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been no systematic appraisal of their relevance to the theory and measurement of income. This project is a conceptual and statistical attempt to explore the role of capital gains and losses as a form of income.

Present practice is to exclude capital gains and losses, whether realized or not, from estimates of personal income. This results in a measure which, for purposes of assessing both the magnitude and the distribution of individuals' purchasing power, is considerably narrower than the theoretically appropriate Haig-Hicks concepts of individual income as consumption plus the change in net worth. Accrued gains and losses are large and highly variable: for the years 1947-64, annual gains on major asset groups—corporate stocks, residential real estate, and the physical capital of the unincorporated business sector (including farms)—range from minus \$50 billion to over \$100 billion, averaging \$26.3 billion after adjustment for price level changes. By comparison, over the same period personal saving averaged \$18.3 billion and in almost every year was exceeded in absolute amount by capital gains (or losses). These estimates are preliminary, and minor revisions will be undertaken in the near future.

At present I am attempting to distribute this expanded measure of income over income size

classes. Not only is this measure likely to show greater inequality than the distribution of income as measured by the Office of Business Economics, but its trend over time may well be toward more inequality. Inequality in the size distribution of OBE personal income has remained virtually constant during the past twenty-five years.

A second phase of the study is analysis of the relevance of capital gains and losses to the measurement of current economic activity or output. It can be argued that major portions of accrued gains reflect "output" in a broad sense, and that they do not cancel out when the basic Haig-Hicks concept of income is summed over individuals. The problem, it is maintained here, is strictly one of measurement, a conclusion that runs counter to the conventional notion of capital gains and losses as "unproductive" increments to wealth. It is argued that the net result of including these gains and losses in national income is a reallocation of income over time precisely analogous to the treatment of tangible investment by the OBE. A set of consistent stock/flow accounts has been developed as an expository framework for this expanded concept of national income.

Michael B. McElroy

### 3. URBAN AND REGIONAL STUDIES

#### Introduction

The National Bureau's research program in urban economics has expanded dramatically during the past year. Studies started last year and the year before have begun to come to fruition, and a number of new staff members have joined the Bureau's urban studies group.

The major part of the ongoing research is related to the development of a large-scale, experimental computer simulation model for studying the processes of urban development.

We are carrying out concurrently the over-all design and programming of the computer simulation model and the empirical investigation of the behavioral relationships needed for the model. Although all members of the urban studies group have made important contributions to the model design, Greg Ingram has assumed principal responsibility for its over-all design and implementation. Special recognition should also be given to Royce Ginn, particularly for his help in solving the complex programming problems encountered in developing

the simulation model. His contributions are not limited, however, to the computer simulation. All of the individual empirical studies involve the processing of large and complex data files; none would have proceeded very far without his tireless efforts.

The individual econometric studies emphasize one or more areas pertinent to the computer simulation and are expected to provide either specific parameter estimates or the theoretical understanding needed for some components of the simulation model. An exhaustive description of these linkages is not appropriate here. However, a few general examples are useful in illustrating the relationship between the individual econometric investigations and the simulation. The Brown-Kain study is designed to evaluate moving behavior and to determine how and why households modify their pattern of housing consumption. Dresch's study investigates the hypothesis that workplace location of the primary wage earner is a major determinant of both the location of the household's residence and the type of housing it consumes. This hypothesis is fundamental to our current model design. If his findings do not confirm this key hypothesis, we will have to re-examine our views about the processes of urban development and possibly make major modifications of our model design. Mayo's study tests this underlying hypothesis in a somewhat different manner and may provide an alternative means of modeling the household's choice of residential location, if his and Dresch's studies fail to support our working hypothesis.

None of the previous studies will provide much direct evidence about how the housing stock adjusts to changes in the demand for housing services by housing-type submarket and location. This is a serious problem that cannot be evaluated fully because of the lack of satisfactory time-series data on changes in the housing stock. Even so, Silver's study of stock adjustment during the decade 1950-60 should provide some guidance for our modeling efforts.

None of these studies involves original data collection. All of them except Silver's use large

bodies of underanalyzed data on housing markets, residential choice, and urban travel collected from land-use transportation studies in a number of metropolitan areas. One of the advantages of our approach to the development of an experimental urban simulation model is that it permits us to use varied bodies of data from several cities. This creates a number of difficult problems in reconciling parameter estimates from different data sources. However, we believe that these difficulties can be overcome and that the model will be more general as a result of the diverse bodies of data employed.

A more practical reason for proceeding in this way is that several million dollars would be needed to reproduce the data sources in a more consistent way and for a single city. Our entire budget is but a small fraction of this. The distribution of money spent on research and data collection is already badly out of balance. Another expensive and large-scale data collection effort would make this balance still more unfavorable. Furthermore, we still lack the knowledge to design a comprehensive data collection scheme of the kind that would be needed to answer the interrelated set of questions incorporated in the simulation model. Such a data collection effort might be justified after we have analyzed more carefully the bodies of data presently available to us and after we have completed a prototype computer simulation, but not before. Without this experience, we will not know precisely what kinds of data are most needed.

The Kain-Quigley study of housing market discrimination, although somewhat peripheral to the central urban modeling effort, is giving us valuable information about the characteristics and operation of urban housing markets and the way in which these markets are affected by racial discrimination.

In a similar way, the Struyk-James study on changes in industry location will be of value in simulating changes in the distribution of employment. We expect that changes in the location of basic industry will be exogenous to the urban simulation model. This is unsatisfactory.

We have been trying for some time to obtain funding that would permit us to begin a large-scale analysis of the determinants of the intrametropolitan location of manufacturing establishments. We have acquired from Dun and Bradstreet a valuable and most unusual body of data from which we could learn a great deal about this process, and we hope that we will be able to expand our research in this area in the coming year.

