Pakistan Journal of Applied Economics, (1997), Vol.XIII No.2, (205 - 226)

DETERMINANTS OF INTRA-URBAN RESIDENTIAL MOBILITY IN DEVELOPING COUNTRIES: An Empirical Study of Pakistan

Nuzhat AHMAD* and Hafiz A. PASHA**

The paper analyses the determinants of intra-urban residential mobility. A maximum likelihood logit model is used to estimate the probability of mobility using data on more than 6000 households in Karachi, Pakistan. The paper extends the basic disequilibrium model of residential mobility to allow for desired changes in housing consumption, tenurial status and unit price differences. Life cycle effects are explicitly incorporated. Variables like changes in workplace location, migration status, location specific income are included to capture the peculiar features of housing markets in developing countries. The empirical results confirm the importance of the above extensions to the standard neo-classical model of intra-urban residential mobility in the context of Karachi.

I. Introduction

Most of the theoretical and empirical work published on residential mobility in developing countries [Greenwood (1975); Harris and Todaro (1970); Levy and Wadycki (1974); Goldstein, Pitaktepsombati and Goldstein (1976)] has concentrated on inter-regional movements, primarily rural-urban migration. Less emphasis has been given to a study of mobility within urban areas. However, as the share of urban population in developing countries expands rapidly, intra-urban residential mobility has acquired a special significance from the viewpoint of understanding the dynamics of the housing market and deciding on the spatial allocation of municipal infrastructure.

This paper analyses the determinants of intra-urban residential mobility in a large metropolitan city, Karachi,[1] of a low income country, Pakistan.[2] It is organised as follows: Section 2 presents estimates of the rate of mobility, Section 3 sets up the theoretical framework, Section 4 gives the model specification, Section 5 presents the results while Section 6 summarises the principal conclusions.

* Director and Professor at Applied Economics Research Centre, University of Karachi.
** Managing Director, Social Policy and Development Centre, Karachi.

[1] Karachi is the largest city of Pakistan with a population currently estimated at 10 million, growing annually at a rate of 4.5 per cent. It is the only port and major trade, industrial and financial centre of the country.

[2] According to the World Bank the annual per capita income in Pakistan places it in the category of a low income country.

II. Rate of Residential Mobility

Mobility rates observed for developed countries, especially in the U.S. are generally high (see Table 1). Goodman Jr., (1976) reported an overall rate of mobility of 21 per cent over a period of two years. Hanushek and Quigley (1978) and Weinberg (1979) estimated that 20 per cent of all metropolitan residents in U.S. cities moved each year and that two thirds of these moves were within the same metropolitan area. Quigley and Weinberg (1977) also reported that 20 per cent of all households made intra-urban moves within a period of 12 months, 40 per cent moved within a period of three and a half years and almost two thirds of them shifted residence within a period of about eight years. The actual rate of mobility was even higher as multiple moves were ignored in calculating the above rates. Renter households and households with younger heads were generally reported to be more mobile [Quigley and Weinberg (1977); Onaka and Clark (1983)].

There is less information available on mobility rates in developing countries. Observed rates of mobility in these countries are presumed to be generally lower. Shefer and Primo (1985) reported a mobility rate of only 10 per cent over a period of twelve to fifteen years in the city of Jaffa, Israel.

TABLE 1

Comparative Rates of Residential Mobility
(Percentage of Households Moving)

Within (Years)	U.S.A[a]	U.S.A[b] (Renter)	U.S.A[c]	Israel[d]	Pakistan[e] Overall	Pakistan[e] Renters	Pakistan[e] Owners
1 Year	19	20	13	-	14	21	8
3.5 Years	40	40	20	-	25	41	12
5 Years	50	-	-	-	32	50	18
8.5 Years	67	-	-	-	47	60	37
10 Years	-	-	-	10	54	70	42
12 Years	-	-	-	10	65	76	57

[a] J.M. Quigley and D.H. Weinberg (1977).
[b] E.A. Hanushek and J.M. Quigley (1978).
[c] D.H. Weinberg (1977).
[d] D. Shefer and N. Primo (1985).
[e] Karachi.

A look at the incidence of residential mobility in Karachi in Table 1 shows that 13 per cent of households changed residence in the last twelve months while 25 per cent shifted during the last three years. More than half the population changed place of residence at least once. This is a relatively high rate of intra-urban residential mobility for a developing country and is comparable to mobility rates in developed countries like the U.S.A.

