AN ECONOMIC ANALYSIS OF THE HOMEOWNERSHIP DECISION

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I. Introduction

It is widely accepted that federal tax policies significantly favor homeownership relative to renting (see, for example, Rosen (1979a)). Specifically, federal policies allow homeowners who itemize to deduct their mortgage interest and property tax payments when calculating their taxable income. Further, homeowners are not taxed on the implicit net income they receive from their home. Taken together these tax advantages provide powerful incentives for individuals to purchase, rather than rent, their residences. Since these benefits rise with one's marginal tax bracket, it is generally asserted that "owning makes much greater sense than renting" (Roulac 1974, p. 359) for those families in relatively high tax brackets. Alternatively stated, the existing literature on the homeownership decision draws an analogy between homeownership and the purchase of municipal bonds and concludes that on economic grounds high income families are better off (that is, not indifferent) owning than renting, while low income families are better off renting, and an infinitesimal group of families establishes the margin of indifference between owning and renting.

The empirical work of Li (1977), Rosen (1979b), and Rosen and Rosen (1980) and others confirm the obvious prediction of these traditional models that homeownership rates increase with income (more precisely, the marginal tax bracket). However, these studies also reveal that not all high income families own and not all low income families rent; that is, contrary to the models, income does not appear to be a sufficient statistic to predict homeownership. This result is indicated in Table 1 which displays the percent of families which own their residence in 1973 in the cities of New York, Chicago, and Los Angeles.[1] With the notable exception of the highest income category (which contains about 3.5 percent of all families) the percent of families which owned their residence increased monotonically with family income. However, even in the lowest income category (under $5,000) fully 20 of the families owned their residences. Similarly, only 65 to 85 percent of those people in the income range $25,000 to $29,999 owned their homes and this ownership figure declined as income continued to rise.

TABLE 1 - PERCENT HOMEOWNERSHIP BY FAMILY INCOME, 1973

	New York	Chicago	Los Angeles	3-City Average
0-$4,999	17.6	27.9	20.6	20.9
$5,000-$9,999	19.7	29.2	29.9	23.7
$10,000-$14,999	26.1	50.0	40.8	34.7
$15,000-$19,999	38.5	60.8	62.7	48.0
$20,000-$24,999	42.1	76.5	72.5	55.2
$25,000-$29,999	63.2	80.0	85.0	70.1
Over $29,999	48.1	61.9	56.4	62.5

Thus, as Li (1977, p. 1081) notes, "a large number of studies" find that a variety of variables, such as "family size, age of the head, and race are generally found to be . . . determinants of homeownership" even when income or the marginal tax bracket are held constant. Existing work attempts to explain why the marginal tax bracket is an insufficient statistic for predicting homeownership by arguing that people differ in their preferences (in a utility sense) for homeownership either because owning and renting are not perfect substitutes in consumption (see, for example, Rosen (1979b) and Rosen and Rosen (1980)) or because of differences "in liquidity, mobility, ability at home repairs and home management, and simply peculiar circumstances" (Diamond and Tolley, 1977, p. 14). Stated differently, the existing literature on

[1]These data are compiled using the 1973 Annual Housing Survey public use tape for the 1973 national survey.

homeownership "explains" divergences from their predicted market equilibrium of universal non-indifference with respect to homeownership by differences in tastes.

This paper develops a general model of the homeownership decision which is capable of explaining both why homeownership rates rise with income and why the marginal tax bracket is not a sufficient statistic without relying on differential tastes for homeownership. This is accomplished by incorporating two dimensions of the homeownership decision which have not previously been explicitly modelled. The first of these is that the transaction costs associated with homeownership relative to renting also affect the financial attractiveness of homeownership. It is shown that even in the simple case of the municipal bond analogy of homeownership that one's marginal tax bracket is only a sufficient statistic if one's relative expected tenancy is known.

The second new dimension added is that the municipal bond analogy to homeownership is seriously flawed. Specifically, the decision to purchase a municipal bond concentrates strictly on its yield since risk elements are diversifiable. Since asset demanders are heterogeneous with respect to the after-tax yield of municipal bonds relative to other assets, only one type of demander (the marginal bidder) can be indifferent with respect to asset choice and all other demanders are either better off holding municipal bonds or not purchasing them at all. However, unlike risk on a bond the consumption quality of a residence is not diversifiable. Since different consumers will find it optimal to demand different residential qualities (see, for example, Linneman (1981)), the market will tend to sort these heterogeneous demanders into a series of homogeneous housing quality markets. If each quality market is completely homogeneous in terms of demander traits, the after-tax price of owning versus renting will equalize within a market. This possibility is introduced by allowing for the case where landlord production efficiency is heterogeneous, that is, there is a relatively upward sloping supply curve for landlord supplied housing within any quality market. It is demonstrated that in the absence of inside information a market equilibrium exists where all consumers are indifferent with respect to their ownership status. If each quality market is homogeneous with respect to demander characteristics then an increase in federal subsidies to homeownership will drive rental prices down until those landlords who are not efficient enough to remain in the market and still earn at least a competitive profit are eliminated and replaced by relatively efficient self-suppliers. This arbitrage process continues until owning and renting are equally priced (after taxes) for the homogeneous demanders of the relevant housing quality or until no arbitrage can eliminate the after tax price differential (a corner solution).

Section II develops a simple yet powerful model of the individual homeownership decision. This model incorporates federal tax law advantages provided to both homeowners and landlords and derives a simple parametric statement of the homeownership decision calculus. The third section of the paper specifies the special case of this general parameterization which yields a homeownership decision rule analogous to the municipal bond model. A richer parameterization, referred to as the efficient market proposition, is developed in the fourth section which incorporates quality market sorting and a relatively upward sloping landlord supply curve. It is demonstrated that under plausible conditions the housing market adjusts until all consumers are indifferent with respect to their ownership status. Section V demonstrates that the presence of lumpy transaction costs associated with migration represent a potential barrier to the full achievement of such an equilibrium. The 1973 Annual Housing Survey (AHS) is used to test the efficient market proposition of homeownership (EMP) in section V. The data are suggestive of a market equilibrium consistent with the EMP, however, measurement error makes it impossible to completely reject alternative market equilibria. The paper concludes with a summary of the model and an examination of its relevance for policy, particularly with respect to rent control and condominium conversion regulations.

II. General Model of Homeownership

This section develops a simple model of the homeownership decision for an individual resident. Since all of the essential results can be derived using a single period-certainty framework, for simplicity the model is specified without explicit use of expected value operators and present value notation. Also, for convenience, the marginal tax bracket of landlords is assumed to be exogenous (see Winahan (1981) for a model of landlord tax bracket determination).

Consumers face the problem of choosing both the optimal level of housing quality and whether to purchase or rent their optimal residence. Since any residence can be transferred from rental to owner occupied status (or vice versa) with a simple transfer of the residence's title, it seems reasonable to assume that consumers derive no direct utility from owning versus renting. This means that consumers will choose the tenure status (that is, whose name is on the property's title) which minimizes the total cost of residing in their optimal quality residence. For their optimal quality residence, a consumer will decide to own (that is, place their name on the title) if

1) $NET \equiv TOTAL^R - TOTAL^O > 0$

where $TOTAL^i$ is the full total cost of tenure mode i where i=R refers to renting and i=O indicates homeownership.

The total cost of renting any residence is equal to the rental payments for the residence

2) $TOTAL^R = RENT$.

In a competitive market the rental price for any residence will represent its full supply cost including expected capital gains, depreciation, maintenance and upkeep, taxes, and competitive profits. It is easily shown that if the expected present value of capital gains taxes are zero then the competitive rental price of any residence can be specified as[2]

$$3) \quad RENT = COST^L + CLOSE^L + DOWN^L + \frac{GAIN^L - \tau ACC + \pi}{1 - \tau}$$

where $COST^L$ is the landlord's production cost, π is the landlord's competitive profit, $CLOSE^L$ is the landlord's transaction cost of finding a tenant, $DOWN^L$ is the opportunity cost of the landlord's equity in the residence, $GAIN^L$ is the landlord's capital gain on this equity, ACC is the value of accelerated depreciation over economic depreciation, and τ is the landlord's marginal tax bracket.