In addition to these studies, there are several others that are not so closely linked to the objective of developing an urban simulation model. David Gordon's research on employment problems in the ghetto, Joseph Persky's analysis of the growth and change in racial composition of Southern metropolitan areas, and Masanori Hashimoto's study of regional employment rates across states and cities fall into this latter category.

John F. Kain

## **Modeling the Urban Housing Market**

This research effort seeks to represent two important components of urban change. It attempts, first, to model changes which occur in the housing stock through new construction, modification of existing structures, and quality change over time; and, second, to simulate the locational choice of new and moving households. Since these activities are fairly complex, they are being represented in a computer simulation model. While there are undoubtedly a myriad of approaches one could use to simulate changes in the housing stock and locational choice, I have decided to represent these activities in a market setting. Thus the model has three major components: a supply submodel, a demand allocation submodel, and a market or assignment submodel.

The supply submodel simulates stock adaptation, construction, and quality change in each

of the several zones which comprise the metropolitan area. The level of each of the possible activities is a function of its expected profitability and several constraints. The profitability is derived from this period's expected prices and engineering cost estimates. The constraints reflect such limitations as zoning restrictions and input availability. The output of this submodel is the revised stock of housing available for occupancy subscribed by structure type and zone of location.

The demand allocation submodel assigns movers of various household classes and workplaces to housing types, by means of traditional demand functions whose arguments are relative prices and incomes. The relative prices incorporate location in a general way in that they include not only the expected housing price but also the expected work-trip cost. This part of the model accommodates the cross elasticities of substitution between house types, since members of more than one household class can select a given house type. The output of this submodel is the number of mover households selecting each house type, subscribed by household class and workplace zone.

The market or assignment submodel matches up the movers with the available units. This will be done with a linear programming algorithm which will produce shadow prices on the various types of units. These shadow prices will then be used to formulate the expected prices for the next period.

The supply submodel was programmed first and is an operating prototype that simulates stock alteration and new construction. This prototype is now being modified to better represent quality change, especially disinvestment. The demand allocation and assignment submodels have been designed and will be programmed next. It is expected that the over-all market model will soon be operational. I will then run sensitivity analyses to identify important model parameters and tentatively simulate the effects of various transport investment and housing policies.

This model uses synthetic data, but it should be fairly easy to adapt to an actual city when

the model is perfected and real data are available. Meanwhile, by means of informal consultations with those doing econometric work in the area, I hope to keep the data requirements of the model realizable and the specified parameters realistic.

Gregory K. Ingram

### **The Detroit Housing Consumption-Residential Location Study**

This study is best described in terms of the broader framework of the National Bureau's urban modeling effort, as outlined by Kain and Ingram. The household sector is of primary importance for three components of the NBER model: (1) the mover identification model, (2) the housing submarket assignment model, and (3) the location model (assigning movers by housing submarket, to residence location). The immediate function of the Detroit study is to estimate the housing submarket demand equations and to identify and assign households to the alternative submarkets. Analyses of other issues of relevance to the NBER model are being pursued simultaneously; particularly important questions relate to the housing consumption choices of "non-normal" households, with normal defined as single-worker, male-headed, white households. Information on the housing consumption and residential location patterns of most non-normal household types is singularly lacking. It is hoped that the present study, with its rich data source, will significantly improve the understanding of these choices.

Although not explicitly incorporated in most previous urban models, a key assumption of the Bureau model is that workplace location alters the relative prices of different types of housing and significantly influences the choice of housing submarket. In this context, housing prices must be defined to include structure supply price, location rent, the costs (if borne by the household) of public services, and trans-

portation costs (direct and opportunity), specifically the cost of the journey to work. The initial objective of the study is to identify the effect of workplace location on housing consumption choices.

The basic data source for the study is the home interview survey of the Detroit Transportation and Land Use Study (TALUS). The first phase of the research has consisted of constructing a "household-workplace" file for the 41,243 sample households. This was accomplished by merging several TALUS files to produce a composite containing (1) summary household information (e.g., residence location by census tract and TALUS analysis zone, structure type, tenure type and duration, race, income, family composition, number of working family members), (2) additional detail for the household head (sex, age, marital status, education, occupation, and industry) and the wife of head (labor force status), and (3) details of the primary work trips of the head and wife (workplace location, mode of travel, and elapsed time). Construction and editing of this file is now complete. Of the 32,629 households with working heads, it was possible to identify workplace location for 27,244. The actual (1960 Census) and sample geographic employment and residential distributions seem to coincide quite closely. This correspondence between the population and the sample is also observed in the socioeconomic dimension.

Major effort is being devoted at this time to identifying bundles of residential services which define the housing submarkets. The first step in this process utilizes the TALUS structure types: (1) single-family, (2) duplex and row, (3) small multiple, and (4) large multiple. Housing types will be further identified by the physical characteristics of housing units within census tracts, by neighborhood prestige, and by public service quality. As indexes of the quality of public service, public school and crime statistics are being developed. Preliminary analysis utilizing only tract characteristics is now under way.

Having defined housing types, the objective is the econometric estimation of the submarket

demand equations of the form:

$$(1) \quad H_i^{h'} = a^{h'} X_i + \sum_{h=1}^n b_h^{h'} p_{j(i)}^h,$$

$h = 1, \dots, n$

where  $H_i^{h'}$  = the probability that household  $i$  will choose submarket  $h'$ ;  $X_i$  = characteristics (e.g., income, family size) of household  $i$ ;  $p_{j(i)}^h$  = the price of housing type  $h$  ( $h = 1, \dots, n$ ), relative to the price of housing type  $n+1$ , at workplace  $j$  (the workplace of the head of household  $i$ ), where the prices include the structure supply price, location rent, public service cost, and the cost of the journey to work. Since the workplace-specific relative housing prices are not observed directly, they must be estimated from the mean within-workplace residuals. The test of the effect of workplace on housing consumption is whether these workplace-specific "incentive factors" differ significantly from zero.

