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THE SPATIAL DISTRIBUTION OF QUALITY OF LIFE IN THE UNITED STATES AND INTERSTATE MIGRATION, 1965–1970 AND 1985–1990*

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ABSTRACT. This study applies a relatively new method called 'co-plot' to examine the relationships between the 48 contiguous states of the United States and selected indicators of quality of life in 1970 and 1990, and how these characteristics coincide with five-year interstate migration rates. The findings show an overall process of polarization of quality of life throughout the country. Strong similarity was found between states of a given division or region. The states which composed New England, the Middle Atlantic and the Pacific divisions are located in the strong sector of the socio-economic space. The direction of migration is toward states of the more external belts of the country. In the second part, multiple regression analysis was applied revealing a strong effect of economic incentives on migration; over time; migration turns into a widespread phenomenon among different socio-economic groups, with income becoming less significant as a predictor of interstate migration.

KEY WORDS: co-plot, migration, quality of life, regression analysis, United States

INTRODUCTION[1]

Increasing attention has been devoted in the scholarly literature, particularly that concerned with the United States, to macro-structural conditions in areas of residence as determinants of human migration. Geographical inequalities in employment opportunities and income, as well as other non-monetary environmental factors, accumulate to shape the individual's quality of life (QOL). As in other voluntary processes involving social and economic changes, these structural forces encourage the attainment of the necessary

threshold of desirability and feasibility of migration (Sjaastad, 1962; Ritchey, 1976; Massey, 1990; Michalos, 1997).

According to economic theories, the main anticipated benefit of migration is improvement in employment opportunities. The higher the rate of unemployment in a given state, the greater the out-migration (Greenwood, 1969; Cebula and Vedder, 1973). Opportunities in the labor market are particularly influential to people at working ages (Heaton et al., 1981; Clark and Hunter, 1992). Further support for a strong connection between migration and employment may be found, inter alia, in Blanco (1963), Miller (1973) and Greenwood et al. (1986), each of whom makes use of different empirical bases and measurements.

Other studies have found that rates of unemployment have insignificant coefficients, and at times even unanticipated signs, with migration (Kohn et al., 1973; Liu, 1975). This may be caused by a methodological approach that introduces several economic variables simultaneously, and where the opportunities in the job market are embedded in a different variable (i.e., income); or by a more substantive explanation of unemployment compensation benefits which deter out-migration (Sommers and Suits, 1973). According to DaVanzo (1978) families whose heads are unemployed, or are dissatisfied with their present jobs, are more likely to migrate than those whose heads do not seek alternative employment. Hence, high levels of unemployment will affect only a small portion of the population and will not be prominent in those studies that attempt to explain the migration of population using aggregate data (Greenwood, 1985). This may also explain somewhat the slightly different findings among white people as opposed to non-whites (Kohn et a1., 1973).

Another standard procedure in most of the studies concerning migration is the use of income per capita or levels of income. Labor supply reacts directly to inter-regional income differentials, and the volume of migration increases in proportion to differences in income (Ritchey, 1976). To exemplify this, we have noted selected studies on interstate migration (Greenwood, 1969; Greenwood and Gormely, 1971; Kohn et al., 1973; Miller, 1973), and on migration between smaller geographic units, such as metropolitan areas or counties (Cebula and Vedder, 1973; Graves, 1979). In a manner similar to rates of unemployment, the sensitivity to regional differences in

income varies over the lifecycle, having greater importance among young people than among older people.

In fact, the transformation of social organization, including progress and innovations in technology and increase in the importance of cultural amenity, may increase the sense of dissatisfaction and is likely to cause out-migration as a result of non-economic environmental factors as well (Liu, 1975; Heaton et al., 1981; Murdock et al. 1984). From the moment that a certain standard of living has been attained or, in a more general way as the standard of living rises, people will often be prepared to exchange purely economic advantages for qualities connected with comfort (Berry, 1977; Heaton et al., 1981). These environmental factors may be either cultural, including the level of crime and the standard of health services (Cebula and Vedder, 1973; Cebula, 1975; Clark and Hunter, 1992); or natural with climate being a most important determinant (Greenwood, 1969; Bass and Alexander, 1972; Miller, 1973; Clark and Cosgrove, 1991; Clark and Hunter, 1992). The importance of climate depends upon the social stratum involved, with lower income groups moving also to cold areas in which they are likely to receive compensation in the form of income, It should be noted that the warmer the climate, the lower the cost of living, and vice versa (Greenwood and Gormely, 1971). Thus, pensioners who are dependent on a fixed nominal income and migrate to a warmer climate may benefit from higher real income (Graves, 1979).

The present article seeks to contribute to the current understanding of the importance of QOL in interstate migration by tracing changes in these relationships over time, and by using different complementary multivariate techniques. We first applied a relatively new method of multivariate analysis, known by the name ''co-plot'', to examine the relationships between the 48 contiguous states of the United States and selected indicators of QOL in 1970 and 1990, and how these characteristics coincide with five-year interstate migration rates.[2] The final product of the co-plot provides three graphic results: (1) similarity among observations (i.e. states) by the composite of all variables (i.e. QOL) involved; (2) the structure of correlations among the variables; (3) the mutual, relations between observations and variables. Hence, we shall also be able to gain insights into tendencies of similarity and difference in QOL between states, and the extent of equilibrium across the regional system of the country (Schachter and

Althaus, 1989; Evans, 1990). In the second part, we attempt to identify the determinants of interstate migration through the use of multiple regression analysis. Separate equations are introduced for each of the time periods 1965–1970 and 1985–1990. The findings of this study are discussed in the context of the theoretical and empirical literature on population dynamics, and are also relevant for regional policy and planning.

THE CONSTRUCTION OF QUALITY OF LIFE

Based upon the cognitive-behavioral approach to location theory (Harvey, 1969), people evaluate the attractiveness and shortcomings of alternative residential areas in a subjective way. Just as people differ in their opinions, in their behavior and in their tastes, so are they motivated by different factors in the process of decision-making concerning migration and its direction. Even if the set includes similar variables that one assumes will increase the feeling of comfort or QOL, their order of importance and relative weight is likely to differ from one individual to another. The factors which have an important impact on the quality of one's life become more complex as it is reasonable to assume that they change in accordance with personal socio-demographic characteristics; according to patterns of migration; as well as over the course of time, with the advance of technology and the growth in the importance of material comfort and individualism. They also differ according to the respective racial, ethnic or religious group that embodies, among other things, unique social and cultural values related to place whether explicitly or relatively defined (Michalos, 1997). Satisfaction and happiness are likewise temporary feelings: "as one want is satisfied, another rises immediately to take its place" (Liu, 1975, p. 329).

The numerous variables of QOL are frequently connected with one another. While migration may be motivated by the desire for progress in one area, it will also function as an investment in other advantages offered by the new place of residence or, alternatively, as exposure to shortcomings, whether these were known in advance or not. Considerations of comfort or other non-economic factors which constituted causes for migration, may in turn create an increase in

economic opportunities at destination (Fuguitt, 1985). Areas with good supply of products and public services, such as social security, educational institutions or ecological conditions, are often characterized by expansion of economic opportunities as well (Michalos, 1997). In other cases, the relation among various local characteristics may be found to operate to the detriment of the residents, such as, for example, the positive correlation between income and price levels (Graves, 1979). Therefore, the fact that people migrate to a given place due to its certain characteristics, is not conclusive evidence that these were the main motivations, and there may be other related stimuli for which no information was available in advance.