There is also evidence of pronounced differences in mobility rates between renter and owner-occupier households in Karachi. Around 41 per cent of renters shifted residence in the last three and a half years as compared to only 12 per cent of the owners. This confirms the generally held view amongst researchers that renters tend to be more mobile than owners.

III. Theoretical Framework

The neo-classical 'disequilibrium' model forms the basis of most of the work on intra-urban residential mobility. It essentially involves a comparison of utility attained in two situations, one with continued residence in the existing dwelling unit and the other following a move. If the latter exceeds the former then residential mobility is likely to occur.

We present the utility function of a typical household as follows:

$$U = U(x_o, q)$$

where q is the quantity of housing consumed and x a composite good of non-housing expenditure, with price normalised to unity.

If the unit price of housing services in the existing dwelling unit is p_o and the quantity of housing consumed is q_o, then the level of utility attained is U_o, where

$$U_o = U(y - p_o q_o, q_o) \quad (1)$$

If the household moves then it can attempt to maximise its utility subject to the budget constraint

$$y = x_1 + p_1 q_1 + m \quad (2)$$

where y = income, p_1 = unit price of housing at the new location and m = moving costs. The difference in price of housing can arise either due to the presence of tenure discounts at the existing location, in which case $p_o < p_1$, or, in the presence of incomplete market information, a bad choice may have been made earlier, whereby $p_o > p_1$.

The maximised utility, V_1, at the new location then is given by

$$V_1 = V_1 (y - m, p_1) \tag{3}$$

where V_1 is the indirect utility function. The level of consumption of housing is given by q_1.

We see the difference between the utility in the two situations via the magnitude of the equivalent income variation, c, associated with the move. As such,

$$U (y - p_o q_o, q_o) = V (y - m - c, p_1) \tag{4}$$

If c is greater than zero then the household has an incentive to move. As c increases, the probability of move increases. Given y and p_1, the magnitude of c depends upon p_o, q_o and m.

Differentiating equation (4) we obtain,

$$U_x (-p_o dq_o - q_o\, dp_o] + U_q\, dq_o = \lambda (-dm - dc)$$

where U_x and U_q are respectively the derivatives of U and λ is the marginal utility of income. This transforms to:

$$dc = \frac{1}{\lambda} U_x \left[p_o - \frac{U_q}{U_x} \right] dq_o + \frac{1}{\lambda} U_x\, q_o\, dp_o - dm \tag{5}$$

Now we have that the rent, R, in the two situations is given by

$$R_o = p_o q_o,\ R_1 = p_1\, q_1$$

and,

$$d (R_1 - R_o) = -p_o\, dq_o - q_o\, dp_o$$

which implies that

$$dq_o = \frac{1}{p_o} \left[-d (R_1 - R_o) - q_o\, d_{po} \right]^3 \tag{6}$$

[3] Substituting (5) and (6) into (4) and simplifying we obtain:

$$dc = \frac{1}{\lambda\, p_o} U_x \left[p_o - \frac{U_q}{U_x} \right] \left[- d (R_1 - R_o) - q_o dp_o \right] - \frac{1}{\lambda} U_x\, q_o\, d(p_1 - p_o) - dm$$

Substituting (6) into (5) and simplifying we obtain,

$$dc = -\frac{1}{\lambda p_o} U_x \left[p_o - \frac{U_q}{U_x} \right] d(R_1 - R_o) - \frac{1}{\lambda p_o} U_q q_o d(p_1 - p_o) - dm \qquad (7)$$

Equation (7) summarises the results of comparative statics.

In the particular case where there is underconsumption of housing, with $q_o < q_1$, then

$$\frac{dc}{d(R_1 - R_o)} < 0 \text{ since } \frac{U_q}{U_x} > p_o$$

When there is overconsumption of housing and $q_o > q_1$, two cases can be distinguished. If $p_o < p_1$ then there is no incentive for moving and c is always less than zero. On the other hand, if $p_o > p_1$ then it can be shown that

$$\frac{dc}{d(R_1 - R_o)} > 0 \text{ since } \frac{U_q}{U_x} < p_1 < p_o$$

The above two results imply that the magnitude of c increases as the absolute difference between R_1 and R_o increases. That is

$$\frac{dc}{d(|R_1 - R_o|)} < 0$$

Similarly from equation (7) we have

$$\frac{dc}{d(p_1 - p_o)} < 0 \text{ and } \frac{dc}{dm} < 0$$

Therefore, c is given by

$$c = c(\underset{+}{|R_1 - R_o|}, \underset{-}{p_1 - p_o}, \underset{-}{m}) \qquad (8)$$

This is the basic theoretical result which motivates the empirical analysis of intra-urban residential mobility.