Assuming that a significant workplace effect is observed, the analysis will then attempt to identify the sources of the price variations. This will involve examining the relationships between the incentive factors and such variables as travel time, transit availability, etc. Also, the changes in the incentive factors over time will be examined through information on length of residence. The observed changes in the geographic residential distribution over the various periods will be decomposed into changes resulting from (a) changing workplace locations, (b) changing prices at given workplaces, and (c) changing household characteristics.

It will also be possible at this stage to estimate quantitatively the effect of housing market discrimination on the housing consumption patterns of nonwhites. The estimation of the submarket demand equations will be restricted initially to whites. By predicting black housing consumption on the basis of the estimated white equations and comparing this with the observed black consumption patterns, the distortion in choice can be specified. An effort will also be made to estimate the reverse effect of housing market restrictions on employment opportunities.

Other specific areas of investigation include the housing consumption patterns of the retired, blacks, female-headed households, and households with multiple workers. Since sample sizes in excess of 4,000 are available for each of these groups, detailed analysis will be possible.

The primary output of the Detroit study, in terms of the Bureau model, will be the submarket demand equations. From the estimated equations it will be possible to specify consistent sets of workplace-specific prices, which can then be used in initializing the simulation model.

Stephen P. Dresch

## Residential Location Decisions

This study is an econometric investigation of the determinants of the residential choices of households. Objectives of the study have been to ascertain those attributes of households which may be used to identify submarkets in the urban housing market and to determine the relative importance of each of a number of subsets of locational attributes within each submarket. At the heart of the theoretical model is a transportation cost—location-rent trade-off model which additionally considers the impact on residential choice of local public services, housing attributes, social amenities, property taxes, accessibility to shopping areas, and pre-existing land use and topography. The theoretical development of the model stresses integration of both the demand and supply sides of the market for urban housing. Empirical testing of the model is conducted by considering each of twelve stratified groups within the population as comprising distinct submarkets who compete for housing. The groups which are considered are stratified according to race and sex of the household head, household income, family size, and the number of contributors to family income. Households are further stratified by workplace in order to isolate workplace and residence interactions.

The form of the model which was tested was:

$$P_{ijk} = F_{jk}(X_i, t_{ji})$$

where  $P_{ijk}$  = the proportion of workers who work at workplace  $j$ , and who are in the  $k$ th socioeconomic category, and who live at residential location  $i$ ;  $X_i$  = a vector of variables which characterizes residential location  $i$  according to the sets of variables mentioned above;  $t_{ji}$  = travel time from workplace location  $j$  to residential location  $i$ . The subscripts of  $F$  indicate that there is a different function for each combination of workplace location and socioeconomic category. The equation thus describes the pattern of residential locations for each combination of  $j$  and  $k$  as a function of the characteristics of residential locations and the characteristics of the transportation system.

The model was estimated using ordinary least squares with census tracts as the unit of observation. Predicted and actual values of  $P_{ijk}$  were grouped according to broader geographical areas than census tracts to evaluate the ability of the model to predict population distributions over larger than tract-size areas.

Estimation of the model at the census tract level resulted in corrected  $R^2$  statistics which ranged from about 0.04 to 0.45. Grouping the predicted and actual observations resulted in proportions of explained variance almost uniformly on the order of 80 to 90 per cent. Major substantive conclusions are:

1. Increases in commuting costs appear to be traded for lower location rents in every socioeconomic group investigated. The relative importance of commuting time and location rent variables decreases with increasing income.
2. Workplace locations of secondary wage earners in households, as well as that of the primary wage earner, seem to have a significant effect on household locational choice.
3. Public services apparently have no significant unambiguous impact on residential choice.
4. School quality seems to affect the locations of only the higher-income groups.
5. Attributes of the housing stock greatly affect residential choices, though different at-

tributes are important for different groups.

6. Land use externalities do not appear to influence residential choices significantly.

7. Property taxes seem to be capitalized almost entirely into property values and therefore have no pervasive effect on location.

Some of these conclusions are subject to qualification because of problems of multicollinearity and sampling errors in the data. The predictive equations do appear to be relatively sound, however, based on the ability to forecast residential distributions about one workplace using behavioral equations estimated on the basis of other workplaces.

This analysis indicates that, while residential location models based upon location rent-transport cost trade-offs are substantially realistic, there are other sets of variables which strongly influence locational decisions and which should be considered in further investigations of this sort. Stratification by socioeconomic categories appears to be absolutely necessary in models of residential choice; behavior is significantly different among practically all groups considered.

Stephen Mayo

## Metropolitan Moving Behavior

This research is concerned with household decisions to move, to purchase particular bundles of housing services, and to choose particular locations within an urban area. We are examining two questions: (1) Given the characteristics and changes in the characteristics of family units and the characteristics of the current residence, can we predict which households will move? (2) For households that move, can we explain how the demand for dwelling unit quality, size, and structure type, neighborhood quality, and the quality of local public services enters into their choice of a new residence?

The principal body of data used for the study was obtained from the Bay Area Transporta-

tion Study (BATS). In addition to the usual origin and destination survey, BATS conducted a more extensive home interview of an additional 3,000 households. This supplemental survey provided ten-year employment and residential histories for each household. From this data we have created a "movers file," which for each move made during the ten-year period describes: (1) the location, dwelling-unit and neighborhood characteristics, and value or rent of each residence; (2) the head of household's occupation, industry, and workplace location before and after each move; and (3) the relationship, sex, and age of all household members before and after the move.