These complexities may explain the different and varied choices by researchers of macro-indicators – economic, cultural, and environmental – as explanatory factors of geographic mobility. Some studies used as explanatory variables only such economic factors as income and employment; others combine these with the level of public services; and still others include such variables as inequality, climate, the presence of people of similar background (''migrant stock''), and the like. Moreover, the specific measurement of each such field may vary. Overall, one may distinguish between what Duncan and Newman (1975) have defined as productive moves, intended to improve the economic situation of the family, and consumptive moves, intended to raise the residential or community environments. These two dimensions are physical inputs that include goods, services, and quantifiable material abundance (as opposed to psychological inputs that are non-measurable; Liu, 1975).

For purposes of the present study, which attempts to examine the relationships between QOL and interstate migration and the trends in these relationships over time, we have chosen several indicators, some of which reflect local economic opportunities, while others relate to conditions of environmental comfort. These variables of QOL are representative of previous studies included in our literature review (e.g. Liu, 1975; Ritchey, 1976; Michalos, 1997). Thus they match, and are accepted as factors reflecting our social well being. Another criterion was that statistical data for those variables had to be available for each of the states separately for the years under discussion. Overall, we derived a set of variables that relate to various areas, but are nevertheless complementary, which we believe together shape a

significant portion of the individual's satisfaction with a given place. These variables of QOL, are as follows:

1. *Per capita income:* (*Ii*) per capita income in state *i* (in 1970 and 1990, respectively). This measure reflects the current income received by persons from all resources net of personal payments to social insurance.
2. *Unemployment rate*: (*Ui*) average of the mean total unemployment rate for each state *i* for the five years interval (1965–1969 and 1985–1989, respectively). We use unemployment rates for the entire five years to reduce the possible effect of intertemporal fluctuations in relative rates of unemployment in the 48 states (Cebula and Vedder, 1973);
3. *Individual equality:* (*Ei*) ratio of black to white percentage below poverty level in state *i* (in 1969 and 1989, respectively). Poverty index is based solely on money income not taking into account any non-cash benefits; and it is being updated every year to reflect changes in Consumer Price Index.
4. *Educational development:* (*Di*) percent of persons 25 years old and over with bachelor's degree in state *i* (in 1970 and 1990, respectively);
5. *Medical care:* (*Pi*) number of physicians per 100,000 resident population in state *i* (in 1970 and 1990, respectively);
6. *Crime rate:* (*Ci*) total rate of crime (both violent and property crime) per 100,000 population in state *i* (in 1970 and 1990, respectively);
7. *Climate:* (*Si*) average percentage of possible days of sunshine for the state's principle city (for period of record through 1969 and 1990, respectively).

For the application of the co-plot method and in order to create a uniform and comparable set suitable for both periods, we have transformed the data for each state to a ratio from the nation-wide average; this was done separately for each variable of QOL (see: Appendix B). Further, the variables unemployment and crime were reordered to reflect lowest to highest values of QOL. The data were taken from official publications of the United States Bureau of the Census including statistical abstracts and census publications; as well as data from the Bureau of Labor Statistics.

EMPIRICAL RESULTS FROM CO-PLOT

Classical multivariate analysis methods, such as principal component analysis or cluster analysis, usually analyze either variables or observations separately. The co-plot method analyzes the two simultaneously. In our case study, this technique makes it possible to locate each state (observation) in the social-economic-welfare-developmental environment, in which the location of each observation is determined by all variables simultaneously.

Co-plot is a graphical display technique that is useful for visual inspection of a data matrix such as $Y_{n \times p}$. The sample units are exhibited as n points (e.g., $n = 96$ states, 48 for each of the years 1970 and 1990), and the variables are exhibited as p arrows (in our study $p = 8$) relative to the same axes and origin. Co-plot maps the rows of a matrix in such a way that similar rows (observations) are closely located on the map. Each variable is represented *individually* by an arrow. A measure of goodness-of-fit is computed and associated for each variable *separately*. Co-plot enables the *simultaneous* study of observations and variables for a set of data, hence its name.

It should be emphasized that the axes of the graphic presentation are only a technical tool for computation which on their own have no meaning; the axis, that is, the frame of the configuration, can be erased without effecting the interpretation of the findings. Thus, the various parts of the presentation and directions are not geographically oriented. The changes in the location of observations (i.e. states) point to their relative proximity to one another in regard to the variables being examined, whether toward more convergence or divergence in QOL, as well as to the changing position of a given observation vis-à-vis each variable of QOL and the rate of migration. From a theoretical planning standpoint, this study is one of those that examine the socio-economic differences among areas that make up 'large' geographic units. This approach questions whether large geographic units are all of one kind or that there are differences among the areas that make up these units. The answers can help us better evaluate whether geographic proximity also means socio-economic proximity. The tracing of changes over time shall provide insights into the dynamics of similarity and dissimilarity among the 48 contiguous states, and how this is associated with population

movements. In this way, a differential development policy for the states based on their socio-economic situations can be combined with a homogeneous development policy based on geographic regions. The main shortcoming of this approach, however, is its inability to predict the direct influence of any single independent variable (QOL) on migration, and hence measures for establishing a theory; for this, we present a complementary multiple regression analysis (for a more detailed explanation of the co-plot method see: Appendix C).

Location and Relocation of States in the Socio-Economic and Welfare Space

The main objective of the co-plot method is to obtain a graphic presentation of the $Y_{n\times p}$ matrix of n p-variate observations. The data matrix Y of order 96×7 (eliminating the variable migration) was first submitted to co-plot, in an attempt to examine the changes in the position of the observations (states) between 1970 and 1990, by the composite of the QOL variables. As noted earlier, we chose the city-block distance of $r = 1$ as our measure of dissimilarity. Table I shows the goodness-of-fit of each arrow r_j to its associated variable, r_j^*. The correlations are fairly good, ranging from 0.64 for individual equality and climate to as high as 0.91 for crime rate.

The 96 observations were placed in a two-dimensional configuration (Figure 1). The general goodness-of-fit obtained by coefficient of alienation of $\theta = 0.16$ is satisfactory. The results reveal an overall trend of expanding variance between states in the socio-economic space defined by the various components of QOL. In 1990, the states were arranged around the center of gravity in a much larger radius than in 1970, inferring a less equal spreads of economic and welfare resources throughout the country.

In this process, some states experienced a relatively long move towards the far ends of the configuration. While the direction of these moves might be different, some strengthening the relative socio-economic level of the state and others relocating in the lower-than-average sector, they have contributed to the more polarized pattern of QOL in the country. These states include West Virginia, Louisiana, Nevada, New Hampshire, Maryland, Connecticut, Massachusetts and New Jersey. Among the states whose distance from the country's average declined, that is, moved closer to the center of gravity, are

TABLE I

Maximal correlation (r_j*) in the co-plot method for the eight variables studied

Variable	Notation	Definition	Maximal correlation
1. Per capita income	*Ii*	Per capita income	0.89
2. Unemployment rate	*Ui*	Average of the mean total for five years interval	0.66
3. Individual equality	*Ei*	Ratio of black/white percentage below poverty level	0.64
4. Educational development	*Di*	Percent of persons with B.A. degree	0.81
5. Medical care	*Pi*	Physicians per 100,000 population	0.82
6. Crime rate	*Ci*	Rate of crime per 100,000 population	0.91
7. Climate	*Si*	Average percentage of possible days of sunshine	0.64
8. Interstate migration	*Mi*	Five years interstate migration rate	0.61

Maine, North Carolina, South Carolina and Utah. Significant alterations characterized some of the medium or smaller size states, while most of the heavily populated states (with more than 10 million inhabitants) maintained a rather stable position in the social and economic space. It stands to reason that smaller localities are more sensitive to evolving trends on the national, or even global, scene; at the same time, they can more easily respond to different types of intervention which are aimed at improving local conditions for development purposes.

