{ijn}\ ;\quad \text{for all } n \neq k)\ ;\quad \text{for all } j,\ k \tag{6a}$$

$$M_{jk} = \sum_{i=1}^{N_j} \left[f(\mathbf{X}_k,\ \mathbf{S}_{jk},\ \mathbf{Z}_{ji}) / \sum_{n=1}^{r} f(\mathbf{X}_n,\ \mathbf{S}_{jn},\ \mathbf{Z}_{ji}) \right]\ ;\quad \text{for all } j,\ k \tag{6b}$$

$$M_{jk} = \sum_{i=1}^{N_j} P_{ij}(k \in \mathbf{A}_{ij}) P_{ij}(k \mid k \in \mathbf{A}_{ij})\ ;\quad \text{for all } j,\ k\ , \tag{7}$$

where: $P_{ij}(k \in \mathbf{A}_{ij}) = g(\mathbf{V}_{ji})$.

As shown in Eq. (5), any migration flow, M_{jk}, between origin region j and destination region k is obtained by summing the probabilities, $P_{ij}(k)$, of each of

the N_j individual inhabitants, i, in region j choosing to move to k. Note that if the individual-level probability functions were identical across all N_j individuals in each of the r origin regions j, (5) is the standard Markovian model ($M_{jk} = N_j P_{jk}$, for all j, k). The individual probability elements $P_{ij}(k)$ are conventionally expressed in the choice and stochastic utility framework of (6a), where U_{ijk} is the utility for individual i in j relocating to k and e_{ik} is a random error (stochastic disturbance) term, and where the migration choice decision is made based on a comparison across all the r possible destinations.

Most commonly in travel demand, migration, and other spatial interaction research, (6a) is operationalized in models taking the form of (6b), where the utility of alternative destination choice k is posited to be a function of a vector of variables, $\mathbf{X}_n$, each variable measured for each of the ($n = 1, 2, \ldots, k, \ldots, r$) regions in the system; one or more measures, $\mathbf{S}_{jn}$, of the spatial separation of j and each of the r alternative destinations; and a vector of characteristics particular to the individual, $\mathbf{Z}_{ji}$. Generally (at least in migration research) considerable attention is devoted to the $\mathbf{S}_{jn}$ variable(s), which is (are) most often operationalized in the form of simple distance deterrence terms such as the negative exponential or negative power function forms – though the broader concept (as set forth in Brown and Horton 1970 and alternatively explored in Plane 1984b) is that of *associational* variables, as opposed to the *attributal* variables included in $\mathbf{X}_n$.

Equation (7) shows the Burnett and Hanson (1982) constrained choice framework incorporating the notion of a spatial choice set, $\mathbf{A}$. The second term of the model, $P_{ij}(k \mid k \in \mathbf{A}_{ij})$, encompasses the usual model but asserts that destination selection is carried out comparing only those regions encompassed by the choice set. The first term of the model, $P_{ij}(k \in \mathbf{A}_{ij})$ posits a probabilistic form for choice set definition, which would be operationalized as a function, g, of a vector of variables, $\mathbf{V}_{ji}$, representing the constraints that impinge upon, and the inclusion criteria pertinent to, inhabitant i in the region j. Note that the choice-set definition portion of the model is flexible enough to handle not only (0, 1) inclusion rules but also nonzero, nonunity probabilities that any specific region, k, will be considered in the final selection process.

3.2 Dimensions of prospective migration research on spatial choice sets

Review of the geographic literature on migration and of the expanding, multidisciplinary literature on choice sets suggests a number of important dimensions for future migration research based on the spatial version of the choice set concept embodied in Eq. (7). A variety of these are detailed in the following five questions. Each focuses on a significant issue or issues about which migration research, to date, has not fully informed us. The suggested further research directions speak to both micro and macro themes within the geographic literature. The issues raised are intrinsic ones for more fully understanding the place-to-place patterns of flow that we have suggested have been of central concern to geographers.

1. How do spatial choice sets vary across individuals? In a recent study of choice set formation for retail store selection, Attaway (1989) finds significant dif-

ferences both in choice-set composition and choice-set size in consumers shopping for women's clothing. The differences she finds are notable across age, education, and especially, racial groups. We know very little, however, about how the composition and size of migration choice sets vary. Research is needed: (a) on the variations across and within demographic and socioeconomic groups of the inhabitants of specific places, (b) on the *spatial* dimension of how collective choice sets are influenced by the *spatial structure* of a migration system, i.e., the relative locations of alternative destinations vis-à-vis each of the r origin regions, and (c) on the *geographic* dimension of how such factors as cultural regions and regional economic specialization give further, predictable shapes to the sets formed by inhabitants of the various origin regions.

