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Residential Mobility Intention by Tenure Type in Korea

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<Abstract>

The present paper jointly estimates residential mobility intention and tenure status in Seoul, korea, with using a recursive probit model including a dichotomous endogenous variable. Furthermore, this paper incorporates the disequilibrium framework and the behavioral aspects of household mobility decision analysis. Disequilibrium in housing services consumption significantly changes the probability of expected moving, but the marginal effects are smaller than we expected. The interaction assumption of duration-of-stay is well supported by the estimation results, especially for renters. The probability of moving intention increases up to 4.5 years of duration at a same place, and then it declines, if everything else is equal, for renters. Savings for housing services improvement have a strong and positive relationship with the probabilility of expected moving. It is a particular effect in the context of imperfect housing financing market in Korea. The probability of moving intention declines with age of household head. Given an age group, the probability increases as household income grows, and the probability appears higher in the newly developed areas than in the old areas of Seoul, Korea. Finally, in contrast to the findings from the previous studies, tenure status has no significant impact on moving intention.

주거소유형태에 따른 주거이동의향의 분석

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<요 약>

본 논문은 서울의 1,500가구를 대상으로 하여 주택소유형태에 따른 주거이동의향을 이분외생변수를 가지는 축차프로빗모형을 사용하여 추정하였다. 본 논문에서는 가구의 주거이동의사결정을 경제적 측면에서의 가구의 주거서비스 소비의 불균형뿐만 아니라 가구의 사회심리적 행태 측면에서도 조사해 보았다. 주거서비스 소비에서의 불균형이 클수록 주거이동의향은 높게 나타났지만, 그 한계효과는 기대했던 것 보다 낮았다. 차가의 경우, 모든 조건이 같다면 같은 집에서 산 기간이 4.5년이 되기까지는 이사의향이 커지지만 그 이후에는 낮아진다. 주거서비스의 개선을 위한 저축은 잠재적 주거이동의 확률과 강력한 양의 관계를 가지는 데, 이것은 한국에서의 불완전한 주택금융시장의 운영측면을 암시하고 있다. 주거이동의향의 확률은 가구주의 나이가 높아짐에 따라 낮아지며, 같은 나이이면 가구소득이 높아짐에 따라 주거이동의향이 높아진다. 또한 강남의 신개발지역 거주자의 주거이동의향이 강북지역보다 높게 나타난다. 마지막으로 선진국의 경우와는 달리 주거이동의향의 확률이 차가와 자가간에 유의한 차이가 없다는 점이 한국주택시장의 한 특징으로 나타났다.

1. Introduction

Housing is the single most important asset of an individual household. Move decision is therefore crucial to adjust housing services of individual households.[1] The study of household mobility within a metropolitan area is very important to understand individual household behavior of residential mobility and the change of intra-urban spatial structure as the aggregate outcome of residential mobility. In a developing economy with insufficient housing quantity and quality, intra-urban residential mobility studies are essential to provide insight for housing policy development (especially housing supply policy) and relevant urban planning (public transit planning, zoning, etc.). The present paper analyzes residential mobility intention within future two years in relation to the current tenure status in Seoul, Korea.

A variety of approaches have been applied to explain residential mobility behavior. Sociologists usually conceptualize intra-urban residential mobility on the basis of life-cycle theory (Rossi, 1955 and Doling 1976) and threshold theory of residential satisfaction level (Speare et al, 1974) and/or environmental stress (Wolpert, 1965 and 1966). Among them, Rossi (1955) has continously influenced the later mobility studies which attempt to conceptualize the linkage between housing demand and residential mobility.

Urban geographers contribute to the conceptualization of intra-urban mobility in terms of urban structual change (Bible and Brown, 1980 and Huff, 1979).

1. This is especially important for renters in that the possibility of changing the characteristics of their dwellings is very limited.

Economic geographers (Brown and Longbrake, 1970, Brummell, 1979, and Clark and Cadwaller, 1973) interrelate the concepts of *place utility* and *residential stress* within the framework of consumer theory. Huff and Clark (1978) attempt to link between the concept of *cumulative inertia* as a certain resistance to move and the concept of residential stress as a stimulus to move. Some geographers also conceptualize intra-urban residential mobility on the basis of life-cycle theory and housing adjustment (Clark and Onaka, 1985), and life-cycle stages and urban structual change (Webber, 1983a and 1983b).

Psychologists' cognitive-behavioral approach tends to focus on the reasons of moving for individual households (Brown, 1983). This approach investigates *facets*[2] which individual households confront at each of stages of residential moving.

Demographers also have interest in population redistribution and urban spatial structural change within a metropolitan area in terms of intra-urban mobility (Frey, 1978, 1979, 1980, 1983, and 1984, and Frey and Kobrin, 1982).

Economic approach of residential mobility studies generally starts with the utility maximization framework. Economists consider residential mobility as the process of adjustment of housing services consumption toward the utility-maximzation bundle of housing characteristics (Goodman, 1976, Hanushek and Quigley, 1978, Weinberg, 1979, and Weinberg, Friedman, and Mayo, 1981). Residential mobility incentives are assumed to be dependent on the gap between the actual level of housing services consumption and the desired or optimal one. This framework is referred to as the disequilibrium model of residential mobility analysis.[3] While Weinberg et al (1981) analyze residential mobility on the theoretical basis of the works of Goodman (1976) and Hanushek and Quigley (1978), they emphasize the cost-benefit analysis framework for moving decision.