Clustering the states into the nine official geographic divisions of the United States reveals that the Middle Atlantic, East–North–Central and Pacific are very homogenous units in terms of QOL; the states which composed each of these divisions are concentrated and have been relocated within a relatively small and defined area.[3] By contrast, states in New England, the South Atlantic, West–South–

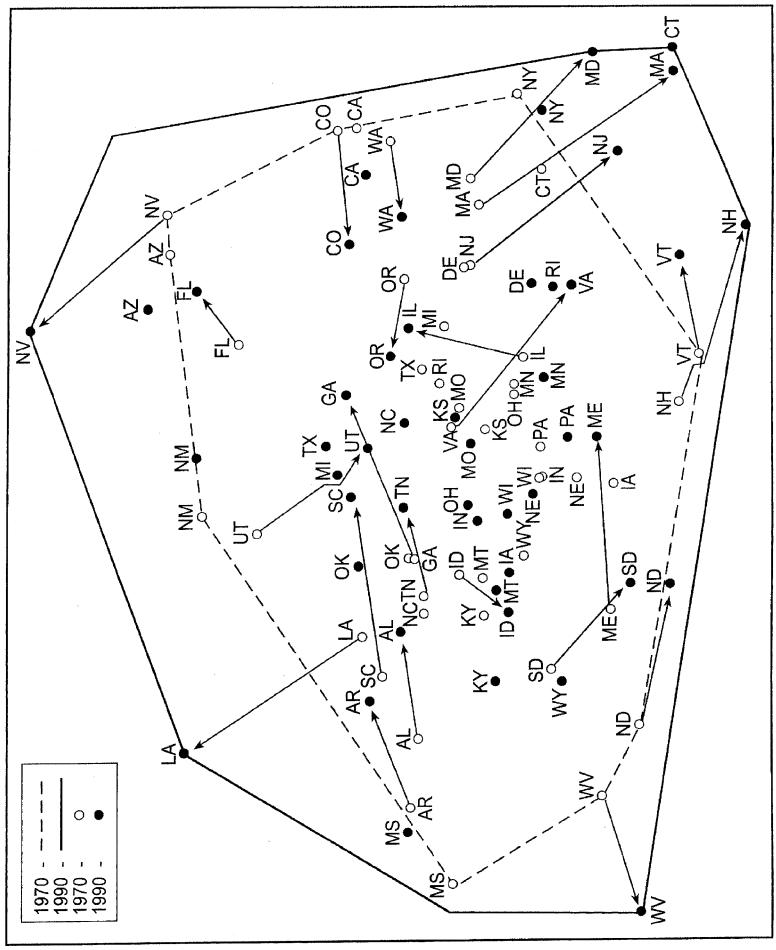

Figure 1. Co-plot graphic display for $n = 96$ states (in 1970 and 1990) measured on $p = 7$ variables.

Central and the Mountain divisions are much more dispersed throughout the configuration. Further, there is much similarity between divisions of the same region in terms of QOL. Divisions of the same region are likely to be located on the configuration next to each other with many osculating or even overlapping areas. In 1970, New England and the Middle Atlantic were located very close to one another, and over the next two decades the states comprising them moved in a rather similar direction, making only a modest change relative to states of other divisions. The West–North–Central division, also largely overlaps with the area captured by its neighbor the East–North–Central division. Despite the wide dispersal of the Southern states, many (but not all) are found along the horizontal axis in the middle-west section of the map. With the exception of Colorado, the other states of the Mountain division are somewhat far from those of the Pacific. To a large extent, the direction and distance in which states have been relocated on the QOL configuration resulted in the maintenance of the intra-division similarity within a given region.

Social and economic changes in a specific state are more similar to those experienced by other states from within the same division/region, as compared to changes in states of other areas. This seems to point to strong relationships and mutual effects based on geographical proximity. The similarity between states of a given area is maintained despite any evolvement of a more polarized socio-economic structure nation-wide.

A rather clear distinction may be drawn between New England, the Middle Atlantic and the Pacific divisions, of whose states are located east to the center of gravity, as against the West–North–Central, East–South–Central and West–South–Central divisions, most of whose states are on the western sector of our map. This general configuration remained largely unchanged over the 20-year period. The inner structures of both the South Atlantic and Mountain divisions are relatively heterogeneous, the states composing each of these divisions being located relatively far from one another. For example, while Maryland is found at the eastern end of the configuration, West Virginia is at the opposite end. Moreover, these are among the states that have experienced a very significant move, resulting in the widening of QOL differences between them.

Spatial Variation in Quality of Life and Interstate Migration

Looking simultaneously at the observations and arrows enables us to interpret the changes in spatial distribution of the states in terms of QOL (Figure 2). An arrow representing a certain variable tends to rise toward the higher-than-average values. All the states that fall on the arrow beginning from the center of gravity opposite to (in) the direction of the arrow, have values lower (higher) than the average.

The co-plot method yields the composite of all seven variables: almost all states in the New England and Middle Atlantic divisions are located southeast of the center of gravity of Figure 2. This part is higher-than-average for the following four variables: medical care, per capita income, individual equality and employment rate. Several states have significantly improved their relative positions over the last two decades; most salient were the moves of New Hampshire. Massachusetts, Rhode Island, Connecticut, New Jersey and Maryland (of the South Atlantic). The population of some of these states, mainly of New Jersey and Maryland, very likely works in neighboring states (i.e., New York and the District of Columbia, respectively); work is widely available for people with professional skills in these large economic and governmental centers, and at the same time great importance is attached to non-monetary conditions such as better medical care and equality between the different races. New York and the District of Columbia provide jobs to well-educated and professional people, but they do not benefit socially and culturally from them as they commute back to their home states. New Jersey, Massachusetts and Connecticut are characterized by relatively high concentrations of prestige academic institutions; these ensure higher than average income for researchers and others engaged in scientific work, who are usually people with high social sensitivity and conscience.

