3515-01 January 1986

HOUSEHOLD TENURE CHOICE:
REVIEW OF THE EMPIRICAL LITERATURE

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ACKNOWLEDGEMENTS

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INTRODUCTION

The Metropolitan Housing Market Model has proven to be an extremely valuable tool for analyzing the likely effects of major changes in housing policy.[1] By simulating the market behavior of housing consumers and suppliers, the Model makes it possible to forecast the long-term implications of a wide range of demographic and macro-economic trends, of housing assistance programs, and of changes in the cost of housing finance. The Model is particularly useful for analysis of changes in the federal income tax system, since provisions affecting owner-occupants are explicitly incorporated.

Largely because the Metropolitan Housing Market Model is so useful for analysis of tax policy, one of its limitations has become increasingly problematic. Specifically, households in the Model are exogenously defined to be either renters or owner-occupants; the Model does not simulate changes in the rate of owner-occupancy that might be expected to result from changes in the relative cost of owning or renting a house. This paper, therefore, represents the first step in a project to enhance the Metropolitan Housing Market Model so that it simulates tenure choice endogenously.

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1. For a full description and application of the Metropolitan Housing Market Model, see Turner and Struyk (1985).

The objective of this initial paper is simply to review the existing literature on tenure choice, in order to identify factors shown to affect households' tenure decisions and to gain insight into how these factors might be combined for predictive purposes.[2] Since the literature on tenure choice is extensive, and since it overlaps with the literature on mobility and housing consumption decisions in general as well as the literature on the user cost of capital, this review does not attempt to be exhaustive. Instead, we focus on books and articles that illustrate useful approaches to predicting household tenure decisions.

Our next step, of course, will be to consider how the existing literature applies to the problem of predicting tenure choice within the Metropolitan Housing Market Model. This question is not explicitly addressed here, although we do raise some questions about the relevance and applicability of various approaches, given the Model's basic framework. A subsequent paper will outline alternative approaches to incorporating tenure choice into the Metropolitan Housing Market Model, drawing from the literature reviewed here.

The remainder of this paper consists of two sections. The next section reviews the existing literature on tenure choice, discussing theoretical concepts, specification

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2. We assume that, in the course of incorporating tenure choice into the Metropolitan Housing Market Model, we will be doing an empirical estimation, probably using Annual Housing Survey data. Therefore, our interest here is in identifying essential explanatory factors and modelling techniques, not in establishing the exact quantitative relationships between explanatory factors and tenure choice.

issues, and explanatory variables. The concluding section returns to several of the key analytic issues raised in the course of the literature review and raises questions about how they might be addressed within the context of the Metropolitan Housing Market Model.

LITERATURE REVIEW

This section reviews the recent literature on the determinants of tenure choice. For the most part, we focus on books and articles that present empirical results, giving our greatest attention to authors who have not only specified models of tenure choice, but who have tested their models empirically. As discussed earlier, our focus is on analyses that explicitly attempt to explain or predict household decisions to own or rent housing, although we give some consideration to housing demand and mobility issues in general, and to the measurement of the user cost of housing capital.

The existing literature on household tenure choice is extremely diverse. One cannot simply enumerate the explanatory factors that various studies find significant without taking note of differences in underlying conceptual frameworks and in empirical specifications. To illustrate, a model that addresses the impacts over time of changing macro-economic conditions on the rate of owner-occupancy is testing very different relationships and yields very different findings than an analysis that focuses on the demographic characteristics of first-time homebuyers. It would be foolish to argue that one of these approaches is more valid than the other, although one may ultimately prove more applicable for our purposes.

In order to incorporate tenure choice into the Metropolitan Housing Market Model, we will ultimately have to define a conceptual framework and resolve basic specification issues, as well as identifying explanatory factors. Therefore, the literature review is divided into three sections. First, we adopt a theoretical perspective, introducing several different ways of thinking about tenure choice in the context of broader housing demand decisions. Next, we discuss basic specification issues that need to be understood before launching into a more detailed discussion of empirical results. The third section of the review then examines a wide range of explanatory factors thought to control tenure choice, and summarizes the empirical evidence supporting them. Finally, we conclude by identifying what appear to be the most important determinants of tenure choice, and their likely interrelationships.

Tenure Choice, Housing Consumption, and Housing Investment

Many analysts view household tenure choice as a decision that can be considered independently, and several of the empirical studies reviewed here reflect this view. However, theoretical analyses more often argue that tenure can best be understood as an element of broader housing consumption and investment decisions, and some empirical studies attempt to model these larger decision processes, of which tenure choice is hypothesized to be a part. In this section, we discuss alternative hypotheses about the context within which tenure choice should be considered, referring to theoretical as well

as empirical analyses.

We can identify four alternative hypotheses about the relationship between tenure choice and broader housing demand decision-making. First, tenure choices can be viewed in the context of mobility decisions. For example, Boehm(1981) and Pickvance(1974) construct and estimate models in which the probability of purchase is estimated simultaneously with the probability of a subsequent move. In other words, households are assumed to make joint decisions about their current tenure and their future mobility. Both authors conclude that these decisions are closely related and mutually explanatory. Krumm(1984) tests a related hypothesis, treating the current decision to move as simultaneous with tenure choice. In other words, he suggests that the decision to move is often prompted by the decision to change tenure, and that the two choices cannot be properly considered independently.

The second alternative hypothesis treats tenure choice as simultaneous with the choice of dwelling attributes. Specifically, some types of dwellings -- such as single-family detached houses -- are assumed to be more generally available for ownership than for rental. Thus, since tenure choice restricts choices about dwelling attributes, the two decisions must be considered together. Boehm(1982) develops a three-stage, hierarchical decision model, encompassing tenure choice, type of housing unit, and housing quality. In this model, the tenure decision is implicitly made first; households are not assumed to consider all tenure-type-quality combinations simultaneously. Boersch-Supan(1985)

develops a similar three-level hierarchy, after testing a wide range of configurations. Specifically, Boersch-Supan defines eight discrete housing alternatives on the basis of tenure, type of structure, and unit size. He then estimates six different nested multinominal logit models, where each model reflects different assumptions about the decision hierarchy. Boersch-Supan concludes that tenure choice precedes and dominates structure type and unit size considerations in households' decision-making.

As a third alternative, the tenure decision can be viewed as jointly determined with the level of housing consumption. Lee and Trost(1978), King(1980), Gillingham and Hagemann(1983), and Cooperstein(1985) all argue that the decision to own and the quantity of housing consumed are simultaneous. Therefore, to avoid bias in their estimates of quantity demanded, these analysts use joint probability models, in which both tenure and the quantity of housing services are endogenously determined. To illustrate, Lee and Trost(1978) propose joint logit probability equations for their model, and use a two stage solution method with probit and ordinary least squares, and two step with maximum likelihood. Gillingham and Hagemann(1983) adopt the Lee and Trost(1978) equations, and test both logit and probit forms. They find that results are not sensitive to the choice between logit and probit equations, but both studies report statistically significant simultaneity in their findings.