The total cost of owning one's residence can be similarly expressed as the sum of the self-production costs, $COST^O$, the opportunity cost of owner equity, $DOWN^O$, closing and other transaction costs, $CLOSE^O$, minus the expected

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[2]Profit for the landlord, π, is equal to his rent minus landlord production costs, $COST^L$, plus capital gains realized on the equity, $GAIN^L$, minus the contracting costs associated with finding a tenant, $CLOSE^L$, plus any tax advantages from accelerated depreciation over true depreciation, ACC, minus the opportunity cost of the equity, $DOWN^L$, and minus federal corporate income taxes levied on adjusted net income at a rate of τ

$$\pi = RENT - COST^L - CLOSE^L - (1-\tau)DOWN^L + GAIN^L - \tau(RENT - COST^L - CLOSE^L - ACC).$$

Rearranging terms and solving for RENT gives the expression of market rent shown in equation (3).

capital gain on one's equity, $GAIN^O$, and minus any tax subsidies given to homeownership, SUB,

$$4)\quad TOTAL^O = COST^O + (1-\sigma t)CLOSE^O + (1-t)DOWN^O - GAIN^O + SUB$$

where σ is the proportion of the owner's transaction costs which are deductible at a personal marginal tax rate of t. If σ=1 then all transaction costs are deductible for homeowners. Also note that the after-tax opportunity cost of equity depends on one's marginal tax bracket. This formulation assumes that the effective capital gains tax on one's residence under current tax laws is zero (see Diamond and Tolley, (1977) for a more complete discussion of this assumption) and that the implicit profit from self provision of one's residence is not taxed. Of course, the major tax subsidies associated with homeownership are the deductibility of mortgage interest and property tax payments.

Substituting (3) and (4) into (1) yields a general statement of the net cost advantage associated with purchasing one's optimal residence

$$5)\quad NET = [COST^L - COST^O] + [CLOSE^L - (1-\sigma t)CLOSE^O] + [DOWN^L - (1-t)DOWN^O] + [GAIN^O - \frac{GAIN^L}{1-\tau}] + [\frac{\pi}{1-\tau}] + [SUB - \frac{\tau ACC}{1-\tau}]$$

The first set of terms on the right side represents the differential production cost (of a given residence) for the landlord relative to self-provision. As expected, if landlords are relatively efficient producers of housing then this factor will favor renting one's residence. The term $\frac{\pi}{1-\tau}$ indicates that as competitive profits earned by landlords rise, homeownership becomes relatively attractive as these profits require increased rents. Since the landlord's marginal tax bracket, τ, is less than one, these higher profits encourage homeownership at a rate of more than one to one because rents must be raised sufficiently to provide the higher required after-tax competitive profits.

The expression $\left(SUB - \frac{\pi \cdot ACC}{1-\tau}\right)$ represents the differential value of the tax advantages of homeownership versus the accelerated depreciation allowance provided to landlords. The attractiveness of homeownership also depends upon the relative capital gain on equity expected by homeowners versus landlords, $\left(GAIN^O - \frac{GAIN^L}{1-\tau}\right)$, as well as the differential after-tax equity opportunity costs of landlords and homeowners, $[DOWN^L - (1-t)DOWN^O]$. Anything that increases the relative equity gain of homeowners versus landlords or reduces the after-tax opportunity cost of homeowner equity versus landlord equity will favor homeownership. Finally, the net full cost of homeownership depends upon the differential transaction costs of providing one's own residence rather than having a landlord supply the residence, $[CLOSE^L - (1-\sigma t)CLOSE^O]$.

This formulation makes it clear that the common statement that homeownership provides an equity interest unavailable through rental housing is misleading. Specifically, the same equity considerations which are available via homeownership are available to the landlord which in turn are reflected in the competitive rental price of the residence. Thus, renters experience the advantages of expected capital gains on equity indirectly through reduced rental prices which allow renters to invest in alternative assets. Further, since landlord profits achieved through capital gains escape taxation, these deferred profits reduce rental prices more than reduced current profits.

In order to obtain more detailed insights into the determinants of homeownership it is useful to introduce simple parameterizations of the economic concepts represented in (5). It will be assumed that the production costs of a given quality housing unit, $COST^i$, are the sum of: 1) mortgage interest payments (the equity purchase beyond downpayment is, for simplicity, assumed to be zero), M; 2) economic depreciation, D; 3) property tax payments, P; and, 4) the upkeep expenditures required to maintain a given housing quality, U. It is further assumed that these production costs for a landlord are proportional to the self-production costs associated with the same unit,

6) $COST^O = \alpha \cdot COST^L = \alpha(M + D + P + U),\ \alpha > 0$

where α is the proportional production efficiency parameter. If $\alpha > 1$ it means that landlords can supply the housing unit at lower production costs than can an owner-occupant.

Mortgage interest payments can be expressed as the product of the value of the housing unit, V, the proportion of the value which was borrowed to finance the purchase, f, and the mortgage interest rate (assumed constant), m,

7) $M = m \cdot f \cdot V, \quad f > 0.$

The remaining components of the housing unit's production costs are assumed to be proportional to the value of the housing unit:

8) $D = \delta \cdot V, \quad \delta > 0$

9) $P = p \cdot V, \quad p > 0$, and

10) $U = u \cdot V, \quad u > 0$

where δ is the proportional rate of true economic depreciation, p is the effective property tax rate,[3] and u is the proportional rate of upkeep costs required to maintain the property.[4] Similarly, it is assumed that the

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[3]Specifically, p reflects the product of the legal property tax rate and the assessment factor applied to the unit.

[4]More generally, upkeep can be viewed as a "catch-all" production cost category including all production costs other than mortgage interest payments, economic depreciation, and property taxes. This factor can be viewed as including, among other factors, mortgage principal payments.

competitive profits, π, are obtained by earning a competitive rate of profit, q, on the value of the housing unit,

11) $\pi = q \cdot V, \quad q > 0.$

The transaction costs of landlord supplied housing, $CLOSE^L$, are expressed as a proportion, B, of the annualized value of the unit for the average time period the unit is resided in, $\bar{N}$,

12) $CLOSE^L = \frac{BV}{\bar{N}}, \quad B > 0.$

This formulation takes into account the fact that any closing costs incurred by the landlord will be reflected in rents and that higher turnover rates (shorter $\bar{N}$) imply that the landlord must transact the unit more often. Homeownership transaction costs are also assumed to be B percent of value of the unit averaged over the time period the decision maker expects to reside in the unit, N,

13) $CLOSE^O = \frac{BV}{N}.$

Thus, the decision maker's expected tenancy period relative to that for the average resident of the relevant quality housing is an important consideration in calculating the benefits of homeownership.[5]

As was noted earlier, the primary tax advantage realized by landlords relative to owner-occupants is the use of accelerated depreciation. The value of this tax advantage, in present value terms net of recapture, is specified as being proportional to true economic depreciation ($D = \delta \cdot V$)

14) $ACC = \gamma \cdot \delta \cdot V, \quad \gamma > 0,$

where γ is the factor of proportionality. If $\gamma = 1$ the value of accelerated

[5]The assumption that the proportionality factors for landlords and owner-occupants are the same is made for convenience and can be relaxed without changing any substantive results.

depreciation is equal to the true depreciation, so that the landlord effectively gets a double depreciation deduction.

The deductibility of mortgage interest and property tax payments from personal income represents the primary tax advantage provided to owner-occupants. The value of these deductions to the owner-occupant depends upon the family's marginal tax bracket, t, as well as the level of these deductible payments. Assuming, for simplicity, that the landlord relative production cost efficiency parameter, α, applies equally to all components of production costs, the value of the tax advantages associated with owning a particular dwelling unit can be written as

15) $SUB = t \cdot \alpha(m \cdot f + p)V, \quad t > 0.$

It is easily seen that this tax advantage increases with the potential occupant's marginal tax bracket, the mortgage interest rate, the property tax rate, the proportion of the unit value which is financed, the relative inefficiency of self-production, and the value of the unit purchased.

