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**Decomposition Analysis of the Household  
Migration**

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## Abstract

The purpose of this research is to show the trends and feature of household migration using the microdata in *Housing and Land Survey of Japan* (at 1993, 1998, 2003, 2008). We screen the effective observation data and examine the variation of the attribute of moving or staying household with regard to age, type of employment, income, housing tenure, residence performance and so on. We characterize the variation in the ratio of household mobility through the decomposition the variation of age distribution (VAD) and the variation of propensity to move (VPM). Drop of the ratio of household mobility is dominated by VAD on the basis advancing aging society. There is the cases that VPM are increasing even if the ratio of household mobility is declining as a whole tendency.

*JEL Classification Code:* C15, O15, R23

*Keywords:* Regional migration, Age distribution, propensity to move, Regional labor and housing markets,

# 1 Introduction

The main motives that the movement of the house is carried out include the things to relate to the life events such as entrance into a school of higher grade, finding employment, job-changing, marriage, the change of the household number of people in addition to improvement of housing quality and the dwelling environment. We observe peoples' ordinary timing when their events occur throughout life by their age. It is important paying attention to the age to get closer the actual migration people.

The purpose of this research is to show the trends and feature of household migration using the micro-data in *Housing and Land Survey of Japan*(HLSJ, by Statistic Bureau, Ministry of Internal Affairs and Communications, at 1993, 1998, 2003, 2008) . There are *National Population Census* and *Residential Basic Book Migration Report* (by Statistic Bureau, Ministry of Internal Affairs and Communications) as official and large quantity statistics recognizing the interregional migration of Japanese people. However, It is not so clear housing and composition of household. Using the four period microdata in HLSJ, we examine the time effects and age effects related to variation of the ratio of household mobility. It is suggested that the variation of the ratio of household mobility is decomposed by the age distribution and moving propensity changing.

Many research are published in the inter-regional or inter-national migration study area. Research Results can be broadly clasified into the migration fields (Schwind 1975), migration expectation (Rogers 1966), migration flows (Ravenstein 1885), and mobility selection (Sjaastad 1962, Wolpart 1965, Askin, Guilkey and Sickles 1979, Mueller and Mills 1982, Quigley 1985). The study related to migration fields (OD table analysis), expectation (Markovian model) and flows (gravity model) are suitable to macro analysis that aggregated regionally the mobility behavior. It is important to estimate the individual moving probability by decision making process (multinomial choice model) for the study of mobility selection.

We organize the remainder of the paper as follows: The following section outlines the survey item of HLSJ and descriptive statistics for the ratio of household mobility. After this, we show the decomposition analysis of the variation of the ratio of household mobility. Section 4 discusses the emprical results used to calculate the model. Finally, we conclude the implications of our findings in this paper.

## 2 Data description

### 2.1 Survey item

HLSJ is the survey of architectural structures and household structures in Japan. Although investigations slightly different by survey year, for instance in 2008 year, contents are as follow: (a) Household informations, (b) Architectural structures, (c) Houses, (d) Owner occupied, (e) Annual income, (f) Householders, (g) Land site. Using this survey, Ministry of Internal Affairs and Communications announce officially the aggregated items with regard to housing, home ownership, household, land sites, dwelling environment, and so on. In this research we show the trends and feature of household migration.

There is *Residential Basic Book Migration Report* (RBBMR) as large scale statistics relative to migration and residential mobility. RBBMR is subject to people's mobility over the municipality boundary, not taking into account people's intra-municipal mobility. In addition, RBBMR lacks information on household (e.g. household composition, house, and income). It is investigated the year when households migrate and the municipality before moving to current residence in HLSJ. We also find out the moving status within the prefecture and same municipality.