The literature has generally considered only the special case where $p_1 = p_o$. Consequently, much of the attention has been focused on the impact of the disequilibrium in housing expenditure on the probability of moving. Our specification is more general in character and allows for the following cases:

i) $R_1 \approx R_o$ but $p_o > p_1$. In this case even though there is no difference in housing expenditure in the two situations, the household may still want to move because the current dwelling is overpriced and the quantity of housing services made available is smaller.

ii) $R_1 > R_0$ but $p_0 < p_1$. In this case, given the disequilibrium in housing expenditure the probability of moving should be high, but the household is disinclined to change its location because of the price discount in the present dwelling unit.

IV. Specification of Model

Much of the earlier work by Goodman (1976) and, Hanushek and Quigley (1978) has, in fact, focused on the absolute magnitude of the gap between actual and desired level of housing consumption. The basic equilibrium model and its variants have been rigorously tested in the U.S. setting by Weinberg et.al., (1981), Cronin (1979), Goodman Jr., (1976) Hanushek and Quigley (1978) and Onaka (1983).

The basic moving equation is specified by us as follows:

$$P = f\,(DIS,\ DIFP,\ M) \qquad (9)$$

where:

P = probability of moving.
DIS = extent of disequilibrium in housing consumption.
DIFP = unit price difference, $(p_1 - p_o)$.
M = moving costs.

We extend the above specification in the following ways:

i) Tenure Status

In traditional analyses of residential mobility, tenure choice is either ignored or renters and owners are treated separately. These studies are based on the assumption that moves are motivated by the disequilibrium between desired and actual consumption of housing only and the former is estimated without considering tenure choice. As such, the disequilibrium arising out of the difference between desired and actual tenurial status is ignored. Hanushek and Quigley's (1978) analysis which forms the basis of the disequilibrium model is limited to renter households and, therefore, does not deal with tenure choice in the estimation of equilibrium demand. Goodman Jr. (1976) did mention moves associated with changes in tenure status but such motivations were not analysed in his work. More recently, joint models of tenure choice, length of stay and consumption choice of families have been estimated by Henderson and Ioannides (1989), Zorn (1988) and Rosenthal (1988).

The jointness of the tenure choice and quantity of housing demanded has also become apparent in recent years and authors have estimated simultaneous models of tenure choice and demand for housing (Goodman 1988). Ignoring this simultaneity may lead to biased estimates and to significance of certain variables (especially socio demographic variables) in the demand equation when they more appropriately belong to the tenure choice equation.

Here we view disequilibrium in demand for housing (which motivates mobility) not only in terms of housing consumption but also in terms of tenurial status. A change in any exogenous variable may lead to both a tenure adjustment as well as adjustment in the consumption of housing. Therefore, if consumption by owners and renters differs[4] and this is not built into the model then the estimated coefficients may be biased. As such, we estimate a probabilistic demand function (R_D) for a particular non-mover household as follows:

$$R_D = f R_o + (1 - f) R_R \tag{10}$$

Where f is the probability of owning rather than renting. R_D is the expected magnitude of demand. This is the sum of probability of owning weighted by the housing services demanded as an owner (R_o) plus the probability of renting weighted by the amount of housing demanded as a renter (R_R). A probabilistic tenure choice equation, used for estimating f, is given in Appendix A. Estimated housing demand functions for owners and renters are presented in Appendix B.

The magnitude of the disequilibrium in housing consumption is then estimated for mover and non-mover households as follows:

Movers:

The disequilibrium is defined as:

$$DIS = \frac{R_A - R_P}{R_P} \tag{11}$$

where:

DIS = magnitude of disequilibrium.

R_A = actual market rent for present rented house or imputed rent for present owner-occupied house.[5]

R_p = rent (actual market rent for rented house or imputed rent for owner-occupied house) of previous accommodation, suitably adjusted for inflation.

[4] Consumption by owners and renters may differ because of investment demand for housing.

[5] Imputed rent is estimated for owner-occupied houses through the rent hedonics technique. Results are reported in Appendix D.

Non-Movers:

In this case we define disequilibrium as:

$$DIS = \frac{R_D - R_A}{R_A} \tag{12}$$

where:

R_D = desired (equilibrium) housing consumption estimated from equation (10).