Although economic approach provides an insightful framework to analyze residential mobility incentives, it still neglects the linkage between the disequilibrium model and the earlier sociological and cognitive-behavioral model. While we basically utilize the disequilibrium framework to analyze residential moving intention, we intend to synthesize economic approach and other streams of residential mobility studies in this paper. One purpose of the present paper is thus to provide a synthesis and an extension of the previous concepts for futher theoretical and empirical analysis of intra-urban residential mobility. The other purpose of the present paper is concerned about a methodological issue. As Hanushek and Quigley (1978) note, the relevant moving decision may well be

2. Facet theory recognizes that people, objects, and things are frequently defined in terms of several relevant dimensions referred to as facets, whose constituents elements make up the values on that dimension (Brown, 1983).
3. Brummel (1979) also develops a geographical framework of residential mobility which is analogous to the disequilibrium model. He assumes that the decision to move is based on the difference between experienced and aspiration place utility, which is defined as the household's residential stress.

endogenous due to different tenure status of individual households.[4] In order to consider such endogeneity, we jointly estimate mobility intention and tenture status with using a recursive probit model including a dichotomous endogenous variable (Maddala, 1983, 122-124).

This paper is organized in the following manner: In section 2, a theoretical framework and a model are provided for residential mobility analysis. In section 3, some methodological issues about joint estimation of mobility intention and tenure status are discussed. In section 4, an empirical model is specified, and variables are defined. In section 5, our assumptions and hypotheses are empirically tested, and the empirical results are discussed. Finally, the results are summarized, and some policy implications and issues for further studies are discussed in section 6.

2. Theoretical Framework and Model for Residential Mobility Analysis

Residential mobility is basically treated as a process of housing demand adjustment based on the household utility maximization framework. Household utility U depends on housing services consumption H and other goods X:

$$U = U(H, X) \qquad (1)$$

If it is assumed that an invidual household consumes H and X with its permanent income Y, then a household budget constraint is given:

$$Y \geq HP^h + XP^x + T(D) \qquad (2)$$

where

P^h indicates the unit price of housing services;

P^x indicaters the unit price of other goods;

$T(D)$ indicates transportation expenditure at distance D from the CBD.

From equations (1) and (2), household utility maximization conditions are:

$$Y = HP^h + XP^x + T(D) \qquad (3)$$

$$U_h/U_x = P^h/P^x \qquad (4)$$

$$HP^h{}_d + T_d = 0 \qquad (5)$$

4. Recently, a model of households' joint mobility-tenure decisions is of interest because of simultaneity between mobility and tenure decision. Boehm (1981), Krumm (1984), Lee (1985), and Zorn (1988) utilize the conditional logit model developed by McFadden (1973) to analyze joint mobility-tenure decision.

Equations (3) and (4) indicate that for individual household utility maximization, all the budget has to be spent, and the ratio of the marginal utilities from the consumption of additional unit of H and X is equal to the ratio of their prices.[5] Equation (5) means that at the margin housing location does not change the household utility in the equilibrium state.[6]

The household utility function may change over time because of preference shift due to the change of other household characteristics and the relative price of housing. Thus, housing demand for an individual household[7] will change with the shift of household characteristics and preference over time. Any change of housing demand of an individual household causes a discrepancy between the actual (or experienced) level of housing services consumption (H^a) and the desired or optimal one (H^d). Such a discrepancy may be an incentive to adjust housing consumption and thus to move.[8]

Considering adjustment costs (discrepancy of housing services consumption, transaction and searching costs, distribution of housing prices, and other locational factors to be individual specific), moving decision becomes more complicated. However, under the control of other factors, the incentive to move depends on the change in the equilibrium housing services consumption of an individual household (Hanushek and Quigley, 1978). Whether an individual household has an intention to move in near future or not is a function of the difference between the actual housing services consumption and the desired (optimal) one.[9] In the context, mobility intention M can be expressed as follows:

$$M = f(H^d - H^a);\ Z) \qquad (6)$$

where

Z indicates household characteristics.

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5. U_h and U_x represent the first partial derivatives of the utility functions in terms of H and X, respectively.
6. $P^h{}_d$ means the first partial derivative of the housing price function in terms of D, and T_d indicates the first derivative of the transportation expenditure function in terms of D.
7. The housing demand function is derived from the household utility maximization conditions as: $H=H(Y-T(D),\ P^h/P^x;\ Z)$; where Z indicatese household characteristics.
8. Move seems to be the sole means of adjustment of housing services consumption for renters, but owners may adjust their housing services consumption by extension, remodelling, renovation of their existing houses. However, the most usual way to adjust housing services consumption seems to be a move for both owners and renters.
9. In fact, the desired level of housing services consumption changes over time, and the difference between the desired levels at present and in the future may affect moving intention at present. However, we have no information about the time that individual households with moving intention will move during the given time period. Thus, we do not distinguish the desired level of housing services consumption at present and that in the future.

Although the difference between the actual housing services consumption and the desired one (the amount of disequilibrium) is same for some households, the intensity of moving intention seems to be different due to the current (actual) housing services consumption.[10] Equation (6) is represented in terms of the percentage change of housing services consumption as follows:

$$M = f(H^d-H^a)/H^a;\ Z) \qquad (7)$$

In fact, moving intention of a household with the positive difference (underconsumption) seems to be different from that of an overconsumption household with the negative difference. Underconsumption is likely to be more sensitive to moving decision than overconsumption. Especially, given rapid housing appreciation in Seoul, Korea, overconsumption households have little incentive to adjust their housing services consumption into the lower level at least in the short run. In the context, equation (7) is modified as follows:

$$M = f(E_1, E_2;\ Z) \qquad (8)$$

where

$E_1 = (H^d-H^a)/H^a$ *if* $H^d-H^a \geq 0$, $E_1 = 0$ *otherwise*

$E_2 = (H^a-H^d)/H^a$ *if* $H^d-H^a < 0$, $E_2 = 0$ *otherwise*

Housing services are basically composed of three factors such as housing size, quality, and location. Housing services consumption is thus trade-off among those three factors, given a budget constraint. Although H^d and H^a are approximately same, the actual consumption and the desired one of each of three factors may be not equal because of the offset effect between overconsumption of one/two factor (s) and underconsumption of the other(s) (Goodman, 1976). It means that the effect of disequilibrium level of each factor on moving intention may be independent of that of total housing services consumption. However, the optimal level of each factor can be considered only when the other factors are controlled. In the present paper, we focus on the size disequilibrium effect on moving intention. The size disequilibrium effect can be treated on the same conceptual framework as the disequilibrium effect of housing services consumption. If we use number of rooms as a proxy of housing size, the model is extended in order to investigate the independent effect of size disequilibrium as follows:

$$M = f(E_1, E_2, R_1, R_2;\ Z) \qquad (9)$$

where

$R_1 = (R^d-R^a)/R^a$ *if* $R^d-R^a \geq 0$, $R_1 = 0$ *otherwise*

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10 Consider two households A and B, whose amount of disequilibrium is 50, and actual housing services consumption is 100 for A and 50 for B. If it is the case, the intensity of moving intention of B may be greater than that of A.

$R_2 = (R^a-R^d)/R^a$ *if* $R^d-R^a < 0$, $R_2 = 0$ *otherwise*
R^d *indicates desired number of rooms;*
R^a *indicates actual number of rooms;*

Moving costs will be an important resistance factor to residential mobility. Moving costs are generally composed of out-of-pocket costs, searching costs, and psychological costs of moving (Weinberg et al, 1981).

Out-of-pocket moving costs vary with tenure status. For owners, out-of-pocket costs include broker's fee (approximately 0.5%), title registration tax (3%) for a new house, real property acquisition tax (2% of purchasing price), real property transfer tax in the special case[11], transportation costs of moving, and other closing costs in Korea. In the context, out-of-pocket costs of moving for owners are arbitrarily calculated to be 8 % of the purchasing price of a new housing unit in the present paper.[12] For renters, out-of-pocket costs are less substantial than those of owners. The costs for renters are also arbitrarily calculated to be 3 % of annual rent under the consideration of broker's fee, transportation and other closing costs.

Searching costs are very difficult to measure, and the impact of searching costs on residential mobility may be more relevantly analyzed for the previous moving decision than for the future intention to move, because potential movers in future tend not to consider searching itself seriously until they are really under the searching process. In the present paper, thus, searching costs are not considered.

Psychological costs of moving are related to the degree of neighborhood social attachment. Those costs vary with household types and individual characteristics of household members. Duration-of-stay is usually used as a proxy of psychological costs of moving. The cumulative inertia hypothesis assumes that the propensity to move is inversely related to duration-of-stay at a same place (Morrison, 1967 and McGinnis, 1968). The hypothesis explicitly indicates that longer stay of residence tends to increase psychological costs of moving as a resistance to move. In contrast, the independent trials hypothesis implicitly assumes that the prior residential history of a potential mover has no impact on the probability of subsequent moving (Brown and Longbrake, 1970, and Huff and Clark, 1978).

In terms of psychological costs of moving, the cumulative inertia hypothesis seems to be plausible. However, the effect of duration-of-stay on residential mobility should be considered to be the interaction between residential stress and cumulative inertia. We therefore assume that the cognitive level of residential

11. If a household owning more than one housing unit sells one of them, large amount of transfer tax (50% of land price and 30% of housing structure price) is imposed. However, transfer tax is not imposed on transaction of the household with just one housing unit.
12. de Leeuw and Ekanem (1971) estimate out-of-pocket costs of moving to be 10-20% of annual expenditure for the U.S.

stress increases more rapidly than that of cumulative inertia as resistance to move in the early stage of residence at a certain place, and then cumulative inertia increases more rapidly than residential stress does. If our assumption is relevant, the probability of move will increase over time in the early stage of residence, and then will decline after a certain length of stay. In order to test the assumption, both duration-of-stay and duration-of-stay squared terms are employed as independent variables in our empirical model.

As Rossi (1955) points out, the life-cycle events such as marriage, birth of a new baby, and death of household members have impacts on household preference and thus on moving decision. There is little consensus on the concept of life-cycle[13], but many previous studies utilize age of household head to distinguish life-cycle stages, and mostly coincide in the fact that the probability of moving declines with age of household head (Porell, 1984). We investigate the age effect on moving intention in our empirical model, and then we will delve into change of the mobility propensity according to a specific household life-cycle stage in the late part of the present paper.

As shown in equation (5), shift of location by move does not change the household utility at the margin due to the offset effect between transportation expenditure and housing price in the equilibrium state. However, the equilibrium state is very rare in a rapidly changing (growing) metropolis because of geographical uneven grown within a metropolitan area, rapid improvement of public transit system, and rapid changes of urban infra-structure. Thus if a household has information that $HP^{h}_{d}+T_{d}<0$ in a certain local area of the city, the household is likely to move into the area and thus increases utility.[14] This encourages intra-urban migration from central city to suburbs and among suburbs. However, that effect on moving is difficult to measure without a substantial information about spatial structural changes. However, the effect of transportation expenditure on moving decision will be prominent in the newly developed areas, and it also reflects suburban uneven development and heterogeneity within a metropolitan area.

Finally, we consider the effect of household savings for housing service improvement[15] on mobility intention. In the Korean housing market, in which the housing financing system is poorly developed[16], household savings are one of the

13 For comparison of the various definitions of life-cycle, see Pickvance(1973), Coupe and Morgan(1981), and Kim(1987).

14 The case can be shown when a new bridge or road is constructed in a certain area of the city. In the area, transportation costs will decrease immediately, but house price will respond more slowly than transportation cost will in the short-run because of the time lag of price adjustment. The phenomenon will be an incentive of moving into the area until housing price is adjusted to the equilibrium price.