The final, and potentially most complex perspective on tenure choice is to view it as an element of both consumption

and investment decision-making. This approach emphasizes the investment and savings dimensions of homeownership (Rothenberg,1983 and Fallis,1983). In fact, a house is the largest investment most families make in a life-time, and for many, may be the only source of investment income. Thus, in deciding whether to own or rent, households are implicitly making portfolio composition decisions as well as consumption decisions. To complicate the picture still further, these decisions can be be considered in the context of life-cycle savings patterns. Specifically, since savings do not contribute per se to current utility, their value is in the income, and hence consumption, that they are expected to yield in the future. Some theorists argue that households make current consumption and savings decisions so as to smooth out their consumption levels over the course of a life-time (Artle and Varaiya,1978). From this perspective, tenure choice becomes an element in an extremely complex, multi-period utility maximization problem, as demonstrated by MacRae(1980).

To date, a fully specified portfolio composition model of tenure choice has not been empirically implemented, though some interesting analytic work has been completed. For example, Jones(1985) demonstrates the importance of constraints such as downpayment requirements and debt service to income ratios when tenure choice is analyzed from a portfolio composition perspective rather than a consumption perspective. Dougherty and Van Order(1982) incorporate savings and investment in their exploratory analysis of the

impacts of inflation on the user cost of housing capital.
And Brueckner(1985) specifies, but does not estimate, a two-
period model of household decisions to sacrifice current
consumption in order to accumulate the downpayment necessary
to achieve homeownership in the future.

General Specification Issues

Table 1 lists the empirical studies reviewed in this
paper, and classifies them according to the way they resolve
several broad specification issues. This classification
table provides a useful reference when the various studies
are considered in greater detail, since the choice of
explanatory variables and the interpretation of results are
to some degree determined by a model's general specification.

The first specification issue any analyst addresses is
the definition of the dependent variable. The majority of
the studies reviewed here predict the tenure choice of
individual households, but a sizeable minority predict
ownership rates over time or for subpopulations. These two
approaches are by no means incompatible, but their
objectives, and the implications of their findings can be
quite different. Generally, studies focusing on
homeownership rates are primarily concerned with the effects
of changing macro-economic or policy conditions, while
studies of individual household behavior naturally give
greater attention to demographic attributes and to the tenure
decision-making process.

TABLE 1
SPECIFICATION OF EMPIRICAL TENURE CHOICE MODELS

	All HHs or Recent Movers	Cross Sectn or Time Series	Stratification	Estimation Technique	Time Period	Primary Data Source	Approx Sample Size	Sample Definition
Dependent Var is the Owner-Occ Rate								
Eilbott & Binkowski(1985)	All HHs	Cross Section	By Type of Hsng Stock	Two-Stage Least Squares	1970	Census	190 SMSAs	All 1970 Census SMSAs
Hendershott & Shilling(1982)	All HHs	Time Series	None	Lagged Adj Model	1955-1979	Published Macro Data	100 Quarters	National
Kent(1984)	All HHs	Time Series	None	OLS	1955-1976	Not Reported	20 Years	National
Rosen & Rosen(1982)	All HHs	Time Series	None	Lagged Adj Model	1949-1974	Published Macro Data	25 Years	National
Rosen et al(1984)	All HHs	Time Series	None	Logit	1956-1979	Not Reported	24 Years	National
Struyk(1976)	All HHs	Cross Section	By Race	OLS	1970	Published Census Data	29 SMSAs	29 SMSAs
Dependent Var is the Indiv HH Choice								
Boehm(1981)	Recent Movers	Cross Section	None	Logit	1969-1972	MSID	1277 HHs	36 Markets
Boehm(1982)	Recent Movers	Cross Section	None	Logit	1968-1972	MSID	1864 HHs	53 Markets
Boersch-Supan(1985)	All HHs	Cross Section	None	Multinomial Logit	1977	AHS	8139 HHs	White, Husb-Wife HHs, 4 SMSAs
Carliner(1974)	All HHs	Cross Section	By HH Type	OLS	1967	Survey Econ Opportunity	Not Reported	Not Reported
Cooperstein(1985)	All Prior Renters	Cross Section	None	Probit	1977-1981	AHS	1776 HHs	23 SMSAs
Dhrymes(1983)	Prior Renters who Moved	Cross Section	None	Logit	1977	AHS	1293 HHs	National
Edel et al(1981)	Recent Movers	Cross Section	None	Logit	1975-1977	AHS	42509 HHs	35 SMSAs
Gillingham & Hagemann(1983)	All HHs	Cross Section	By HH Type	Maximum Likelihood	1972-1973	Cnsumr Expnd Survey	5300 HHs	24 SMSAs

Study	Sample	Design	Stratification	Method	Year(s)	Data Source	Sample Size	Location
Jones(1985)	All HHs	Cross Section	None	OLS	1977	Survey of Consumer Fin (Canada)	1011 HHs	Husb-Wife HHS, 18-34 years, urban areas
Kain & Quigley(1975)	Both	Cross Section	By Race	GLS	1967	HH Survey	1789 HHs	St. Louis SMSA
King(1980)	All HHs	Cross Section	By Emp Status	Maximum Likelihood	1973-1974	Family Expend Survey	5895 HHs	England & Wales
Kruma(1984)	All HHs	Cross Section	None	Logit	1977-1978	MSID	1812 HHs	Male Headed HHs
Ladenson(1978)	Recent Movers	Both	By Race & Income Class	GLS	1968-1974	MSID	Not Reported	National
Lea & Wasylenko(1983)	Both	Cross Section	By Pre & Post Condo Convrsn	Logit	1980	HUD Survey	861 HHs	Condo Residnts 12 SMSAs
Lee & Trost(1978)	All HHs	Cross Section	None	Maximum Likelihood	1971	MSID	3028 HHs	National
Li(1977)	All HHs	Cross Section	By SMSA	Logit	1970	Census of Housing	12740 & 4095 HHs	Boston & Baltimore
Linneman(1985)	All HHs	Cross Section	By SMSA	Logit	1973	AHS	707 & 1774 HHs	Chicago & New York
Pickvance(1974)	All HHs	Cross Section	By Race	Path Analysis	1968	HH Survey	Not Reported	Minority HHs Manchester Eng
Rudel(1985)	Prior Renters who Moved	Both	By Region	Logit	1974-1978	AHS	6000 Renters	Prior Yr Renters
Struyk(1976)	All HHs	Cross Section	By Race & HH Type	OLS	1970	Census Public Use Sample	3000 whites 332 blacks	Pittsburgh SMSA
Weinberg(1978)	Recent Movers	Cross Section	By Race, Sex & Prior Tenure	Logit	1957-1964	HH Survey	Not Reported	San Francisco SMSA

Notes

MSID : Michigan Survey of Income Dynamics
AHS : Annual Housing Survey

Among studies that predict individual household decisions, we encounter a second dependent variable specification issue. Some authors use samples that include all households, and therefore focus on the decision to own, while others restrict their samples to recent mover households, and therefore predict the decision to purchase.[1] A frequent argument for analyzing the decision to purchase rather than the decision to own is that the housing circumstances of recent movers are more likely to reflect equilibrium conditions. However, given the large transactions costs involved in changing tenure status, it seems likely that households base their purchase decisions not only on their present needs but also on anticipated future needs (Struyk,1976). If this is the case, then recent movers are no more likely to represent equilibrium conditions than do other households. Another reason to focus on home purchase rather than home ownership is that this enables the analyst to study changes in tenure, particularly first home acquisition. Both Dhrymes(1983) and Rudel(1985) adopt this approach, constructing samples of prior renters and differentiating those who continue to rent from those becoming owner-occupants.