Aggregation is perhaps the number one bogy of migration research. In part because of the aggregate nature of much migration data, too little attention has been paid until recently to the role of the personal characteristics, $\mathbf{Z}_{ji}$, variables of Eq. (6b). Most state-of-the-art econometric and spatial interaction models of interregional migration use multiple attributes of destination regions, the $\mathbf{X}_k$ variables of the Burnett-Hanson framework, which are operationalized in the familiar form of average wages, unemployment rates, mean January temperatures, and so forth. The potential migrants themselves, however, typically have been treated as an undifferentiated mass, despite a wide body of other research, particularly in sociology, that has shown that migrants and stayers significantly differ in terms of their demographic and socioeconomic characteristics. The geographic literature is replete with studies showing that the realized place-to-place patterns of migration differ across demographic and socioeconomic groups. Although it is well-recognized that this comes about, in part, because individuals differentially weight each of the $\mathbf{X}_k$ variables in their utility functions for destination choice, an even more important part of the story may be constraints shaping individuals' choice sets.

At a micro-scale this seems to be an important empirical issue begging for more research, with useful concepts that could be adapted from the large body of literature on intraurban activity spaces. Although hypothesis generation seems relatively straightforward, measurement issues for the migration context will likely be challenging. The notion of "evoked" sets as employed in marketing research (e.g., Narayana and Markin 1975; Spiggle and Sewall 1987) may have a migration counterpart in the early geographic work on residential preference mapping, but more detailed work is needed on determinants of migration choice sets and the conjunction of these with the discriminating variables in the destination-selection process itself.[11]

Life-cycle factors have repeatedly been shown to be primary generators of interregional movement. Change in age composition is probably the most predictable driver to use in longer term forecasting of mobility (Greenwood 1988; Plane 1991). To fully unlock the geographic dimensions of future migration change, however, it seems critical to obtain a better understanding of how choice sets evolve throughout the entire life-cycle. Whereas the role of climatic and other amenity variables in shaping the patterns of elderly migration has received con-

[11] See Abler et al. (1971), pp. 519–530 and the discussion pertaining to question 5, below.

siderable attention, we need to now go beyond treating labor force migrants as a composite group. In Plane (1989a) some stark evidence is presented about the dominant role of the baby-boom, labor-force-entrant cohorts in the 1970s' manifestation of the regime of accelerated U.S. core-to-periphery deconcentration. The migration responses varied dramatically across labor force age groups to the changing economic conditions of that decade, including the labor-supply pressure of greatly increased numbers of first-time entrants, suggesting a need for much richer aggregate models.

2. How serious is the misspecification in traditional models that assume all-inclusive choice sets? From the macro-modeling perspective, an important area for investigation is how bad, from the usual criteria of estimation and forecasting accuracy, is it to aggregate across individual choice sets and thus to include essentially irrelevant alternative destinations for most potential migrants? In any form of aggregate modeling, simplification is necessary to make the tasks tractable, and perhaps no significant biases result from assuming away the choice-set formation stage of actual migration decision-making. Johnson and Meyer (1984) report mixed results of an attempt to examine such aggregation issues from a theoretical perspective, as well as through a more specific empirical examination. The evidence, however, for modeling intraurban shopping behavior is that substantial gains in forecasting ability may be obtained through excluding largely irrelevant, distant locations.

Black (1984, 1986a, b), starting from the spatial probabilistic choice framework of Huff (1964), has pioneered a distance-threshold method for incorporating spatial choice sets in consumer patronage modeling. In the 1984 paper, he proposes a distance-based choice set index (CSI) reflecting the tradeoff between model errors due to the exclusion of relevant shopping alternatives versus those due to including irrelevant ones. For each of a series of distance blocks around each commercial outlet the CSI is computed as the cumulative proportion of zero probability values divided by the cumulative proportion of nonzero values. In his application the two sets of probability values needed for the index are constructed from the actual automobile purchase patterns of residents in a large metropolitan area, aggregated to the census tract.

In migration research, however, the "zero problem" is not quite so pervasive as in retail choice modeling in that the distance attenuation effect is less strong. While distance should play a leading role in the formulation of migration choice sets, our next question suggests that more work on multifaceted conceptual definitions of associational variables are required to operationalize the choice-set concept within aggregate models.

3. What are the major "shaping" variables of migration choice sets? Plane (1984b) reports that a *doubly-constrained*, negative exponential gravity model assigns more than 22% of actual 1978–1979 aggregate United States interstate flows to the wrong cells of the 51×51 migration matrix.[12] In any model incor-

[12] Doubly-contrained, negative exponential gravity models use the actual total numbers of out-migrants and in-migrants as the origin and destination mass terms, with "balancing factors" embedded to ensure that both margins of the matrix of predicted flows sum correctly to these exogenous totals.

porating a function of attributal variables to proxy origin and destination "mass," the predictions would be even less accurate, suggesting that a distance-deterrence component needs modification to proxy the outcomes of aggregating individual-level migration choice sets.

If asked to refine the notion of distance as a cost and thus disutility to movement, a geographer would probably first advance the role of information flows. Indeed, in the only apparent direct application of the choice-set modeling framework to migration, Smith and Slater (1981) operationalize Eq. (7) in a spatial form of the elimination-by-aspects model of Tversky (1972) with an information flow component. The destination-selection portion of their model takes the typical spatial interaction form:

$$P_{ij}(k \mid k \in \mathbf{A}_{ij}) = D_k e^{-\gamma d_{jk}} / \sum_{n \in \mathbf{A}_j} D_n e^{-\gamma d_{jn}} , \tag{8}$$

where d_{jk} is distance from the population centroid of j to that of k, and D_k is a measure of overall destination attractiveness. They then base the choice-set selection portion of the model on the probability of receiving at an origin region, j, a message about a job opportunity in a given destination region, k:

$$v_{jk} = R_j Q_k e^{-\beta d_{jk}} , \tag{9}$$

where $0 \leq R_j \leq 1$ is a measure of message "receptivity," $0 \leq Q_k \leq 1$ is a term for message "emissivity," and $e^{-\beta d_{jk}}$ is a distance-attenuation component proxying the pattern of information diffusion.