Nevertheless, it should be noted that the states in a division are not cut of one cloth, and there are differences between localities as the aggregate analysis reveals. These differences manifest themselves in the different locations of the states in Figure 2 (in the south-east sector). For example, Maine, Massachusetts and New Hampshire are marked in different locations. Over time, all the states of these divisions (New England and the Middle Atlantic) have either retained their positions or, more often, moved eastward, thus improving their

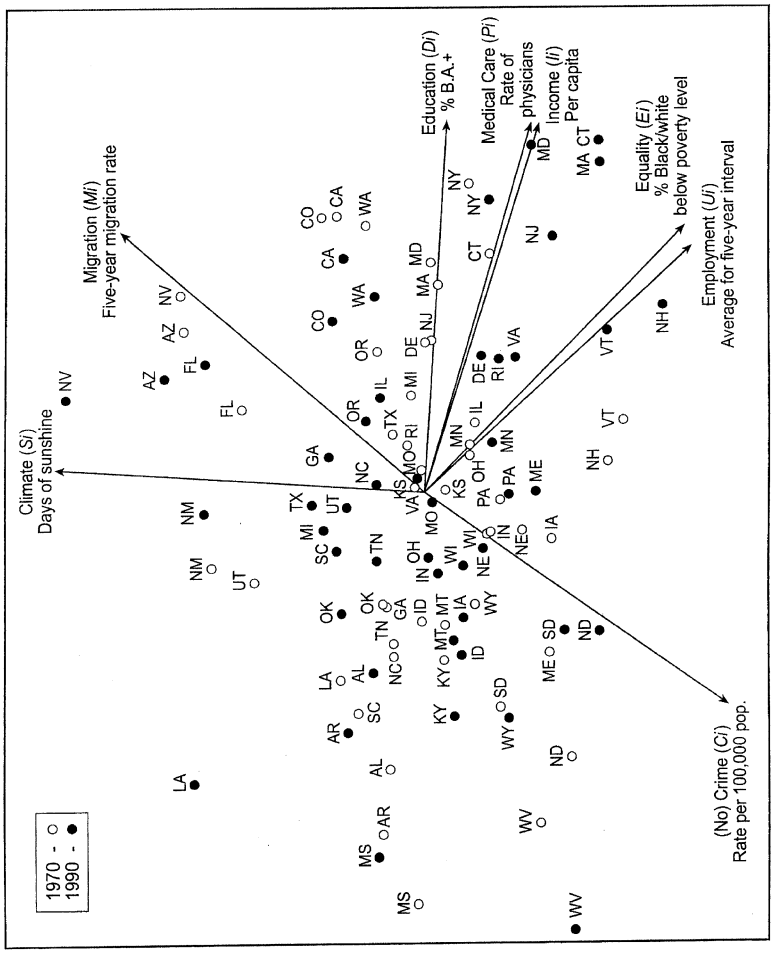

Figure 2. Co-plot graphic display for $n = 96$ states (in 1970 and 1990) measured on $p = 8$ variables.

already above-average values of medical care, income, equality and employment.

Washington, Oregon and California are located in the north-eastern sector of Figure 2. These states are mainly characterized by higher-than-average educational development. However, all three states have somewhat moved down on the arrows, closer to the center of gravity. This may be attributed to the economic crisis of the defense-related industries during the post-Cold-War era, which also reduced the attractiveness of the western states, especially California. Moreover, large industries were "pulled" to other areas, which offered stronger economic incentives. The difficult economic conditions were accompanied by high levels of crime and relatively poor social services. A substantial proportion of those who left came from the middle-educated class.

A few states of the South Atlantic and Mountain divisions are also found in that sector of the configuration which reflects strong social and economic status. This is mainly true of Maryland, Delaware, Virginia and Colorado. All other states of the South Atlantic and Mountain divisions are to be found in the negative socio-economic direction, namely, below average on welfare variables. This western part of the figure also includes most of the states composing the West–North–Central, East–South–Central and West–South–Central divisions. Yet, the multivariate analysis of variables shows, again, that not all these states are alike. Kansas is not like North Dakota: there are great differences between the locations of these two states relative to the rays representing the variables of crime, education, medical care, per capita income, individual equality and employment. Texas also differs from Louisiana, and so on. As the illustration shows the location for each variable, we will not describe the differences in length here.

The states of the West–North–Center have higher-than-average values of personal security. Other "secure" states are Maine and Pennsylvania. The arrow of the climate variable is directed northward in the figure. It thus differs from other variables of QOL, which are in the lower-east or lowest-west sector. These somewhat weak relationships between socio-economic opportunities or personal security and environmental conditions such as climate may result in a conflict between these two complementary dimensions of QOL when deciding if and where to move. The decision between the two largely depends

on stages in the lifecycle. Among the states that are positioned close to the climate arrow are Florida, Arizona, Nevada and New Mexico.

To a large extent, the East–North–Central division can be defined as representing the average American socio-economic and welfare values. All states in this division are located in a circular structure around the center of gravity. Despite some important differences between states with, for example, Illinois positioned in the stronger socio-economic part and Wisconsin in the weaker one, none of these states display any extreme deviation from the country's average.

In the second stage of the co-plot analysis, the variable of interstate migration in 1965–1970 and 1985–1990 was inserted. Relative to the previous illustration, the new data matrix of Y_{96*8} had a negligible effect on the correlations as well as on the coefficient of alienation. Hence, the locations of observations and of the variables of QOL remained almost unchanged. The direction of the migration arrow is opposite to the location of those states composing the West–North–Central and East–South–Central divisions. It is similar to the trends of several states belonging to different divisions, yet are nearer to the more external belts of the country. These states include, mainly, Florida, North Carolina and Georgia in the South Atlantic division; Colorado in the Mountain division; and Oregon in the Pacific division.

The close position of Florida to the arrow of migration is attributed to the tendency of retired elderly whites, a growing segment of the American population, to prefer areas with warm weather. Other states in the South Atlantic have benefited from the economic boom of the region and the "coastal restructuring and amenity-related economic gains" (Frey, 1995a, p. 285). These in-migrants are likely to be "positively selective," namely, well educated and professional persons. Another stream of internal migration is that of whites from minority-dominant immigration states. Many of these migrants move to adjacent states. One state that gained substantial immigration from abroad was California, which in turn had only a very small net in-migration. Many of those who left moved to nearby states. This out-migration of whites is, to a large extent, a response to job competition; hence it is led by people with less-than-college education and low income (Frey, 1995b).

The relationships between migration and some major economic factors turned out to be rather vague; the arrows of the variables income and employment are somewhat distant from the arrow of