15. In Korea, savings for housing improvement (savings account for housing purchase) are encouraged to increase housing financing fund, and priority of new apartment purchase is given to the households with the savings account

16 For more details, see Gyourko and Han(1989) and Kim (1990).

most important source to improve housing services. The effect of household savings for housing improvement on moving decision will be evident. But the effect may be captured in the effect of housing services consumption disequilibrium, because the existence of such savings violates one of the utility maximization conditions shown in equations (3-5). And thus a household with the savings cannot maximize its utility and must lie in the suboptimality. On the other hand, if mobility is considered to be a strategy to achieve a stated goal, savings for housing improvement may have some independent effect on moving decision. It is different from the disequilibrium effect of housing services consumption as a sort of response behavior, because savings for housing improvement are a manifestly stated goal to improve housing services in future.

3. Methodological Issues and Estimation Procedure

Moving decision of owners seems to be different from that of renters because of the different magnitude of transaction costs and different preference between oweners and renters. Mobility intention may be affected by the current tenure status of an individual household, which is endogenously determined. Thus, mobility intention and tenure status should be jointly estimated. For the purpose, we utilize a recursive probit model including a dichotomous endogenous variable.[17]

Consider two equations determining tenure status and mobility intention as follows:

$$T^* = X_t B_t + \varepsilon_t \quad (10)$$

$$M^* = \gamma T + X_m B_m + \varepsilon_m \quad (11)$$

where

T^* and M^*: unobservable indexes determining tenure status and mobility intention, respectively; $T=1$ if $T^*>0$, $T=0$ otherwise; $M=1$ if $M^*>0$, $M=0$ otherwise

X_t and X_m: independent variable vectors

ε_t and ε_m: disturbance terms

B_t, B_m, and γ: parameters to be estimated

For estimation of the model, we use a maximum likelihood (ML) method. If ε_t and ε_m are not independent, separate estimation of equation (11) does not guaratee the consistent parameter estimates. Moreover, the two stage method, in which the probit estimates B_t are first obtained and then $\Phi(X_t B_t)$[18] is substituted

17. The model is a modification of Heckman's two stage model (Heckman, 1976 and 1979).

18. $\Phi(\cdot)$ indicates the cumulative density function, and $\phi(\cdot)$ indicates the standard

for T, is invalid in this model (Maddala, 1983, 122-124). Instead of the two stage model, Maddala (1983) suggests the following model as:

$$M^* = \gamma\hat{T} + X_mB_m + \varepsilon_m \qquad (12)$$
where $\hat{T} = \text{Prob}(T^* \geq 0)$

He also suggests that in this case the substitution of $\Phi(X_tB_t)$ for $\hat{T}$ is valid, and the resulting estimates of equation (12) can be consistent. In this context, our model is represented as follows:

$$T^* = X_tB_t + \varepsilon_t \qquad (13)$$
$$M_o^* = \gamma_o\Phi(X_tB_t) + X_oB_o + \varepsilon_o \qquad (14)$$
$$M_r^* = \gamma_r\Phi(-X_tB_t) + X_rB_r + \varepsilon_r \qquad (15) \qquad (3.6)$$
where
$M_o=1$ if $(M_o^*>0 \mid T=1)$, $M_o=0$ otherwise
$M_r=1$ if $(M_r^*>0 \mid T=0)$, $M_r=0$ otherwise

For estimation of the model, we first estimate equation (13) by the probit ML method, and $\Phi(X_tB_t)$ and $\Phi(-X_tb_t)$ enter into equation (14) for owners and equation (15) for renters, respectively. Then equations (14) and (15) are separately estimated by the probit ML method.

4. Data, Model Specification, and Variable Definition

The data utilized in the present paper is the cross-sectional survey data collected in 1982 as part of a national housing survey in Korea, which is conducted by the Korea Research Institute for Human Settlement (KRIHS) in Seoul, Korea, and sponsored by the World Bank. The data include following information: 1) household characteristics; 2) housing characteristics; 3) household's previous mobility history and future mobility intention; 4) housing improvement history; and 5) household attitude and opinions. Additional micro-land value information is obtained from the data published by the Korea Appraisal Board.[19] Some descriptive statistics are presented in Table 1.

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normal probability density function

19. The Korea Appraisal Board has been maintaining records of land prices by Dong, which is the smallest administrative division in Korean cities - average size of Dongs in Seoul in 2.061 km^2 in 1982.

Table 1. Household Characteristics and Housing Market Conditions in Seoul

	Owner			Renter		
	Mean	Min	Max	Mean	Min	Max
Household Income*	574.04	30.00	17000.00	332.83	60.00	203.00
Household Size	5.63	1.00	12.00	2.78	1.00	12.00
Household Head Age	42.98	17.00	64.00	39.96	16.00	68.00
Number of Rooms	3.08	1.00	9.00	1.78	1.00	5.00
Person/Room	2.18	0.25	12.00	2.25	0.40	10.00
Transportation Expenditure*	38.60	0.00	350.00	20.42	0.00	250.00
Savings for Housing Improvement*	8.49	0.00	600.00	36.38	0.00	320.00
Housing Service Expenditure*	358.49	0.00	2748.33	124.76	0.00	570.00

*: thousand Won (700 Won per US Dollar) per month

Two moility intention equations are specified on the basis of the theoretical and methodological framework in the previous sections, and a tenure status equation is specified based on household characteristics as follows:

$$T = T(PI, SZH, AGHH, SXHH, MSH) + \varepsilon_t \quad (16)$$

$$M_O = \Psi(E_1, E_2, R_1, R_2, MC, AGHH, DS, DS^2, MSH, TE, \Phi_O) + \varepsilon_O \quad (17)$$

$$M_r = \Omega(E_1, E_2, R_1, R_2, MC, AGHH, DS, DS^2, MSH, TE, \Phi_r) + \varepsilon_r \quad (18)$$

All the dependent variables in the model are dichotomous; T=1 if an owner, T= 0 otherwise; M_O (M_r) = 1 if an owner (a renter) has moving intention in near future (within future two years), M_O (M_r) = 0 otherwise. All the independent variables are described in Table 2. The expected signs of the coefficients, which are based on the theoretical framework discussed in section 2, are also presented in Table 2.