R_A = rent (actual market rent for rented house or imputed rent for owner-occupied house) of present accommodation.

ii) Unit Price Differences

Difference in price of housing may arise either due to the presence of tenure discounts at the existing location or long term residence may slow down the adjustment of rents to inflation or other changing market conditions. In this case $p_o < p_1$ and relocation may mean forgoing these rent discounts. On the other hand, lack of information may have led to a bad choice earlier whereby $p_o > p_1$. Mobility behaviour of otherwise comparable households may, therefore, differ due to the unit price differential and it is necessary to make adjustments to the mobility model accordingly.

Some authors have pointed towards the presence of unit price difference. However, no attempt has been made to incorporate their impact on residential mobility. Hanushek and Quigley (1978) hint at these rent discounts but they are not included in the analysis due to lack of systematic data. Weinberg et. al., (1981) include rent discounts associated with long-term occupancy as a negative exponential function of the length of residence. Other studies on determinants of mobility have tried to capture this effect by including a variable measuring the period of residence or length of tenure.

We measure the price difference variable for movers and non-movers as follows:

Movers:

For renter movers it is measured as :

$$DIFP = \frac{p_1 - p_o}{p_o} = \frac{(p_1 - p_o)q_o}{q_o} = \frac{p_1q_o - p_oq_o}{p_oq_o} = \frac{R_p - RI_{-1}}{RI_{-1}} \tag{13}$$

where:

DIFP = measure of price difference $(p_1 - p_o)$.

R_P = actual rent of previous residence.

RI_{-1} = imputed rent of previous residence.

The imputed rent is a measure of the market rent that would have been commanded by the housing unit.

For non-movers renter households price differential are measured as:

$$DIFP = \frac{p_1 - p_o}{p_o} = \frac{(p_1 - p_o)q_o}{q_o} = \frac{p_1 q_o - p_o q_o}{p_o q_o} = \frac{R - RI}{RI} \qquad (14)$$

where:
DIFP = measure of price difference.
R = actual rent.
RI = imputed rent.

For owner occupants by definition no rent discounts are applicable. As such, DIFP = 0, in these cases.

iii) Life Cycle Effects

Household needs generated by life-cycle changes may cause mobility. The age of the head of household and its interaction with underconsumption in housing are used to test this effect. For older household heads the benefits from moving are spread over a shorter period of time, therefore, given the size of the equilibrium the probability of moving is expected to decline with age. Younger households, on the other hand, are likely to be more mobile as most changes in the composition of the household occur then, leading to changes in housing consumption needs.

iv) Adjustments Relevant to Developing Countries

Finally, the residential mobility model is modified to suit the conditions particular to a developing country. These include workplace location, migration status and location specific income.

a) Change in Workplace Location

In a large city, like Karachi, burdens of commuting to work both in terms of money costs and time are substantial. A change in workplace location changes the distance of work from residence and, therefore, the decision to move. In fact, in Karachi, a considerable proportion of workers live in close proximity to their place of employment.[6] Therefore, a workplace location variable (taking the value of one if households head changed job within one year of move and zero otherwise) is included in the analysis as a determinant of residential mobility.

[6] Over 26 per cent of workers in Karachi walk to work and around 9 per cent work at home.

b) Migration Status

Migrant households may be inherently more mobile especially in the earlier years when they are searching for suitable employment and accommodation. The effect of the variable on mobility is of significance to a developing country like Pakistan and has special policy implications for a large metropolis like Karachi which is growing continuously due to in-migration from other parts of the country. A migrant dummy variable (taking the value of one for migrant households and zero otherwise) is included in the mobility equation.

c) Location Specific Income

In third world cities informal activities operated from places of residence account for a considerable proportion of employment. An additional variable included in the mobility equation is the location specific income (MLOCY) which is the component of household income earned at the residential location. The variable is expected to have a negative effect on the decision to move.

V. Emperical Results

A maximum likelihood logit model is used to estimate the above probability of mobility equation. Results of the estimation are presented in Table 2. The determinants of mobility included in the analysis are (i) measures of disequilibrium in housing consumption (OVRPDIS or UNDPDIS); (ii) unit price difference variable (ADJRENT); (iii) the age of the head of household to represent life-cycle effects on mobility (AGE); (iv) interaction term of age with measure of underconsumption (UDAGE1, UDAGE2);[7] (v) household size (HHSIZE) as a proxy for moving costs; (vi) work location variable (WORKLOC); (vii) dummy variable for migrant households (MIG); (vii) proportion of family income earned at residential location (MLOCY). The dependent variable is the probability of moving as opposed to staying. The empirical results are discussed in detail below.

a) Disequilibrium in Housing Consumption

As mentioned earlier disequilibrium in housing consumption is considered to be the main reason for households to change their place of residence. We have tested for the impact of proportionate overconsumption and underconsumption separately. The designated variables are OVRPDIS and UNDPDIS respectively.