In addition, we are now working on a second file which will give the characteristics of each household and residence in each year and indicate whether it moved in that year. We will use this file to analyze the determinants of moving.

The bundles of housing services included in the analysis are described in terms of tenure (own vs. rent), value or rent, structure type, age of structure, number of rooms, location, neighborhood quality and prestige, school quality (average achievement scores), and tax rates. Many previous studies have emphasized the importance of school quality and tax rates on the location decisions of urban households. Dwelling unit characteristics were obtained from the home interview survey; measures of neighborhood quality and prestige, from census tract statistics; and school quality and tax data, from local governments.

We assume that, at any moment in time, households demand a particular collection of attributes of the bundle of housing services and a particular location. Household demands for particular housing services depend on family structure, income, and where family members are employed. Therefore, changes in household characteristics may change the demand for either particular attributes or a particular location. When these changes in demand are large enough, the household will change its residence. For example, the birth of a child may cause the family to demand more space, or an in-

crease in income may cause a family of the same size to demand a higher-quality unit.

Changes in bundles of housing services may or may not be associated with a move from one part of the metropolitan area to another. Similarly, a major change in workplace location from one part of the region to another may cause the household to move while it consumes otherwise identical bundles of housing services. On the other hand, changes in workplace location may change the price of certain attributes of housing bundles, thereby changing the characteristics of the bundle. The empirical testing of these several hypotheses has great significance in the validation of alternative theories of residential location.

A variety of statistical methods will be used in estimating these relationships. We have yet to determine the exact nature of the equations needed to estimate these demand relationships. The individual equations are obviously inter-related, but we still have to determine how this interrelationship should be specified.

Besides being of general theoretical interest, we expect the findings of this research to be helpful in determining the demand equations for the simulation model.

John F. Kain  
H. James Brown

### **Housing Consumption, Housing Demand Functions, and Market-Clearing Models**

Analysis of variance tests reveal rather dramatic differences in housing consumption by family type, employment status, workplace, income, and race. These differences among households are attributable to differences in tastes, differences in prices in the housing market as determined by workplace location, and by racial segregation, which effectively creates a separate housing submarket for blacks in major urban areas. There may also be effects on the side of supply, such as market imperfections or long lags in changing the housing stock.



To date most empirical research on urban housing has been devoted to describing the housing market prices, quantities purchased, and the quality of the stock. Little attention has been given to specifying the underlying demand and supply functions or how the housing market operates (e.g., how the stock is utilized or altered). For example, regression analysis relating housing prices or rents to resident income, housing quality, neighborhood characteristics, and race is essentially a description of the current housing market as determined by both demand and supply considerations and market imperfections. That housing prices are closely related to resident income and stock quality is testimony to the workings of the housing market. However, the particulars of the causal structure remain obscure. High-income residents, high-quality housing, and high house prices in a geographic area are all endogenous variables, reflecting the spatial configuration of jobs and the current housing stock throughout the city, which determines who will outbid whom at a given site.

To disentangle the sources of variation in housing consumption and housing prices requires in the first instance a specification of housing demand functions. Household interview data are required for this analysis. Previous analysis based on aggregated data, e.g., census tracts, unfortunately obscures the role of the workplace, a fundamental determinant of the relative prices of housing and work-trip costs confronting the household. Housing demand functions for the complex set of residential services which can be considered "housing" are being estimated from household interview data; these include income elasticities and price elasticities as derived from the effects of workplace location on relative prices.

These demand estimates permit a determination of the separate effects on housing consumption of supply imperfections, or lags in supply adjustments to demand, relative to differences in tastes. They also can be employed in simulation models of the "market clearing" process, a specification of how households relocate and what price they pay for different

housing bundles. Recourse to either a mathematical programming formulation or more ad hoc iterative schemes in such a simulation depend for their success on using realistic housing demand functions as inputs.

The output of these simulations would therefore be the assignment of households to the existing housing stock and a set of derived prices. These, in turn, are important inputs to models representing housing stock additions and improvements as well as changes in such neighborhood characteristics as the tax base and the need for education.

Mahlon R. Straszheim

## The Demand for Housing

The objective of this research is to examine the demand for housing in the short run. The general model upon which the analysis is based is of the form:

$$E(Q_i) = f(x_{i1}, \dots, x_{ki}, x_m, \dots, x_s) \\ g(Y_i, p, Q_{i,t-1}, H_i)$$

$$f(*) = 0 \text{ if no residential move} \\ = 1 \text{ if residential move}$$

where  $E(Q_i)$  = expected value of housing services demanded by household  $i$  in a transaction during the period;  $x_{i1}, \dots, x_{ki}$  = a series of "status" or "change" variables specific to household  $i$ ;  $x_m, \dots, x_s$  = a series of variables specific to the neighborhood;  $Y_i$  = income;  $p$  = price;  $Q_{i,t-1}$  = level of housing services consumed at the beginning of the period;  $H_i$  = household characteristics

This model emphasizes two important aspects of housing demand behavior. First, a portion of all households adjust their housing consumption by moving. Second, out of the total population, those households which do move are more likely to display a long-run level of demand, as measured by the amount of housing services purchased or rented in the market, than are "sitting" owners or renters, whose consumption of housing is measured by the poten-

tial market value or existing rental level of the dwellings which they occupy.

The empirical work employs data from several thousand individual household records collected by the Southeastern Wisconsin Regional Planning Commission. These data include information over a period of up to thirteen years (eight points in time) prior to the year of interview, on places of work and residence, and on income and value of housing for years in which place of work or residence was changed.