All the independent variables described in Table 2 are self-explanatory, but some variables have measurement problems. We discuss the measurement methods of such variables as permanent income (PI), ratios of disequilibrium to actual housing services consumption (E_1 amd E_2), and ratios of disequilibrium to actual number of rooms (R_1 and R_2).

First, permanent income is measured by the fitted value of a regression of current income on characteristics related to life-time earnings (Mayo, 1981 and Harmon, 1988). The regression equation of current income is structured on the basis of the human capital theory.[20]

20. $CI=\beta_0+\beta_1 AGHH+\beta_2 AGIIH^2+\beta_3 EDU+\beta_4 EDU^2+\beta_5 INT+\beta_6+\Sigma c_i D_i+\varepsilon$ where CI: household current income; AGIIH: age of household head; EDU: schooling years of household head; INT: monetary interest income; SXHH: gender of household head; D_i's:

Table 2. Variable Definitions, Descriptive Statistics, and Hypothetical Signs

Variable	Definition	Mean(std) Owner	Mean(std) Renter	Expected Sign
E_1	$(H^d-H^a)/Ha$ if $H^d>H^a$	1.269	1.180	+
	0 otherwise	(3.886)	(1.726)	
E_2	$(H^a-H^d)/H^a$ if $H^d<H^a$	0.489	0.065	+
	0 otherwise	(0.359)	0.284	
R_1	$(R^d-R^a)/R^a$ if $R^d>R^a$	0.353	0.284	+
	0 otherwise	(0.381)	(0.359)	
R_2	$(R^a-R^d)/R^a$ if $R^d<R^a$	0.015	0.127	+
	0 otherwise	(0.068)	(0.168)	
MC	out-of-pocket moving costs*	221.700	20.474	−
		(346.050)	(16.157)	
AGHH	age of household head	43.981	39.955	−
		(13.076)	(12.100)	
DS	duration-of-stay (years)	4.676	2.109	+
		(2.697)	(2.229)	
DS^2	duration-of-stay squared	29.151	9.383	−
		(25.739)	(16.919)	
MSH	savings for housing improvement*	0.849	3.683	+
		(4.227)	(7.200)	
TE	transportation expenditure*	3.860	2.042	+
		(4.824)	(2.414)	
H^d	optimal housing services consumption	27.602	18.746	
		(14.921)	(8.373)	
H^a	actual housing services consumption	35.651	12.482	
		(39.864)	(9.947)	
R^d	optimal number of rooms	2.732	1.724	
		(0.833)	(0.479)	
R^a	actual number of rooms	3.081	1.779	
		(1.258)	(0.932)	
Φ_0	$\Phi(X_tB_t)$	0.828		−
		(0.147)		
Φ_r	$\Phi(-X_tB_t)$		0.303	+
			(0.703)	
PI	household permanent income **	43.239		+
		(29.894)		
SZH	size of Household **	3.764		+
		(2.445)		
SXHH	sex of household head**	0.943		+
	(male=1, female=0)	(0.231)		

* 10 thousand Won (700 Won/$1)

** estimation from all sample

Second, actual housing services consumption of a renter is measured as monthly rent including foregone interst of security deposit, but that of an owner is measured as the inputed rent on the basis of the concept that homeownership is analogous to paying rental income to oneself for the flow of housing services (Smith et al, 1988 and Kim, 1990).[21] In fact, optimal housing services consumption cannot be estmated without knowledge of each household utility function. Therefore we use an indirect method, in which optimal housing services consumption is measured as the fitted value of a housing expenditure regression from the subsample of households without mobility intention, assuming that households without mobility intention have reached their optimal housing services consumption.[22] Optimal number of rooms is measured on the basis of the same framework as optimal houseing services consumption measurement. The measurement methods of other variables have been explained in section 2.

5. Empirical Analysis

In this section, we discuss and analyze the probit estimates of tenure status and mobility intention equations, which are presented in Table 3. We briefly discuss the probit estimation results of a tenure status equation, and then focus on the estimation results of mobility intention.

Homeownership has a strong positive relationship with household permanent income (PI). Positive relation between homeownership and income indicates that a household inclines to own its own house as its income grows. One possible reason of the positve relationship in korea is the mortgage market imperfections, which make financing the house purchase difficult for low income households, as noted by Rosen (1979).

Size of household (SZH) and age of household head (AGHH) have also significant and positive associations with homeownership. Most tenture choice studies show that female-headed households are less likely to be homeowners. Nevertheless, our result represents that male-headed households have negative relationship with homeownership despite its insignificant coefficient (SXHH). However, the result is coincident with the finding from a previous tenure choice study in Korea (Lim et al, 1980), and it may reflect a particular wealth status of female-headed household in Korea[23] or sampling error.