Although the Smith and Clayton model is significant as an application of the choice-set concept to migration, the terms of the information-flow portion of the model are determined as additional parameters fit through statistical means rather than with actual empirically measured variables; the terms thus posit the leading role of information, but because of the way they are derived, they encompass much more general relational measures of interregional complementarity – and physical distance is still used as a proxy for a real-world information separation concept. An empirical literature in geography and demography on destination selection may prove useful in future modeling endeavors (e.g., Fuguitt and Zuiches 1975; Gustavus and Brown 1977; Toney 1978).

In the labor-market/job-search context, seemingly much of the past geographic literature on functional economic bases of settlements and settlement-system structure has relevance to the network of linkage structures through which job-opportunity signals are actually transmitted. It would seem possible to explore the incorporation of measures of industrial structure complementarity into aggregate choice-set formation models. From a micro perspective, Plane and Rogerson (1991) suggest that more work is needed on how individuals define themselves along sectoral as well as occupational dimensions, because it is probably only within a few cells of a two-dimensional occupation/sector matrix that specific job signals will be taken as pertinent. Variables reflecting labor market conditions may serve as the perceptual indicators to potential "speculative" migrants, but in the context of labor-migration systems dominated by "con-

tracted" migrants, or migrants who already have jobs when they move (Silvers 1977), we ought to be able to do better in replicating and forecasting the patterns of interregional flow by taking advantage of the industry-specific inputs and outputs of standard regional econometric models. In one sense the ways that we define our future roles in society serve as constraints that shape migration choice sets, and, in another sense, such definition is but one of many ways that we simplify the myriad of options that we face in life. We turn now to this micro-level question regarding the real nature of migration choice sets.

4. What is the relative significance of "constrained" versus "simplified" choice in the formation of spatial choice sets for migration? A dichotomy might be made of the embryonic literature on modeling choice sets. Some researchers are fundamentally interested in the use of choice sets for simplifying complex cognitive tasks, whereas others approach the choice set as something defined through real (or perceived) constraints on actual behavior. Both seem pertinent to future migration research needs.

Payne (1982) reviews research that shows information-processing to be highly contingent on the demands of the task, organizing it into three theoretical frameworks: (1) cost/benefit principles (as applied to the strategies for choice), (2) perceptual processes, and (3) adaptive production systems – a hybrid of the other two viewpoints. Migration decisions, because they lead to so many fundamental changes in a person's life, and because in many cases they may involve joint decisions by household members, belong in the realm of highly complex choice tasks for which the choices of simplifying strategy may become crucial for determining the outcomes. Due to the many attendant implications of movement (e.g., houses to sell and buy, children to be placed in new schools, job opportunities to be explored), decision makers probably use destination elimination rules.

At least some of the destination elimination rules will likely be formed so as to represent real or perceived constraints. These may be amenable to representation in the form of measurable place attributes or associational variables. Constraints, however, probably also have a highly personal dimension not easily measurable with region-specific variables. Considerable attention has been given to the inertia built into migration systems through so-called "beaten path effects," and lagged migration has been found to be a consistently strong variable for replicating current and predicting future patterns of flow.[13] However, past migration patterns only crudely proxy the complex lifetime activity spaces of individuals and their webs of interpersonal contacts – both of which influence knowledge about and evaluation of alternative potential destinations.

In another retailing application of a choice-set model, Landau et al. (1982) screen out shopping destinations that lie outside the time-budget range as defined by the activity patterns of different groups of consumers.[14] In geography, the migration research of Roseman (1977), Roseman and Oldakowsky (1984), and White (1980) has been notable for highlighting the significance of personal and indirect contact fields for shaping the spatial spheres within which a move is most

[13] See the discussions in Greenwood (1985) and Plane (1982).

[14] See also the treatment of retail search in Rogerson (1990), forthcoming.

likely to occur. The prevalence of return migration (White 1987) and of temporary movements as a precursor to "permanent" relocation (McHugh 1989b) attests to the importance of further exploring the links between an individual's lifetime activity spaces and migration decision-making. As emphasized in the "stress" models that have dominated the geographic literature on intraurban mobility, migration decisions often take considerable time to be formed. We now turn to this temporal dimension.

5. What are the dynamic dimensions of choice-set formation for migration? What are the implications of these for modeling? Although the choice-set formulation (7) might seem to imply a two-step decision process, the processes of elimination of alternatives and evaluation of included ones is carried out simultaneously and probably in more than a single round of deliberation. Geographic work on job search (Rogerson and MacKinnon 1981; Rogerson 1982, 1987; Amrhein and MacKinnon 1988) has focused on the temporal dimension, examining optimal stopping rules for deciding when to accept a job offer and thus to terminate the decision process.[14] Geographic housing search is also an interesting process to examine because choice-set enlargement and evaluation takes places concurrently and iteratively. Two papers by Aitken (1987a, b) are notable for their treatment of the evaluative dimensions and mental schemata that renters use in the search process. (See also Aitken 1983, 1990.) The representation in (7) likely requires further enhancement to capture the dynamic dimensions of choice set formation in migration.