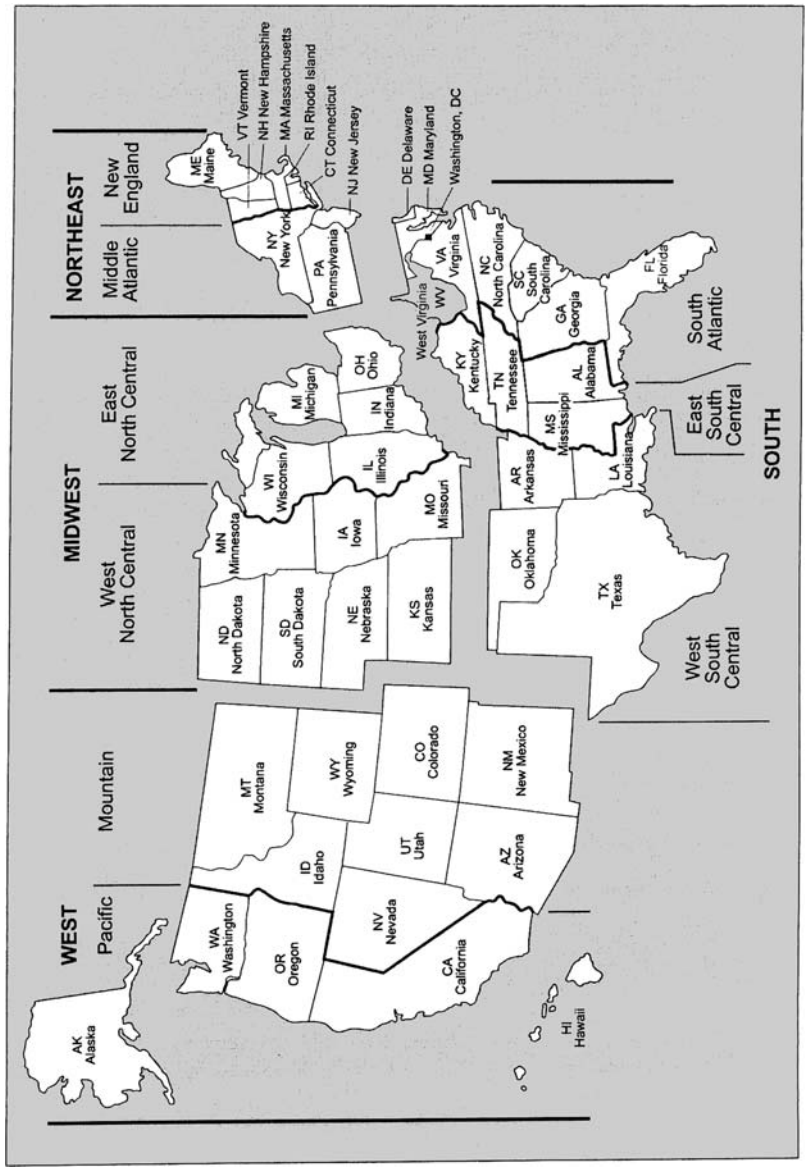

Figure 3. Map of the United States, Showing Census Divisions and Regions. *Source*: Statistical Abstract of the U.S., 2001.

migration (Figure 2). Different determinants are involved in the internal migration processes, and thus the position of the arrow of migration reflects the correlation with a given variable of QOL relative to the correlations with all other variables. Another interpretation of the spatial socio-economic and migration configuration of the United States is that climate serves as an important factor in residential preference. By contrast, migration is totally opposite to the crime variable; this requires further investigation on the micro-geographic level of the considerations of the interstate migrant when choosing the specific residential neighborhood in his new state of settlement.

MULTIPLE REGRESSION ANALYSIS

While the co-plot method provides insights into the structure of correlations among the variables, a complementary attempt was made to examine the net effect of each variable of QOL on interstate migration rates. This is done separately for the periods 1965–1970 and 1985–1990. The metric nature of both the independent and dependent variables is appropriate for the application of multiple regression analysis. Our regression model employs a confirmatory perspective wherein the entire set of independent variables is specified. The basic migration model is given by:

$$M_i = a_0 + a_1 I_i + a_2 U_i + a_3 E_i + a_4 D_i + a_5 P_i + a_6 C_i + a_7 S_i + e_i \quad (1)$$

where a_0 is a constant, and e_i is the residual, or prediction error, term.

The estimation of this formulation for the first period (1965–1970), by ordinary least squares, yields:

$$\begin{aligned} M_i = {} & 5.57 - 0.002 I_i - 1.20 U_i + 0.684 E_i + 0.11 D_i + 0.18 P_i \\ & \quad (1.91) \quad (2.30) \quad (0.95) \quad (0.35) \quad (0.87) \\ & + 0.002 C_i + 0.063 S_i \\ & \quad (3.50) \quad (0.92) \end{aligned} \quad (2)$$

$F = 4.41$; R^2 (adjusted) $= 0.34$

where the numbers in parentheses are t-statistics.

A striking feature of the empirical results is the apparent lack of importance of many of the independent variables which, *a priori*, had

Definitions of Variables in the Equations

Mi	Interstate migration rate	*Di*	Educational development
Ii	Per capita income	*Pi*	Medical care
Ui	(Un)employment rate	*Ci*	Crime rate
Ei	Individual equality	*Si*	Climate

been assumed to have a significant effect on interstate migration. The three significant determinants of migration – income (at 6% level), employment (at 3% level) and crime (at 1% level) – suggest that in the late 1960s both economic and amenity factors had important roles in geographical relocation. These variables have signs which are largely in accordance with the conclusions we derived from the co-plot analysis. Yet, the employment variable indicates the attractive power of job opportunities much beyond other economic considerations such as per capita income. According to the equation, each one percent change in average employment over the five-year period 1965–1970 is expected to yield a decline in net interstate migration by roughly 1.2%, other factors held constant.

The equation further suggests that for each added percent of crime rate, net migration is expected to increase somewhat. This positive relationship coincides with the opposite directions of the arrows of these two variables in the co-plot configuration. This supports our earlier interpretation that different types of crime on the state level do not deter in-migration but, although not tested here, might be taken into consideration when deciding on the specific city or neighborhood of residence.

A separate examination was conducted for the period 1985–1990. The following regression model was estimated:

$$\begin{aligned} M_i = {} & 13.65 + 3.26I_i - 1.65U_i - 0.84E_i - 0.83D_i + 7.79P_i \\ & \qquad (0.73) \quad (3.27) \quad (0.88) \quad (2.73) \quad (0.34) \\ & + 0.002C_i - 0.25S_i \\ & \quad (3.11) \quad (0.24) \end{aligned} \tag{3}$$

$F = 3.46$; R^2(adjusted) $= 0.27$.

Our results indicate that per capita income is no longer a significant predictor of net migration. At the same time, job oppor-

tunities and crime rates remained important determinants of interstate migration. In the late 1980s, the educational profile of a state's population played a significant role in explaining variation in net migration. Yet; the negative sign of the coefficient is somewhat unexpected and reflects a low tendency to move to areas with highly educated people which are likely to be also characterized by technological development and cultural amenities. The interpretation is that today different groups are involved in migration between states, including low-skilled people and retirees, each group destined to areas with different economic and social characteristics. This largely coincides with the notion of a "culture of migration" (Gober, 1993), and with the high premium placed on self-fulfillment and personal freedom, including the freedom to move (Goldstein and Goldstein, 1996), in the social context of contemporary America.

After adjustment for degrees of freedom, 35% of the variation in interstate migration rates between 1965 and 1970 were explained by means of the QOL variables with only a few turning out to have a significant statistical effect. By 1985–1990 the explanatory power of the model was reduced to 27%. Interstate migration is increasingly determined by factors other than those which were assumed a-priori to affect it. As migration becomes less selective, it will probably involve a wider range of causations within the different social, economic, cultural, environmental and psychological arenas. Finally, it should be noted that the Variance Inflation Factor (VIF) shows no problem of multicollinearity in either of the two periods with all VIFs in the models being smaller than 4.

SUMMARY AND DISCUSSION

In this paper we have applied a fairly new statistical method (co-plot) which enabled us to locate geographic units at two different points of time within a socio-economic-welfare-developmental environment. Simultaneous examination of observations and variables provided an integrated look at the mutual relationships between physical-geographic space, socio-economic and welfare resources and population redistribution. An examination of the effect of the QOL variables on migration was carried out through multiple regression analysis.

The findings point to an overall process of polarization of QOL throughout the United States; while some states have moved closer to the country's average, others have significantly moved towards both extremes. The co-plot method made it possible to identify the relative socio-economic and welfare proximity between states, and the trends each has experienced between 1970 and 1990. There exists a strong similarity among the states of a given division, and divisions of the same region were located very close to one another. The states which compose the New England, Middle Atlantic and Pacific divisions are located in the stronger sector of the socio-economic space, clearly distinguishing them from most of the other states which are closer to the center, or in the weaker part in terms of QOL indicators. This general pattern has remained largely unchanged over time.