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21. Inputed rent for owners (IR) is obtained from current house value (CPH) times use cost index (I=r+t+d−g); IR = CPH*I where r: market interest rate; t: property tax rate; d: rate of miscellaneous expenses; g: housing price appreciation. For more details, see Kim (1990).
22. The housing expenditure regression equations for both owners and renters are estimated by OLS from the subsample of households without mobility intention.
23. Average value of fixed assets, from the data used in this paper, are 25 million Won($36,000) for 644 male-headed households, and 34.3 million Won ($49,000) for

Finally, monthly savings for housing services improvement (MSH) has a strong and negative relationship with homeownership. Most households in Korea depend on self-financing efforts to purchase their houeses, because the mortgage market in Korea is not well organized and not well operating.[24] Therefore, the savings are essential for renters to be homeowners. The negative coefficient of MSH thus reflects lager amount of savings for housing services improvement of renters than that of owners.

Now we interpret the probit estimation results of mobility intention equations. For the interpretation of the probit estimates, we focus on not only asymptotic t-ratios and signs of the estimates, but also the marginal effects[25] on the probability of moving intention of the relevant variables.

The ratio of disequilibrium to actual housing services consumption of underconsumption households (E_1) has a significant and positive relationship with moving intention for both owners and renters. This means that households who consume less housing services than their optimal level are more likely to move as the percentage of disequilibrium to the actual level increases. However, The ratio of disequilibrium to actual housing services consumption of overconsumption households (E_2) has an insignificant and negative relationship with moving intention for both owners and renters. This indicates that overconsumption households have little intention to adjust their housing services downward at least during the short period. It reflects *ratchet effect* that households are sensitive to adjust their consumption upward, but they are reluctant to reduce their consumption even if they overconsume relative to their income (Goodman, 1976, and Hanushek and Quigley, 1978). The marginal effect of E_1 on the probability of moving intention for renters is larger than that for owners, as shown in Tables 4 and 5. The marginal effect of disequilibrium in housing services consumption on the probability of moving intention is only 0.006 for owners, but about 0.045 for renters. This indicates that moving intention of renters is much more affected by housing services consumption disequilibrium than that of owners.

The effects of disequilidrium of rooms as a proxy of space consumption on mobility intention (R_1 and R_2) are positive but insignificant for both owners and renters. Although the evidence is weak, it indicates that households are likely to adjust their space consumption toward the optimal level.[26] However, desire to adjust number of rooms is dependent on the degree of household crowdedness, quality and size of rooms. Thus insigificant coefficients seem to reflect various

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41 female-headed households.

24. For Korean housing financing market analysis, see Gyourko and Han (1989).

25. Consider $P_i = \phi(Z_i)$, $Z_i = XB$ then

$\partial P_i/\partial X_i = \partial P_i/\partial Z_i * \partial Z_i/\partial X_i = \phi(Z_i)B_i$

26. In the case that a household occupy more rooms than those of optimal level, the household tends to adjust number of rooms downward, but quality or size of rooms upward, on the given housing servicies consumption.

Table 3 Probit Estimates of Tenure Status and Mobility intention*

	Tenure Status	Mobility Intention	
	All	Owner	Renter
Variable	Coefficient (T-ratio)	Coefficient (T-ratio)	Coefficient (t-ratio)
Constant	-1.7176 (-6.533)	-0.9917 (-2.864)	0.8833 (0.867)
E_1		0.0218 (2.269)	0.1889 (2.517)
E_2		-0.0032 (-0.018)	-0.2485 (-0.383)
R_1		0.1153 (0.840)	0.4678 (1.499)
R_2		0.1987 (0.273)	0.1592 (0.244)
MC		0.0002 (0.089)	0.0140 (1.819)
DS		0.0563 (0.799)	0.3196 (2.598)
DS^2		-0.0031 (-0.425)	-0.0348 (-2.217)
TE		0.0187 (1.926)	0.0488 (1.153)
AGHH	0.0258 (6.412)	-0.0136 (-2.282)	-0.0556 (-3.932)
MSH	-0.0455 (-6.035)	0.0345 (3.335)	0.0522 (3.638)
PI	0.0107 (6.394)		
SZH	0.2765 (15.788)		
SXHH	-0.1563 (-0.886)		
Φ_0		0.2763 (0.659)	
Φ_r			-1.7610(-1.003)
Log-Likelihood	-638.46	-412.97	-155.49
Chi-Squared (df)	581.29 (5)	27.48 (11)	68.88 (11)
Signif. Level	0.3217E-13	0.3887E-02	0.4217E-12
# of Sample	1539	993	307

* t-ratio is asymptotically computed

household preferences about the combination of such bundles. Even though the coefficients are insignificant, the marginal propensity of the variables on the expected moving probability is higher than that of the services disequilibium variables (E_1 and E_2) by 5.2 times for owners and by 2.4 times for renters, respectively, as shown in Tables 4 and 5. This means that the effect of space disequilibrium on moving intention seems to be more serious than that of disequilibrium in aggregate housing services consumption, in the sense that the magnitude of the coefficient in question is large enough for its explanatory variable to have a meaningful (as opposed to significant) influence on the dependent variable (Kennedy, 1985).

The coefficients of out-of-pocket moving costs (MC) for both owners and renters are both insignificant and positive, and their magnitudes are very small. This result indicates that out-of-pocket moving costs have little impact on mobility decision at least in Korea. It contradicts our expectation and the previous findings (Weinberg et al, 1981, and zorn, 1988), which show the significant negative effect on the probability of move.

The effect of duration-of-stay (DS) on moving intention appears in accord with our expectation that the effect of duration-of-stay should be understood as the interaction between residential stress and cumulative inertia, and thus residential stress grows more rapidly than cumulative inertia up to a certain period of duration and then the phenomenon will reverse. For both owners and renters, the sign of DS is positive, and that of DS^2 is negative. In case of renters, both coefficients are significant, but insignificant for owners. For renters, the probability of moving intention increases up to approximatily 4.5 years of duration at a same place, and then it decreases. Although the coefficients of the variables for owners are insignificant, the probability of moving intention declines after 9 years of duration at a same place. Our result of the duration-of-stay effect is implicitly similar to Goodman (1976) and Huff and Clark (1978), while Weinberg et al (1981) and Zorn (1988) show the consistently negative effect of duration-of-stay on the probability of moving.