Spiggle and Sewall's (1987) model of choice-set formation for retail selection can serve as a useful prototype for further refining parallel concepts in migration research. Their model is represented schematically in Fig. 1. It is an extension and refinement of the "evoked set" concept, with several additional subsets proposed. The total set in Spiggle and Sewall's context consists of all retailers that carry a particular brand of product. In the migration context this is equivalent to the set of destinations $k = 1, 2, \ldots$. Spiggle and Sewall then make a first dichotomy between the awareness set and the unawareness set, with the former containing only those stores known to a particular consumer. In migration research the matter is probably not so binary. For example, everyone knows several things about California, but most everyone is also at least aware of Idaho. To represent the information dimension, a probabilistic or fuzzy set concept would be more pertinent in migration research; a threshold level of awareness may be necessary for a region to be considered for further evaluation.

In Fig. 1 the awareness set is trifurcated into inert, evoked, and inept sets. At the initiation of search, these correspond to stores about which the consumer reaches a "neutral," "positive," or "negative" evaluation based on holistic assessment and previous knowledge. Fruitful areas for migration research would involve strengthening the linkages to the literatures on residential desirability and quality-of-life indicators. An important difference, however, between the migration decision and a shopping decision should be noted. In migration the current region of residence provides the benchmark against which other potential migration-destination regions are compared. In shopping no single store choice necessarily plays this role.

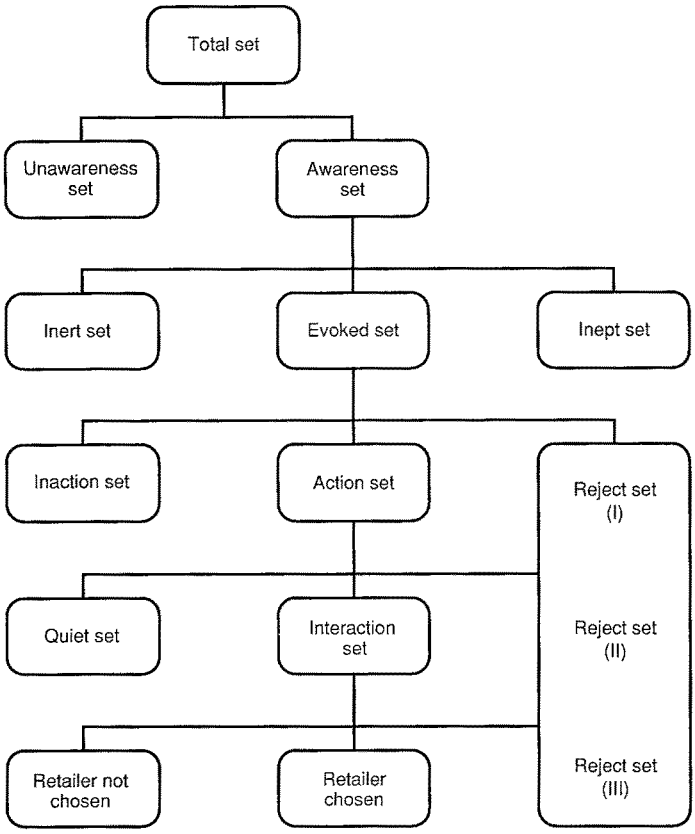

Fig. 1. The Spiggle and Sewall spatial choice sets model for retail store selection. (Adapted from: Spiggle S, Sewall MA (1987). A choice sets model of retail selection. J Market 51(2):97–111)

Spiggle and Sewall proceed to clarify the evoked set of actual candidate stores into a series of further subsets based on stages in the shopping process. The set is first broken down into an "action" set of stores actually visited, the portion of a "reject" set containing stores considered too distant or otherwise unappealing to actually travel to, and an "inaction" set of stores simply not visited, though not necessarily ruled out for later consideration. In migration, such a clearly defined active-search-initiation step is not always evident. For example, migrants may move to regions never physically entered previously. On the other hand, a variety of actions involving both preliminary inspection and exploration of alternatives may narrow remaining options beyond those in the evoked set. For contracted migrants, knowledge of, and a generally favorable preliminary assessment of, actual job openings may be somewhat analogous.

The action set is then distilled into an "interaction" set, which for retailing is defined on the basis of the decision to engage in contact with sales personnel. The "quiet" set consists of those stores exited after "just looking," but that are not now placed in the second portion of the reject set – stores for which the

shopping activity has resulted in elimination from further consideration. In migration second- and higher-order thresholds of more active search are also probable. For instance in the case of the contracted migrant the following steps seem reasonable: formal job application, telephone contacts with potential employers, personal job interviews, second site visits with family members, and real-estate searches.