[7] The overconsumption variable and its interaction term were included in an earlier specification but excluded from the final estimation due to insignificance. Results are available with the authors on request.

TABLE 2

Cooefficients from Logit Estimation
(Dependent Variable is Probability of Moving)
(t-statistics in parenthesis)

	(1)	(2)	(3)
OVRPDIS	-0.11	-0.10	-0.80 - 01
	(-1.41)	(-1.31)	(-1.06)
UNDPDIS	1.07	1.89	1.92
	(5.70)***	(8.95)***	(8.97) ***
AGE	-0.18 - 01	-0.21 - 01	-0.19 - 01
	(5.76)***	(-6.41) ***	(-5.59) ***
UDAGE1	-0.56	-0.74	-0.64
	(-2.45)**	(-3.00) ***	(-2.59) **
UDAGE2	0.81	-1.01	-0.99
	(-2.99) ***	(-3.53)***	(-3.43) ***
HHSIZE	-0.72 - 01	-0.83 - 01	-0.77 - 01
	(5.82) ***	(-6.57) ***	(-6.07)***
ADJRENT	-0.46	0.53	-
	(2.64) ***	(8.68) ***	
WORKLOC	-	-	0.21
			(2.22) **
MIG	-	-	1.21
			(8.37)***
MLOCY	-	-	-0.10 - 03
			(-2.40) **
CONSTANT	-0.33	-0.15	-0.37
	(-2.03)	(-0.89)	(-2.15)
NO. OF CASES	6058	6058	6058
CHI SQUARE	203.21	243.90	268.30
LOG LIKLIHOOD	-2674	-2591	-2550

* Significant at the 90 per cent level of significance.
** Significant at the 95 per cent level of significance.
*** Significant at the 99 per cent level of significance.

Results of the analysis show that the probability of moving is positively related to underconsumption in housing. The coefficient of the variable is highly significant at the 99 per cent level of significance in all specifications of the model. The effect of the underconsumption variable is insignificant. Families who underspend on housing appear to be more likely to move than families who overspend. This finding is consistent with the 'rachet effect' in consumption. Families are quick to adjust their consumption upward, but are hesitant to reduce consumption if they are overspending relative to their income.

b) Unit Price Differential

The variable ADJRENT has a positive and highly significant coefficient at 99 per cent level of signficance. The positive coefficient indicates that renters do gain from long-term rent contracts and are hesitant to move out of houses where they have been staying for some length of time or when a bad choice was made earlier with the price paid exceeding the market price.

c) Life-cycle Effects

The age of the head of household and its interaction with underconsumption in housing (UNDAGE1, UNDAGE2)[8] are included to see the life-cycle effects on mobility. As heads get older the benefits of moving are spread over a shorter period of time in the life-cycle sense. Therefore, given the size of the disequilibrium the probability of moving ought to decline with age.

Coefficients of the life cycle variables are always highly significant at the 95 per cent level of significance. The consistently negative coefficient implies an inverse relationship between age of the head and mobility indicating that older heads are less mobile, given the disequilibrium in housing consumption. The mean spot elasticity for the age variable in Table 3 is close to -0.6 (column 3). These results confirm the hypothesis that the need for housing generated by changes in the life-cycle are a significant determinant of mobility.

d) Moving Costs

Moving involves substantial costs, both direct and indirect, of a financial and psychic nature. In addition to the money costs of moving, the psychic costs of severing social ties may be substantial for some families. Studies of determinants of mobility often include moving costs in their analysis. Since it is difficult to measure these costs directly, proxies are used in most analyses. The propensity to move is expected to be inversely related to all moving costs.

[8] Two dummy variables are defined as 35 years - 49 years, (AGE1) 49 years and above (AGE2). Interaction terms - UDAGE1, UDAGE2 are the interaction terms with the underconsumption in housing variable.