### 2.2 Household mobility rates

Table 1 show the sample size, effective number of the observations, household mobility, and the ratio of household mobility in HLSJ (1993, 1998, 2003, 2008 year). Sample size is the number of households intended in these survey. The effective number of the observation is the size removing unobserved or non-response records in the year when households migrate, household size, home ownership, floor area of house, age of house. The value subtracting the effective number of the observation from sample size is missing. The effective number of the observation is decline from 1993 to 2008 year. There are many cases not to observe the year when households migrate as a reason for that missing<sup>1</sup>. It is necessary to be careful varying in precision by years. Household mobility is the number of householder moved to current residence

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<sup>1</sup>The number of unobserved with the year when households migrate is 0.50 millions in 1993 year, 0.66 millions in 1998 year, 0.80 millions in 2003 year, 0.92 millions in 2008 year, approximately.

less than 5 years previously, except that we remove the unobserved or non-response records in the year when households migrate, household size, home ownership, floor area of house, age of house. The ratio of household mobility is the proportion of the effective number of the observation to household mobility. The ratio of household mobility can disintegrate more in the municipality (within the prefecture and same municipality, within the prefecture and other municipality and outside the prefecture) before moving to current residence.

### 3 Decomposition analysis

We define the ratio of household mobility. Let  $P_{jt}$  be the number of households in householder age group  $j (= 1, 2, \dots, J)$  and observed period  $t = (1, 2, \dots, T)$  (every five years), and assemble in an  $J \times 1$  vector,  $\mathbf{P}_t = (P_{1t}, \dots, P_{jt}, \dots, P_{Jt})'$ . Let  $m_{jt}$  be the ratio of households who moved from other region for the past five years. Total number of household mobility is written by  $\mathbf{m}'_t \mathbf{P}$ , where  $\mathbf{m}_t = (m_{1t}, \dots, m_{jt}, \dots, m_{Jt})'$  is an  $J \times 1$  vector. The ratio of  $j$ -th age group households to total number of households at period  $t$  is expressed by  $q_{jt} = P_{jt} / \sum_{j=1}^J P_{jt}$ . Total number of household mobility is also rewritten by  $\mathbf{m}'_t \mathbf{P} = \mathbf{m}'_t \mathbf{q}_t \sum_{j=1}^J P_{jt}$ , where  $\mathbf{q}_t = (q_{1t}, \dots, q_{jt}, \dots, q_{Jt})'$  and  $\mathbf{P}_t = \mathbf{q}_t \sum_{j=1}^J P_{jt}$ . Therefore the ratio of household mobility at period  $t$  is

$$M_t = \frac{\mathbf{m}'_t \mathbf{P}}{\sum_{j=1}^J P_{jt}} = \mathbf{m}'_t \mathbf{q}_t. \quad (1)$$

This equation is the sum of cross product of the ratio of household mobility by age group and the ratio of household by age group.

We show the ratio of household mobility equation (1) will be changing period from  $t - 1$  to  $t$ . The difference of the ratio of household mobility between  $t - 1$  and  $t$  can be written by

$$\Delta M_t = M_t - M_{t-1} = \mathbf{m}'_t \Delta \mathbf{q}_t + \Delta \mathbf{m}'_t \mathbf{q}_{t-1}, \quad (2)$$

where  $\Delta \mathbf{q}_t = \mathbf{q}_t - \mathbf{q}_{t-1}$  and  $\Delta \mathbf{m}_t = \mathbf{m}_t - \mathbf{m}_{t-1}$ . In the upshot, the difference of the ratio of household mobility within one period is the sum of two of variations as follow:

- 1st term: Variation of the ratio of household by age group weighted sum by the ratio of household mobility by age group at current period.
- 2nd term: Variation of the ratio of household mobility by age group weighted sum by the ratio of household by age group at previous period.

The 1st term will be referred to as the variation of age distribution (VAD), and the 2nd term will be referred to as the variation of propensity to move (VPM).