As shown in the previous studies (Goodman, 1976, Boehm, 1981, Zorn, 1988), the effect of household head age is negatively and significantly related to the likelihood of moving. The age effect will be discussed more in relation to the family life-cycle in the later part of this section.

The effect of transportation costs is not clear, and the effect of commuting time (as a proxy of transportation costs) is sometimes contradictory to the monetary transportation expenditure effect in terms of the previous researches (Goodman, 1976, Boehm, 1981, and Krumm, 1984). Our result of transportation expenditure effect shows the positive but insignificant effect on the probability of moving intention for renters, but the positive and significant (at a 90% level) effect for owners. Although the marginal effects on the probability of moving intention are very small for both owners and renters, that of renters is much larger than that of owners.

The effect of savings for housing services improvement (MSH) seems to be particular in the Korean housing market, in which the housing financing market and mortgage system are imperfect. The positive and significant coefficient of this variable for both owners and renters indicates that households with more savings for housing services improvement (eventually, housing purchase) are more likely to move in near future. It is evident in that the existence of such savings are manifestly stated goal to improve housing servives in future, rather than in that households are in the suboptimal condition of housing services consumption.

Now we investigate how the probability of moving intention and the marginal effects of the relevant variables change due to family life-cycle, household income, and specific location. From Tables 4 and 5, we find that; 1) the probability of expected moving consistently declines with age of household head for both owners and renters; 2) the probability in the given age group tends to increase as household income grows for both owners and renters[27]; 3) the

27. In the groups of both Age 3 and Age 4, the probability of the middle income group is lower than that of the others, for renters.

Table 4. Average Probability of Moving Intention and Marginal Effect on Probability of Moving Intention in Selected Variables: Owners

Prob of Moving Intention*			pdf**	E_1	R_1	DS***	AGHH	MSH
Age 1	Income 1	Central (0.194)	0.271	.0059	.0312	.0119	-.0037	.0093
	(0.227)	Suburb (0.246)	0.271	.0060	.0318	.0319	-.0038	.0095
(0.239)	Income 2	Central (0.219)	0.286	.0062	.0330	.0131	-.0039	.0099
	(0.239)	Suburb (0.245)	0.307	.0067	.0354	.0143	-.0042	.0106
	Income 3	Central (0.231)	0.296	.0065	.0341	.0136	-.0040	.0102
	(0.260)	Suburd (0.293)	0.314	.0068	.0362	.0148	-.0043	.0108
Age 2	Income 1	Central (0.161)	0.243	.0053	.0280	.0105	-.0033	.0084
	(0.195)	Suburb (0.214)	0.268	.0058	.0309	.0116	-.0036	.0092
(0.217)	Income 2	Central (0.184)	0.263	.0057	.0303	.0107	-.0036	.0091
	(0.207)	Suburb (0.229)	0.281	.0061	.0323	.0121	-.0038	.0097
	Income 3	Central (0.217)	0.280	.0061	.0323	.0120	-.0038	.0097
	(0.262)	Suburb (0.301)	0.306	.0067	.0353	.0137	-.0042	.0106
Age 3	Income 1	Central (0.152)	0.234	.0051	.0270	.0087	-.0032	.0081
	(0.164)	Suburb (0.172)	0.251	.0055	.0289	.0101	-.0034	.0087
(0.211)	Income 2	Central (0.159)	0.240	.0052	.0577	.0098	-.0033	.0083
	(0.208)	Suburb (0.247)	0.273	.0060	.0314	.0111	-.0037	.0094
	Income 3	Central (0.200)	0.269	.0059	.0310	.0107	-.0037	.0093
	(0.254)	Suburb (0.289)	0.285	.0062	.0329	.0122	-.0039	.0098
Age 4	Income 1	Central (0.125)	0.203	.0044	.0234	.0070	-.0028	.0070
	(0.136)	Suburb (0.151)	0.217	.0047	.0250	.0082	-.0030	.0075
(0.161)	Income 2	Central (0.168)	0.206	.0045	.0238	.0076	-.0028	.0071
	(0.155)	Suburb (0.184)	0.233	.0051	.0269	.0090	-.0032	.0080
	Income 3	Central (0.163)	0.239	.0052	.0276	.0090	-.0033	.0082
	(0.193)	Suburb (0.223)	0.255	.0056	.0294	.0110	-.0035	.0088

probability of suburban households is higher than that of the households in the central city[28] for owners, but it is still true for renters except 4 out of 12 cases for the given income and age group; 4) the average probability of moving intention appears higher in renters than in owners except in the group of age 3 (46-55).

6. Conclusion

This paper jointly estimates residential mobility intention and tenure status. Although a model utilized in this paper is basically based on the concept of

28. In fact, we cannot distinguish central city and suburbs in the case of Seoul, Korea. For the convenience, we define the newly developed areas (especially, south part of Seoul and two Ku's in north part of Seoul to be suburbs.