The final terms in the expression for the net cost advantage of ownership relate to the capital gain and opportunity cost components. For simplicity it is assumed that landlords and owner-occupants finance the same proportion of the purchase price. Further, it is assumed that the opportunity rate of return on the equity of the unit is the same for both owner-occupants and landlords. Thus, the before-tax opportunity cost of equity can be expressed as

16) $DOWN^L = DOWN^O = r(1 - f)V,$

where $(1 - f)V$ is the downpayment amount, and r is the pre-tax opportunity rate of return on equity. Since, to a first approximation, the same investment instruments are available to both landlords and owner-occupants, it is reasonable to assume that not only is the opportunity rate of return the same for both decision-makers but also that the expected capital gain rate on a given housing unit is identical for both landlords and owner-occupants. If, for simplicity, it is assumed that neither owner-occupants nor landlords can borrow on the margin, the expected capital gains from a given quality housing unit can be specified as[6]

$$17)\quad GAIN^{L} = GAIN^{O} = g(1 - f)V,$$

where g is the expected capital gain rate and $(1 - f)V$ represents the equity on which the investor realizes this gain.

Given the parameterizations of (6) through (16) the net cost advantage of homeownership can be written as

$$18)\quad NET = V\Big\{(1-\alpha)(\delta + u + mf + p) + \frac{B}{N\bar{N}}\left[N - \bar{N}(1-\sigma t)\right] + \frac{q}{1-\tau} - \frac{\tau\gamma\delta}{1-\tau} + t\alpha(mf + p) + (1-f)\left(tr - \frac{\tau g}{1-\tau}\right)\Big\}$$

If the derivative of the net cost advantage of homeownership with respect to the a parameter in (18) is greater than zero then homeownership is positively related to the relevant parameter.[7]

It is noteworthy that the impacts of: depreciation, upkeep, property taxes, mortgage payments, the corporate tax rate, the finance ratio, transaction costs, and the value of the dwelling unit are all ambiguous. For example, increases in the rate of upkeep costs are positively related to the attractiveness of homeownership only if self-supply of housing is relatively production cost efficient ($\alpha < 1$). Similarly, if landlords are relatively inefficient (or equally efficient) suppliers then increases in property tax

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[6]It is not essential that no borrowing on the margin occurs. All substantive results are obtained, with greater algebraic complexity, when marginal borrowing occurs as long as both owner-occupants and landlords are equally capable of borrowing in this manner.

[7]These derivatives are displayed in Appendix 1.

rates or mortgage interest rates will increase the attractivenes of homeownership. However, if landlords are sufficiently more efficient than owner-occupants at supplying housing then this production advantage is increased by any further increases in production costs. In contrast, due to the presence of accelerated depreciation, the impact of increases in the rate of economic depreciation on the full cost advantage of homeownership is negative unless owner-occupants are significantly more efficient producers of housing.

The attractiveness of homeownership will increase with the proportional transaction cost parameter for sufficiently high expected tenancy periods relative to average tenancy periods. This is because both landlords and owner-occupants must pay transaction costs. If one expects a relatively long tenancy period they can use this "inside" information to avoid the unnecessary payments of transaction costs implicit in rent. As expected, the advantage of homeownership unambiguously increases as one's expected tenancy period rises, and unambiguously falls as the average tenancy period for the relevant quality housing unit rises. The net cost advantage of homeownership also increases as the proportion of transaction costs which can be deducted rises. Further, the transaction cost advantages of homeownership rise with one's marginal tax bracket.

Since the implicit net income earned on owner-occupied housing is not taxed, the net advantage of homeownership rises with the after-tax competitive rate of profit. Also, as expected, the advantages of homeownership rise with the potential owner-occupant's marginal tax rate as the value of the subsidy given through the deductibility of mortgage interest and property taxes increases with the marginal tax bracket. Similarly, as the rate of accelerated depreciation (net of recapture) increases, the net advantage of homeownershi

A major innovation of this model is the inclusion of a parameter measuring the relative production cost efficiency of landlords (α). While this parameter is more fully exploited in section IV, it is clear that as landlords experience relatively lower production costs, competitive rental prices fall and the net advantage of homeownership declines. This result, along with the earlier results in terms of transaction costs, clearly indicates that previous models of homeownership have seriously limited their predictive capabilities by concentrating solely on the taxation and capital gain aspects of the homeownership decision.

Finally, the net advantage of homeownership increases with the opportunity rate of return on equity and falls with the rate of capital gain. These results reflect the tax sheltering advantages of capital gains for landlords relative to current opportunity costs. Since deferred profit sheltering has no advantage for owner-occupants and significant advantages for landlords, as sheltering opportunities decline competitive rental prices, and hence homeownership advantages, rise.

In conclusion, this section has developed a simple model of the homeownership decision. It was assumed that decision-makers derive no direct utility from possessing the title for their optimal quality residence. The model indicates that there are four broad categories of variables which enter the homeownership decision:

1) relative production cost efficiency,
2) tax considerations of alternative tenure modes,
3) capital gains and opportunity costs of the alternative tenure modes, and
4) relative transaction costs of the alternative tenure modes.

It is important to remember that most discussions (both academic and casual) of the homeownership decision concentrate solely on the tax considerations and either totally ignore the other factors or deal with them in ways which are not consistent with the workings of a competitive market. The next two sections evaluate two special cases of the general homeownership model. The next section specifies the homeownership decision, in its traditional context, as analogous to the decision to purchase tax-exempt municipal bonds, while the fourth section develops the homeownership model in the context of a "fully efficient" market.

III. Special Case 1—The Municipal Bond Analogy

The last section developed a simple model of the homeownership calculus which was summarized by (18). The special case of this model employed by previous analysts of the homeownership decision argues that only a trivial number of consumers will be indifferent with respect to their tenure status in equilibrium. Since this type of equilibrium is generally used to describe municipal bond purchases this special case will be referred to as the municipal bond analogy of homeownership (MBAH).[8]

To appreciate the relevance of MBAH it is necessary to point out two critical assumption associated with the municipal bond model. It is argued that the favorable federal tax treatment (tax exempt) of municipal bonds makes the after-tax return on these bonds exceed that of alternative assets if all assets have the same pre-tax return. This suggests arbitrage occurs which bids down the return on municipal bonds and drives up the returns of alternative investments. How much of this type of arbitrage is necessary to

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[8]See Miller (1977) for a description of this type of market equilibrium for municipal bonds.

equate after-tax returns depends on the conversion factor for pre-tax to after-tax return, that is, the marginal tax rate of investors. However, since investors are heterogeneous with respect to their marginal tax rate and the risk characteristics of all investment instruments are the same (via portfolio diversification) this arbitrage process will continue until only members of a particular marginal tax bracket will be indifferent with respect to the choice of investment instruments. Investors in higher tax brackets (relative to this critical bracket) will choose to purchase municipal bonds as they provide higher expected after-tax returns than alternative investment instruments. Similarly, investors in relatively low tax brackets will not purchase municipal bonds because market arbitrage makes their after-tax return for low tax bracket investors less than that of other instruments. Thus, when it is assumed that heterogeneous investors bid for a tax sheltering investment instrument in the presence of homogeneity with respect to all other instrument characteristics (most notably risk which is made homogeneous via diversification) an equilibrium is generated in which only a small fraction of the population is indifferent with respect to asset choice while all other investors prefer one of the investment instruments.

It is easy to see the attractiveness of modelling the homeownership decision analogously to the municipal bond purchase decision: homeownership represents an investment instrument whose investment risk is diversifiable with an after-tax yield dependent on one's marginal tax bracket (which is heterogeneous across the population). Thus, a heterogeneous population bids for a homogeneous investment instrument (in terms of risk) and arbitrage occurs until the marginal bidder is indifferent between homeownership and renting given the system's exogenous parameters. Since only a small fraction of the total population will be marginal bidders, most of the population will strictly prefer either homeownership or renting.[9]

This special case of the general model has been either the implicit or explicit model used in all of the existing literature [for examples of this model see Diamond and Tolley (1977) and Rosen and Rosen (1980)]. For this special case the critical marginal tax rate, t^c, which defines the tax rate which exactly makes homeownership equally attractive with renting (that is, for which NET = 0 given the exogenous parameters) is obtained by solving (18) for the critical marginal tax rate

$$(19)\quad t^c = \left[\frac{\tau\gamma\delta + (1-f)\tau g - q}{1-\tau} - (1-\alpha)(\delta+u+mf+p) - \frac{B(N-\bar{N})}{N\bar{N}}\right]\left[\frac{B\sigma}{N} + \alpha(mf+p) + (1-f)r\right]^{-1}.$$

The homeownership decision rule for the special case of the MBAH can be simply stated as own if and only if one's marginal bracket equals or exceeds the critical tax rate and rent otherwise,

$$20)\quad OWN = \begin{cases} 1 \text{ iff } t > t^c \\ 0 \text{ iff } t < t^c . \end{cases}$$

Table 2 displays 5 examples of the critical tax rate for several sets of values of the exogenous parameters. Example I provides a base case calculation. As the expected tenancy period, N, rises, the relative transactions costs associated with ownership decline and the critical tax bracket falls (at a decreasing rate). Comparing example II to I shows that as the transaction costs (B) rise, the disadvantages of homeownership increase

[9] It should be noted that in this special case renting really refers to using alternative investment instruments to build one's portfolio with the funds that could otherwise be used for purchasing equity in one's own residence.