The analysis falls into two principal parts:

1. For that portion of the population which moved in the period prior to the interview date, the parameters of a variety of demand equations have been estimated.<sup>1</sup> The principal findings are: that a measure of income which includes the influences of wealth is superior to income measures which do not; that the level of housing services consumed prior to the residential move adds significantly to the explanatory power of all of the income measures employed; and that aggregation leads to a severe upward bias on the coefficient of the income variable, whether this be current income or some representation of the permanent component of income. Extensions of this portion will include further experiments with the income variable and attempts to account for quality differences among housing units.

2. The second principal portion of the analysis involves a sample of households present at the beginning of the period, regardless of whether they moved their residence during the period. The object is to discover the determinants of the residential move. Those variables which will be emphasized are: the divergence between long-run and actual housing consumption levels, differences in individual and average neighborhood household characteristics, changes in family size, and changes in travel time from home to work. In addition, hypotheses about the differences in causality between

workplace change and residence change are to be tested. Differences in behavior between white and nonwhite households will also be examined. Nearly all the work on this portion has been concerned with preparing the data for analysis. Some preliminary examination of the processed data file is being conducted to familiarize the investigator with distributions within the data, primarily by means of cross tabulations and hierarchical decision trees where sequential decisions are hypothesized, e.g., workplace move, residential move, tenure type in new housing, type of area of new housing, location of new housing.

Irving R. Silver

## A Housing Market Model

While a series of studies concerning specific components of housing market behavior are being developed from an urban simulation model, a simpler model of the housing market has been formulated which can analyze actual changes in the housing stock of individual metropolitan areas. This model attempts to explain adjustments in the quality of the existing stock of housing units as a response to price. The model postulates a continuum of quality within the stock, which, for empirical simplification, is divided into a few discrete classes. It is hypothesized that, within each small and relatively homogeneous area of the metropolitan area, change in the quantity of housing services, by converting the housing unit for some level of demand, depends upon the vector of price changes in the various quality levels weighted by some a priori measure of interclass degree of substitutability, e.g., spatial separation. Conversion, by definition, includes deterioration and improvement in addition to actual alteration of dwellings.

The empirical work is based on census tract data for several metropolitan areas for 1950 and 1960. Data for the San Francisco-Oakland and the Washington, D.C., areas are being processed and are nearly ready for analysis.

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<sup>1</sup> Results of this analysis are summarized in the paper, "A Model of Housing Demand in Metropolitan Areas," to be published with other papers presented at a Conference on Urban Land Economics, by the John C. Lincoln Institute.

Additional data for St. Louis are also being acquired. Since the data include separate figures for the nonwhite portions of those census tracts having a large percentage of nonwhite households, additional hypotheses may be tested about racial discrimination. The predictive accuracy of the model will be tested against the results of the 1970 Census.

Irving R. Silver

## An Analysis of Ghetto Housing Markets

There is a growing recognition that housing market discrimination plays a central role in the nexus of problems facing urban areas. Yet, in spite of the far-reaching effects of housing market discrimination, there has been very little systematic investigation into its nature and consequences.

This study, an econometric analysis of the ghetto housing market in St. Louis, Missouri, should help fill this gap. The analysis is based on a sample of approximately 1,500 households in St. Louis in 1967. The sample contains detailed information on both the characteristics of households and their dwelling units. Particularly noteworthy are detailed data on the quality of each dwelling unit and the surrounding neighborhood. There have been many surveys of dwelling units and many surveys of households, but we know of no other large-scale effort to collect and merge comprehensive housing and household information in this way.

Although the study emphasizes the impact of discrimination on urban housing markets and the resulting distortions of Negro housing consumption, it is cast in the more general framework of an analysis of urban housing markets. Therefore, we consider the actual patterns of housing consumption by both black and white households in St. Louis and attempt to evaluate the racial discrimination in determining these "patterns." The study deals explicitly with the multidimensional character of

housing services. Thus, it considers the physical characteristics of individual dwelling units (e.g., number of rooms, total floor area, number of baths, condition, and over-all quality), the quality of surrounding properties and the neighborhood as a whole, and the quality of local public services.

For the most part, research into housing market discrimination has been concerned with measuring the extent of segregation, evaluating the causes of current and historical patterns of racial segregation, and determining whether Negroes pay more than whites for comparable housing. Although the last question has been the focus of a large number of empirical studies, there is no completely persuasive evidence either way on the matter. Most researchers would accept the view that blacks pay more than whites for housing of comparable size and quality, but this view is by no means unanimous. Our own findings for St. Louis in 1967 indicate that equivalent housing is roughly 8 per cent more expensive in the ghetto than outside.<sup>1</sup>

In any case, price markups for comparable housing may be relatively less important than other consequences of housing market discrimination. A far more serious result, for example, may be a limitation on or a distortion of Negro housing patterns. Many kinds of housing services may be completely unavailable to blacks or available only at prices or under circumstances that virtually prohibit blacks from consuming them. Indeed, our research indicates that a much smaller proportion of Negroes purchase housing than whites, even after differences in income, family size and structure, and other determinants of homeownership are taken into account. Thirty-two per cent of the Negro households in our sample were homeowners in 1967. Our analysis suggests that 45 per cent would have been homeowners had they been white. The differences for home pur-

<sup>1</sup> Some preliminary findings including those pertaining to housing market discrimination are contained in John F. Kain and John M. Quigley, "Measuring the Value of Housing Quality," *Journal of the American Statistical Association*, June 1970.

chasers were larger still.<sup>2</sup> If nonwhites are systematically excluded from homeownership, the consequences may extend beyond housing consumption. For example, homeownership is by far the most important form of saving for low-income households. If nonwhite households are discouraged from owning their homes, they may be denied an important method of wealth accumulation.