The variable used as a proxy for moving costs in this analysis is household size. Household size is assumed to be proportionately related to the direct costs of moving. The variable has a negative and highly significant coefficient (99 per cent level of significance) in all the mobility equations. It has an elasticity of around -0.4 as shown in Table 3. Neither the level of significance nor the magnitude of the coefficient is influenced by the choice of the disequilibrium variable or by altering specifications. The above results are comparable to other studies where moving costs are an important and substantial deterrent to household residential mobility.

e) Workplace Location

The workplace location variable (WORKLOC) has a significant and a positive coefficient. This shows that decisions on workplace and residential locations are made, more or less, simultaneously and households which have changed their job location recently are more likely to move. The link of residential location with work place location also explains why previous attempts in Karachi to relocate the poor away from their places of employment have failed.

TABLE 3

Mean Spot Elasticities
(Probability of Moving)

	(1)	(2)	(3)
OVRPDIS	-0.24 - 01	-0.60 - 02	-0.40 - 02
UNDPDIS	0.17	0.80 - 01	0.79 - 01
AGE	-0.70	0.21	-0.19 - 01
UDAGE1	-0.30 - 01	0.10 - 01	-0.10 - 01
UDAGE2	-0.55 - 01	0.20 - 01	-0.17 - 01
HHSIZE	-0.43	-0.13	-0.12
ADJRENT	-	0.50 - 01	0.50 - 01
WORKLOC	-	-	0.70 - 02
MIG	-	-	0.20 - 02
MLOCY	-	-	-0.10 - 01

f) Migration Status

Results of the analysis show that the migration status variable, MIG, is highly significant with a very high positive coefficient of 0.61 indicating that probability of moving is not only sensitive to this variable but the effect is substantial. The above results are consistent and robust in the sense that the inclusion of the variable adds considerably to the Chi-Square statistic and neither the magnitude of coefficients nor their significance level is effected by the choice of disequilibrium variable or change in specification.

g) Location Specific Income

MLOCY consistently has a negative and highly significant coefficient when used with different measures of disequilibrium. The magnitude of the effect, however, is small.

VI. Conclusions

This paper extends the basic disequilibrium model of residential mobility to allow not only for desired changes in housing consumption but also in tenurial status and unit price differences. In addition, life cycle effects on the probability of moving have been explicitly incorporated. Further, a number of variables like changes in work place location, migration status, location specific income, etc., have been included to capture the peculiar features of the housing and labor markets in developing countries.

The empirical results confirm the importance of all the above extensions to the standard neo-classical model of intra-urban residential mobility in the context of a large, metropolitan city, Karachi, of a low income developing country Pakistan. Contrary to expectations, mobility rates appear to be high in Karachi because of, first, the general tendency for underconsumption of housing caused primarily by limited access to and imperfections in the credit market and lack of supply response of infrastructure and construction inputs, second, high rates of in-migration, third, increase in the proportion of young household heads and, fourth, rapid changes in work place locations because of transformation in the economic and spatial structure of the city. Mobility rates could have been even higher but for the high rate of owner-occupancy in the city, location specificity of a large component of income in the informal sector and the high prevalence of long term tenure discounts arising largely from rent control and key money transactions in the older and central parts of the city.

The high observed rate of residential mobility implies the need for planners to observe at regular intervals the pattern of intra-city population movement so as to determine changes in residential densities at the neighbourhood level and orient thereby the provision of municipal infrastructure to fast growing areas. Also, intervention may be required if high rates of mobility reinforce the tendency towards spatial segregation in the city by income level or ethnicity. This is essential if the level of urban crime and violence is to be minimised.

Applied Economics Research Centre
University of Karachi, and
Social Policy and Development Centre
Karachi

References

Cronin, F., 1979, An economic analysis of intra-urban search and mobility using alternate benefit measures, Washington D.C.: The Urban Institute.

Goldstein, S., A. Pitaktepsombati and A.Goldstein, 1976, Migration and urban growth in Thailand: An exploration of inter-relations among origin, recency and frequency of moves, in: A.H. Richmond and D.Kubat, eds., Internal migration: New and the Third World, USA: Sage Studies.

Goodman, A.C., 1988, An econometric model of housing price, permanent income, tenure choice and housing demand, Journal of Urban Economics, 23(3): 327-353.

Goodman Jr, J.L., 1976, Housing consumption disequilibrium and local residential mobility, Environment and Planning, A-8: 855-874.

Greenwood, M.J., 1975, Research on internal migration in the United States: A survey, Journal of Economic Literature, 13(2): 397-433.

Hanushek, E.A., and J.M.Quigley, 1978; An explicit model of intra-metropolitan mobility, Land Economics, 54(4): 411-429.

Harris, J., and M. Todaro, 1970, Migration, unemployment and development: A two sector analysis, American Economic Review, 60(1): 126-42.