TABLE 2: NUMERICAL EXAMPLES OF CRITICAL TAX RATES FOR MBAH

$u = p = \delta = .01$ $\quad mf = .01$
$\tau = .5$ $\quad \sigma = .5$
$\overline{N} = 5$
$r = g = .12$

I. ($B=.01$, $\gamma=2$, $q=.07$, $\alpha=2.5$)

N	1	4	7	10
t^c	.30	.28	.27	.27

II. ($B=.02$, $\gamma=2$, $q=.07$, $\alpha=2.5$)

N	1	4	7	10
t^c	.33	.28	.27	.27

III. ($B=.01$, $\gamma=3$, $q=.07$, $\alpha=2.5$)

N	1	4	7	10
t^c	.34	.32	.31	.31

IV. ($B=.01$, $\gamma=2$, $q=.10$, $\alpha=2.5$)

N	1	4	7	10
t^c	.07	.04	.03	.03

V. ($B=.01$, $\gamma=2$, $q=.07$, $\alpha=3.0$)

N	1	4	7	10
t^c	.44	.42	.42	.42

for relatively short expected tenancy periods.[10]

In the third example the accelerated depreciation allowance (γ) has been increased, which reduces the advantages of homeownership and hence raises the critical tax bracket for all expected tenancy periods. Case IV indicates that increases in the effective after-tax rate of profit earned by landlords increases the attractiveness of owning as these higher profits infer higher rents.

Finally, the fifth example in Table 2 demonstrates that any increase in the relative production efficiency of landlords will be reflected in lower rental prices which, in turn, reduce the attractiveness of homeownership.

It should be remembered that the homeownership model developed in this section (MBAH) is a special case of the more general model. This special case possesses the characteristic that one's marginal tax bracket and expected tenancy period are sufficient statistics for describing the homeownership decision given the exogenous parameters in the system. In fact, most previous research in this area has ignored the explicit modelling of the impacts of expected tenancy and concludes that the marginal tax bracket alone is a sufficient statistic for the homeownership decision.[11] While the sufficiency of the marginal tax rate and expected tenancy in determining homeownership has never been explicitly tested, it seems clear that existing empirical work casts doubt on the validity of this special case of the general model. Contrary to the result implied by this special case, the data generally indicate that not all similarly situated families choose the same ownership

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[10]The lower critical tax rate at high expected tenancy periods reflects that an owner who expects to move relatively seldom can avoid the transaction costs of renting to average tenancy consumers, which are reflected in rental prices.

[11]See Shelton (1968) for a notable exception.

status. This outcome has been "explained" by Diamond and Tolley (1977), and Rosen and Rosen (1980) by variations in the taste for homeownership among families.[12] The next section specifies another special case of the general model which is consistent with data and does not rely on variations in tastes.

IV. Special Case 2—The Efficient Market Model

In the previous section it was noted that the essential assumption of MBAH is that heterogeneous consumers are bidding for a homogeneous asset. In the case of municipal bonds this assumption seems warranted due to the diversifiability of risk. However, for housing this assumption is flawed because although the investment risk of homeownership is diversifiable, the consumption aspects of housing are not. In fact, perhaps the major task of modern urban economics has been to describe how a heterogeneous population consumes an equally heterogeneous housing supply (in terms of housing quality).[13] A critical insight provided by this literature is that a heterogeneous consumer population will tend to generate an equilibrium which consists of a number of internally homogeneous housing quality markets. Alternatively stated, modern theories of residential choice suggest that, contrary to the assumption underlying MBAH, in equilibrium the housing market can be best characterized as a series of quality markets with each quality market composed of homogeneous consumers bidding for a homogeneous housing

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[12]Diamond and Tolley (1977) utilize a preference for ownership to explain the data while Rosen and Rosen (1980) use a random utility specification with respect to tenure status. Most other studies appear to use, generally implicitly, one or the other of these variations to "explain" the failure of the MBAH.

[13]See, for example, Linneman (1981), Rosen (1974), Straszheim (1975) and Tiebout (1956) for various discussion of this problem.

quality. It will be seen that if this fully sorted equilibrium occurs, the equilibrium homeownership rule will no longer be represented by MBAH.

A simple example is useful in demonstrating the equilibrium associated with the special case of a fully sorted housing market, that is, when the heterogeneous population is sorted into a series of internally homogeneous housing quality markets. Assume, for simplicity, that income is the sole determinant of the demand for housing quality. Let the heterogeneous population be comprised of three consumers with a high income and three with a low income. Similarly, let the heterogeneous housing stock be composed of three identical high quality units and three identical low quality units. In order to maximize their utility the three high income residents will choose to consume the three high quality units while the three low quality units will be consumed by the three low income families. Thus, the heterogeneous population sorts into two internally homogeneous quality markets.

Initially the rental price for the three low quality units reflects the lowest rent consistent with a competitive profit realization by the least efficient developer. If the tax advantages associated with homeownership for the low income residents make the net of tax cost of homeownership less than this rental then there will be an incentive for the residents to transfer the title of the marginally efficient landlord to the resident of the unit. As the marginally efficient landlord sells his low quality unit to one of the three (identical) low income residents he is no longer the marginal landlord. Instead, with an upward supply curve of landlord supplied housing (for any given quality), the remaining two developers will be more efficient landlords (lower α) and hence can earn competitive profits at lower rents. Assume that the new marginal landlord is sufficiently more efficient so that the full cost of homeownership is equal to the rental cost. An equilibrium will occur where all of the homogeneous units cost the same net of taxes full cost irrespective of whether they are owned or rented from the equilibrium efficient landlord. In this simple example, 1/3 of the units will be owned and 2/3 will be rented to identical residents. The three low income residents are indifferent as to whether they are the owner or one of the two renters so long as 1/3 of the units are owned, that is, the inefficient landlord is eliminated.