Virtually all of the studies of individual household

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1. Generally, analysis of the decision to buy focuses on a slightly different set of explanatory factors than analysis of the decision to own. However, Kain and Quigley(1975) experiment with a single set of variables to explain both decisions. Most of their results are similar for the two models, but there are some interesting -- and logical -- differences. For example, retired households are far more likely to own than to rent, but, among recent movers, retired households are no more likely to buy.

decisions conduct cross sectional rather than time series analysis. Rudel(1985) and Ladenson(1978) are exceptions; both predict the decision to purchase for cross sections of recent movers in each of several years. This allows the authors to explore changes in the relative importance of explanatory variables under changing economic and policy conditions. Ladenson concludes from this methodology that black households enjoyed better access to homeownership after 1968, when critical civil rights legislation was implemented. Rudel attempts to find evidence of a homeownership affordability crisis by analyzing changes in the number and characteristics of first-time homebuyers during the 1970s. He concludes that the number of first home purchasers declined, and that their relative incomes rose. In addition, Rudel finds some evidence of changes in the age characteristics and household composition of first-time homebuyers.

While the individual household choice studies generally present cross sectional analyses, studies predicting homeownership rates are almost all time series analyses. These studies focus on changes over time in national owner-occupancy rates, attributing these changes to variations in macro-economic conditions and in the policy environment. Again, there are exceptions to this generalization. Eilbott and Binkowski(1985), as well as Struyk(1976) attempt to explain differences in owner-occupancy rates across SMSAs, while Struyk(1976) also analyzes differences between homeownership rates among black and white households.

Another specification issue that warrants discussion here involves the stratification of data samples. Several studies, after specifying a general tenure choice model, estimate the model separately for subsets of their samples. Pickvance(1974), for example, estimates his model separately for blacks and whites, on the assumption that the impacts of other explanatory variables on the decision to own or rent are different for blacks than for whites. Other studies stratify by household type, income class, or SMSA, based on similar reasoning. Weinberg(1978) presents an extreme example of this kind of methodology; he stratifies his sample by race, sex of head, and prior tenure, simultaneously. Results of these various stratification schemes are discussed below, in conjunction with other explanatory variables.

All of the empirical studies discussed in this section apply multivariate techniques to test the usefulness of various independent variables in explaining a household's choice of tenure. They differ, however, in the structure and type of multivariate model estimated. Studies that seek to explain and predict the homeownership rate generally rely on regression techniques -- including ordinary least squares and two-stage least squares. Hendershott and Shilling(1982) and Rosen and Rosen(1982), however, estimate more complex, lagged adjustment models, since the rate of owner-occupancy cannot be expected to change immediately in response to changing economic conditions. Ordinary least squares regression is also the simplest approach for predicting the tenure choice of individual households, using a dummy dependent variable --

1 if the household owns and 0 otherwise. To avoid problems
of consistency and heteroscedasticity, however, most studies
of individual household tenure choices employ more
sophisticated methods, particularly logit and other maximum
likelihood estimation techniques.

The remaining columns in Table 1 summarize
characteristics of the data samples used in each empirical
analysis. These items need not be discussed at this point,
but have been included for reference.

Determinants of Tenure Choice

Analysts have tested a wide range of variables thought
to influence tenure decisions. These variables fall into
five categories: 1) income and wealth; 2) life-cycle status;
3) other household characteristics; 4) price and other market
factors; and 5) location and neighborhood attributes. Each
of these five groups of explanatory variables is now
discussed in turn. Table 2 provides a summary of the major
variables included in empirical models.

Income and Wealth. Given the substantial investment
required for most home purchases, one naturally expects
household income to play a prominent role in determining a
household's ability to own a home. Of all the studies
reviewed, only Pickvance(1974) fails to conclude that income
is statistically significant as a predictor of tenure choice,
and even he acknowledges that the insignificance he observes
may well be a function of his data, since housing outlays are

TABLE 2
EXPLANATORY VARIABLES IN EMPIRICAL TENURE CHOICE MODELS

	INCOME & WEALTH		LIFE-CYCLE STATUS				OTHER HH CHARACTERISTICS			PRICE & OTHER MARKET FACTORS			LOCATION			
	Income	Wealth	Age	HH Size	Marital Status	Sex	Race	Prior Tenure	Future Mobility	Price	Supply Constrnts	Credit Constrnts	Region	Rural/ Urban	Size	Distance to Work
Dependent Var is the Owner-Occ Rate																
Eilbott & Binkowski(1985)	X	--	X	X	--	--	--	--	--	X	X	--	X	--	--	--
Hendershott & Shilling(1982)	X	--	Homeownership rates adjusted for demographic changes							X	--	--	--	--	--	--
Kent(1982)	X	X	X	X	--	--	--	--	--	X	--	X	--	--	--	--
Rosen & Rosen(1982)	X	--	X	X	--	--	--	X	--	X	--	X	--	--	--	--
Rosen et al(1984)	X	--	Homeownership rates adjusted for demographic changes							X	--	X	--	--	--	--
Struyk(1976)	X	--	X	--	X	--	X	--	--	X	X	--	--	--	--	--
Dependent Var is the Indiv HH Choice																
Boehm(1981)	X	X	X	X	X	--	X	X	X	X	--	--	--	--	--	X
Boehm(1982)	X	X	X	--	X	--	X	X	--	X	--	--	--	--	--	--
Boersch-Supan(1985)	X	--	X	X	X	X	X	--	--	X	--	--	--	--	--	--
Carliner(1974)	X	--	X	X	X	X	X	--	--	--	--	--	--	X	X	--
Cooperstein(1985)	X	X	X	X	X	X	X	X	--	X	--	--	--	--	--	--
Dhrymes(1983)	X	--	X	X	--	X	X	X	--	X	--	X	X	X	--	--
Edel et al(1981)	X	--	X	X	--	X	X	--	--	X	--	--	X	--	X	--
Gillingham & Hagemann(1983)	X	--	X	X	X	X	--	--	--	X	--	--	--	--	--	--
Jones(1985)	X	X	X	X	--	--	--	--	--	X	--	--	X	--	--	--

Kain &
Quigley (1975)

King (1980)

Kruae (1984)

Ladenson (1978)

Lee &
Masylenko (1983)

Lee & Trost (1978)

Li (1977)

Linneman (1985)

Pickvance (1974)

Rudel (1985)

Struyk (1976)

Weinberg (1978)

roughly constant over his entire sample.