We classify the place of residence before moving to current residence in three as follow:

$$\ell = \begin{cases} 1 & \text{within the prefecture and same municipality} \\ 2 & \text{within the prefecture and other municipality} \\ 3 & \text{outside the prefecture} \end{cases}$$

Let the  $J \times 1$  vector  $\mathbf{m}_t^\ell = (m_{1t}^\ell, \dots, m_{jt}^\ell, \dots, m_{Jt}^\ell)$  be the ratio of  $j$ -th age group households who moved from other region  $\ell$  for the past five years in period  $t$ . It is simply defined as  $\mathbf{m}_t = \sum_{\ell=1}^3 \mathbf{m}_t^\ell$ . According to equation (2), the difference of the ratio of household mobility between  $t - 1$  and  $t$  can be rewritten by:

$$\Delta M_t = \sum_{\ell=1}^3 \left( \mathbf{m}_t^{\ell'} \Delta \mathbf{q}_t + \Delta \mathbf{m}_t^{\ell'} \Delta \mathbf{q}_{t-1} \right). \quad (3)$$

This difference is the sum of two of variations by the place  $\ell$ , VAD and VPM, which is shown by (2) in the same way.

## 4 The variation in the ratio of household mobility in the whole country

According to equation (3), we calculate the variation in the ratio of household mobility in period  $t$  based on HLSJ. Table 2 is show  $\mathbf{q}_t$  (age distribution),  $\mathbf{m}_t$  (propensity to move) and  $\mathbf{m}_t^\ell$  (propensity to move by the place of residence before moving to current residence,  $\ell = 1, 2, 3$ ) in three period ( $t = 1998, 2003, 2008$  years).

There is a tendency that aging society are advancing in Japan. Although the mode of householder age is 50-59 years, The young groups decrease, and

the aged group increases in age distribution from 1998 to 2008 years. The highest mobility group is aged 20-29 years. As age rises, mobility lowers. Mobility within the prefecture and same municipality ( $\ell = 1$ ) is the highest ratio among the places of residence before moving to current residence.

We show the result of decomposition equation (3) in Table 3. The ratio of household mobility is declining at 2.2 percent point (ppt) from 1998 to 2003 year. This is the sum of VAD  $\mathbf{m}'_t \Delta \mathbf{q}_t = -2.8$  ppt and VPM  $\Delta \mathbf{m}'_t \Delta \mathbf{q}_{t-1} = +0.6$  ppt. Drop of the ratio of household mobility is dominated by VAD on the basis of advancing aging society. It is possible to conjecture that the ratio of household mobility is declining by increasing of the proportion of aged groups where had low propensity to move even if the propensity to move of 20s, 30s and 40s are increasing, respectively. The VAD of each place of residence before moving to current residence are negative in all places by aging.

The ratio of household mobility is declining at 3.0 ppt from 2003 to 2008 year. This is the sum of VAD  $\mathbf{m}'_t \Delta \mathbf{q}_t = -2.4$  ppt and VPM  $\Delta \mathbf{m}'_t \Delta \mathbf{q}_{t-1} = -0.6$  ppt. Unlike with the case from 1998 to 2003 year, both of VAD and VPM are negative ppt. The VAD of each place of residence before moving to current residence are equally negative by aging in the same way in the case from 1998 to 2003 year. In the case of the place within the prefecture and same municipality before moving to current residence,  $\Delta \mathbf{m}'_t \Delta \mathbf{q}_{t-1} = +1.0$ . In the both cases within the prefecture and other municipality and outside the prefecture, the propensity to move is declining. It is reasonable to expect the decrease of long distance moving.

## 5 Conclusion

The purpose of this research is to show the trends and feature of household migration using the microdata in *Housing and Land Survey of Japan* (at 1993, 1998, 2003, 2008). To clarify the variation factor of migration, we define the decomposition equation of the ratio of household mobility. The difference of the ratio of household mobility within one period is the sum of two variations as the variation of age distribution and the variation of propensity to move. Drop of the ratio of household mobility is dominated by VAD on the basis of advancing aging society. It is possible to conjecture that the ratio of household mobility is declining by increasing of the proportions of aged groups where had low propensity to move even if the propensity to move

of 20s, 30s and 40s are increasing, respectively. There is the cases that the variations of propensity to move are increasing even if the ratio of household mobility is declining tendency.