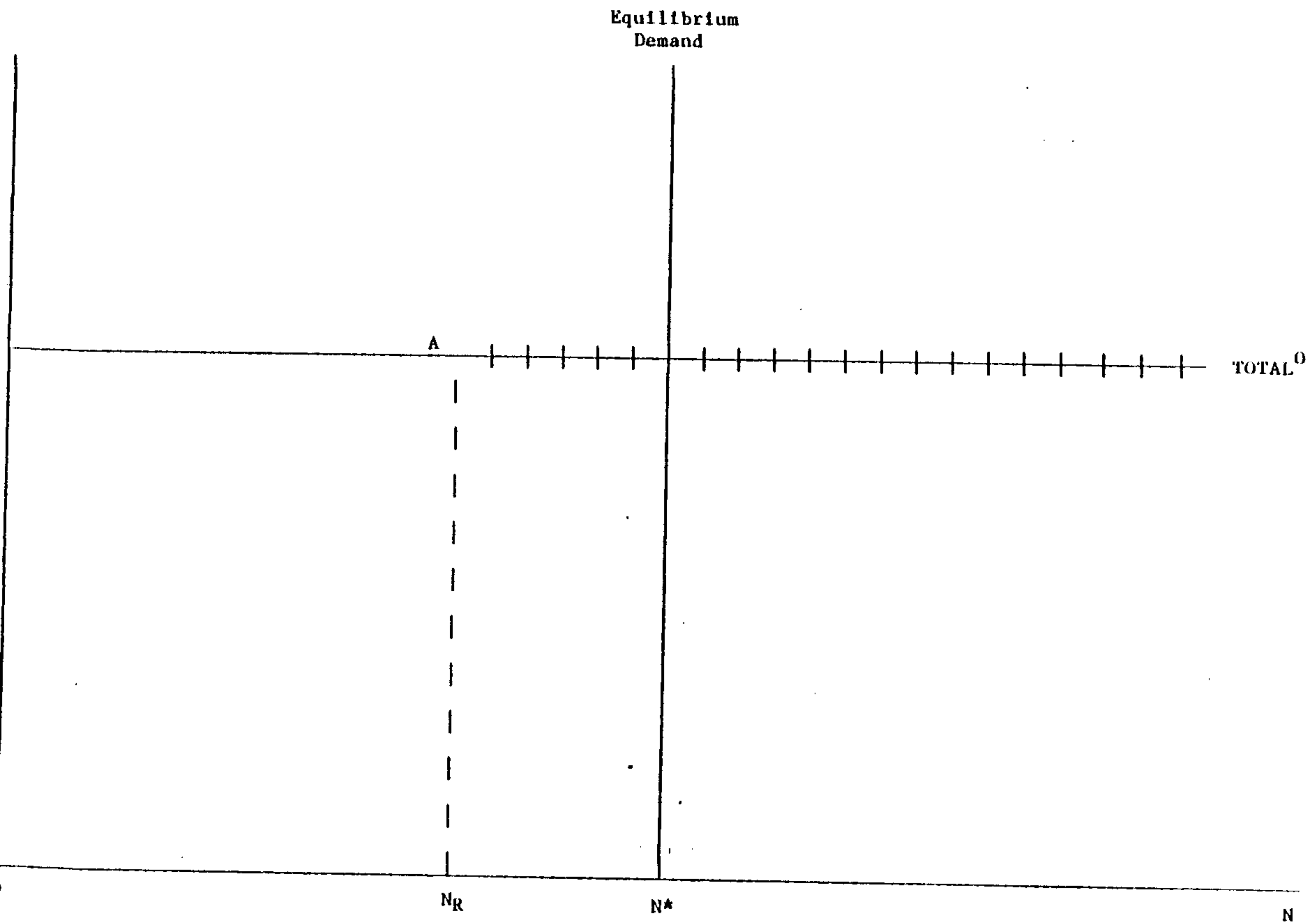
A similar analysis applies to the three high income residents. While they would realize higher tax advantages than the low income residents from consuming low quality housing, they can realize both larger absolute tax advantages and higher utility from consuming the high quality housing. Since the tax advantages associated with homeownership are greater for the high income residents, more landlords will have to be eliminated before the high quality market achieves equilibrium. For example, only the most efficient landlord of high quality housing may be able to reduce his rents to successfully compete with the tax advantages of owning high quality housing. In that case 2/3 of the units will be owned and 1/3 will be rented with all three of the high income residents paying the same full cost for housing. Once again, none of these high income residents would prefer owning over renting as long as an equilibrium is established where only sufficiently efficient landlords survive in the market.

In sum, this simple example makes it clear that a special case of the general model exists where all consumers are indifferent with respect to homeownership status in equilibrium. This special case assumes: 1) complete sorting of heterogeneous consumers into homogeneous housing quality markets; and, 2) a relatively upward sloping landlord supply curve. This special case, referred to here as the efficient market proposition (EMP), is capable of explaining why not all high income residents own, and not all low income consumers rent, without relying upon tastes. A sufficient statistic for the individual's homeownership decision in this special case is the equilibrium percentage of the relevant quality market which is owned. That is, if the EMP is applicable then one's best guess of any individual's homeownership propensity is the percent of their quality market which is owned (in equilibrium) because the individual is indifferent with respect to tenure status.

Figure 1 provides a graphic representation of the EMP equilibrium for any arbitrary housing quality market. For diagramatic simplicity the total cost, of homeownership, $TOTAL^O$, is assumed constant as the number of units (of the given quality), N, increases. This would be the case if all of the equilibrium consumers of this housing quality are each equally efficient self-suppliers of this housing. The total cost of renting, RENT, is assumed to rise as landlords supply more units of this housing quality. This would be the case if increasingly inefficient landlords enter the market at higher rents. Finally, the number of identical demanders of this quality is assumed constant at N^*.

The effective supply curve for this housing is the lesser of the cost of renting and the total cost of owning. This is represented by the cross-hatched curve in Figure 1. The EMP equilibrium occurs at A where inefficient landlords have been eliminated until the market rent (established by the marginally efficient landlord) is equal to the total cost of owning. In the case pictured ON_R of the N^* units will be rented and N_RN^* of the units will be owner occupied. Since, by assumption, all demanders for this quality are identical and the full costs of owning and renting are equalized, these residents are indifferent as to whether they are one of the ON_R renters or the N_RN^* owners. Of course, any factor which reduces the total cost of

FIGURE 1: EFFICIENT MARKET PROPOSITION FOR QUALITY MARKET X



homeownership relative to renting, such as larger tax subsidies in higher income markets, reduces the percent of the market rented by pushing point A downward and to the left along the landlord supply curve. Of course, it is possible that a corner solution is achieved in some quality markets.

The EMP can be stated mathematically in terms of the general model by noting that due to the sorting of individuals into homogeneous housing quality markets, the marginal tax bracket (t) and the expected tenancy period (N) become exogenous parameters for any given quality market. That is, since any quality market is inhabited by identical individuals, all consumers in any quality market have identical marginal tax brackets and expected tenancy periods. The only unknowns in the special case of the EMP for any quality market are the equilibrium relative landlord efficiency parameter (α) and the equilibrium percent of homeownership implied by the equilibrium value of α. Solving (18) for α provides equilibrium relative landlord efficiency parameter, α^c, as a function of the exogenous parameters (including t and N)

$$21)\quad \alpha^c = \left\{\frac{B}{N\,\overline{N}}[N - \overline{N}(1-\sigma t)] + \frac{q-\tau\gamma\delta}{1-\tau} + (1-f)\left(tr - \frac{\tau g}{1-\pi}\right) + (\delta+u+mf+p)\right\} \cdot \left[\delta + u + (1-t)(mf+p)\right]^{-1}$$

Once the equilibrium value of relative landlord efficiency is known for any quality market, the percent of homeownership in that market is equal to one minus the percent of the market which is supplied by landlords with relative efficiency parameters greater than or equal to α^c. This can be simply expressed as

$$22)\quad \%OWNED(Q=Q_i) = 1 - \int_{\alpha_i^c}^{\infty} f_i(\alpha)\,d\alpha = \int_{-\infty}^{\alpha_i^c} f_i(\alpha)\,d\alpha$$

where $\%OWNED(Q=Q_i)$ is the percent of quality market Q_i which is owned in equilibrium, $f_i(\alpha)$ is the distribution of the relative efficiency parameter in quality market i, and α_i^c is the equlibrium relative landlord efficiency in quality market i.

Table 3 displays several numerical examples of equilibrium landlord efficiency and percent homeownership when α is assumed to be distributed uniformly over the interval 1 to 5. The first example relative to the second example indicates that an increase in the tenancy period in a market brings about an increase in the equilibrium efficiency parameter and hence homeownership rates as long as a portion of transaction costs are deductible. This is particularly true for consumers with relatively high tax brackets as the value of transaction costs deductions is greatest for these consumers. Further, since all tax advantages associated with homeownership rise with the marginal tax bracket, the equilibrium percent homeownership increases as a quality market becomes inhabited by relatively high tax bracket consumers.

Comparing the third example to example 2 indicates that an increase in the transaction costs parameter favors homeownership because these costs are only partially born by the homeowner given the deductibility of transaction costs. Finally, an increase in the rate of accelerated depreciation allowances reduces the equilibrium percent of homeownership.

In sum, this section has developed a special case of the general model of homeownership. This case, referred to as EMP, yields an equilibrium where (absent corner solutions) all consumers are indifferent with respect to their housing tenure status. This result occurs because a heterogeneous consumer population completely sorts into a number of internally homogeneous housing markets. Arbitrage via the elimination of inefficient landlords occurs within each of these markets until consumers are indifferent between ownership and renting. In this special case the proportion of the relevant quality market

TABLE 3: NUMERICAL EXAMPLES OF EMP EQUILIBRIUM

$\delta = u = p = .01$ $\quad r = g = .12$
$mf = .08$ $\quad q = .07$
$\tau = .5$ $\quad \alpha \sim U[1,5]$

Example 1: ($N=\bar{N}=2$, $B=.01$, $\gamma=1$, $\sigma=.5$)

t	α^c	% Owned
.10	2.264	31.6
.30	2.819	45.5
.50	3.681	67.0

Example 2: ($N=\bar{N}=5$, $B=.01$, $\gamma=1$, $\sigma=.5$)

t	α^c	% Owned
.10	2.292	32.2
.30	2.849	46.2
.50	3.715	67.9

Example 3: ($N=\bar{N}=5$, $B=.03$, $\gamma=1$, $\sigma=.5$)

t	α^c	% Owned
.10	2.353	33.8
.30	2.929	48.2
.50	3.823	70.6

Example 4: ($N=\bar{N}=5$, $B=.01$, $\gamma=3$, $\sigma=.5$)

t	α^c	% Owned
.10	2.094	27.4
.30	2.608	40.2
.50	3.408	60.2

Example 5: ($N=\bar{N}=5$, $B=.01$, $\gamma=1$, $\sigma=0$)

t	α^c	% Owned
.10	2.291	32.3
.30	2.846	46.2
.50	3.708	67.7

which is owned is a sufficient statistic for predicting any individual's probability of homeownership because all consumers are indifferent to their tenure status given the market equilibrium.

