ISSN-0570-1864

REPRINT FROM

Vol. XVIII No. 2

THE ANNALS OF REGIONAL SCIENCE

July 1984

A JOURNAL OF URBAN, REGIONAL AND ENVIRONMENTAL RESEARCH AND POLICY

SOCIOLOGICAL AND CULTURAL VARIABLES IN HOUSING THEORY

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Abstract

This paper discusses the relative lack of the use of sociological and cultural variables in the basic conceptual models of regional science. It presents sociological and cultural additions to classic residential location and land value theory. The augmentation of the topographic physical models and theories of regional science by the explicit introduction of social geography would permit improved land use decisions to be made. Survey or market research techniques are frequently required to identify the key links between the externally observable demographic characteristics of a group and the consumer preferences and behavior information needed to estimate the group's location-specific bid-rent function.

I. Introduction

There have been many definitions of regional science, but the one I like best is W. H. Miernyk's, "Regional science is the study of those social, economic, political and behavioral phenomena which have a spatial dimension" (6). Over the last 20 years, during which time I have considered myself part of the regional science community, I have seen scant attention given to the social, cultural and behavioral dimensions of regional science in the presentations I have listened to or in the preponderance of articles that have been published.

In the mid-sixties, when both regional science and I were in our relative youth, I first noted this methodological omission as I began to review the retail location studies that were then being produced. The gravity model, with or without statistical refinements, was the preferred approach for selecting among two or more retail locations. The key variables in the gravity model equation were population size and distance from the retail center(s). An income variable was sometimes introduced as one of the statistical refinements. For example, in the early sixties, Arthur Getis created a map of disposable income for an urban area in which the various subarea units of a city corresponded to their potential grocery sales rather than area size (2).

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Now, while I had only been introduced to regional science in the early sixties, I had been an enthusiastic consumer since puberty and knew that when people purchase the big ticket items that are referred to as "shoppers goods," behavior plays a key role. Therefore, when I was in charge of selecting store location sites for a women's specialty chain, the Joseph Magnin Company, I began by developing a customer profile that could be successfully used to define the probability that a member of a specific consumer group was likely to be a Joseph Magnin customer. This profile was based on age, income and occupation. We discovered that a middle-aged plumber's wife had a far lower probability of shopping at an equally proximate Joseph Magnin store than did the wife of a budding young attorney--even if both households had identical incomes. We further discovered that there were numerous instances in which consumers would drive by a close-in shopping center to reach a more distant one that was no larger but offered the tenancies they preferred (3).

The lessons that I have learned in my early retail analysis work have stayed with me. I continue to introduce the hard-to-quantify social or behavioral variables in almost all land use analyses, even at the expense of mathematical or statistical elegance, because I have found they have permitted me to provide more accurate descriptions of the way regions work, and to result in more accurate forecasts of what will happen in light of economic, social and policy change.

I have also asked myself, why have so many regional science practitioners been so slow to incorporate these important social variables? I believe that much of the cause lies with the origins of the discipline--when the primary focus was on how populations and goods were distributed among two or more regions. When the focus is on the interregional analysis, the simplifying assumptions of population and distance tend to work quite well. It is when the focus shifts to intraregional analysis that the simplifying assumptions act to limit our perceptions.

It is important to remember that what we perceive is focused by our theories of how things are. For model builders who love their work, it is all too easy to forget that the model is just a description of the real world, or more frequent still, an abstract way of examining the processes at work in the real world. The model should fit the real world--not the other way around. While August Lösch has given us much to emulate, we need not accept his position that theory is more interesting than sorry reality. Nor do we want to become like the model builder who, when told about an actual occurrence, responded, "Yes, but will it work in theory?"

In this paper, I am going to suggest a way in which sociological and cultural variables could be included in residential location and land value theory and how the empirical consideration of such variables--in light of the sociologically-augmented model--would permit improved central city land use decisions to be made. It is my contention that the explicit addition of social geography to the topographical physical factor already included in the models or theories of regional science would greatly enrich the usefulness of these tools. The empirical consideration of these factors would further expand our ability to utilize and test the models for two reasons. First, because sociological variables play a key role in changing locational attributes over time, the inclusion of such variables would enhance the dynamic expository powers of the models. Second, the social geography of regions tends to vary at least as much as, if not more than, the physical attributes of regions. The inclusion of sociological variables will help avoid the error of drawing incorrect inferences from cross-regional

tests with empirical data that suggest comparability which does not exist because of ignored variations in sociological and cultural variables within and between regions.