Several studies hypothesize a nonlinear relationship between income and the probability of homeownership, with slope diminishing toward the upper end of the income spectrum. Gillingham and Hagemann(1983), Krumm(1984), and Struyk(1976) therefore include quadratic income terms in their regression equations, and all except Gillingham and Hagemann(1983) find significance for the square of income. Li(1977) also tests for nonlinearities in the relationship between income and the probability of homeownership, and finds that the income effect becomes more powerful as income increases. However, Li's(1977) analysis divides households into only three income classes, the highest of which includes all households with incomes over $15,000. Therefore, it is likely that he simply does not include enough variation in income to observe a declining slope among the most affluent households.

In general, measures of "permanent" or "normal" income are preferred to actual, current income measures as predictors of tenure choice. The concept of permanent income represents the income a household can be expected to receive given the marketable skills of its members along with its stock of non-human wealth. Gillingham and Hagemann(1983) acknowledge the theoretical advantage of permanent over actual income, and estimate permanent income as a function of household, employment, and location characteristics. However, they do not find that this instrumental variables approach affects their results appreciably. Struyk(1976), on

the other hand, uses a similar methodology, and finds that
his estimates of permanent income generally play a more
significant role in the determination of tenure choice than
does measured, current income.

Although most analysts agree on the theoretical
advantages of a permanent income measure, they differ
in their methods of deriving one. Several authors use a
weighted average of a household's past and present reported
incomes in deriving a permanent measure (Boehm,1982,
Ladenson,1978, Kent,1984, Lee and Trost,1978). Studies
without multiple years of data, however, must devise other
methods. Rosen, Rosen, and Holtz-Eakin(1984) use household
consumption as a proxy for permanent income in their
regressions. Others estimate regression equations that
predict "normal" income terms based on household
characteristics (Struyk,1976, Goodman,1985). These predicted
values are then either used directly, or combined in a
weighted average with actual income. Simpler approaches
include the use of average incomes by SMSA (Eilbott and
Binkowski,1985) or by education level (Kain and Quigley,1975).

Also emphasized in discussions of tenure choice is a
household's potential difficulty in acquiring the down
payment necessary to purchase a home.[2] While household
income is certainly a factor, some analysts argue that

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2. The significance of downpayment requirements, and
other constraints on the availability of mortgage credit are
discussed below, in the context of price and other market
factors.

household wealth should also play a direct role, particularly
in the decision to purchase. Most analysts who include
wealth measures or proxies for wealth find these variables to
be significantly related to the probability of homeownership,
even when income measures are included as well (Kent,1982,
Boehm,1981, Boehm,1982, Cooperstein,1985, Ladenson,1978,
Jones,1985).

Kent(1984) includes household wealth in his time series
analysis by using separate variables for average per
household assets and liabilities (net of home equity and
mortgage debt) to predict changes in owner-occupancy rates.
Both play a significant role, with larger per household
assets increasing the owner-occupancy rate, and larger per
household liabilities decreasing the rate. Jones(1985) uses
a measure of household net worth, classified into intervals
to reflect threshhold effects, and finds that the impact and
explanatory power of these variables far exceeds that of his
income variables.

Unfortunately, direct measures of a household's wealth
are rarely available, and must often be derived or inferred.
Boehm(1981) uses his sample's information concerning a
household's income from non-labor sources as a proxy for
household wealth. Similarly, Ladenson(1978) finds
significance for a household's reported income from farm or
business assets, income from wife's assets, and car value to
represent a household's financial holdings.
Cooperstein(1985) estimates the capitalized value of income
from investments to obtain a measure of a household's stock

of wealth.

Some researchers rely on even less direct methods. Li(1977), for example, suggests that the interaction of income and age might serve as a proxy for household wealth, since an older household has had more time to accumulate savings. Similarly, Rudel(1985) interprets his age variable as a proxy for household wealth. The next section discusses this issue further, since some analysts also consider age to be a determinant of tenure choice in its own right.

In summary, both theory and empirical evidence argue strongly for the inclusion of income as an explanatory variable in any tenure choice model. If possible, a permanent income measure should be constructed, either from cross-sectional data or from multiple years of data for individual households. Nonlinearities in the relationship between income and tenure choice should be allowed for, either by including a squared term or by constructing dummy variables for income classes. In addition, a wealth measure should be estimated if possible, so that reliance on proxy measures such as age is not necessary.

Life-Cycle Status. The second group of variables widely used for explaining and predicting tenure choice encompasses measures of life-cycle position, including age, family type, and household size. There are numerous theories about why life-cycle status plays a role in the tenure choice decision. One hypothesis is that different types of households exhibit different demands for housing relative to other goods, and

that homeownership may be associated with higher levels of housing consumption. Others argue that certain types of housing -- such as single-family, suburban dwellings -- are more likely to be available for sale than for rent, and that, therefore, groups of households that prefer these types of dwellings will be more likely to own. A third life-cycle hypothesis is that some types of households are more mobile than others, and, since ownership may be more expensive than renting for short-term stayers, mobile groups will exhibit low owner-occupancy rates. Finally, as discussed earlier, tenure choice can be viewed in the context of a household's life-time cycle of wealth accumulation and decumulation. This perspective suggests that housing represents a major savings mechanism for many households, so that changing preferences for consumption versus savings over the life-cycle are critical determinants of the tenure choice decision.

One frequently used technique for incorporating life-cycle status into models that predict tenure choice is to construct composite measures encompassing age, family composition, and household size. For example, Kain and Quigley(1975) divide households into five discrete categories: 1) single persons, living alone or in groups, under 45 years of age; 2) singles over 45 years of age; 3) couples without children but with heads of household under 45 years of age; 4) childless couples with heads of household over 45 years of age; and 5) "typical families" -- individuals or married couples with children. These "typical

families" are further described by age and sex of head, family size, and the number of school-age children. Using this scheme, along with other variables, Kain and Quigley(1975) predict the probability of purchase for households in St. Louis in 1967. They conclude that families are more likely to buy than any other household type, and that families headed by men are the most likely. Ladenson(1978) tests the same classification scheme with several years of recent mover data and obtains comparable results nationally, for the 1968 to 1974 period.

Other analysts, while not explicitly adopting a life-cycle approach, nevertheless include life-cycle indicators in their models. Many include age of household head in their models, and almost all of these studies find age to be a significant predictor of tenure choice. Boehm(1981), however, argues that age is merely a proxy for a family's wealth and expected future mobility. In his model -- which simultaneously predicts the decision to own or rent and future mobility behavior -- Boehm(1981) includes a term for veteran status, to control for subsidies available through the Veterans Administration's guaranteed loan program. This variable, in conjunction with an indicator of wealth, reduces the age variable to insignificance. Other models that include both a wealth measure and an age measure (Ladenson, 1978, Kent, 1982, Cooperstein, 1985, Jones, 1985) also suggest that age of head may be reduced to insignificance when household wealth is effectively measured. However, this issue has not been fully explored because of difficulties

measuring household wealth. No analysis, for example, has focused on the differential impacts of household wealth by life-cycle status.