V. Empirical Test of EMP

The relevance of either the EMP or the MBAH for observed homeownership decisions depends critically on the degree to which a heterogeneous population actually sorts into internally homogeneous markets. While the zero-sorting equilibrium required by MBAH seems unlikely, it does not necessarily follow that complete sorting (in terms of t and N relative to housing quality) occurs. Two simple examples demonstrate that partial sorting may plausibly characterize housing markets.

The first case assumes that the demand for housing quality depends solely on income and family size (for simplicity all families have the same expected tenancy period). In this case two families with different incomes and family sizes may find it optimal to demand the same housing quality.[14] In such a case the marginal landlord efficiency will be established by arbitrage between owning and renting of some critical tax bracket consumers and all higher income consumers will prefer homeownership and lower income consumers will prefer renting. Thus, a fully sorted market in terms of housing quality will yield the EMP equilibrium only if there is a unique mapping of relevant personal traits into housing quality demand. It should be noted that the presence of a vector of housing demand characteristics (for example, rooms, air quality, school quality, size of lot, access to CBD, etc.) reduces the probability that this type of non-sorting equilibrium will occur. This is

[14] For example, if one extra child or $1,000 income increases quality demand by 1 unit then a variety of family sizes and income levels will desire the same housing quality.

because the probability that different consumers desire the exact same housing quality configuration decreases as the dimensionality of housing quality increases.

A more interesting scenario for incomplete sorting occurs when the determinants of expected tenancy differ from the determinants of the demand for housing quality. Since sorting occurs with respect to the demand for housing, if some of the determinants of migration do not affect housing demand then markets would sort into homogeneous markets in terms of the determinants of housing demand but contain consumers with heterogeneous expected tenancy periods ($N \neq \overline{N}$). In such a case the expected transaction costs would differ across consumers in the same quality market and therefore the arbitrage process would leave only a small group of consumers (with the critical expected tenancy period) indifferent with respect to ownership status. For example, if a quality market was inhabited by some "movers" ($N < \overline{N}$) and some "stayers" ($N > \overline{N}$) the "movers" will tend to prefer renting in equilibrium while the "stayers" will tend to prefer owning. In this case the percentage of the relevant market which is owned would no longer be a sufficient statistic for the individual's probability of homeownership because knowing whether the individual is a mover or stayer assists in predicting whether the individual will be an owner or a renter.

These examples, in conjunction with the MBAH special case, indicate that the primary testable hypothesis of the EMP is that the relevant market's ownership proportion is a sufficient statistic for predicting individual ownership probabilities. If it is assumed that all parameters other than the marginal tax bracket and expected tenancy are cross-sectionally invariant then only the personal characteristics which determine t and N should systematically affect the net cost of homeownership. The EMP implies that cross-sectional variations in individual ownership probabilities should be unrelated to these personal characteristics except as these characteristics affect the quality market chosen and hence the arbitrage required to equilibrate their market. This means that once the percent of their market which is owned (MARKET) is controlled, the individual's marginal tax bracket (t) and expected tenancy (N) should have no impact on the individual's probability of homeownership

23) $\text{Prob}(\text{OWN}_j=1) = P(t_j, N_j, \text{MARKET}_j)$

with $P_t=P_N=0$ and $P_{MARKET}=1$ if EMP is correct, where j indexes a cross-section of individuals.

Generally stated, one's marginal tax bracket will be a function of family income (I), family size (X), age of the head (A), and whether there are two adults in the family (Z)

24) $t = t(I,X,A,Z)$.

The marginal bracket declines with age, family size, and the presence of two adults and increases with family income. Similarly, the expected tenancy period will be a function of income, family size, the presence of two adults, age of the head, and a set of other personal characteristics including race and sex (G),

25) $N = N(I,X,A,Z,G)$.

Graves and Linneman (1978) find that higher income families are significantly less likely to migrate and hence have longer expected tenancy periods. Similarly, they find that larger families, especially those with two adults, experience significantly longer tenancy periods. Finally, female headed households experience significantly longer and whites slightly shorter tenancy periods.

Substituting (24) and (25) into (23) provides a cross-sectional specification of the model which allows a direct test of the validity of EMP,

26) $\text{Prob}(\text{OWN}_j=1) = P(I_j, X_j, A_j, Z_j, G_j, \text{MARKET}_j)$

with $P_{\text{MARKET}}=1$ and all other derivatives equal to zero if EMP is correct. It will be assumed that the error term of (26) fulfills the properties described by McFadden (1974), that is, a logit functional form is used to estimate (26).

Implementing this test of the EMP requires that operational definitions of "housing quality markets" be established. That is, the observations must be allocated to housing markets defined on the housing quality characteristics consumed in order to determine the percent of the individual's "market" which is owned (MARKET_j). For example, if a consumer resides in a two bedroom unit with one bathroom in a 17 year old structure, etc., they are assigned to that "market" and one uses the percent of the consumers assigned to that market which own as the measure of MARKET for all consumers in that "market" cell.

Unfortunately a statistical trade-off exists in defining housing markets. Specifically, if many finely detailed cells are defined in terms of their housing characteristics the measurement error associated with defining housing markets declines, however, the sampling error associated with MARKET rises due to smaller sample sizes in each cell. For example, if a sample of 1000 observations are allocated to 10,000 finely detailed (in terms of housing traits) housing markets, none of the markets will contain two different "true" housing markets and hence measurement error of MARKET will be small. However, since few housing market cells will contain more than one observation, the sampling error associated with MARKET will be quite high. This problem suggests that a large sample is necessary in order to minimize this problem. Specifically the 1973 Annual Housing Survey for New York and Chicago are used to estimate (26). The quality market definitions used for these cities are reported in Appendix 2.

Table 4 displays the summary statistics (for each city) of the variables used in this study. It is noteworthy that New York has a smaller portion of the population owning their residences.

The first and third columns of Table 5 report the mean impacts of the independent variables on the individual probability of homeownership for Chicago and New York respectively when MARKET is not included in the model.[15] The results for both cities are generally significantly different from zero at standard confidence levels. The estimates are consistent with previous empirical modeling efforts. Further, the estimated impacts are consistent for both cities, with the exception of the impact of a male household head.[16]

The second and fourth columns of Table 5 display the estimated mean impacts of the independent variables on the individual's probability of homeownership when MARKET is included in the logit equations for Chicago and New York respectively.[17] Recall that if the special case of EMP accurately describes reality then the only significant variable in the second and fourth columns should be MARKET, as the relevant market's equilibrium

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[15] Appendix 3 reports the complete logit equations for the models reported in Table 5.

[16] Following Li (1977) interactive specifications were also estimated. Since the results do not critically depend upon the functional specification, only the simple functional specification results are reported here. Complete results are available from the author.

[17] Each quality market cell contains approximately 40 observations. The Chicago sample consists of 17 quality cells while the New York sample contains 39 quality cells.

TABLE 4: CITY SPECIFIC MEANS

	CHICAGO	NEW YORK
Income	$9,621	$10,680
Age of Head	48.2	48.8
Family Size	2.7	2.6
White Head	0.65	0.79
Male Head	0.67	0.68
Two Adult Family	0.51	0.52
Percent Home Ownership	0.39	0.26
Observations	707	1,774

TABLE 5: ESTIMATED MEAN IMPACTS ON INDIVIDUAL HOMEOWNERSHIP PROBABILITIES (1973)

	(1) Chicago	(2) Chicago	(3) New York	(4) New York
Income (per $1000)	.017*	.009*	.104*	.003
Age of Head (per 10 years)	.159*	.145*	.075*	.064*
Family Size	.080*	.026	.034*	-.029*
White Head (1 if yes)	.102*	.128	.063*	.058
Male Head (1 if yes)	.110*	.130	-.061	-.009
Two Adult Family (1 if yes)	.158*	.088	.162*	.108*
Market		1.258*		1.144*

*Significantly different from zero at the 95 percent level.

proportion of homeownership will be a sufficient statistic for describing any individual's homeownership probability.

