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JEL classification: R21, C41, G21, K21, H31.
Keywords: Residential mobility, housing equity constraint, conditional fixed effects logit model, tax deduction, loan-to-value ratio, debt-to-income ratio, Japan, recourse loan.

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[*] The paper was presented at the Asian Real Estate Society-American Real Estate and Urban Economics Association Joint International Conference, the University of California, Los Angeles, July 11-14, 2009, and received the Best Paper Award for the Maury Seldin Advanced Studies Institute Award.
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Residential Mobility Decision in Japan: Identifying the Effects of Housing Equity Constraints and Income Shocks under the Recourse Loan System*

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Abstract

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1. Introduction

The purpose of this paper is to examine whether housing equity constraints and negative income shocks deter owner-to-owner residential mobility, whether government policy aimed at addressing equity constraints under the recourse loan system has a timely impact on residential moves, and also whether switching from the present recourse loan system to the non-recourse loan system increases or decreases the mobility of positive and negative equity households.

The degree of residential mobility varies across countries[1] and Japan is known as a low residential mobility society. Relatively high residential mobility rates are common in the U.S. and Canada; the residential mobility rate between 1995 and 2000 in the U.S. is 50.4 percent while that between 1996 and 2001 in Canada is 41.9 percent.[2] In contrast, the Japanese residential mobility rate between 1998 and 2003 is 24.1 percent, less than half of that in the U.S., and this rate has been decreasing.[3]

Well-functioning housing markets can allocate housing to each household, and determine housing equity, a very important component of household wealth. Residential mobility is an equilibrating factor in this allocating function of housing markets. When institutional constraints or other barriers impede residential mobility, this allocating role of housing markets is disrupted. Countries with low rates of residential mobility tend to suffer from high price volatility (Englund and Ioannides, 1993). Due to high transaction costs, most households cannot immediately react to price changes by changing their residences, causing market disequilibrium and price volatility. In addition, low rates of residential mobility make labor markets less efficient, and hence can adversely affect economic growth (Hardman and Ioannides, 1999). To address these problems, government policies are devised to promote residential mobility (Englund and Ioannides, 1993; Long, 1991).

In the following analysis, we focus on important government policies related to residential mobility in Japan, i.e. the 2004 income tax deduction systems in the owner-occupied housing market. This policy was devised to cope with housing equity constraints that resulted from sharp asset deflation after Japan's asset bubble burst in the 1990s. This significant change in the tax

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[1] Long (1991) analyzed residential mobility differences among developed countries. Strassmann (1991) made an international comparison of housing market interventions and mobility. Angel (2000), Table A.25 (p.372) shows annual residential mobility rates as of 1990 among 53 major cities in 53 countries. Harsman and Quigley (1991), Table 1-5 shows annual residential mobility rates among European countries and the U.S.

[2] U.S. census 2000 analyzed by the Social Science Data Analysis Network. http://www.censusscope.org/us/s48/chart_migration.html .
Statistics Canada released 2001 census mobility data.

[3] This figure is based on the *2003 Housing and Land Survey of Japan*. The annual residential mobility rate was 8.1% between 1968-1973, 7.5% between 1973-1978, 6.8% between 1978-1982, 6.2% between 1982-1988, 6.1% between 1988-1993, 5.8% between 1993-1998, and 5.1% between 1998 and 2003.

code is having a significant impact on residential mobility and the Japanese housing market. The 2004 income tax deduction system that greatly revised the regulations regarding the carrying over of capital losses on replacement of residential property is unique to Japan.[4] It was a belated policy response to the implosion of real estate prices after Japan's asset Bubble burst beginning in 1991. From the late 1980s, Japan witnessed a rise and fall in land and housing values that rivals that of any period in modern history anywhere. The sharp downturn in the 1990s left many Japanese homeowners with low or negative housing equity that constrained residential mobility. We investigate the effect of this government policy on residential mobility in Japan.

Apart from the recent tax reform discussed above, another policy option for enhancing residential mobility involves a shift from the present recourse loan system to a non-recourse loan system. In Japan, since recourse loans are prevalent, financial institutions (lenders) determine the amount of money to lend based on the quality of the applicant (such as income, job status, etc.) and the value of land. Since Japanese land prices kept increasing in the post-WWII era and the land price typically exceeds the building price, at least until the bubble burst in the early 1990s, lenders have not factored in the value of the housing even if it is part of the property asset being used as collateral. As a result, borrowers are not interested in maintaining and investing in the quality of second-hand housing. The second-hand housing market is not popular in Japan because housing is usually of uncertain quality, built quickly and not intended to last a long time, and is also poorly maintained. New housing is usually better insulated, more energy efficient, has modern conveniences and kitchens installed, and looks better. In contrast, in the United States and other countries under the non-recourse system, financial institutions determine the amount to lend taking into consideration the value of the housing. As a result, there are strong incentives to maintain the quality of housing so that it retains its value and can thus collateralize a larger mortgage. Thus, higher quality at the outset and better maintenance helps create a more robust second-hand housing market in those countries. Since there is much higher quality housing and its value as collateral is very high, non-recourse loans in those countries are legal and common. Thus, we examine whether the introduction of non-recourse loans in Japan would enhance mobility in the Japanese housing market by promoting an improvement in the quality of housing stock, create incentives for better maintenance and stimulate a larger second-hand housing market.