The search process does not necessarily proceed in a linear fashion. In Spiggle and Sewall, the model of choice-set formation and store selection is simply viewed as a temporal sequence of transitions in the composition of any of the included choice sets. It would be interesting to explore empirically the analogous dynamic choice-set concepts for migration and to make use of measures similar to the awareness, consideration, capture, and selling effectiveness indices that Spiggle and Sewall propose and use in their empirical application.

With respect to dynamics, one further difference between the migration and retailing contexts is pertinent. Whereas retail shopping is proscribed in time, migration "shopping," can be carried on for an unbounded and lengthy portion of one's total life. If anything, the dynamic dimensions of spatial choice-set formation would seem even more important for migration than for retailing.

3.3 Conclusions: the spatial choice set as holy grail?

The concept of the spatial choice set does not encompass all the needed future research in migration from a geographical perspective. Yet the dimensions of needed research on the concept that has just been discussed suggest that it can serve as a useful construct for piquing further studies – both in migration decision making and aggregate migration modeling. Researchers may find, however, that the concept is an elusive one to pin down in practice. Unlike migration flows themselves (which we have enough trouble measuring!), the underlying choice sets are inherently ethereal. At a minimum, the spatial choice-set concept should be able to serve as a sort of Holy Grail for future migration research undertaken from the geographer's characteristic perspective. Many useful results should be generated along the way by those who engage in the quest.

4. New directions: employment and migration

The United States economy demonstrates a high degree of geographic mobility. The U.S. Bureau of the Census (1981) notes that almost one fifth of the adult population moves during a five-year period, and this fraction rises sharply to one third for adults in their twenties. Survey-based questionnaires that have investigated the reasons for geographic mobility, such as those discussed by Lansing and Mueller (1967) and Bartel (1979), indicate that economic reasons are extremely important. Of particular interest is the inference from these surveys that approximately one half of all moves are associated with a decision to change jobs. Facts such as these help explain the interest of economists in migration and the extensive economic literature on the determinants of migration.

Greenwood (1985) argues that migration research has a strong orientation toward the determinants as opposed to the consequences of migration. "In general, migration research has maintained its strong orientation toward the determinants as opposed to the consequences of migration, and consequently most of the recent advances have concerned the causes of migration" (1985, p 521). The observation that the consequences of migration have received only modest attention provides major opportunities for future research. These opportunities seem all the more available because the major thrust of migration research during the last 10 to 15 years has involved the use of micro and panel data, and such data do not lend themselves to an analysis of the consequences of migration, except the personal consequences.

In the past, traditional economic theory assumed that labor-force migration is efficient from both an individual and societal perspective. However, a considerable body of recent empirical literature has evolved that questions the equilibrating role of the market mechanism in redistributing labor resources across space.[15] Research in this area is difficult to characterize in that many of the investigations derive or infer implications relevant to migration "effectiveness" in an indirect fashion from empirical studies of related topics. Perhaps the best examples of this are the many studies that attribute sizeable and persistent interregional (real) wage differentials to market failures in migration. On the other hand, simultaneous-equations models of migration and labor market conditions provide direct evidence of the adjustment tendencies of interregional migration.

In considering these issues, the discussion that follows is organized around four major themes: (1) migration as a reflection of interregional labor market adjustment; (2) regional labor market dynamics, migration, and economic efficiency; (3) internal migration patterns of recent U.S. immigrants; and (4) migration issues incorporated in nontraditional areas of economics.

4.1 Migration as a reflection of interregional labor market adjustment

To a significant extent, economists view migration patterns as a reflection of interregional labor market adjustment. Employment and population components of regional growth and decline are jointly determined. However, the existing literature is much more successful at explaining population reordering after it has occurred than at focusing on the economic determinants of the spatial redistributions. This observation may explain why our ability to forecast trends in migration patterns has been somewhat limited. This is particularly true in the context of the dramatic changes in the spatial distribution of both population and employment

[15] The question of the efficiency of migration in reallocating labor supplies has been seriously debated in Canada, especially with respect to migration induced by differential provision of public goods across regions (Mills et al. 1983). Goss and Paul (1990) suggest that the availability of unemployment insurance benefits in the United States significantly discourages the migration of individuals who were laid off. Consequently, they feel that unemployment insurance benefits have a negative effect on allocative efficiency during downturns of the business cycle because more individuals become involuntarily unemployed. Issues like these warrant more attention.

that occurred in the United States between 1970 and 1985. Coincident with the differentially high rates of employment growth in the South and West, a spatial population reordering has occurred vis-a-vis migration in favor of these regions, with net out-migration occurring from the Northeast and Midwest.

In a recent paper, Greenwood et al. (1989) examine the differential rates of both employment and population growth over the period 1970 to 1985. Causes of these various dimensions of spatial reordering are attributed to five interrelated circumstances. These are: (1) changes in the costs of conducting business in older urban centers; (2) growth of resource-based industries in nonmetropolitan areas; (3) rising income and attendant increased demand for location-specific amenities; (4) changing demographic structure of the U.S. population and labor force; and (5) government policy. To a major extent these factors have simply not been incorporated into either descriptive or analytical migration research concerned with trends in interregional population movements.