Table 5. Average probability of Moving Intention and Marginal Effect on Probability of Moving Intention in Selected Variables: Renters

Prob. of Moving Intention*			pdf**	E_1	R_1	DS***	AGHH	MSH
Age 1	Income 1	Central (0.279)	0.312	.0589	.1460	.0845	-.0173	.0172
	(0.304)	Suburb (0.323)	0.279	.0527	.1305	.0775	-.0155	.0153
(0.342)	Income 2	Central (0.420)	0.326	.0616	.1525	.0883	-.0181	.0180
	(0.386)	Suburb (0.349)	0.289	.0546	.1352	.0803	-.0160	.0160
	Income 3	Central (0.371)	0.264	.0499	.1235	.0743	-.0147	.0146
	(0.406)	Suburb (0.470)	0.300	.0567	.1403	.0823	-.0167	.0166
Age 2	Income 1	Central (0.250)	0.276	.0521	.1291	.0645	-.0153	.0152
	(0.258)	Suburb (0.265)	0.279	.0527	.1305	.0678	-.0155	.0154
(0.297)	Income 2	Central (0.278)	0.270	.0510	.1263	.0675	-.0150	.0149
	(0.315)	Suburb (0.388)	0.294	.0555	.1375	.0602	-.0163	.0162
	Income 3	Central (0.526)	0.297	.0561	.1389	.0701	-.0165	.0164
	(0.453)	Suburb (0.396)	0.333	.0629	.1558	.0902	-.0185	.0184
Age 3	Income 1	Central (0.191)	0.173	.0327	.0809	.0396	-.0096	.0095
	(0.176)	Suburb (0.162)	0.210	.0397	.0982	.0423	-.0117	.0116
(0.177)	Income 2	Central (0.145)	0.205	.0387	.0959	.0405	-.0114	.0113
	(0.151)	Suburb (0.157)	0.233	.0440	.1090	.0583	-.0130	.0129
	Income 3	Central (0.179)	0.222	.0419	.1039	.0659	-.0123	.0122
	(0.230)	Suburb (0.273)	0.281	.0531	.1315	.0761	-.0156	.0155
Age 4	Income 1	Central (0.105)	0.108	.0204	.0505	.0123	-.0060	.0060
	(0.133)	Suburb (0.152)	0.123	.0232	.0575	.0273	-.0068	.0068
(0.180)	Income 2	Central (0.106)	0.145	.0274	.0678	.0383	-.0081	.0080
	(0.119)	Suburb (0.142)	0.206	.0389	.0964	.0443	-.0115	.0114
	Income 3	Central (0.394)	0.344	.0650	.1609	.0728	-.0191	.0190
	(0.379)	Suburb (0.365)	0.162	.0306	.0758	.0428	-.0090	.0089

* probability of moving intention estimated at average characteristics in a given cetegory

** standard probability density $\phi(\cdot)$ estimated at average characteristics in a given category

*** $pdf*(\beta_{DS}-2*DS*\beta_{DS2})$

· Age groups are classified on the basis of age of household head;
less than 35 (Age 1), 35-45 (Age 2), 46-55(Age 3), greater than 55 (Age 4).

· Income groups are divided by monthly household income (10 thousand);
less than 35 (Income 1), 35-60(Income 2), and greater than 60 (Income 3).

disquilibrium in housing services consumption, we intend to incorporate such a concept and a cognitive-behaviroal approach. All the probit estimation results except E_2, Φ's, and MC are consistent with our expectations and the findings from the previous studies. The important findings from our estimation results are as follows:

First, disequilibrium in housing services consumption significantly changes the probability of expected moving, but the marginal effects are smaller than we expected, especially for owners.

Second, the interaction assumption of duration-of-stay is well supported by the estimation results, especially for renters. The probability of moving intention increases up to approximately 4.5 year of duration at a same place, and then it decreases in the case of renters. For owners, the probability decreases after 9 years of duration at a same place.

Third, out-of-pocket moving costs have little impact on mobility intention at least in Seoul, Korea.

Fourth, savings for housing services improvement have a strong and postive relationship with the probability of expected moving. It should be understood to be a manifestly stated goal rather than the suboptimal condition of current housing services in the context of imperfect housing financing market in Korea.

Fifth, although most previous studies find that the probability of moving intention is greater for renters than for owners, our result shows that tenure status has no significant impact on the probability of moving intention.

Finally, the probability of moving intention decreases with age of household head. Given an age group, the probability increases as household income grows, and the probability appears higher in the newly developed areas than in the old areas of Seoul.

Our findings provide some policy implicatilns. First, policy attention should be paid to improving housing welfare of low income households in particular. From the estimation results, low income homeowners have the least intention to move. They may be stucked to the areas providing inadequate housing services, and thus it could be an important factor which tends to make such areas slum. The appropriate policy for low income homeowners should be developed to encourage more frequent and upward moving or housing improvement by residential redevelopment.

Second, sufficient housing units with reasonable price and moderate size should be provided to satisfy upward mobilty intention among middle and high income renters, especially younger group (less than 45 years old) renters, who show highest mobility intention from the estimation results. For the purpose, we suggest to abandon the regulation on the initial unit price of housing units for installment sales, especially for apartments, so as for much more housing constructors to enter into the housing market, and thus to build housing units appropriate for upward mobile renters.[29] We also expect that it will have some effect to reduce rapid rent hike and that it also lessen the forced move by rent

29. Housing constructors, especially in Seoul, Korea, are reluctant to build moderate-size housing units with appropriate quality, because to build such kinds units provides less returns than to build larger and higher quality housing units, due to the regulation on the initial distribution prices.

hike of low income renters.

Finally, development of the appropriate housing financing system is imperative, and appropriate policy is necessary to prevent dead storage of massive amount of savings for housing services improvement. For the purpose, special functions of the Korea Housing Bank should be deregulated and diffused into the other financing institutes.

The weakness of this paper occurs from the measurement problems of the optimal levels of housing services consumption and number of rooms, and out-of-pocket moving costs. In order to estimate optimal levels, we utilize the regression estimation results from the subsamples of households without moving intention. However, it is not certain that the households without moving intention enjoy equilibrium housing services, because they seem to be more possibly overconsumption household, or they are such households that cannot move or have no intention due to their lower income status. Therefore, researchers should pay more attention to those kinds of the measurement problems for advanced modeling of intra-urban residental mobility.

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