In both samples it is clear that when the market homeownership is introduced as a regressor, the importance of personal characteristics significantly diminishes.[18] For example, in the New York sample family income has a very small and insignificant impact on individual homeownership probabilities when MARKET is included. This suggests that once it is known that a person resides in a quality market where in equilibrium 60 percent of the residences are owner-occupied, knowing the person's income does not tell us if they will tend to be one of the owners or one of the renters. This result is clearly consistent with an EMP equilibrium and inconsistent with an MBAH equilibrium. Similarly, the introduction of MARKET eliminates the previously significant importance of the race and sex of the household head in both cities and the impacts of family size and two adult families in the Chicago sample. In fact, only 5 of the 12 personal characteristic parameters (6 for each city) continue to exhibit significant impacts on the individual homeowner probability when MARKET is included in the regression. Further, the magnitude (in absolute value) of all five of these remaining significant (and 5 of the 7 nonsignificant) personal characteristic parameters are reduced when MARKET is introduced in these regressions. All of these factors are supportive of the existence of an EMP equilibrium and contrary to the predictions of the MBAH.

It should be noted, however, that all of the findings in Table 5 are not supportive of the existence of an EMP equilibrium. Specifically, the

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[18]It is noteworthy that in both samples the inclusion of MARKET in the logit equation results in a significantly better fit of the individual homeownership equation.

remaining significance of some of the personal characteristics after MARKET is included as a regressor and the tendency of the mean impact of MARKET on individual ownership probabilities to significantly exceed unity are contrary to the implications of the EMP that MARKET is a sufficient statistic for the individual homeownership decision. These results which contradict the EMP may indicate either: (1) that a complete EMP equilibrium does not exist; or, (2) that an EMP equilibrium, in fact, exists but that significant measurement error in terms of the quality market cells is present. In a case when different quality markets are incorrectly categorized as a single quality market, personal characteristics will remain significant determinants of homeownership even when the proportion of homeownership in the incorrectly combined market is included as a regressor. This is because the personal characteristics will capture the different equilibrium homeownership rates in the true markets, which are not measured by MARKET. Since sample sizes required a relatively small number of quality market cells, it is reasonable to suspect considerable measurement error of this type is present in this study.

Unfortunately, the data employed here are unable to distinguish whether measured divergences from EMP noted here are due to measurement error or the absence of the complete sorting required for an EMP equilibrium. However, the results developed in this section are strongly suggestive of the presence of sorting across housing quality and, therefore, inconsistent with the traditional model of homeownership (MBAH). In concluding this section it should be noted that EMP does not state that personal characteristics have no impact on homeownership, but rather that via the sorting across quality markets these impacts exert their influence at a market level rather than an individual level. Thus, the results developed in this section suggest, for example, that due to larger tax advantages and longer expected tenancy periods higher income families are more likely to own, but also that all high income families are indifferent with respect to ownership status once the market has obtained an equilibrium which has eliminated all landlords who are not efficient enough to overcome these factors.

IV. Summary and Conclusions

This paper has developed a simple model of the homeownership decision. It was shown that the net full cost advantage of homeownership increases with one's marginal tax bracket and relative expected tenancy period. It was also noted that the relative production efficiency of landlords is an important determinant of the net full cost advantage of homeownership.

Two extreme cases of the general model were specified. The municipal bond analogy model of homeownership assumed that consumers do not sort into homogeneous markets and hence only a small fraction of the population will be indifferent with respect to tenure status. This special case was contrasted to the efficient market proposition equilibrium where the heterogeneous population completely sorts into a series of internally homogeneous housing quality markets. In this special case, arbitrage occurs in a quality market until only landlords who can successfully compete with homeownership remain in the market. In equilibrium, all consumers would be indifferent with respect to their tenure status (barring corner solutions) in this special case.

The main testable hypothesis of the EMP is that the percent of a person's optimal quality market which is owned is a sufficient statistic for the individual's homeownership propensity. This hypothesis was partially supported by 1973 data for Chicago and New York City. However, the presence of measurement error makes it impossible to reject an equilibrium characterized by less than complete sorting.

It is interesting to note that the notion, associated with EMP, that all consumers are equally well off irrespective of their homeownership status conflicts with the common wisdom of tax lawyers and accountants. This conflict may be due to the fact that the common wisdom of these tax experts fails to recognize the possibility that any tax advantage of homeownership will cause a reduction of equilibrium rental prices. Thus, one can reduce one's federal tax payments at the costs of equally increased before tax payments of homeownership relative to renting.

An interesting policy implication of an EMP equilibrium is that the conversion of rental properties to condominiums is the market response to parameter changes. For example, inflation induced "bracket creep" increases the required relative landlord efficiency and thus brings about an increase in the equilibrium homeownership proportion in any quality market (except that market inhabited by maximum marginal tax bracket consumers). Regulations which restrict condominium conversions in a market where exogenous parameter changes are altering the equilibrium homeownership proportion reduce economic efficiency by restricting arbitrage activity. Specifically, these regulations will increase rental prices by stopping relatively inefficient landlords from transfering their ownership titles to residents. Since most protests over condominium conversions have been from central city areas experiencing rapid and unanticipated neighborhood improvements, it seems reasonable to believe that these outcries inappropriately blame condominiums for the increases in real housing costs associated with improved neighborhood quality. That is, consumers who found it optimal to reside in these neighborhoods prior to their improvement were paying the costs associated with these low quality neighborhoods. As neighborhood quality rose, so too did the real payments required to obtain these housing services. This is because higher income consumers are attracted to these better neighborhoods. Since these higher income consumers have higher marginal tax brackets, the percent of these improved units which will be owned in equilibrium also rises as higher income residents are attracted to these improved neighborhoods. Thus, the unanticipated neighborhood improvement causes both the displacement of former reisdents (for whom the new quality is nonoptimal) and a conversion of some of the units to condominiums. That is, condominium conversions are a response to exogenous shifts which also cause residential displacement, but not a cause of the displacements. It is also worth noting that the argument that condominium conversions hurt renters by reducing the supply of rental housing is incorrect because tenancy status is clearly an endogenous variable. Alternatively stated, a unit going condominium equally reduces both the supply and demand for "rental housing."

Another housing regulation policy, rent controls, will also have an adverse effect on economic efficiency. This is because only extremely efficient landlords will be able to realize competitive profits when a binding rental ceiling is in place. This means that some landlords, who would otherwise be efficient enough to compete with self-provision of housing, will not make competitive profits at the rental ceiling prices and will transfer their property titles to residents (for example, via condominium conversions). This process causes higher after-tax prices for housing for all consumers except those fortunate enough to obtain their housing from one of the remaining landlords.[19]

In conclusion, although the empirical evidence in support of the EMP is only suggestive of its relevance, the general model presented in this paper,

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[19]Of course, sidepayments to landlords may even eliminate any benefits available to the residents of rent controlled units.

and in particular the special case of EMP, does suggest a new and different approach to the homeownership decision. Since the impacts of a wide range of regulatory policies depend upon the workings of the housing market, the model developed here should prove useful in evaluating these regulatory policies. It is hoped that this paper, particularly through the statement and testing of EMP, represents a significant step towards obtaining a more complete understanding of the housing market and the housing tenure decision.

Appendix 1: Derivatives Of The Net Advantages Of Homeownership: General Model

Differentiating (18) with respect to the relevant parameters:

(1) $\frac{dNET}{dV} = \{\cdot\}$ where $\{\cdot\}$ refers to the bracketed expression in (18).