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Table 1: Household mobility rates

Year	1993	1998	2003	2008
Sample size <sup>1</sup>	3,849,340	3,969,761	3,580,378	3,464,946
Effective number of observations	3,272,203	3,250,404	2,718,146	2,458,991
Ratio of missing value	0.15	0.18	0.24	0.29
Household mobility <sup>2</sup>	878,488	857,155	647,922	510,091
Ratio of household mobility	0.27	0.26	0.24	0.21
Included number (the municipality before moving to current residence)				
Within the prefecture and same municipality	0.14	0.13	0.12	0.12
Within the prefecture and other municipality	0.06	0.07	0.07	0.05
Outside the prefecture	0.07	0.06	0.05	0.04

Note: 1 Sample size show the number of micro data records. 2 In *Housing and Land Survey of Japan* (by Statistic Bureau, Ministry of Internal Affairs and Communications), We defined the Household mobility that the number of householder moved to current residence less than 5 years previously, except that we remove the unobserved or non-response records in the year when households migrate, household size, home ownership, floor area of house, age of house.

Table 2: Householder age distribution and ratio of household mobility

Householder $j$ -th age group	$q_{jt}$	$m_{jt}$	Place of residence before moving to current residence		
			$m_{jt}^1$	$m_{jt}^2$	$m_{jt}^3$
A. HLSJ $t = 1998$					
20–29 years	0.090	0.857	0.334	0.265	0.257
30–39 years	0.145	0.551	0.261	0.174	0.117
40–49 years	0.212	0.241	0.133	0.060	0.048
50–59 years	0.234	0.136	0.076	0.034	0.026
60–69 years	0.186	0.082	0.050	0.019	0.014
70–79 years	0.101	0.065	0.042	0.013	0.009
80– years	0.033	0.058	0.039	0.012	0.008
B. HLSJ $t = 2003$					
20–29 years	0.066	0.864	0.316	0.283	0.264
30–39 years	0.140	0.557	0.265	0.177	0.115
40–49 years	0.172	0.255	0.138	0.065	0.052
50–59 years	0.244	0.139	0.077	0.035	0.026
60–69 years	0.202	0.089	0.054	0.021	0.015
70–79 years	0.133	0.062	0.040	0.013	0.009
80– years	0.043	0.054	0.035	0.011	0.008
C. HLSJ $t = 2008$					
20–29 years	0.049	0.877	0.358	0.234	0.285
30–39 years	0.127	0.550	0.305	0.142	0.103
40–49 years	0.162	0.246	0.146	0.051	0.049
50–59 years	0.221	0.127	0.076	0.027	0.023
60–69 years	0.219	0.087	0.056	0.016	0.015
70–79 years	0.156	0.057	0.040	0.009	0.008
80– years	0.066	0.048	0.033	0.008	0.007

Table 3: Result of decomposition  $\Delta M$  into VAD and VPM

variable	1998 to 2003 years	2003 to 2008 years
	percent point	percent point
$\Delta M_t$	-2.2	-3.0
$\mathbf{m}'_t \Delta \mathbf{q}_t$ (VAD)	-2.8	-2.4
$[\mathbf{m}_t^{1'} \Delta \mathbf{q}_t]$	[-1.1]	[-0.9]
$[\mathbf{m}_t^{2'} \Delta \mathbf{q}_t]$	[-0.8]	[-0.8]
$[\mathbf{m}_t^{3'} \Delta \mathbf{q}_t]$	[-0.8]	[-0.7]
$\Delta \mathbf{m}'_t \mathbf{q}_{t-1}$ (VPM)	0.6	-0.6
$[\Delta \mathbf{m}_t^{1'} \mathbf{q}_{t-1}]$	[0.1]	[1.0]
$[\Delta \mathbf{m}_t^{2'} \mathbf{q}_{t-1}]$	[0.4]	[-1.4]
$[\Delta \mathbf{m}_t^{3'} \mathbf{q}_{t-1}]$	[0.1]	[-0.2]