Since the value of a location shifts with alterations in the social make-up of a location's residents, predictions of neighborhood change are likely to be more accurate when focused by a model that includes social as well as transportation variables. Similarly, such a model can be used to make forecasts of future change in land values and the mix and density of feasible residential uses at alternative locations.

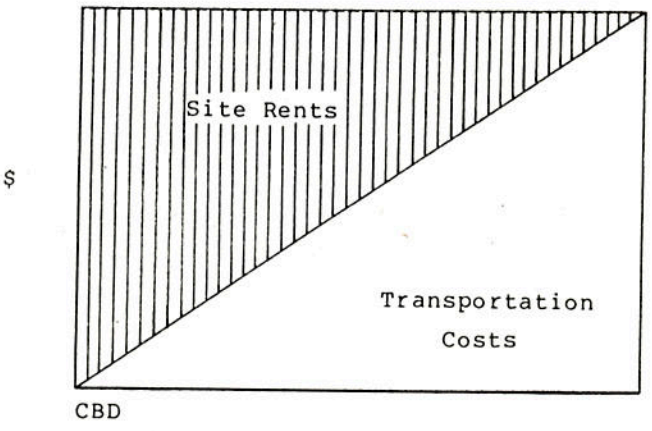
II. A Simple Expansion of the Classic Model of Urban Land Values

A Description of the Classic Theory as Applied to Housing Markets

Figure 1 presents the classic locational site rent model for homogeneous households living in similar-sized units at uniform densities on an infinite plain surrounding a city center in the shape of a point. Other bidders for land use are ignored, all transportation costs are assumed to be strictly proportional to distance from the central business district (CBD), and all other determinants of land value are ignored.

Even with all of its limitations and conditions, the model presented by Figure 1 has justifiably had an important and lasting impact on the study of urban land values. Insights into urban land values also provide insights into locational patterns and relationships because as William Alonso has pointed out, "...rent and locations are twins" (1).

FIGURE 1



By gradually relaxing the conditions upon which the model is based, regional scientists have developed an increasingly complex and accurate model of the workings of the land market in and around a central place. For example, assumptions about uniform density and transportation costs, the lack of competition from nonresidential land uses and the homogeneity of households can be dropped so that inferences about variations in these variables can be made.

Richard Muth's model of the spatial structure of the housing market considers the trade-offs that consumer households of differing incomes make between their desire for land and unit size, the avoidance of transport costs and desire for other goods (8). But, for all such variations in the classic model as well as in the "plain vanilla" version shown in Figure 1, the key assumption is that households are motivated primarily by an aversion to distance plus, perhaps, a preference for housing size (lot and unit).

While expansions of the model have increased its expository power, they have not enriched it sufficiently to reflect empirically the locationally specific workings of urban residential land markets. The crucially needed change is for sociological determinants of housing demand to be explicitly included in the model. The fact that different individuals and subgroups have inherently variant preferences for the consumption of similar goods must be considered in any reasonably valid estimations of bid-rent functions. Determining the shape of the effective demand curve for a good can be accomplished only after the utility of that good to its potential consumers is understood.

Expansion of the Classic Model to Include Multiple Nuclei

While the model synopsized by Figure 1 assumes the existence of an employment center of zero area in the center of an infinite featureless plain, that requirement can be relaxed through a simple expansion of the model. As it stands, the classical model can be summarized by the equation:

$$sr = c - tc \qquad (1)$$

which states that for any location on the urban plain, obtainable site rents, sr, are equal to some constant, c, minus transportation costs associated with travel between that location and the city center.

Because site rent is expressed in cost per unit of space, equation (1) implicitly assumes that in order to maximize utility, the individual consumer of residential housing will make trade-offs between the consumption of four groups of goods—travel costs, housing size, housing location, and all other numeraire nonhousing goods. Housing location refers solely to distance from the center and does not consider the social make-up of the immediate area. Thus, as is typical in any partial equilibrium analysis, we assume the utility function to be maximized by the individual consumer as shown in equation (2):

$$u\,(ac, hs, hl, o) = U \qquad (2)$$

where ac is avoided transportation cost, hs is house size and quality, hl is household location (that is, effective distance from the center), o is the consumption of all nonhousing goods, and U is the utility level achieved by the consumer. Avoiding transportation cost, ac, rather than transportation cost, tc, is used in the above equation so that, ceterus paribus, the increased consumption

of any one factor will increase u. Note that for any given level of total income, all variables are interdependent—increasing the consumption of any one good can be accomplished only by decreasing the consumption of one or more of the others.