Even the somewhat more specialized simultaneous models of employment and population growth reviewed in Greenwood (1985) tend to focus on an aggregate concept such as "employment change." Future research, particularly that dealing with multiregional migration flows, needs to more precisely incorporate the economic determinants of evolving spatial patterns. The challenge of future research is to explicitly recognize the above five factors, as well as newly emerging forces, in migration research.

Interest in modeling and forecasting migration from a temporal perspective has been matched by methodological approaches that are suited to a time-series focus. These approaches have led to an increasing recognition of implicit identities in multiregional models, such as that net interregional migration within a closed system must sum to zero. Milne (1981) and Greenwood and Hunt (1984) represent research that has derived various "adding-up" constraints with respect to migration flows. However, existing econometric analyses of regional systems tend to continue to treat migration in simple terms. The methods of regional economic analysis reviewed in Bolton (1985) and Glickman (1977), for example, utilize net migration more as an accounting concept than as an integral component of regional employment growth, change, and adjustment. Regional econometric models clearly need to recognize the implicit identities analyzed in the migration literature. An important avenue for future research is the integration of migration studies from a temporal perspective into multiregional econometric models.

4.2 Regional labor market dynamics, migration, and economic efficiency

Labor force migration poses two questions for the economist. The first concerns the nature, magnitude, and direction of labor force response to perceived earnings differentials and other regional characteristics over space. The second concerns the effectiveness, or efficiency, of this response – namely, migration – and other market mechanisms in reducing both employment and earnings differentials over time. Indeed, most of the economic literature on the determinants of migration has dealt, either directly or indirectly, with these questions. Based on research to date, several general themes emerge that warrant additional investigation.

For individuals, the decision concerning whether or not to move, and to where, is dependent upon information on spatially diffused labor markets, including wages, both general and job-specific employment opportunities, relocation costs, and other micro/macro dimensions of human capital and spatial job search. This is particularly true for unemployed individuals. DaVanzo (1978) and Schlottmann and Herzog (1981) have shown that personal unemployment does indeed induce migration. Other recent literature investigating the individual migration decision has confirmed the significant influence of personal unemployment. However, three questions remain concerning the role of unemployment on migration.

The first centers on the possible existence of occupation-specific effects. Herzog and Schlottmann's (1984) analysis of the migration decision for several large occupation groups suggests that unemployed blue-collar workers differ from other occupations. Moreover, as noted by Morrison and DaVanzo (1986), among those who quickly move on after an initial move, individuals in white-collar occupations are relatively heavily represented. Among those who quickly return, blue-collar occupations and especially those unemployed before the initial move, are disproportionately represented. The extent to which workers in different occupational or education categories vary in spatial job search remains unanswered. Little research has focused, for example, on workers in the lowest skill categories.

A second question involves the impact of unemployment on the migrant's choice of destination. The impact of both personal unemployment and regional unemployment levels on the migrant's choice of destination has been a relatively neglected aspect of migration analysis. Most of the research to date has focused solely on unemployment within the initial decision to migrate. Future research on the impacts of personal and regional unemployment on destination choice could provide important new evidence on the role of migration as an unemployment equilibrating mechanism.

The third question involves verifying the findings of DaVanzo (1978) and Herzog and Schlottmann (1984) regarding the United States, but for other nations. These authors have shown that personal unemployment importantly influences an individual's responsiveness to local unemployment. However, studies of the Netherlands (Van Dijk et al. 1989), the United Kingdom (Hughes and McCormick 1989), and Sweden (Harkman 1989), while verifying the importance of personal unemployment in migration decisions, have failed to uncover a result similar to DaVanzo's. The failure to observe that the unemployed in these countries are particularly sensitive to local unemployment may be due to the differences in social programs, specifically unemployment insurance programs, but this remains to be demonstrated.

Aspects of the regional labor market adjustment process and migration efficiency can be inferred from spatial earnings differentials and spatial variations in the returns to worker characteristics. Dickie and Gerking (1989) provide a comprehensive survey of empirical research on interregional (real) wage differentials in the United States. They argue that the validity of the interregional wage equality (or inequality) view is unsettled; however, they show that the outcome of debate on this topic bears directly upon important policy questions. For instance, should interregional migration be considered within an equilibrium setting or as a dis-

equilibrium phenomenon?[16] Moreover, should public resources be employed to reduce the impediments to geographic mobility or to augment the human capital of low-wage workers?

The Dickie and Gerking survey and associated studies summarized in Greenwood (1985) suggest that additional research is needed in order to establish whether interregional differences in labor characteristic prices (returns) is a warranted conclusion given the existence of significant interregional migration. In this context, two areas of research are needed. First, workers of different skill levels need to be more carefully distinguished. This is particularly true in an interregional context since highly skilled persons have a greater incentive to migrate in response to geographic wage differences. Almost no literature deals with those members of the labor force with the lowest skill levels. Second, tests for interregional wage inequality and the associated migration response need to more carefully define factors relating to labor demand. Many of the existing studies focus on labor supply and workplace characteristics and ignore labor demand considerations. This is particularly surprising given the implicit recognition in most studies that interregional labor force movement is responsive to employment opportunities.