John F. Kain  
John M. Quigley

### **Industrial Location within Metropolitan Areas**

The main thrust of the study during the past year has been developing data and more clearly defining the process of metropolitan industrial location. With respect to the latter, the importance of the marginal components—new firms, firms relocating within the area, firms going out of business or moving out of the area, and firms expanding their employment at present locations—in producing the observed locational pattern of industry and industrial employment is being examined for four metropolitan areas. These areas are Boston, Cleveland, Minneapolis-St. Paul, and Phoenix. A report of the preliminary findings for the Boston area was presented at the Fall 1969 Research Conference of the Committee on Urban Economics, and a report on the findings of all four areas will soon be given.

A considerable part of last year's efforts was also devoted to investigating the limitations and usefulness of the establishment-level Dun and Bradstreet data, which are serving as our primary data source. As a result of this work, the cost of carrying out similar work for other cities will be substantially reduced,

<sup>2</sup> These preliminary findings were included in a paper presented at the December 1969 meetings of the AEA. They may be found in John F. Kain and John M. Quigley, "Housing Market Discrimination, Homeownership, and Savings Behavior," Harvard University, Program on Regional and Urban Economics, Discussion Paper No. 58.

and the quality of the data will be generally improved.

The ultimate goal of the project since its initiation has been not only to understand the dimensions of the location process but also to determine which factors most strongly influence the intrametropolitan location decision of manufacturers and to quantify those influences using behavioral models. It is anticipated that one of the four metropolitan areas currently under study will be selected for this purpose and that modeling will begin in the second half of 1970. In addition, Robert Leone and Gordon Saussy of Yale University are using the data to study the influence of transportation facilities and other factors on the location decision of firms in the New York and New Orleans metropolitan areas.

Franklin James  
Raymond J. Struyk

### **Ghetto Employment Problems**

I have spent the past year trying to complete some exploratory research on ghetto employment problems. The data needed became available much later in the year than I had expected, and in thinking about my work I have reconsidered many of the underlying analytic assumptions.

In my own area of interest, conventional marginal analysis has been applied quite directly to the analysis of ghetto employment problems and discussions of manpower policy. Typically, an individual's "disadvantage" is presumed to vary more or less as the sum of a collection of individual handicaps. A person earns low wages, for instance, because he has had relatively little education, or because he has had little specific training, or because he has had little information about job opportunities. Policy conclusions have derived directly from that framework. Since disadvantage is presumed to vary as a continuous function of a variety of relatively independent variables, analysts assume that marginal improvement

of any relevant labor market characteristic will automatically bring about an incremental improvement in the worker's labor market situation. Thus, if he receives one additional year's equivalent of education, his earnings will be expected to increase automatically by a certain amount, regardless of his other characteristics and regardless of the social structure.

An alternative hypothesis might be to presume that, at any point in history, the prevailing and constantly evolving system of social and economic institutions defines and maintains class distinctions. It might be further assumed that these class distinctions change in such a way as to maximize the advantage of those in control of the institutions. At the most general level, it would envisage that individual labor market outcomes are determined primarily by those characteristics along which class distinctions are made, and only secondarily by those characteristics to which economists usually attribute productivity. With reference to ghetto employment problems, it would assume that those who are "disadvantaged" remain so more because it serves the interests of those in control of institutions that a class of people is considered "disadvantaged," than because they are relatively unproductive.

This kind of analytic framework suggests several illustrative observations about ghetto employment problems, observations which ought to be subject to empirical test. For example, it implies that those with easily determined and conventionally accepted second-class characteristics (blacks and women, for instance) dominate those jobs at the bottom of the hierarchical ladder (lower-status clerical, laborer, and service jobs). It would also predict that training programs designed to increase a disadvantaged worker's productivity will not necessarily bring about improvements in his labor market status; institutions may continue to channel him into low-status jobs despite his apparent increase in skill.

To begin to test these alternative hypotheses, I have been working with what seemed to me the most useful available set of data about ghetto employment problems, the new Urban

Employment Survey, sponsored by the Bureau of Labor Statistics and the Bureau of the Census. In its first year, fiscal 1969, it sampled large numbers from the ghetto populations of New York, Chicago, Los Angeles, Detroit, Houston, and Atlanta (and also, for control purposes, from the rest of Detroit and Atlanta). Its extensive questionnaires provide more detailed information about job histories and labor market problems than we have ever had before. Using these data, I am trying to test the differences between a "conventional" and "class" analysis of these labor markets in several ways.

First, I am trying to explore the explanatory power and interrelationships of different sets of variables that influence such labor market outcomes as wages and occupational status—on the one hand, variables like education and job experience, which we tend to assume are directly related to "productivity" and, on the other hand, variables like race and sex, which we assume are more distantly related to productivity. Second, I am trying to test for discontinuities in the structure of jobs in the labor market, looking for evidence that a certain subset of jobs (defined by both industry and occupation) comprise the secondary half of what some have called the "dual" labor market. Third, I am trying to use these empirically derived definitions of the secondary labor market to help explain the relative effectiveness of the first and second sets of explanatory variables in influencing labor market outcomes—to look for evidence, in short, that some people are channeled into certain jobs with little reference to their skills.

David Gordon

### **Migration and Employment in Southern Metropolitan Areas**

Over the last year my research has focused on large southern metropolitan areas. This work is meant to complement the earlier work I did with John Kain on the nonmetropolitan South. The general purpose of the current research is

to explore the relation of migration and growth of employment in determining the racial and skill composition of southern cities.