Several studies test for nonlinearities in the relationship between household age and tenure choice by including the square of age in their models. Kain and Quigley(1975), as well as Ladenson(1978) find the coefficient for the square of age to be negative and significant, indicating that the positive impact of age gradually declines among elderly households. Li(1977) similarly observes that the slope of the relationship between age and the probability of homeownership declines. He also finds, however, that this flattening is more pronounced at high income levels than among lower income households. From this, Li(1977) concludes that at low income levels age continues to play a stronger positive role through wealth accumulation.

Household size has also been shown to be related to tenure choice, although its effect appears ambiguous. Carliner(1974) documents a significant increase in the rate of home ownership as family size rises from two members to three or more members. Kain and Quigley(1975), on the other hand, find the coefficient on the logarithm of family size to be negative and highly significant, indicating that, holding other factors constant, a larger household is less likely to purchase a home than is a smaller one. However, their coefficient on the number of school-age children is positive and highly significant in the same equation. Kain and Quigley(1975) conclude from this that the presence of school-

age children increases a household's demand for space and a tranquil environment with better schools and that these attributes are usually associated with owner-occupied housing, while large family size otherwise discourages homeownership by increasing the household's demand for other goods. Ladenson(1978) was unable to reproduce these results, using the same model specification for a national data set.

Li's(1977) analysis of the interaction between income and family size may help explain these differing results. He finds that for all but the highest income group in his sample, the probability of ownership increases up to a household size of five, and decreases thereafter. For the highest income group, probability of ownership peaks at a household size of six. These conclusions suggest that the effects of household size on tenure choice vary with income.

Another interesting possibility is that the relationship between household size and tenure choice is changing over time, possibly due to changes in the relative prices of owning and renting, to changes in credit constraints, or to changing demographic patterns. This hypothesis has not been fully tested, although Myers(1985a and 1985b) suggests that relationships between household size and the probability of ownership were weakened during the 1970s, as wives joined the labor force, postponing child-rearing in order to generate sufficient income for homeownership. Rudel's(1985) analysis also suggests that the household composition of first-time homebuyers may have changed during the 1970s.

Another life-cycle component that frequently receives

individual attention is the marital status of the household head. Carliner(1974) notes that 71 percent of the married couples in his sample own their homes, while fewer than 46 percent of the households with unmarried heads are homeowners. In his regression model, Carliner(1974) finds marital status to be highly significant, with married couples 16 percentage points more likely to own than any other group. Boehm(1981) and Krumm(1984) also include variables for marital status in their models. Both find that, among movers, households with married heads are more likely to buy.

As mentioned earlier, a number of studies stratify their sample populations by household type, and perform separate regressions for each subpopulation. Gillingham and Hagemann(1983), for example, divide their sample into four subgroups -- single person, husband and wife, husband-wife family, and other family -- and conclude that their evidence "soundly rejects" homogeneity of tenure choice parameters across subpopulations. Carliner(1974) also subdivides his sample by household type -- using age and marital status criteria, but ignoring family size -- and likewise finds that coefficients on other explanatory factors differ between subsamples. In particular, he notes that the effect of income differs by household type, with young married families most sensitive to variations in income and single individuals least sensitive.

Li(1977) does not stratify his sample, but achieves similar results by constructing a complex set of interaction terms among his explanatory variables. Using this

methodology, he examines the effects of household size and age for different income groups and achieves a significant improvement in explanatory power over a simple additive model.

To review, life-cycle indicators are consistently found to play a significant role in patterns of tenure choice. However, the empirical evidence does not provide clear support for any one hypothesis about why life-cycle status is important. In fact, some life-cycle variables -- such as age -- may actually be serving a proxies for economic factors -- such as wealth. Moreover, given ongoing changes in demographic patterns (smaller household sizes, postponed child-bearing, two-earner families, increased numbers of single parent households) old life-cycle patterns may be in a state of flux. Therefore, it is essential to specify the explanatory variables in any predictive model as completely as possible, so that, for example, income and/or wealth effects are not being incorrectly attributed to marital status or family size.

The findings of studies that stratify by household type provide strong support for estimating separate tenure choice models for carefully defined life-cycle classes, or for constructing interaction terms between life-cycle status indicators and economic determinants of tenure choice. In particular, the relative importance of economic factors can be expected to vary with 1) age, particularly young/middle-aged/elderly households; 2) marital status; 3)household size and/or number of children.

Other Household Characteristics. In addition to life-cycle status, several other household attributes have been explored as possible determinants of tenure choice behavior. The relationship between race and tenure choice has been considered in detail by several investigators. Carliner(1974) observed that, in 1970, 65 percent of white households in his sample owned their homes, compared to only 42 percent of black households. How much of this difference is attributable to discrimination in housing and credit markets and how much is attributable to differences in the incomes and household composition of blacks and whites? In his regression model, Carliner concludes that (as of 1967) blacks were consistently less likely to be homeowners, even after controlling for age, marital status, sex of head, household size, and income.

By contrast, Boehm(1981) finds that black households do not have a significantly different probability of ownership than whites. He explains his findings (which are based on data for 1968-1972) by citing Ladenson's(1978) argument that the addition of section 235 to the National Housing Act in 1968, and the enactment of the National Fair Housing Act in the same year, may have reduced racial discrimination in the housing market substantially. Indeed, Ladenson's year-by-year results suggest considerable improvement in homeownership opportunities for black households between 1968 and 1974. Both Boehm and Ladenson obtain their results from samples of recent movers. But Boehm(1981) also finds that

black households have significantly lower expected mobility rates than do white households, which he claims reflects different sets of housing preferences among blacks and whites. Boehm(1981) further suggests that discrimination may force blacks to pay higher transactions costs in the housing market, thereby discouraging frequent housing adjustments. In other words, among recent movers, blacks may not face significant disadvantages, but many blacks are discouraged -- possibly by discrimination -- from moving at all.

A common approach to analyzing relationships between race and tenure choice is to stratify by race, estimating separate models for black and white households. For example, Kain and Quigley(1975) estimate parallel models for black and white households (using data for St. Louis in 1967), and find no significant differences between the two, except in the constant term. They therefore conclude that blacks do not have different preferences than whites, but are deterred from becoming homeowners by discrimination. Weinberg(1978), on the other hand, finds that the coefficients on demographic and economic variables are significantly different when he stratifies by race, sex, and prior tenure simultaneously (using data for San Francisco, 1957-1964). He also argues that his stratified models provide considerably greater prediction accuracy than his pooled model. Li(1977) constructs interaction terms between income and race (using 1970 data for Boston and Baltimore), and argues that the negative impact of race declines at higher income levels, suggesting that more affluent blacks are able to overcome the

affects of discrimination.

Prior tenure is also considered by some analysts as a determinant of either individual household decisions to purchase or market-wide owner-occupancy rates. Upon moving, prior owners are much less likely to change tenure than are prior renters. This pattern, documented by Kain and Quigley(1975) and by Ladenson(1978), reflects the fact that once households overcome the hurdle of accumulating a downpayment, they are relatively unlikely to return to renter status. In this regard, prior tenure serves as a proxy for wealth. Moreover, present tax law creates strong incentives for continued ownership (among households under age 55), since an owner who sells faces zero taxation on capital gains as long as the gain is rolled over into another house. One might expect older owners with decreasing incomes to be most likely to change from ownership to rental, but as Carliner(1974) points out, this population is often slow to readjust.