Henderson J.V., and Y.M. Ioannides, 1989, Dynamic aspects of consumer decisions in housing markets, Journal of Urban Economics, 26(2): 212-230.

Levy, M.B., and W.J. Wadycki, 1974, Education and the decision to migrate: An econometric analysis of migration in Venezuela," Econometrica, 42(2): 377-388.

Onaka, J., 1983, A multi-attribute housing consumption disequilibrium model of intra-metropolitan residential mobility, Environment and Planning, A-15: 751-765.

Onaka, J., and W.A.V. Clark, 1983, A disaggregate model of residential mobility and housing choice, Geographical Analysis, 15: 287-304.

Quigley, J.M., and D.H. Weinberg, 1977, Intra-metropolitan residential mobility: Review and Synthesis, International Regional Science Review, 2: 41-66.

Rosenthal, S.S., 1988, A residence time model of housing markets, Journal of Public Economics, 36(1): 87-109.

Shefer, D., and N. Primo, 1985, The determinants of housing migration into and out of distressed neighbourhoods, Urban Studies, 22(4): 339-347.

Weinberg, D.H., 1979, The determinants of intra-urban household mobility, Regional Science and Urban Economics, 9: 219-246.

Weinberg, D.H., J. Friedman and S.K. Mayo, 1981, Intra-urban residential mobility: The role of transactions costs, market imperfections and household disequilibrium, Journal of Urban Economics, 9(3): 332-348.

Zorn, P.M., 1988, An analysis of household mobility and tenure choice: An empirical study of Korea, Journal of Urban Economics, 24(2): 113-128.

Appendix-A

Estimation of Tenure Choice Equation

The tenure choice equation is estimated through the maximum liklihood probit technique (used in most studies on tenure choice). The dependent variable is the probability of ownership (taking value of one for owner households, and zero for rented ones). The independent variables in the analysis are size of household (HHSIZE) permanent income (MYLIN), transitory income (TMYLIN), age of head (AGE) and dummy variable taking value of one for Planned Areas, zero for Katchi Abadis.

Permanent and transitory household incomes are estimated in the following way:

Measured income (y) of an individual consists of permanent and transitory components.

$$Y = Y_p + Y_t \qquad (A1)$$

Permanent income is estimated for over 10,000 workers in Karachi as:

$$Y^p = (P, S, E, A, A^2) \qquad (A2)$$

Where P = Period of employment in current job; S = Skill (skilled = one, otherwise zero); E = Education (years); A = Age; A^2 = Squared term of age.

Results are reported in Table A-1 below.

TABLE A-1

Estimated Parameters of Probit Tenure Choice Equation
(Dependent Variable Probability of Owning)
(t-statistics in parenthesis)

HHSIZE	0.059
	(3.90) ***
MYLIN	0.0001
	(2.84) ***
TMYLIN	-0.0001
	(-1.56)
AGE	0.0054
	(1.66) *
DUMMY	0.2936
	(3.144) ***
CONSTANT	-1.1503
	(-4.54)
CHI SQUARE	36.03
SIG. LEVEL OF (CHI SQUARE)	99.9%

* Significant at the 90 per cent level of significance.
** Significant at the 95 per cent level of significance.
*** Significant at the 99 per cent level of significance.

Appendix-B

Estimation of the Demand for Housing

Linear demand equations are separately estimated for renter and owner households. The variables included in the equations are permanent household income (MYLIN), transitory household income (TMYLIN), age of head (AGE), household size (HHSIZE), education of the head (EDUC) and LAMBDA (Mills Ratio) variable which is included to see if there is simultaneity between choice of tenure and consumption of housing. The results are presented in Table B-1 below.

TABLE B-1
Housing Demand Equations
(t-statistics in parenthesis)

	Renter Households	Owner Households
MYLIN	0.19	0.26
	(4.61)***	(6.46)***
TMYLIN	-0.16	-0.13
	(-10.73)***	(-9.75)***
AGE	9.31	10.71
	(4.70)***	(6.13)***
HHSIZE	34.87	78.74
	(2.80)***	(7.03)***
EDUC	35.60	16.23
	(3.43)***	(1.70)*
LAMBDA	631.25	561.48
	(2.37)***	(5.96)***
CONSTANT	-1103.26	-1799.86
	(-3.53)	(-6.02)
R^2	0.65	0.61
$\bar{R}^2$	0.42	0.37
F	54.52	56.42
N OF CASES	461	583

* Significant at the 90 per cent level of significance.
** Significant at the 95 per cent level of significance.
*** Significant at the 99 per cent level of significance.