Because the transportation cost is assumed to be a direct function of distance, equation (1) could be written as follows:

$$tc(x, y) = s \cdot d(x,y) \tag{3}$$

$$sr = c - tc(x,y) \tag{4}$$

In the above equations, transportation costs, tc, are calculated as a function, d(x,y), of the distance between some point, (x, y), and the city center (which is assumed to lie at point (0,0)) and s is some arbitrary scaling factor. Site rents, sr, are defined as the residual of the constant land value maximum, c, minus the transportation costs.

While most treatments of the classic theory assume that the city center is a point, such need not be the case. Given a plain defined by an infinite series of coordinates, (x,y), and the existence of employment locations at any number, n, of points on that plain, an "effective transportation cost" function, tc, may be defined for any point, (a,b), as follows:

$$tc(a,b) = S \sum_{i=1}^{n} (d(x_i,y_i) \cdot e(x_i,y_i)) \tag{5}$$

where $d(x_i,y_i)$ is the distance from point (a,b) to point (x_i,y_i), $e(x,y)$ is the employment available at point (x,y), and S is a scaling factor.[1] The traditional treatment of the site rent theory can be seen as a trivial case in which there is exactly one employment location at which all employment is based. In the 1940's. Harris and Ullman initially demonstrated that urban structures of America's cities or regions consisted of multiple nuclei with the central business district being only one, though perhaps the largest, of many employment nodes within the region (5). Since then the evaluation of our cities or urban regions has shown an increase in the number and importance of employment centers located outside of the traditional central business district.

Visually, the multiple nuclei conception of the site rent function results in an "economic plain" which is covered by hills and valleys. A place of employment is represented by a hill, with the height of the hill proportional to the number of jobs existing at that location. For a typical city, the plain will contain its highest points in and around the city center. These areas of intense employment density will then be surrounded by valleys of relatively lower employment densities. (In contrast, a visual representation of the simple classical model would be a large, perfectly flat plain with a needle soaring up from its center to an infinite height.)

By substituting equation (5) for equation (3), the classic model is transformed into a considerably more complex and realistic model. Whereas the simple model would lead one to expect that land values are always highest at some imaginary point in the center of the city and that they decline smoothly from that point to the city periphery, where they are zero, a model that incorporates equation (5) would lead one to expect that land values will tend to be higher nearer the city center, but that there will be many areas where land values are relatively higher than for the immediately surrounding areas. (While the plain of land values defined by the classic model will always have exactly one

saddle point, the plain of land values defined using a model which incorporates equation (5) can have an unlimited number of saddle points.)

III. Adding a Sociological Variable and Analysis to the Urban Land Value Model

The Addition of "Social Areas" as a Variable in the Model

The expansion of the model of urban land values suggested above is a simple extension of the logic that led to the original model. In contrast, expanding the model to consider explicitly the impact of social geography on the price of land is a major revision of the theory in that totally new elements are being introduced.

The social geography of a region affects land prices through the following mechanism: In any area, there exist subareas which, for any reason, are perceived by some individuals to be more desirable places of residence than other surrounding areas. If all other determinants of land value are held constant, market forces will cause the land values of areas perceived to be relatively more desirable to be higher than the land value of areas perceived to be less desirable.

The reasons why some areas are perceived to be more desirable than others relate to variables exogenous to the classic theory of urban land values. Factors such as the local crime rate, the level of congestion and noise, the quality of the public schools, the presence or absence of recreational and cultural amenities, the existence of distinguishing geographic features, the historic and present character of the neighborhood, and the prevalent architectural design of existing structures combine in people's minds to form an overall impression of the desirability of any given area. Perhaps the most significant component of the social factor that creates land value is the make-up of the present and anticipated residents.

Thus, the classic model as presented in equation (1) could be modified as follows:

$$sr = c - tc + sa \qquad (6)$$

where sr, tc and c are defined as before and sa is the social area benefit function. The form taken by sa will be dependent on the social geography of the area in question.