The existing tenure distribution may influence future homeownership rates by another route as well. Given the heterogeneity of the housing stock, and the high search and transaction costs involved in moving, the adjustment of a population's ratio of homeowners to match the ratio desiring homeownership is necessarily gradual. Three of the reviewed studies consider the rate at which the housing market responds to changes in the relative attractiveness of homeownership. Kent(1982) proposes a simple stock adjustment model, wherein the rate of ownership is adjusted each year in

proportion to its difference from the current ideal. Rosen

and Rosen(1982) propose a similar, though multiplicative,

partial adjustment model, and find that homeownership rates

take three to four years to respond to changes in the

relative prices of owning and renting. Hendershott and

Shilling(1982), using lagged price ratios, conclude that

complete adjustment occurs within five years.

Tenure choice may also be significantly influenced by

the likelihood that a household will move in the next few

years. Following Shelton's(1968) assertion that high

transactions costs make ownership more expensive than rental

for occupancy of less than four years, a number of studies

have sought further insight into the tenure choice-mobility

relationship. Johnson's(1981) "equivalent rent" model shows

a marked increase in equivalent rent for owners with expected

residence of less than five years, suggesting that a rational

household will not buy a house if it expects to move in the

near future. Boehm(1981) estimates a joint logit probability

function for tenure choice and future mobility. In this

model, he tests both measures of expected mobility

(in the household's opinion) and observed mobility, with

similar results. The coefficient reflecting interaction

between tenure and mobility is the most significant in his

regressions.

Boehm(1981) also tests other household characteristics as

possible determinants of home purchase decisions. He finds

significance for the amount of illness experienced by the

household's head in the last year, and expected change in

family size. Ladenson(1978) tests years of education, years
with current job, retirement, and whether the household head
is self-employed. None of these is found to be significant
when regressed in combination with age, income, race, and
various indicators of wealth. Krumm(1984) tests head's
education level, wife's education level, change in number of
people in the household, a dummy representing employment
status of the wife, change in the number of hours the
household head was ill in last year, change in household
size, and number of years on present job. Of these, only the
change in number of household members and the number of years
at present job prove to be significant.

In summary, although past results are ambiguous with
respect to racial differences in tenure choice, race should
be included as an explanatory variable. Moreover, predictive
equations should at least be tested for separate samples of
white and black households to determine whether significant
differences exist. Prior tenure and expected mobility are
certainly critical factors for analysis of the decision to
purchase, but have not been tested in models of current
tenure status. These are the factors with the strongest
empirical support. In addition, variables reflected recent
or expected changes in household composition or status seem
likely to play significant roles, but are rarely measured.

Price and Other Market Factors. A household's tenure
decision is clearly influenced by conditions in the local
housing market. Of foremost concern to most investigators is

the relative household cost of renting versus owning a
dwelling unit.[3] Measures of rental cost are usually
straightforward. Generally, observed rents or a rent index
is used to reflect the cost of rental housing.
Shelton(1968) uses rental supply costs to reflect the price
of rental housing to a tenant, but Johnson(1981) points out
the danger of assuming that the rental market is in a
competitive long-run equilibrium, and therefore argues for
the use of observed rents rather than landlords' supply
costs.

Estimating the cost of homeownership is more
problematic. Researchers have grappled with this problem in
a variety of ways until quite recently. Now, the most widely
accepted method for measuring homeownership cost applies a
user cost of capital approach to approximate the implicit
"rent" paid by owner-occupants for housing services.[4] The
user cost of owner-occupied housing incorporates current
values for the opportunity cost of invested equity, mortgage
interest costs, depreciation, maintenance or operations,
property taxes, and expected appreciation. All of these cost
components are typically expressed as a percent of the
original purchase price or value, and are adjusted for tax

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3. These cost measures should refer to comparable
dwelling units. However, not all analysts construct their
relative cost terms for a "constant quality" unit. This issue
is discussed further below.

4. For excellent explanations of the user cost of
capital approach, see Diamond(1980) or De Leeuw and
Ozanne(1979).

benefits. Specifically, neither the implicit return on invested equity nor expected appreciation gains are included in taxable income, and mortgage interest payments and property taxes are deductible for owners who itemize.

This approach has been implemented by Hendershott and Shilling(1982), Rosen and Rosen(1982), and Rosen, Rosen, and Holtz-Eakin(1984), all of whom use lagged price terms to predict homeownership rates over time. Few of the studies that focus on individual tenure decisions implement a user cost of capital approach,although several do include tax bracket variables and inflation estimates to capture the special benefits of homeownership. Lea and Wasylenko(1983), in an analysis of residents of recently converted condominiums, do compute the real, after-tax cost of homeownership on a household-by-household basis, and find that this variable plays a significant role in their equation.[5]

Clearly, relative price data entered as explanatory variables should refer to a constant quantity of housing services (or level of housing quality) over time, across locations, and between owning and renting. However, this is not always achieved. For example, Eilbott and Binkowski(1985) simply use average SMSA rents and average SMSA house values, without adjusting for quality differences. Hendershott and Shilling(1982) and Kent(1984) use constant

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5. The decision analyzed in Lea and Wasylenko is whether to rent or purchase a condominium unit. Two samples of households are analyzed -- one consisting of pre-conversion residents who stayed, and the second consisting of new, post-conversion residents.

quality rent and house price series to construct price indices, but do not address the problem of measuring both renter and owner-occupant costs in comparable dwelling units. Goodman(1985) and Lea and Wasylenko(1983), on the other hand, estimate hedonic equations that enable them to compare renter and owner costs in comparable dwellings.

Rosen, Rosen, and Holtz-Eakin(1984) inject yet another interesting consideration into the user cost of capital approach to measuring housing costs. They develop an adaptive expectations model to derive households' forecast values for the price of homeownership and the price of rental housing. Their model also includes terms for the variance of these forecasts to reflect a households' perception of the financial risk of homeownership. Inclusion of these variance terms, they claim, increases the predictive power of their model.

Most authors, assuming partial market equilibrium and perfectly elastic supply, focus exclusively on demand considerations as determinants of tenure choice. Rosen, Rosen, and Holtz-Eakin(1984), however, worry that their estimates of homeownership rates may be inconsistent because of simultaneity bias. They speculate that the proportion of owner-occupants may drive up the price of owner-occupied housing, subsequently reducing the attractiveness of homeownership. Eilbott and Binkowski(1985) reach the conclusion that tenure choice is demand-determined, but only after testing across SMSAs for measures thought to be indicators of supply/demand disequilibrium. They theorize,

for example, that vacancy rates in the homeowner and rental markets can be used as a measure of the relative availability of the two types of housing. Similarly, they assume that a given housing market might be constrained by the proportion of its existing housing stock in dwellings of five or more units, because the short-term market response to an increased demand for owner-occupied dwellings might be limited by the proportion of the existing housing stock appropriate for homeownership. Testing for variation in ownership rates across SMSAs, however, they find no significant relationship between these supply variables and the rate of owner-occupancy.