The heart of this effort is a migration model. This model includes four streams of migrants for the period 1955-60: white in-migrants from metropolitan areas, white in-migrants from nonmetropolitan areas, black in-migrants from metropolitan areas and black in-migrants from nonmetropolitan areas. Out-migration has been broken down into white and black streams. The most interesting (and still tentative) findings to date are: (1) the importance of the hinterland in determining white and black nonmetropolitan in-migration. Each SMSA in the sample has been assigned a hinterland as defined by Rand McNally trading areas. Thus two SMSA's close to one another have a smaller "supply pool" of nonmetropolitan migrants to draw upon. This effect comes up clearly in regression results. (2) The relative constancy of white and black out-migration rates once adjustments are made for military movement. Blacks, however, tend to out-migrate at a substantially lower rate than whites. Differences in employment growth have only minor effects on out-migration. This can be interpreted as a substitution effect of "cheaper" labor within each racial labor force or, alternatively, an indication that the city in question is a "stopping off" point for migration elsewhere (e.g., Memphis for migration to Chicago). (3) Other things being equal (in particular the rate of employment expansion), blacks tend to be more willing to move to and less willing to leave SMSA's with a low proportion of blacks. This may reflect a larger pool of "available" jobs in these cities.

My research effort is currently moving backward in time. The central question is whether a simple migration model as described above can be adapted to explain the changes in the racial and skill composition of southern cities since 1900. I am currently working on a "simulation model" which will attempt such an explanation.

Joseph J. Persky

## Research on Regional Unemployment

The purpose of this study is to analyze unemployment rates across states and cities. The study so far deals only with state differences, but the analytical procedure would be the same for cities.

Observed differences in state unemployment rates at any point in time reflect both short-run and long-run components. The unemployment,  $u_{jt}$ , for the  $j^{\text{th}}$  state at time  $t$  can be decomposed into the cyclical component,  $c_{jt}$ , the secular component,  $s_{jt}$ , and the residual,  $v_{jt}$ . Two alternative forms of the decomposition were attempted here. One assumes that the three components are additive and the other assumes a multiplicative relation:

$$(1) \quad u_{jt} = c_{jt} + s_{jt} + v_{jt}$$

or

$$(2) \quad u_{jt} = c_{jt} \cdot s_{jt} \cdot v_{jt}$$

To facilitate the empirical separation of these components, the following relationships for the cyclical and the secular components were assumed. For the cyclical component,

$$(1-a) \quad c_{jt} = \beta_j u_{t+n_j}$$

or

$$(2-a) \quad c_{jt} = \frac{\beta_j}{u_{t+n_j}}$$

where  $u_{t+n_j}$  is the U.S. unemployment rate at time  $t+n_j$  and  $\beta_j$  is a measure of cyclical sensitivity.

For the secular component,

$$(1-b) \quad s_{jt} = \alpha_j + \gamma_j t + \delta_j t^2$$

or

$$(2-b) \quad s_{jt} = \alpha_j e^{(\gamma_j t + \delta_j t^2)}$$

Thus the cyclical component of unemployment in a given state is related to the aggregate level of economic activity as represented by the aggregate unemployment rate, while the secular component is represented by a constant plus a trend. Substituting into (1) and (2), we get:

$$(3) \quad u_{jt} = \alpha_j + \beta_j u_{t+n_j} + \gamma_j t + \delta_j t^2 + v_{jt}$$

or

$$(4) \quad \log u_{jt} = \alpha'_j + \beta_j \log u_{t+n_j} + \gamma_j t + \delta_j t^2 + v'_{jt}$$

The first task is to obtain meaningful measures of the parameters in the above relationships, while the second is to compare and analyze the differences in these measures among states. Finally, I hope to identify mechanisms by which labor markets adjust to changes in demand and supply conditions in both the

short and the long run.

Using seasonally adjusted quarterly data on insured unemployment rates for states from 1950-I to 1968-IV, the parameters  $\alpha_j$ ,  $\beta_j$ ,  $\gamma_j$  and  $\delta_j$  were estimated for both linear and logarithmic equations. The best fit for both equations in every state was obtained when  $n_j = 0$ ; apparently there are no quarterly leads or lags in state unemployment responses to aggregate economic activity.

The following table summarizes the distribution of the parameters across states.

	linear equation				log equation			
	$\alpha$	$\beta$	$100\gamma$	$1000\delta$	$\alpha'$	$\beta$	$100\gamma$	$1000\delta$
mean	0.144	0.906	1.013	-0.189	-0.155	0.980	0.505	-0.062
standard deviation	1.476	0.315	4.917	-0.535	0.670	0.249	1.230	0.165
coefficient of variation	10.25	0.35	4.85	2.83	4.32	0.25	2.44	2.66

The dispersion of the parameters as measured by both the standard deviation and the coefficient of variation is smaller in the log than in the linear equation. In the short and long run, state unemployment rates behave more alike relatively than absolutely.

An examination of the results suggests that  $\beta$  is higher in high-unemployment states than in low-unemployment states when the linear equation is used; there is no comparable relationship with the log equation. For the linear equation, there is a positive correlation between  $\beta$  and average unemployment between 1950 and 1968 ( $r = 0.59$ ), but for the log equation there is a weaker and negative correlation ( $r = -0.37$ ). Evidently, a given fall in the aggregate unemployment rate is associated with a greater absolute decline in unemployment

rates in high-unemployment states than in low-unemployment states. But a given decline in aggregate unemployment tends to be associated with a proportionately smaller decline in unemployment rates in higher-unemployment states.