Simultaneous-equations models of migration and labor market conditions provide direct evidence of adjustment tendencies of interregional migration. Based upon articles utilizing this modeling approach, we are able to identify three crucial links, or adjustment mechanisms, within regional labor markets. These are: (1) the response of migration to both income and employment differentials, (2) the reaction of employment to regional wage rates, and (3) the relationship between regional wages and excess demand variables.

Although exceptions exist, such as Vanderkamp (1988), much of the research to date focuses only on the first two mechanisms and, moreover, does not adequately model income differentials.[17] Additional research focusing on the third adjustment mechanism identified above, and more precisely investigating the role of income differentials, is warranted. Future refinements of this work would provide useful insights into regional labor market dynamics and migration. For example, within spatially-linked labor markets, to what extent is migration induced by spatial disparities in economic well-being itself destabilizing? Not only do migrants create short-run multiplier and accelerator effects, but the migration process is selective of the more educated and skilled members of the labor force. An important and largely unresolved public policy issue relates to how (persistent) regional disparities arise within spatially-connected labor markets characterized by these adjustment linkages. The five interrelated circumstances identified by Greenwood et al. (1989) result in both frequent and differential shocks to local economies, and the local adjustment mechanism is not instantaneous. These fac-

[16] For discussion of migration in equilibrium versus disequilibrium systems, see Greenwood (1985).

[17] As discussed by Greenwood (1985), simultaneous-equations models of migration and labor market conditions tend to be limited by data availability. For example, separate equations for in-migration and out-migration are often not feasible within these models. However, the suggestions presented here can be addressed in future research.

tors have not been incorporated in a meaningful way in specifications of local labor markets within simultaneous models.

Many studies of place-to-place migration suggest that information and psychic costs provide significant and quantitatively important deterrents to successful geographic mobility. Because information and psychic costs of relocation are under most circumstances not measurable, the literature has focused on repeat migration to another area or return migration to the area of origin. Such "additional" migration behavior is an expected response by those who discover that job opportunities were not what they expected or that the psychic costs of living without friends and family nearby were higher than anticipated. DaVanzo (1983), for example, provides several interesting hypotheses concerning repeat migration. However, most studies of repeat migration are based on a cross-sectional framework. Such models do not allow any consideration of migration as a dynamic process. The availability of panel data on migration should allow future research to address several questions that remain concerning repeat migration. Is repeat migration necessarily a "mistake," or does it represent a lag in the migration process? To what extent are we truly observing a remigration propensity due to information and psychic costs or have we simply rediscovered Ravenstein's (1885) counterstream effect based upon the simultaneous determination over time of employment and population?

4.3 Location behavior of immigrants

Recent literature has examined the relative success of immigrants within the U.S. labor market and whether immigrants displace domestic workers and/or reduce domestic wages. Greenwood and McDowell (1986) survey this literature. Recent surveys and case studies of professional immigration identify immigration as an important source of highly trained manpower to the United States. For example, 26% of U.S. immigrants hold professional and technical occupations compared to 16% for the resident U.S. labor force (US Immigration and Naturalization Service 1979). These facts and the literature on immigration suggest several interrelationships with the migration literature worthy of investigation.

As discussed in Keely (1975) and North (1974), recent immigrants are concentrated spatially because U.S. immigration law and practice heavily favor family reunification. In 1975, 76% of all immigrants resided in nine states, with 25% living in California and 18% living in New York. However, much less is known about the subsequent locational behavior of immigrants and how such behavior is governed by regional labor markets. The significant percentage of highly educated immigrants within these potential migration flows is of particular interest to receiving localities. Although a few recent studies, such as Daneshvary et al. (1986), suggest that the average likelihood of interestate remigration among immigrants after initial settlement is considerably higher than for the native American population, the economic determinants of this migration behavior have received little study to date. The internal migration decision of immigrant families warrants serious attention. The results of such analyses should be of appreciable interest to those interested in regional development policy, particularly in areas

with an emphasis on high technology job growth and associated requirements for workers with high technology occupations.

As discussed in Hoover and Giarratani (1984), analyses of early migration patterns often emphasized the concept of social distance – that is, the degree of difficulty a migrant has in making adequate social adjustments after arrival. Social distance was particularly important in explaining the concentration of late-nineteenth century U.S. immigrants from Europe. In the present context, future analyses of the internal migration determinants of immigrants can shed important evidence on the role of language as contributing to social distance. In 1980, for example, 26% of the U.S. foreign-born came from Spanish-speaking countries. As discussed in Greenwood and McDowell (1986), several studies have investigated the impact of English-language ability on the determination of wages. However, the extent to which social distance and language inhibits an individual's geographic mobility remains unclear. To what extent, for instance, do immigrants follow a beaten-path effect similar to historical waves of internal migration that were ethnically distinct? Is such migration behavior conditioned by English-speaking ability and, if so, associated with specific occupations? To what extent does a clear dichotomy exist between highly and less highly skilled workers? In addressing these issues, the notion of a choice set similar to that discussed in Sect. 3 may prove useful.