Appendix-C

Sampling Methodology and Descriptive Statistics of Data

A survey of 6275 households was conducted by the Applied Economics Research Centre, University of Karachi in 1987-88. The sample for the survey was spatially distributed throughout the city of Karachi. It was allocated to the different areas (planning zones) of the city on the basis of their population. Sample within the zones was allocated to the different types of houses on the basis of net residential area under each type of use. Sixty five per cent of the sample was allocated to the Planned Areas and thirty-five per cent to the Katchi Abadis (unplanned and illegal settlements).

In the Planned Areas, zones were divided into clusters on basis of plotsizes and the sample was distributed in proportion to the number of plots by size. This was done separately for each type of housing category within the zone. In case of flat sites one household on each floor was selected from each block in a housing complex.

Since no information on number of plots is available the sample in Katchi Abadis was spatially distributed between clusters of predominant housing types. Within each cluster starting points for selection of households were determined randomly. A Monte Carlo experiment indicated that movement in all directions from the starting points was the best strategy. Whether to turn left or right at every intersection was decided by the toss of a coin. Then every fifth house was chosen for interview. With houses on both sides of the street toss of a coin again decided whether to select the house on the right or on the left.

In case of subdivision of plots or different households living on separate floors all households living in the selected structure were interviewed.

Summary statistics of the key variables are given in Table C-1 below.

TABLE C-1

Summary Statistics for Key Variables

	Mean	Standard Deviation
OVRPDIS	0.27	0.97
UNDPDIS	0.19	0.28
AGE (Years)	43.61	13.42
UDAGE1	0.064	0.19
UDAGE2	0.081	0.20
HHSIZE (Numbers)	7.12	3.32
ADJRENT	-90.81	267.88
WORKLOC	0.14	0.35
MIG	0.058	0.23
MLOCY (Rs.)	443.78	944.17
MYLIN (Rs.)	2177.50	976.33
TMYLIN (Rs.)	-26.15	1475.96
DUMMY	0.58	0.36
EDUC (Years)	6.62	13.00
PLOTSZE (Sq. yds.)	117.99	131.87
ROOM (Numbers)	2.52	1.37
BATH (Numbers)	1.12	0.48
WALL	0.75	0.44
ROOF	0.59	0.49
WTR	0.69	0.46
ELECTR	0.90	0.30
PARK	0.28	0.45
GARBCL	0.56	0.49
PERRES (Years)	8.72	10.74

Appendix-D

A hedonic equation is estimated using data on 1072 rented houses properties in the city of Karachi. This equation is used to determine the imputed rent of owner properties. The standard Box Cox transformation is used to identify the best functional form. The following equation is estimated:

$$\frac{P^{\lambda}-1}{\lambda} = \alpha_o + \sum_{i=1}^{n} \alpha_i z_i^{\lambda} + e$$

where:

P	=	rent.
Z_i	=	housing traits.
P^{λ}, Z^{λ}	=	Box Cox transformations.
α_i	=	parameters of the model.
e	=	the error term.

Four sets of variables are used in the analysis, size, quality, services, neighbourhood characeristics and period of residence. Plotsize (PLOTSZE), number of rooms (ROOMS), and number of bathrooms (BATH) measure size. The quality of dwelling variables included are plastered Wall (WALL) and quality of roof (ROOF). Availability of water (WTR), and electricity (ELECTR) are included to represent services. The PARK and GARBCL variables represent neighbourhood characteristics of avaiability of a park as a playground. Another variable included in the analysis is the period of residence in present dwelling (PERRES). Results are presented in Table D-1 below:

TABLE D-1
Hedonic Coefficients
(t-statistics in parenthesis)

PLOTSZE	0.619
	(12.15)***
ROOM	1.657
	(9.11)***
BATH	0.267
	(2.20)**
WALL	0.072
	(1.18)
ROOF	1.13
	(0.36)
WTR	0.220
	(3.38)***
ELECTR	43.99
	(0.98)
PARK	0.329
	(6.16)***
GARBCL	0.079
	(1.66)*
PERRES	- 0.684
	(-13.09)***
CONSTANT	0.558
	(2.30)
R^2	0.698
$\bar{R}^2$	0.49
F	136.64
NO. OF CASES	1072

* Significant at the 90 per cent level of significance.
** Significant at the 95 per cent level of significance.
*** Significant at the 99 per cent level of significance.