The co-plot method showed that different factors are related to the internal migration processes. In this configuration, the arrow of migration was somewhat distant from the arrows of the income and employment variables relative to those representing climate and educational development. Despite this, multiple regression analysis revealed that, all other things being equal, economic incentives have a significant effect on patterns of interstate migration. Over time, however, income has become a less significant predictor of interstate migration. Somewhat surprisingly, both methods delineated positive relationships between high rates of crime and migration; it is suggested that this aspect of QOL be more closely examined on the micro-geographic level of city or neighborhood of settlement.

It is well documented that the equilibrium between economic and amenity environmental preferences change over an individual's life-cycle. Time per se has affected the social, cultural and ideological processes at the macro level of the American scene, and seems also to affect the relative importance attached to different aspects of standard of living in choosing residential location. Since the various components of QOL are not necessarily linked one to the other, these overall structural changes enhance the difficulties and the complexity challenging spatial policy. Nevertheless, a look at similarities and dissimilarities between states over time, and their various indicators of QOL can be a useful tool for public policymakers whishing to intervene in the spatial variation of economic and social resources and hence in the geographic redistribution of the population.

APPENDIX A

Synopsis of Literature on Macro-Structural Determinants of Human Migration (in Chronological Order)

Year of publication	Author(s)	Geographic unit	Interval years	Brief description
1962	Sjaastad, L.A.	Theoretical analysis	Theoretical analysis	This is one of the first attempts to place human migration into an investment context. The author identifies some important costs and returns to migration – both public and private. Within each of these domains, he distinguishes between monetary and non-monetary costs/returns.
1963	Blanco, C.	Interstate, USA	1950–1957	Level of unemployment is the single most important determinant of interstate migration. Other factors, including racial prejudice, wage levels, and climate did not produce a direct influence on rate of migration.

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Continued

Year of publication	Author(s)	Geographic unit	Interval years	Brief description
1969	Greenwood, M.J.	Interstate, USA	1955–1960	"Migration stock" is the most unique explanatory variable of interstate migration. Level of income did not have a particular effect on the allocation of migrants. At the same time, the higher the rate of unemployment in a given state, the greater is the out-migration. Likewise, migrants tend to go to states with temperate climates.
1971	Greenwood, M.J. and Gormely, P.J.	Interstate, USA	1955–1960	Distance deters both white and non-white migration; both groups respond positively to high-income states, and to states with high concentrations of their respective populations. Whites are more attracted to areas with temperate climates than are non-whites.

1972	Bass, B.M. and Alexander, R.A.	Interstate, USA	1950–1960	For whites, a better climate (e.g. more sunshine, higher minimum temperature) was about equally predictive of migration as were economic factors. For non-whites, economic factors best predicted migration while good climate was negatively associated with migration.
1973	Cebula, J.C. and Vedder, R.K.	Standard Metropolitan Statistical Areas (SMSA), USA	1960–1968	Individuals attempt to benefit by migration from one place to another. They are interested in explicit economic considerations of job opportunities and earnings, as well as in more implicit considerations of an environmental nature.

APPENDIX A
Continued

Year of publication	Author(s)	Geographic unit	Interval years	Brief description
1973	Kohn, R.M., Vedder, R.K., and Cebula, R.J.	Interstate, USA	1965–1970	According to expectation, variables such as distance, per capita income, and climate largely influence interstate migration. Whites are not significantly responsive to unemployment, while black migrants are found to be much more responsive to interstate differentials in welfare and unemployment rates in making the decision to move.
1973	Miller, E.	Interstate, USA	1955–1960	Rate of growth of employment is the paramount economic determinant of out - migration. Temperature also has a direct, albeit small, effect on out-migration.

1973	Sommers, P.M. and Suits, D.B.	Interstate, USA	1950–1960 and 1960–1970	Economic and regional factors affect net migration of white families and black families in different ways; these influences have changed over time. Some of the coefficients turned to be statistically insignificant, including that of the relationship between unemployment rates and migration among black migrant.
1975	Cebula, R.J.	Interstate, USA	1965–1970	Findings from multivariate analysis imply that environmental factors such as climate, medical care, and pollution are important determinants of interstate migration in late 1960s America.

APPENDIX A
Continued

Year of publication	Author(s)	Geographic unit	Interval years	Brief description
1975	Liu, B.	Interstate, USA	1960–1970	On the average, net migration is higher as quality of life, measured by various physical inputs, is improved. Some differences were found among the total population and non-whites; most striking is the absence among the former of influence of income and unemployment indexes upon migration rates.
1976	Ritchey, P.N.	Literature review	Literature review	After reviewing more than 150 studies, the author concluded that efficient development of explanations of migration should simultaneously consider the conditions of areas, the individual's position or status in society, and social-psychological attributes.

1977	Berry, B.J.L.	Central city-suburbs and Metropolitan - non-metropolitan areas, USA	Mainly the 1950s, 1960s and 1970s	Developments in transportation and communication reduce the constrains of geographic space making it possible for people to live farther from activity centers. Likewise, industries and employment are moving to small cities and non-metropolitan areas in accordance with people's preference to live in remote environments of pleasant landscape and climate.
1978	DaVanzo, J.	Interdivisional, interstate, and intercounty, USA	1971–1972	The connection between rate of employment and migration depends upon the personal characteristics of employment status. Families whose heads are unemployed, or are dissatisfied with their present jobs, are more likely to migrate than those whose heads do not seek alternative employment.

APPENDIX A
Continued

Year of publication	Author(s)	Geographic unit	Interval years	Brief description
1979	Graves, P.E.	Standard Metropolitan Statistical Areas (SMSA), USA	1960–1970	Economic opportunities and climatic amenities are important determinants of migration, with the direction and significance of the effects being largely dependent on age and race.
1981	Heaton, T.M., Clifford, W.B., and Fuguitt, G.V.	Non-Metropolitan areas	1950–1960, 1960–1970, 1970–1975	Economic factors are more important determinants for young migrants than for older migrants, while the reverse is true for non-economic factors. Over time, economic determinants lose some of their significance among both populations; in turn, they attach more importance to non-economic environmental factors and to leisure-oriented consumption.

1984	Murdock, S.H., Parpia, B., Hwang, S., and Hamm, R.R.	Texas counties	1960–1970, 1970–1980	Over time, the importance of economic factors as predictors of migration has decreased, and that of non-economic factors has increased.
1985	Greenwood, M.J.	USA	Literature review	Survey of the literature on internal migration in the United States which was been published over the preceding ten years. Many factors contributed to the decision to migrate including differential characteristics of area of origin and area of destination, and individual and life-cycle considerations. Among other things, the author discusses regional variations in the effect of job increments on migration; and the often revealed insignificant coefficients of local unemployment rates on migration.

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Continued

Year of publication	Author(s)	Geographic unit	Interval years	Brief description
1986	Greenwood, M.J, Hunt, G.L McDowell, J.M.	Bureau of Economics Analysis Economic Area	1958–1975	During an average year, every addition of two new jobs attracts one additional net migrant.
1989	Schachter, J. and Althaus, P.G.	Interstate, USA	1975–1980	The paper presents an equilibrium model according to which gross migration and regional labor markets are interrelated. Even in equilibrium, however, gross migration is substantial. Levels of gross migration are influenced by amenities and government policies.
1990	Evans, A.W.	USA	Review essay	Contrary to some recent works, a study of empirical evidence seems to confirm the view that regional economies are not in equilibrium. Migration can thus be explained by interregional differences that are not fully realized into wages and property values.