Just as tc, the effective travel cost, was defined earlier as a function that varies in some well-defined but not necessarily simple manner with location, sa also varies. A visual representation of the value of sa at all points in a region would likewise resemble a plain covered by hills and valleys.

The associated change needed in the utility function, (2), is as follows:

$$u\,(ac, hs, hl, sa, o) = U \qquad (7)$$

where sa is the benefit derived from living in a given social area. As in equation (2), for any given total income level, o, ac, hs and hl are directly related. In addition, because land in areas perceived to be more desirable will have a higher site rent, as presented in equation (6), any increase in the consumption of sa must be accompanied by a decrease in the consumption of one or more of the other goods.

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The inclusion of social area designations on the city or regional map permits consideration of demand-influencing factors that are different from and frequently more determinant than the income elasticity of demand for housing services and commute costs per mile, emphasized by Muth (8), Mills (7) and others. Observed variances in incomes cause trade-offs between the quantity of housing and commuting services likely to be bought by differing groups. But, differences in the demand for housing at locations that vary from each other due to historically-evolved differences in the character of housing space and social environment can frequently overshadow the influence of housing quantity and transport cost variances.

Using Sociological Factors to Help Determine the Shape of the Utility Function

To map the utility-maximizing bid-rent functions of all the possible buyers and renters of housing at all urban sites would be an impossible task. Similarly, all sites could not be given individual social area designations. It is possible, however, to determine the relationship between variations in consumer preferences (the utility derived from consuming goods) among groups and the differences in the groups' demographic profiles. Therefore, market research can be used to estimate the demand that groups with relatively similarly housing demands have for locations with relatively homogeneous social area characteristics. Fortunately, the market itself provides considerable evidence of the relative value or social area status that should be assigned to neighborhoods and groups of neighborhoods to be given social area designations.

One of the basic premises upon which market research rests is that there exists a quantifiable relationship between the externally observable demographic characteristic of a group and the consumer preferences and behavior of that group. This relationship frequently necessitates the use of survey research to make the required linkage between the relevant demographic characteristics and the likely consumer response of the important subgroup. In housing market and policy impact studies, the demographic characteristics of the household, rather than the individual, is the appropriate unit of analysis. My own experience has indicated that in addition to the standard income variable, age and type of household are critical variables.

Let me illustrate the use of survey research to identify the social area ranking of a neighborhood and the attractions it holds for demographically distinct groups with an analysis of the housing preferences of a sample of downtown Seattle, Washington employees that Gruen Gruen & Associates recently completed for that city. The City of Seattle is interested in encouraging downtown housing and therefore wanted to know how many of the region's households could be attracted to new market rate housing units if such were to be built in their business core. In investigating the housing location preferences of a sample of downtown Seattle employees, type of household proved to be the most statistically telling variable. The unrelated adult category evidenced the strongest interest, with 72 percent of this group stating a preference for both living and working in the downtown core. The other two subgroups indicating above average interest consisted of single-person households and single-parent households who were currently employed in downtown Seattle. In fact, if an analyst had merely looked at the factor of presence or absence of children in the home, he or she would have found this variable to be

statistically nonsignificant. This is because inclination of the Seattle downtown employee single-parent household basically cancelled out the strong disinclination of the traditional family household for a downtown Seattle residence.

Age, too, was a statistically potent variable with the under-30 workers far more likely to hold a preference for downtown living than those downtown employees who fell into older age categories. I would like to point out that the linkages between demographic characteristics and housing preferences can be expected to differ by regional area. These differences can be tied to the relative housing and nonhousing amenities and positive and negative externalities that exist at any one time in a region's central place and alternative suburban locations. Thus, while older downtown Seattle workers tend not to want to live in downtown Seattle, older downtown San Francisco workers are much more inclined to live in closer-in downtown neighborhoods. One major reason for this difference in preference for downtown living is that downtown San Francisco has far more cultural, recreational and retail amenities than does downtown Seattle at its present stage of urban development.