(2) $\frac{dNET}{d\tau} = \frac{V}{1-\tau}\left\{\frac{q - \tau[\gamma\delta - (1-f)\ g]}{1-\tau} - \gamma\delta + (1-f)g\right\} \gtrless 0$

(3) $\frac{dNET}{df} = V\left[(1-\alpha)m + t(\alpha m - r) + \frac{\tau g}{1-\tau}\right] \gtrless 0$

(4) $\frac{dNET}{dr} = V(1-f)t > 0$

(5) $\frac{dNET}{dg} = -\frac{V(1-f)\tau}{1-\tau} < 0$

(6) $\frac{dNET}{dq} = \frac{V}{1-\tau} > 0$

(7) $\frac{dNET}{d\delta} = V\left[(1-\alpha) - \frac{\tau g}{1-\tau}\right] \gtrless 0$

(8) $\frac{dNET}{d\gamma} = -\frac{V\delta\tau}{1-\tau} < 0$

(9) $\frac{dNET}{du} = V(1-\alpha) \gtrless 0$

(10) $\frac{dNET}{dm} = fV[1 - \alpha(1 - t)] \gtrless 0$

(11) $\frac{dNET}{dp} = V[1 - \alpha(1 - t)] \gtrless 0$

(12) $\frac{dNET}{dB} = \frac{V[N - \bar{N}(1-\sigma t)]}{N\bar{N}} \gtrless 0$

(13) $\frac{dNET}{dN} = \frac{VB(1-\sigma t)}{N^2} > 0$

(14) $\frac{dNET}{d\bar{N}} = -\frac{B}{\bar{N}^2} < 0$

(15) $\frac{dNET}{dt} = V\left[\frac{B\sigma}{N} + \alpha(mf+p) + (1-f)r\right] > 0$

(16) $\frac{dNET}{d\alpha} = V\left[t(mf+p) = (\delta + u + mf + p)\right] < 0$

APPENDIX 2

The following definitions are the quality cells used in the empirical analysis to obtain the percent of homeownership.

NEW YORK CITY QUALITY DEFINITIONS

QUALITY	DEFINITION
1	ROOMS<3 AND FURNISHD=0 AND UNIT<15
2	ROOMS<3 AND FURNISHD=0 AND UNIT=34.5
3	ROOMS<3 AND FURNISHD=0 AND UNIT>35
4	ROOMS<3 AND FURNISHD=1
5	ROOMS=3 AND UNIT<3
6	ROOMS=3 AND UNIT=3.5
7	ROOMS=3 AND 4<UNIT<8
8	ROOMS=3 AND UNIT=14.5
9	ROOMS=3 AND UNIT=34.5 AND PASSELEV=0
10	ROOMS=3 AND UNIT=34.5 AND PASSELEV=1
11	ROOMS=3 AND UNIT=60 AND STRUCAGE<18
12	ROOMS=3 AND UNIT=60 AND STRUCAGE=18
13	ROOMS=3 AND UNIT=60 AND STRUCAGE=28
14	ROOMS=3 AND UNIT=60 AND STRUCAGE=48
15	ROOMS=4 AND FULLBATH=1 AND UNIT<3 AND STRUCAGE<30
16	ROOMS=4 AND FULLBATH=1 AND UNIT<3 AND STRUCAGE=48
17	ROOMS=4 AND FULLBATH=1 AND UNIT=3.5.
18	ROOMS=4 AND FULLBATH=1 AND UNIT=7
19	ROOMS=4 AND FULLBATH=1 AND UNIT>7 AND STRUCAGE<12
20	ROOMS=4 AND FULLBATH=1 AND UNIT>7 AND STRUCAGE=18
21	ROOMS=4 AND FULLBATH=1 AND UNIT>7 AND STRUCAGE=28
22	ROOMS=4 AND FULLBATH=1 AND UNIT>7 AND STRUCAGE>28 AND PASSELEV=0
23	ROOMS=4 AND FULLBATH=1 AND UNIT>7 AND STRUCAGE>28 AND PASSELEV=1
24	(ROOMS=4 AND FULLBATH>1) OR (ROOMS=5 AND FULLBATH=1 AND UNIT=1)
25	ROOMS=5 AND FULLBATH=1 AND UNIT=2 AND STRUCAGE>28
26	ROOMS=5 AND FULLBATH=1 AND UNIT=2 AND STRUCAGE>28
27	ROOMS=5 AND FULLBATH=1 AND UNIT=3.5
28	ROOMS=5 AND FULLBATH=1 AND 3.5<UNIT<15
29	ROOMS=5 AND FULLBATH=1 AND UNIT=34.5
30	ROOMS=5 AND FULLBATH=1 AND UNIT=60
31	ROOMS=6 AND FULLBATH=1 AND UNIT=1
32	ROOMS=5 AND FULLBATH>1
33	ROOMS=6 AND FULLBATH=1 AND UNIT=2
34	ROOMS=6 AND FULLBATH=1 AND UNIT>2
35	ROOMS=6 AND FULLBATH=1.5
36	ROOMS=6 AND FULLBATH>1.5
37	ROOMS>6 AND FULLBATH=1
38	ROOMS>6 AND FULLBATH=1.5
39	ROOMS>6 AND FULLBATH>2

Appendix 2 (continued)

CHICAGO QUALITY DEFINITIONS

QUALITY	DEFINITION
1	ROOMS<3 AND FURNISHD=0
2	ROOMS<3 AND FURNISHD=1
3	ROOMS=3 AND UNIT<8
4	ROOMS=3 AND UNIT>8
5	ROOMS=4 AND FULLBATH=1 AND UNIT>3
6	ROOMS=4 AND FULLBATH=1 AND UNIT=3.5
7	ROOMS=4 AND FULLBATH=1 AND UNIT=7
8	ROOMS=4 AND FULLBATH=1 AND UNIT>7
9	(ROOMS=4 AND FULLBATH>1) OR (ROOMS=5 AND FULLBATH=1 AND UNIT=1)
10	ROOMS=5 AND FULLBATH=1 AND UNIT=2
11	ROOMS=5 AND FULLBATH=1 AND UNIT>2
12	(ROOMS=5 AND FULLBATH>1) OR (ROOMS=6 AND FULLBATH=1 AND UNIT=1)
13	ROOMS=6 AND FULLBATH=1 AND UNIT=2
14	ROOMS=6 AND FULLBATH=1 AND UNIT>2
15	ROOMS=6 AND FULLBATH>1
16	ROOMS>6 AND FULLBATH<2
17	ROOMS>6 AND FULLBATH>2

Appendix 2 (continued)

ROOMS is the number of non-bathrooms in the residence.

FURNISHED is equal to 0 if the unit is non-furnished and equal to 1 if the unit is furnished.

UNIT is the number of residence units in the building.

PASSELEV is equal to 0 if the building has no elevator and equal to 1 if the building does have an elevator.

STRUCAGE is the average (of a categorical bracket) age of the building in years.

FULLBATH is the number of bathrooms in the unit.

APPENDIX 3: LOGIT ESTIMATES OF THE PROBABILITY OF HOMEOWNERSHIP

HOMEOWNERSHIP LOGIT COEFFICIENTS FOR CHICAGO [a]

	(1)	(2)
Constant	-6.398 (0.531)	-7.543 (0.729)
Income	7.235×10^{-5} (1.343×10^{-6})	3.726×10^{-5} (1.689×10^{-5})
Age of Head	0.067 (0.007)	0.061 (0.009)
Family Size	0.338 (0.061)	0.109 (0.078)
White Head	0.430 (0.217)	0.538 (0.283)
Male Head	0.461 (0.322)	0.547 (0.416)
Two Adult Family	0.666 (0.310)	0.372 (0.407)
Market (17 Cells)		5.290 (0.453)
-2 lnL	704.52	463.0
Chi^2	252.7	436.8

[a] Assymptotic standard errors reported in ( ) beneath each coefficient.

Appendix 3 (continued)

HOMEOWNERSHIP LOGIT COEFFICIENTS FOR NEW YORK CITY [a]

	(1)	(2)
Constant	-4.606 (0.319)	-4.958 (0.402)
Income	5.406×10^{-5} (7.530×10^{-6})	1.424×10^{-5} (9.371×10^{-6})
Age of Head	0.039 (0.004)	0.033 (0.005)
Family Size	0.177 (0.042)	-0.149 (0.058)
White Head	0.323 (0.162)	0.297 (0.202)
Male Head	-0.312 (0.219)	-0.045 (0.264)
Two Adult Family	0.832 (0.209)	0.555 (0.251)
Market (39 Cells)		5.891 (0.305)
-2 lnL	1795.8	1221.9
Chi^2	251.4	825.3

[a] Assymptotic standard errors are reported in ( ) beneath each coefficient.

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