1990	Massey, S.M.	Literature review	Literature review	Human migration should be investigated through multiple level analysis, including both individual and macro characteristics and within a longitudinal perspective.
1991	Clark, D.E. and Cosgrove, J.C	Standard Metropolitan Statistical Area (SMSA), USA	1975–1980	Both economic factors and amenity differentials are significant in explaining regional migration.
1992	Clark, D.E. and Hunter, W.J.	Inter-country, USA	1970–1980	Labor market opportunities are the most significant determinants of migration of young adults males. Amenities are consistently found to influence middle-aged and older cohorts. Fiscal conditions, e.g. high income taxes, high state inheritance tax, and estate taxes deter in-migration. Cultural amenities (e.g. museums, theaters) have a statistically insignificant effect on inter-country migration.

APPENDIX A
Continued

Year of publication	Author(s)	Geographic unit	Interval years	Brief description
1997	Michalos, A.C.	USA and Canada	Review essay	A review of the past 30 years of research on the relationships between migration and quality of life broadly defined. Migration is highly motivated by job-related considerations and higher income in the receiving areas. Non-economic incentives aimed at improving the quality of life, including the presence of family or co-ethnics, climate, and gender equality in the labor force, likewise play an important role in residential mobility. Distance between two areas is negatively associated with levels of migration.

APPENDIX B

The distribution of the quality of life variables by states, 1970 and 1990

State	Quality of life variables							
	Per capita income	Unemployment rate	Individual equality	Educational development	Medical care	Crime rate	Climate	Interstate migration
1970								
Alabama	2849	4.24	3.369	7.84	89	1865.5	61	−2.3
Arizona	3581	3.92	3.000	12.56	157	3445.7	86	7.5
Arkansas	2791	4.50	2.912	6.65	93	1603.8	62	−0.7
California	4443	4.94	2.484	13.44	192	4306.9	73	2.1
Colorado	3806	3.18	2.109	14.92	186	3661.3	70	4.3
Connecticut	4865	3.58	3.612	13.66	193	2574.0	57	0.8
Delaware	4332	3.06	3.896	13.09	140	2973.8	58	2.5
Florida	3643	2.70	3.525	10.06	161	3600.0	66	10.4
Georgia	3334	3.36	3.634	9.21	108	2207.2	61	1.8
Idaho	3222	4.10	2.664	9.96	99	1785.4	67	−1.7
Illinois	4501	3.02	3.265	10.31	140	2347.1	57	−1.9
Indiana	3779	2.96	2.579	8.32	105	2270.2	59	−0.9
Iowa	3681	2.34	2.324	9.09	117	1435.6	60	−2.8
Kansas	3825	2.96	2.661	11.37	124	2145.4	65	−2.3
Kentucky	3071	4.06	1.834	7.21	102	1924.6	58	−1.6
Louisiana	3054	4.76	3.619	9.04	119	2404.6	61	−1.2
Maine	3251	4.34	1.375	8.36	131	1141.1	59	−2.3
Maryland	4264	3.28	3.579	13.93	181	3346.7	58	3.6

APPENDIX B
Continued

State	Quality of life variables							
	Per capita income	Unemployment rate	Individual equality	Educational development	Medical care	Crime rate	Climate	Interstate migration
Massachusetts	4361	4.24	3.200	12.55	211	3004.0	60	−0.8
Michigan	4058	4.04	2.846	9.42	147	3790.1	54	0
Minnesota	3815	3.26	2.298	11.10	152	2103.8	58	−0.4
Mississippi	2575	4.48	3.625	8.05	83	863.4	59	−2.4
Missouri	3697	3.40	2.410	8.97	152	2764.9	59	0.1
Montana	3370	4.74	2.756	11.01	109	1638.0	64	−5.2
Nebraska	3738	2.56	2.392	9.64	118	1518.6	62	−3.0
Nevada	4599	5.48	3.000	10.78	117	3996.8	80	5.3
New Hampshire	3585	2.14	1.901	10.85	143	1193.1	54	3.9
New Jersey	4598	4.98	3.531	11.83	153	2743.0	56	0.6
New Mexico	3128	5.16	2.074	12.73	123	2866.2	77	−5.8
New York	4771	3.94	2.569	11.88	238	3921.7	59	−3.4
North Carolina	3208	3.38	3.396	8.45	109	1862.9	66	0.5
North Dakota	2990	4.24	1.580	8.38	95	846.2	62	−8.3
Ohio	3965	3.10	3.011	9.26	142	2377.5	52	−0.9
Oklahoma	3300	3.66	2.843	10.02	117	1949.3	67	0.1
Oregon	3700	4.48	25.94	11.77	152	2987.1	46	3.1
Pennsylvania	3921	3.46	2.912	8.74	165	1541.6	58	−1.7
Rhode Island	3902	3.92	3.240	9.38	163	2926.1	57	0.1

South Carolina	2934	4.38	4.040	8.96	91	2066.7	64	0.5
South Dakota	3165	3.20	2.278	8.59	86	1153.0	63	−7.1
Tennessee	3084	3.64	2.432	7.89	120	1888.3	65	0.1
Texas	3525	3.12	2.381	10.87	123	2705.7	65	1.4
Utah	3195	5.14	4.083	13.97	139	2372.4	70	−1.3
Vermont	3457	3.86	1.628	11.48	196	1270.2	52	3.4
Virginia	3616	2.78	3.238	12.30	121	2148.8	63	1.6
Washington	4004	4.58	2.185	12.72	152	3157.0	45	6.4
West Virginia	3012	6.58	1.805	6.77	111	959.2	48	−4.8
Wisconsin	3688	3.40	2.945	9.75	124	1515.8	56	−0.5
Wyoming	3535	4.06	2.946	11.78	104	1746.0	64	−6.2
1990								
Alabama	14998	8.14	3.222	15.7	158	4915	59	0.1
Arizona	16006	6.22	2.433	20.3	197	7889	86	7.0
Arkansas	14176	8.08	2.965	13.3	150	4867	62	1.1
California	20689	6.02	2.318	23.4	244	6604	73	0.7
Colorado	18860	6.64	2.390	27.0	211	6054	70	−2.5
Connecticut	25395	3.74	4.304	27.2	305	5387	57	−1.7
Delaware	20095	3.90	3.859	21.4	199	5360	58	4.4
Florida	18539	5.52	3.351	18.3	208	8811	73	10.1
Georgia	17045	5.84	3.443	19.3	175	6764	61	5.4
Idaho	15250	7.10	1.868	17.7	125	4057	64	−2.1
Illinois	20433	7.46	3.987	21.0	212	5935	55	−3.2
Indiana	16921	6.20	3.222	15.6	157	4683	55	0.1
Iowa	17301	5.86	3.435	16.9	151	4101	59	−3.5