The market price for housing in any location will necessarily be influenced by the housing preferences of consumers. While the housing market within any region is very heterogeneous, the social areas that constitute housing submarkets within a region tend to be homogeneous with respect to that collection of personal values and demographic characteristics that make up the inexact concept popularly called "social class." In a 1973 Planning article entitled, "Man and His Neighbors Reexamined," I wrote:

> The preference for neighborhoods homogeneous with respect to class is not confined to middle-class families. Vast income or class disparities within neighborhoods are not desired by most families. However, preference for similar age and income groupings can not and should not be considered as either anti-democratic or as evidence of bigotry. It is better described as a preference for living among those whom one perceives as similar and with whom one feels comfortable (4).

This same statement holds true today. As Anthony Pascal has suggested, this element of the model could be pulled out of its context within the model to stand alone as a theory of segregation (9).

These relatively homogeneous neighborhoods or housing submarkets seldom reach the size of census tracts; instead, they must be evaluated on a block-by-block basis.

Past studies also indicate the existence of a strong relationship between certain socioeconomic factors and an individual's transportation preferences. Based on this research, it appears likely that the transportation costs perceived by the individual are not strictly related to distance, but are strongly related to other factors. Transportation costs can be measured as the time, monetary cost and discomfort associated with any trip. These three factors are influenced not only by the distance to be traveled, but other factors such as the individual's preferences concerning mass versus private transportation. Through careful sociological analysis, the relationship existent among all of these factors and an individual's demographic profile can be quantified.

In survey studies that measure the elasticity of demand of public transit ridership for commute trips, income and type of employment are strongly

correlated with whether the market segments are most concerned with time, convenience or monetary factors. Ignoring the trade-offs between housing quality and location and assuming for the moment that two differing households live an equal distance from their place of work, their cost avoidance preferences can be identified. Let us suppose that one household consists of one or more highly paid professionals whose wages directly depend upon the number of hours billed to clients, while the other consists of salaried personnel whose wages are not directly dependent upon the number of hours worked. Previous survey research studies show the former value time far above monetary savings while the reverse preference holds true for the latter.

In a similar fashion, market analysis can be used to quantify the relationships between a variety of demographic characteristics and the preference of certain groups to reside in certain social areas. Once again, the type of household plays a significant role as to which social areas are desirable or, for that matter, even acceptable. The presence or absence of children is a key variable with the age of the children being a significant factor. Many family households will accept one type of social area for their pre-schoolers, another for their pre-teens and yet a third when their children reach puberty. Buried among the many sociological trade-offs that lie behind the household's ability to seek to maximize their housing quality and minimize transportation costs is the cost of private schooling. For many upper-income households, private schooling is an explicit factor in their housing cost calculus when they are faced with the choice of a central city versus suburban social area residential location.

IV. An Overview of the New Model

The market price of any parcel of land is not the result of any single factor. Instead, a number of factors, most notably transportation and social geography, will combine to determine the final market price.

Of the total obtainable land price, parts of that price may be attributed to different factors. For example, based upon census place of work information, the effective transportation cost for each area of a city or region should be computed. If those data were used to create a picture of land value creation due to transportation cost savings, the picture would again resemble a large plain with numerous hills and valleys. The highest hill would occur around the city center, but other hills would be located near to other subcenters. In addition, because the utility of the savings in transportation cost varies for different subgroups of the population, a single picture could be accurate for only one such population subgroup.

For the same city or region and the same population subgroup, a picture of land value created due to social geography could be drawn. For example, if the subgroup for which the analysis is performed is defined by a marked preference for small, quiet neighborhoods, the picture drawn would have a low point around the city center and other low points around all other subcenters. In general, the height of the "economic plain" would increase with increasing distance from the urban core and employment subcenters.

Consumers are willing to pay the most for land which, on the whole, has the highest utility to them. The final price that members of any specific subgroup are willing to pay for land can be determined by adding the price component attributable to each primary factor, with the social topography of the region being a key land value variable. Survey analysis and other market research tools can delineate the social areas of a region or subregion and

estimate their relative values. Such definitions and quantifications can provide the empirical estimates required to include social and behavioral variables in the analysis of residential locational patterns and land values even though such estimates are less precise than are physical measures of time and distance. The suggested addition of social and behavioral variables to a space/economy model can add a great deal of expository and predictive power.

In the housing model example presented in this paper, a clearer picture of reality is provided by the addition of a social area map to an expanded transportation topography. I hope this model has also made a small contribution to meeting Miernyk's definition that "Regional science is the study of those social, economic, political and behavioral phenomena which have a spatial dimension."

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