Some investigators suggest that the availability of credit may influence tenure choice. Kent(1982) investigates non-price rationing of credit by looking at mortgage maturity and loan-to-value ratios. He finds that more lenient credit terms encourage homeownership. Similarly, Plaut's(1984) theoretical treatment of tenure choice predicts that a household's transition from renter to owner will be delayed according to the structure of leverage premia, and Brueckner's(1985) two-period model of downpayment accumulation similarly suggests that higher down-payment requirements may reduce the rate of home purchase. Rosen, Rosen and Holtz-Eakin(1984) include a variable for the rate of increase in deposits to thrift institutions as a proxy for credit availability but find no statistical significance. Dhrymes(1983), on the other hand, includes a percent downpayment variable to reflect the tightness of credit

markets in an analysis of the first home purchase decision. This variable proves significant, even in combination with income and price measures.

To review, there seems to be little doubt that the user cost of capital approach is the most appropriate way to measure homeownership costs. The real, after-tax cost of homeownership can be directly compared to observed rents, either on a household-by-household basis or market-wide. One can make an argument, however, for including an expected appreciation term separately from the composite price term. The rationale is that appreciation benefits are not realized until the time of sale, and really represent a form of savings. Thus, some groups of households may respond differently to expected appreciation benefits than to current cost differentials. Following, Rosen, Rosen, and Holtz-Eakin(1984), the notion of incorporating measures of risk or uncertainty is extremely appealing, though technically rather difficult. Finally, supply constraints do not appear to warrant extensive consideration, particularly from a long-term equilibrium perspective. Credit constraints, however, measured by downpayment requirements or maximum loan amounts, appear to deserve further exploration.

<u>Location.</u> Locational characteristics constitute another source of factors that have been tested as possible determinants of tenure choice. Specifically, analysts have included indicators for geographic region, urban versus rural location, city size, and distance of residence from the

central city. Generally, no explicit rationale has been presented for including variables of this kind, although some analysts have argued that tastes may vary be location. Instead, location variables appear to serve primarily as proxies for excluded variables such as price, appreciation, discrimination, and housing stock characteristics. Region and urban/rural location generally prove to play a significant role, while results for other location variables are mixed. If price and housing stock characteristics were fully specified in an empirical model, it is possible that the role of location would be diminished or even eliminated altogether. Nevertheless, region and urban/rural location should be tested as explanatory variables. If their impacts are substantial, careful thought should be given to what underlying conditions they actually reflect, since changes in the underlying conditions would change the role of geographic indicators.

Summary of Findings

As indicated at the start of this section, the existing literature on household tenure choice is extremely diverse. Each study represents an almost unique combination of theoretical perspective, data constraints, policy interest, and empirical specification. No single study is directly applicable to our objective of predicting household tenure in the context of the Metropolitan Housing Market Simulation Model. In the next section, we raise a number of conceptual and empirical issues about how best to apply the lessons of

the existing literature within the context of the

Metropolitan Housing Market Model. Before launching into

that task, however, we conclude our review of the literature

with a summary of what appear to be the key determinants of

tenure choice.

Despite the diversity of the tenure choice literature,

there is solid evidence for relying on the following set of

factors:

Household income -- preferably a measure of "permanent"
or "normal" household income from all sources.
Allowance should be made for a non-linear relationship
between income and the probability of ownership.

Household wealth -- represented by total assets or by
investment income.

Life-cycle status -- a classification scheme reflecting
marital status, age of head, and presence of dependent
children should be used to stratify the analysis
sample. In addition, the continuous effects of age
and household size within life-cycle groups should be
tested.

Expected or recent changes in life-cycle status.

Race -- should be used in combination with life-cycle
status to stratify the analysis sample.

Prior tenure -- particularly applicable when predicting
home purchase for a sample of recent movers.

Expected mobility -- particularly for analysis of recent
movers.

Relative price of ownership versus rental -- measured
for constant quality dwelling units. Ownership price
needs to be adjusted for appreciation and tax
benefits. The role of uncertainty about appreciation
benefits deserves further testing.

Credit constraints -- reflected by downpayment
requirements.

Geographic region and urban/rural location.

TENURE CHOICE IN THE

METROPOLITAN HOUSING MARKET MODEL

In the previous section we reviewed the existing empirical literature on households' tenure decisions. Some of the findings discussed are clearly applicable to the problem of incorporating tenure choice into the Metropolitan Housing Market Model. The implications of other findings in the existing literature, however, are ambiguous. This chapter explores several of these estimation issues, discussing alternative approaches to simulating tenure choice in the Model framework.

We begin by briefly reviewing some salient features of the Metropolitan Housing Market Model's theory and solution algorithm. This is not to suggest that the Model is immutable, but rather to highlight aspects of the Model that may make it more or less difficult to implement some of the concepts suggested by our literature review. After this review of the Model's framework, we raise a series of conceptual and empirical issues. These issues are posed as starting points for further thought and discussion.

Salient Features of the Metropolitan Housing Market Model

The Metropolitan Housing Market Model is a long-term (seven- to ten-year) comparative statics model of the housing market. In other words, it is not a dynamic model that

simulates year-to-year changes in households' location and
consumption decisions. In fact, households' initial housing
circumstances have never been considered in the determination
of the Model's end-of-period outcomes.

The Model allocates a distribution of "model"
households across a distribution of "model" dwellings. Model
households are differentiated by household type and tenure,
and each is assigned an income and a household size. The
distribution of model households and their incomes reflect
end-of-period demographic conditions.

Model dwellings are differentiated by location --
currently central city or suburbs, and each model dwelling is
assigned a level of housing services. The model dwelling
distribution reflects beginning-of-period housing stock
conditions. Then, the Metropolitan Housing Market Model
simulates the construction of new dwelling units, the
deterioration or improvement of existing dwelling units, and
the allocation of households across new and existing
dwellings.

Household demand decisions are based on a utility
function that incorporates four basic factors: 1) the
quantity of housing services offered by each new and existing
dwelling; 2) after-tax income remaining for other goods
consumption; 3) average travel time from a dwelling's
location to employment opportunities; and 4) the racial and
socio-economic composition of a dwelling's zone. Before
households are allocated among new and existing dwelling
units, each household evaluates the utility offered by each

dwelling unit, assuming micro-equilibrium is achieved between the household's individual demand curve and the dwelling's individual supply curve.

Housing supply is governed by a production function combining operating and capital inputs, and suppliers are assumed to maximize the present discounted value of profits. Both landlords and owner-occupants face the same production function and supply costs, and their behavior is assumed to be comparable. The differential tax benefits available to landlords and owner-occupants are, for the most part, assumed to reduce the effective demand price of housing services rather than the supply price. In other words, tax benefits are assumed to be entirely passed through to the housing consumer.