APPENDIX B
Continued

State	Quality of life variables							
	Per capita income	Unemployment rate	Individual equality	Educational development	Medical care	Crime rate	Climate	Interstate migration
Kansas	18104	4.82	3.030	21.1	175	5193	65	−1.0
Kentucky	14992	8.34	1.977	13.6	168	3299	56	−0.6
Louisiana	14528	11.08	3.410	16.1	188	6487	60	−6.1
Maine	17183	4.60	1.869	18.8	178	3698	57	3.0
Maryland	21857	4.30	3.132	26.5	334	5830	57	2.4
Massachusetts	22555	3.64	3.285	27.2	337	5298	58	−1.7
Michigan	18378	8.32	3.585	17.4	185	5995	53	−1.5
Minnesota	18731	5.00	4.229	21.8	220	4539	58	0.1
Mississippi	12830	9.68	3.515	14.7	133	3869	60	−1.1
Missouri	17479	6.00	2.669	17.8	196	5121	57	0.6
Montana	15304	7.18	2.214	19.8	158	4502	61	−6.7
Nebraska	17490	4.42	3.141	18.9	172	4213	60	−2.7
Nevada	19049	6.10	2.773	15.3	159	6064	79	19.0
New Hampshire	20773	3.02	2.000	24.4	200	3645	54	6.5
New Jersey	24881	4.52	3.860	24.9	246	5447	56	2.7
New Mexico	14254	8.28	1.726	20.4	183	6684	76	−0.8
New York	22129	5.40	2.873	23.1	315	6364	58	−4.8
North Carolina	16266	4.46	3.151	17.4	190	5486	63	4.8
North Dakota	15355	5.30	1.210	18.1	170	2922	59	−8.0

Ohio	17568	7.10	3.230	17.0	196	4843	49	−1.4
Oklahoma	15451	7.00	2.525	17.8	147	5599	68	−4.2
Oregon	17182	7.00	2.614	20.6	205	5646	48	3.3
Pennsylvania	18679	6.02	3.295	1.79	235	3476	56	−0.7
Rhode Island	18809	3.98	3.225	21.3	254	5353	58	1.4
South Carolina	15141	5.56	3.694	16.6	161	6045	64	3.5
South Dakota	15890	4.42	1.555	17.2	140	2909	63	−3.4
Tennessee	15868	6.70	2.592	16.0	196	5051	64	3.0
Texas	16717	7.66	2.230	20.3	175	7827	64	−2.1
Utah	13985	5.56	2.990	22.3	185	5660	66	−2.3
Vermont	17506	3.92	2.164	24.3	253	4341	49	3.4
Virginia	19701	4.52	3.027	24.5	213	4441	61	4.2
Washington	18777	7.26	2.425	22.9	213	6223	46	5.2
West Virginia	13744	10.82	1.884	12.3	166	2503	40	−4.2
Wisconsin	17590	5.60	4.915	17.7	189	4395	54	−0.8
Wyoming	16283	7.46	2.355	18.8	139	4211	65	−12.0

APPENDIX C

THE CO-PLOT METHOD

The co-plot is based on the integration of mapping concepts with a variant of regression analysis. It starts with a data matrix $Y_{n\times p}$ of n rows and p columns; the rows are p-variate observations and the columns are the variables. Co-plot has four stages: two preliminary treatments of the data matrix Y and two subsequent stages.

In order to treat the variables equally, stage 1 normalizes $Y_{n\times p}$ in the usual way into $Z_{n\times p}$. The elements of matrix $Z_{n\times p}$ are deviations from column means ($\overline{Y}_j$) divided by their standard deviations (S_j), i.e.

$$Z_{ij} = (Y_{ij} - \overline{Y}_j)/S_j$$

In stage 2, we choose a measure of dissimilarity $S_{ik} \geq 0$ between each pair of observations (rows of $Z_{n\times p}$). A symmetric $n \times n$ matrix (S_{ik}) of distances between the observations is produced from the $\binom{n}{2}$ different pairs of observations. One possible measure is the Minkowski metric:

$$S_{ik} = \left[\sum_{j=1}^{p} \left|Z_{ij} - Z_{kj}\right|^r\right]^{1/r} \geq 0, \quad (1 \leq i, k \leq n; r \geq 1)$$

In this paper $r = 1$, known as the city-block distance (the sum of absolute deviations), was chosen. Thus, the diagonal elements vanish ($S_{ii} = 0$).

The subsequent two stages of co-plot yield two superimposed graphs. In stage 3, the matrix (S_{ik}) is mapped by means of some form of a multidimensional scaling (MDS). Thus, observations are represented as n points P_i, $i = 1,..., n$ in an Euclidean space (of, say, $m = 2$ dimensions). In the example to follow, we choose Guttman's Smallest Space Analysis (SSA)[1] as a particular form of a non-metric MDS. SSA provides a graphic presentation of pairwise interrelationships of a set of objects (here $n = 96$ for 48 states in

[1] One property of this technique is that if the dissimilarity between observations i and k is larger than that between l and t, then the (Euclidean) distance d_{ik} between P_i and P_k will be larger than that between P_1 and P_t.

each of the years 1970 and 1990) (for more details on this technique, see: Guttman, 1968). SSA uses the coefficient of alienation[2] θ as a measure of goodness-of-fit. In summary, for two-dimensional space, this stage yields $2n$ coordinates $(X_{1i},\ X_{2i})$ $i=1,...,n$ where each row $Z_i=(Z_{i1},...,Z_{ip})$ is mapped into a point in two-dimensional space $(X_{1i},\ X_{2i})$.

In stage 4, the p arrows $(\tilde{X}_j, j=1,\ldots,p)$ are drawn on the Euclidean space obtained in stage 3. Each variable j is represented by an arrow j emerging from the center of gravity of the points P_i. Each arrow $\tilde{X}_j$ is chosen so that the correlation between the actual values of variable j and their projections on the arrow is *maximal*. Therefore, the arrows associated with highly correlated variables point in about the same direction. As a result, the cosines of the angles between arrows are approximately proportional to the correlations between their associated variables.

The goodness-of-fit of co-plot is assessed by two types of measures, one for stage 3 and another for stage 4. In the former stage, a general (single) coefficient of goodness-of-fit for the configuration of n observations is obtained by MDS. For the SSA method, the coefficient of alienation θ is used. In stage 4, p individual measures are obtained for the p variables. These are the magnitudes of the p *maximal* correlations $r_j^*,\ j=1,\ldots,p$ that measure the goodness-of-fit of the p regressions. Measures of goodness-of-fit (r_j^*) are obtained for each variable *separately*. This might be helpful in deciding whether to eliminate (or add) variables. Variables that do not fit the graphical display, namely, those which have low r_j^*, should be eliminated, in our opinion. Therefore, there is no need to fit all the 2^p subsets of variables, as in other methods that have a general coefficient of goodness-of-fit. The higher the correlation r_j^* the better $\tilde{X}_j$ represents the common direction and order of the projections of the n points along the rotated axis $\tilde{X}_j$ (arrow j).

[2] The coefficient of alienation $\theta=(1-\mu^2)^{1/2}$ varies between 0 and 1, where μ is a coefficient of monotonicity (see: Raveh, 1986). Perfect fit is represented by the value 0, and the worst possible fit by the value 1. Intermediate values of the coefficient represent intermediate degrees of goodness-of-fit. The number θ expresses the extent to which distance between pairs of points in the two-dimensional space do not adhere to the rule regarding the monotone relationship between input coefficients and output distances. Coefficient of alienation of less than 0.15 is considered a good candidate for being "satisfactory".

Co-plot is based on two graphs that are superimposed sequentially. The first graph maps the rows by n points. The second is conditioned on the first, and consists of p arrows that are portrayed individually.

NOTES

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[1] All references in this section appear in Appendix A in chronological order with a brief assessment of each as well as its relevance.

[2] Rate of net migration is net migration divided by the beginning-of-period surviving population, multiplied by 100. Data on rate of net migration for 1965–1970 derive from: Long, 1988; for 1985–1990, net migration rates were calculated from data on state of residence in 1990 by state of residence in 1985, available through the web site of the United States Bureau of Census.

[3] To easily associate states with their larger geographic division or region, see attached map of the United States (Figure 3).

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