To explore the determinants of cyclical sensitivity, the following regressions were run across states:  $\log \bar{u}$  is the logarithm of the average state unemployment rate between 1950 and 1968,  $SW$  represents the proportion of secondary labor force in the population, i.e., teenagers, women over 20, and men over 65,  $CD/RS$  is the ratio of employment in construction and durable manufacturing industries to employment in wholesale, retail, and service industries, and  $S$  is median years of schooling.

$$\beta \text{ (from equation 3)} = 0.579 + 0.494 (\log \bar{u}) - 0.011 (SW) + 0.005 (CD/RS) - 0.012 (S) \quad \bar{R}^2 = 0.522$$

(0.811) (4.800) (-0.821) (4.358) (-0.393) n = 49

$$\beta \text{ (from equation 4)} = 2.309 - 0.333 (\log \bar{w}) - 0.026 (SW) + 0.005 (CD/RS) - 0.005 (S) \quad \bar{R}^2 = 0.396$$

(3.647)
(-3.653)
(-2.167)
(5.204)
(-0.199)
n = 49

t values are in the parentheses.

The negative coefficient of *SW* in these regressions suggests the predominance of the discouraged worker effect. The positive coefficients of the *CD/RS* variable suggest that unemployment in construction and durable manufacturing industries is more cyclically sensitive than in the retail and service industries. This result is to be expected since output and sales in the former groups of industries are cyclically more sensitive.

Human capital analysis predicts negative signs for the coefficients of the *S* variable, assuming that skill level is a positive function of schooling level and that the specificity of skills is also related positively to the total amount of skill. Short-run fluctuations in final demand cause immediate fluctuations in the demand for variable factors of production. The more specific the skill, the less variable a factor of production is the worker possessing the skill. The results are consistent with this analysis, although the *S* coefficients are quite weak.

A preliminary investigation of the secular component,  $s_{jt}$ , shows interesting patterns in change over time.

1. States whose secular component declined experienced a faster growth in per capita income and a faster growth in nonagricultural employment than states whose secular component tended to rise.

2. States with declining secular components experienced faster growth in population, a smaller decline in the male labor-force participation rate, and a smaller increase in the female labor-force participation rate than states with rising secular components.

3. States with declining secular components showed net in-migration, while those with rising secular components showed the reverse. This suggests that migration was largely job-

oriented, in that most migrants were formerly in the labor force and moved simply to obtain new employment.

At any given time, what proportion of the observed variation across states in unemployment rates is cyclical and what proportion is secular? To answer this question, I examined the composition of the variance in unemployment rates across states during different cyclical periods. While the calculations are not yet complete, the results indicate that the contribution of the cyclical component of variance to the total variance is larger during cyclical troughs than during peaks. If this is so, depressed areas would be more accurately identified by unemployment rates during periods other than recessions.

My current plans call for refinement and extension of the analysis. A few areas in immediate need of development are:

1. Refinement of the analysis of factors influencing  $\beta_j$ .

2. Identification and analysis of economic variables that explain differences in  $s_{jt}$  at a given time.

3. Exploration of interactions of changes in the demand for and supply of labor associated with particular trend patterns.

4. Use of these findings to synthesize relevant economic factors into a more complete model that explains cyclical and secular features of the regional unemployment distribution.

Finally, a parallel study of the effects of minimum wages on the labor market is being carried out. Preliminary results suggest that federal minimum wages had a depressing effect on both the employment rate and the labor-force participation rates of low-skilled groups in the labor force. Thus unemployment alone may



not be a good indicator of minimum wage effects, since labor-force participation may also be affected. A more thorough study, with special attention paid to the lagged patterns of re-

sponse to minimum wages, is planned in the future.

Masanori Hashimoto

## 4. HUMAN RESOURCES AND SOCIAL INSTITUTIONS

### Introduction

During the past year work has proceeded on three broad research programs: education, the economics of the legal system, and the economics of health.

Some ongoing programs in education are being directed by Gary S. Becker (personal income distribution, consumption-labor supply decisions), while others are under the direction of F. Thomas Juster (net returns to education, savings, obsolescence of educational capital, school production functions, and agricultural productivity). Becker is primarily responsible for the legal economics studies, and Victor R. Fuchs is directing studies in the health area, which are reported on in Section 7 of this report.

*Education Studies.* A volume with contributions by three authors on the effects of human capital on the personal distribution of income is almost ready for a staff reading committee. One essay, by Barry Chiswick, deals with the effects of differences in the distribution of schooling on differences between regions and countries in inequality and skewness in the distribution of income.<sup>1</sup> Jacob Mincer has almost completed his study of the influence of schooling and postschooling investment on the structure and age profile of earnings. Becker's study of the theory underlying the observed distribution of schooling and other human capital was published as a Woytinsky Lecture at the University of Michigan.<sup>2</sup>

Gilbert Ghez, Robert Michael, and Becker are examining the influence of education on consumption and labor supply decisions. Michael's study, which concerns the influence of education on a household's "efficiency" in utilizing goods and time, has been through a reading committee and is being revised for publication as an Occasional Paper. Ghez's study, based on the household production function model, is designed to explain variations in consumption with age. It emphasizes the interdependence over the life cycle between consumption decisions and labor supply decisions. Becker's companion study uses the household production function model to examine life-cycle patterns in the amount of time spent by males in the labor force.

Both the income distribution and consumption-labor supply studies are being financed with the aid of a grant from the Carnegie Corporation.

Considerable progress has been made during the past year on a series of education studies being conducted with the aid of a grant from the Carnegie Commission on Higher Education. Paul Taubman and Terence Wales, who are studying net returns to education, have completed a paper on the historical relation between mental ability (as measured by the usual test scores) and educational attainment. Their results are surprising in some respects: the data show that the average ability of those entering college has increased steadily during the past several decades—a period when the proportion of high school seniors entering college has also increased. Thus the widely expressed fear that expansion of college enrollments to accommodate a rising fraction of the high school population would inevitably lead

<sup>1</sup> See the *1969 Annual Report*, pp. 69-70, where Chiswick's work is discussed.

<sup>2</sup> See his *Human Capital and the Personal Distribution of Income*, Institute of Public Administration, University of Michigan, 1967.