Moreover, the impacts of those immigrants who subsequently migrate internally could be different than when they first entered the United States because they have had an opportunity to adjust, which is to say to accumulate human capital specific to the U.S. labor market. The consequences of the in-migration of immigrants to specific localities could conceivably differ in quantitative and qualitative ways from the in-migration of other U.S. residents, but to date no research has addressed this issue. Immigrants could also affect the internal migration patterns of other U.S. residents. It is noteworthy that between 1975 and 1980 California experienced fairly heavy net out-migration of persons who were classified in those occupational categories that tended to characterize immigrants. Immigrant location in California was extremely high during the same period.

4.4 Migration in nontraditional research areas

Although the economic literature on migration is varied with respect to both topics of study and methodological approaches, a focus on spatially diffused labor markets is a universal theme. In this respect, migration can provide new insights for other areas of economics that have traditionally not incorporated spatial labor markets into their analyses.

Industrial location studies comprise a significant and growing area of interest. As discussed by Stevens (1985), these studies tend to emphasize "traditional" locational determinants, such as regional markets and transportation access. However, what recent information has been obtained from surveys and case studies of firm location indicates that firms are increasingly drawn both to specialized resources such as labor skills and education, and to factors that help attract and maintain a skilled work force, most notably state and local taxes. As shown in Rees (1986), high-technology firms are particularly footloose in terms

of the more traditional location factors (such as market access and transportation), and appear to be dominated in their location decision by their ability to obtain and retain individuals with specific technical, scientific, and engineering occupations.

New research may discover much about the location determinants of industry by examining the location (migration) decisions of workers with specific occupations. The location decisions of both firms and workers are, of course, interdependent. Yet even less ambitious models than joint location systems should provide new insights into the industry location decision.

Individuals frequently "vote with their feet" in the sense that they reveal through their migration decision their satisfaction or dissatisfaction with various attributes of their current residence. That such attributes are important and significantly affect migration likelihood has been demonstrated for location-specific amenities by Graves (1979).

Environmental economics is receiving renewed interest through the valuation of disamenities associated with hazardous wastes and similar problems (Dietz and Heijman 1988). One of the fundamental research questions with respect to such disamenities is the extent to which they "matter" in private and public decision making.[18] Since many of these environmental issues involve location-specific activities, migration research is a highly applicable concept of analysis. To what extent, for example, is either out-migration or in-migration affected? Does such response differ by occupational category, with resulting implications for regional development and industry location?

Within the industrial relations literature, important aspects of labor force behavior include interindustry and interoccupational mobility. This is particularly true since upgrading job skills, and resulting mobility, is seen as a natural way of augmenting a worker's human capital and associated earnings potential. This literature is reviewed in Leigh (1978). However, less attention is devoted within this literature to resulting geographic mobility associated with increases in human capital. For example, how does spatial job search expand with increased human capital? Does the level of occupational "upgrading" affect the extent of geographic mobility?

5. Summary and conclusions

Several earlier surveys of the migration literature provide the background for this paper. These surveys have assessed migration research from a number of disciplinary perspectives. However, in many instances they have not provided guidance regarding where migration research is going or should go. The present paper takes a forward-looking perspective by discussing possible new directions in migration research from the perspective of regional science disciplines.

Past migration research has had a strong orientation toward empirical studies. Although the fairly recent development and use of several micro data sets have

[18] For example, Greenwood et al. (1991 b) recently used laboratory experimental techniques to assess the effects on migration to Nevada due to locating the nation's nuclear waste repository there.

opened new vistas, the use of aggregate data has remained the mainstay of migration research, primarily because in most situations only aggregate data are available. Such data necessarily entail the use of gross or net migration measures. In this paper, we argue that gross migration measures are based on a choice model, but may be misleading due to their failure to incorporate the dynamic character of migration. On the other hand, net migration measures take advantage of the equilibrium tendency of the population system by focusing on those aspects of location that cause migration flows to differ from their equilibrium levels. When the population system is far from equilibrium, the analysis of net flows may also be misleading. We argue that a focus on changes in migration-propensity patterns could be useful. Moreover, we argue for increased attention to the specialized functions that locations provide for different populations.

Study of the determinants of migration has occupied the attention of most migration researchers. In many instances, however, the selection of those determinants upon which to focus has been somewhat arbitrary, perhaps capturing some aspects of the migration decision at the expense of others. We argue here that the notion of a spatial choice set could provide important guidance in studying the determinants of migration.

The concept of a spatial choice set emerges from the findings of psychologists that the human mind is unable to effectively process all available information. In the migration context, this means that individuals are unlikely to be able to consider all relevant characteristics of all potential destinations and simultaneously trade off the pros and cons of each destination against the others so as to arrive at a "preferred" location. Rather, decision makers focus on a manageable subset of potential destinations, as well as on a manageable subset of characteristics. The idea of a spatial choice set involves the selection of the subset of potential destinations. The notion of a spatial choice set provides a new direction in migration research both in its own right and because it can be applied in a laboratory experimental context.

We also argue that future migration research needs to incorporate the economic determinants of evolving spatial patterns, and in general needs to adopt a temporal perspective, which has been taken far too infrequently. Immigration has again become an important component of U.S. population growth. Yet, we know surprisingly little about why immigrants locate where they do and how their subsequent internal migration patterns unfold as they adapt to the U.S. economy and society. Exactly why does the spatial choice set of the foreign born differ form that of the non-foreign born, if in fact it differs at all?

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