For the current implementation of the Metropolitan Housing Market Simulation Model, exogenous data are obtained primarily from Annual Housing Survey (AHS) micro-data files. Therefore, this rich data source could easily be used to supplement existing data sets as needed for the incorporation of tenure choice.

What Conceptual Framework Should Guide the Treatment of Tenure Choice?

As discussed in the previous section, one can distinguish four competing approaches for fitting tenure choice into the context of other housing demand decisions. These four approaches can be characterized as follows:

Tenure decisions are made in conjunction with the decision to move. In other words, households simultaneously decide whether or not to change the characteristics of the housing bundle and whether to own or rent.

Tenure decisions are made in conjunction with choices about other (discrete) dwelling attributes. For example, tenure and type of structure are often viewed as simultaneous choices.

Tenure decisions are made in conjunction with the determination of (continuous) levels of housing consumption. In other words, tenure status and the level of housing services are jointly determined.

Tenure decisions are made in conjunction with both housing consumption and longer term savings decisions. Thus, expected future income from the accumulated stock of housing wealth is a factor in determining tenure choice and current consumption levels.

The first two of these approaches are basically inconsistent with the framework of the Metropolitan Housing Market Model. The second two, which accomodate continuous measures of housing services and apply to current tenure status are more readily applicable. Of the two, the final approach is the most complex, but also the most appealing. Since housing is the primary vehicle for wealth accumulation for many households, it makes sense to explicitly consider savings and portfolio composition issues when we attempt to model tenure outcomes under changing economic and policy conditions.

How Should Income be Specified?

Economic theory suggests that permanent or normal income should be a better predictor of tenure choice than current income. The empirical literature provides some support for this position, but does not identify an ideal permanent

income measure. The Metropolitan Housing Market Model uses both current and permanent income for its demand calculations. Current income is used to determine eligibility for assistance programs, while consumption levels and utility are based on permanent income. A household's permanent income is calculated as the geometric average of its current income and the median income among all households of the same tenure and household type. When tenure choice is determined in part by permanent income, this treatment will obviously have to be changed. One option is simply to calculate a model household's permanent income as the geometric average of its current income and the median income of all households in the same type, regardless of tenure.

Should a Wealth Measure be Incorporated?

Several of the studies reviewed suggest that household wealth is an important determinant of tenure choice, even after adjusting for income. Currently, there is no wealth measure in the Metropolitan Housing Market Model, but it would not be difficult to construct one for each model household from the underlying AHS data. Cooperstein's(1985) technique of capitalizing investment income appears applicable. Alternatively, investment income alone could be treated as a proxy for the stock of non-human wealth. AHS data will not, however, allow us to compute a net worth variable like that of Jones(1985).

Should the Household Types be Redefined?

The existing literature on tenure choice provides fairly strong evidence that functional relationships between economic variables -- such as income, wealth, and price -- are different for different types of households. Several stratification schemes have been tested, and there seems to be a consensus that marital status, age of head, and household size or number or presence of dependent children are the relevant factors. In addition, there is considerable evidence for including race in the household stratification scheme. Currently the four household types used in the Metropolitan Housing Market Model are 1) white, non-elderly, husband-wife households; 2) white, non-elderly, other households; 3) white elderly households; and 4) black households. This stratification scheme reflects some of the relevant factors, although household size or number of children is notably absent. Further thought about the contribution of age, household composition, and race to tenure choice may suggest better household classification schemes. However, the final stratification scheme will be constrained by sample sizes in the AHS, and by limits on the number of model households. For example, when a Model data set includes only three or four black model households, it is unrealistic to stratify them further by life-cycle status.

Should Additional Demographic Characteristics be Incorporated for Each Model Household?

Given the availability of AHS data, it would not be infeasible to add to the information available about each model household. For example, number of school age children, additional age detail, or expected future mobility might improve the Model's capacity to predict tenure choice under changing economic circumstances. In other words, if the household types remain the same, each model household could be assigned an age and a number of children, based on the average characteristics of the actual households represented.

Should Prior Tenure be Considered?

As discussed above, the Metropolitan Housing Market Model's basic framework ignores the beginning-of-period allocation of households. It does not simulate mobility or changes in the housing circumstances of model households. It simply predicts how the end-of-period household distribution will be allocated, given the beginning-of-period housing stock. This makes it difficult to incorporate prior tenure without making fundamental changes to the Model's theory and solution algorithm. Moreover, the Model's framework implies that we will be simulating tenure status outcomes over the solution period, not changes in tenure or purchase/rent decisions. Prior tenure has not been included as a factor in any of the empirical models that predict ownership status among all households.

Nevertheless, it is clear that once households become owners, they are unlikely to change, and that changes in the tenure distribution that occur in response to economic or policy conditions probably result primarily from changing patterns of first home purchase. One approach worthy of discussion is to classify households on the basis of their beginning-of-period tenure status. Thus, for a 1973-1980 simulation, model households would be stratified by household type and by tenure in 1973 (owner-occupant versus renter or not yet a household). Separate predictive functions would of course be estimated for each group, so that a model household's response to changes in the economic or policy environment would depend on its initial tenure.

The primary drawback to this approach is that, given the structure of the AHS data set, we will not know with certainty the 1973 tenure status of each household in the 1980 data set. More seriously, the initial tenure status of households in 1980-1987 policy simulations will have to be assigned somewhat arbitrarily. Since initial tenure is likely to be an overwhelmingly dominant determinant of predicted tenure status, reliance on arbitrarily assigned values may not represent any significant improvement over the current method of assigning tenure exogenously.

How Should the Price of Housing be Measured?

The existing literature on tenure choice includes considerable debate about how housing prices should be measured. Obviously, it is particularly important to

construct comparable price measures for owner-occupied and rental housing, since it is the relationship between the two prices (for a constant quality unit) that is relevant to the tenure choice decision. In addition, it is clearly essential to incorporate the effects of taxes, depreciation, and expected appreciation into the price of owner-occupied housing.

These concerns have all been quite carefully addressed in the Metropolitan Housing Market Model. The price measure is a monthly price per unit of housing services. For renters, this corresponds to the observed gross rent -- contract rent plus average monthly expenditures for utilities not included in rent. For owners, the sum of operating costs, mortgage interest payments, property taxes, and depreciation are fully adjusted for federal tax benefits (if the household itemizes its deductions) and for appreciation.

One enhancement to this specification that might be interesting to consider is the introduction of uncertainty about appreciation benefits. Rosen, Rosen, and Holtz-Eakin's(1984) offer tantalizing evidence that if measures of uncertainty about housing price inflation are included in a predictive model, the impacts of other factors are changed.

Should Supply Constraints be Considered?

Several tenure choice analysts explored the possibility that a metropolitan area's housing stock characteristics or the past tenure distribution might prevent some potential homebuyers from becoming owner-occupants. However, the

consensus seems to be that, over periods greater than five years, the stock will adjust to demand pressures. This is consistent with the current framework of the Metropolitan Housing Market Model, which does not assign tenure to existing dwelling units. The assumption is that, over the course of a simulation period, existing units can be converted from rental to owner-occupancy or vice versa.

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