This is a rigorous econometric analysis based on household longitudinal data to investigate the effects, under the recourse loan system, of housing equity constraints, income shocks and government policy aimed at addressing such constraints on residential mobility in Japan, focusing on the owner-occupied housing market. We also examine the effects of shifting from the

[4] This tax deduction system was originally introduced in 1998 under stricter eligibility conditions.

recourse loan to non-recourse loan systems on residential moves of both positive and negative equity households. It is essential to understand the impact of government policies and housing loan systems on residential mobility to formulate more effective housing policy and housing loan systems so that Japanese housing markets can function more effectively. The distinctive characteristics of the Japanese owned housing market detailed above, together with the availability of the recent, large-scale household longitudinal data, enable us to assess the effect of government policies and housing loan systems on residential mobility in Japan. Our micro-data is based on the "Keio Household Panel Survey" (KHPS) covering all Japan. In this research, the conditional fixed effects logit model is used to investigate those effects on residential moves. We carefully constructed the Extended Loan-to-Value (ELTV) and the Extended Debt-to-Income (EDTI) ratios incorporating the characteristics of the recourse loan system.

The organization of the remainder of this paper is as follows: in Section 2, we briefly review the characteristics of the Japanese economy, Japanese housing markets and relevant government policies; in Section 3, we briefly review the related research, in Section 4, we discuss the econometric model, in Section 5, we discuss the data and variables; in Section 6, we present the estimation results about the effect of government policy and the change in housing loan systems on residential moves, and; Section 7 offers some concluding remarks.

2. Overview of the Japanese economy, housing market and housing related policies

Since 1986, Japan has experienced a sharp rise and fall in land and housing values that rivals that of any period in modern history. Figure 1 shows the trend in land prices, nominal GDP and stock prices between 1965 and 2008 and Figure 2 shows the actual price of 75 square meters of housing in the Tokyo Metropolitan Area between 1975 and 2007. Asset prices began increasing in 1983, and it was around 1986 when the rise began accelerating rapidly. The rise in land prices spread from Tokyo to major cities such as Osaka and Nagoya, and then to other cities.

<Figure 1 around here>

<Figure 2 around here>

Many Japanese households that bought housing during the Bubble era have a low or negative net equity due to subsequent asset price deflation. Due to the high price of housing in Japan, many households carry large mortgages and for those that bought housing during the Bubble era, in many cases loans outstanding exceed the current value of the housing. In 2005, for example,

64.4% of households that bought houses took out loans, 75.0% of which suffered capital losses when they sold their previous houses.[5]

In Japan, housing finance is based on recourse loans. Hence, in periods of asset deflation, borrowers assume all risks stemming from the decline in collateral values in the form of real estate because they cannot move to a different residence without fully repaying the borrowed amount (i.e. principal plus interest). In order to address the problems of these borrowers and enable them to buy and move to another residence, in 2004 the Japanese government greatly revised the tax deduction system that permits carrying-forward of capital losses on replacement of residential property.

In Japan, there are several other housing-related tax subsidies. Regarding income tax, the marginal tax rates as of 2009 are 5-40%. Imputed income on owner-occupied housing is not taxed. As for capital gains, nominal gains are taxed on a realization basis. A taxpayer's own residence is exempted from capital gains tax if certain conditions are met. Tax rates differ depending on length of ownership: 15% of taxable capital gains income for more than 5 years ownership and 30% for less than 5 years ownership. Property taxes are not deductible. Interest payments on housing loans are deductible although the total amounts are not large. Interest income on housing-related saving is tax-exempt up to a certain limit. There is also a partial tax credit relating to the housing loan for recent home-buyers.

As for property taxes, the tax rate ranges from 1.4% to 2.1% of assessed market value.[6] In general, assessed market value has been far lower than actual market value until the bubble burst in the early 1990s.

In 2003, the ratio of the total amount of housing-related subsidies to government annual expenditure in Japan was only 0.8%.[7] For comparison, this ratio in the U.S. for 2003 was 5.9%. Even if we include other housing-related government expenditures, the ratio was only 2.1% in Japan compared with 7.5% in the U.S.

We focus on the effect of the capital losses-related tax deduction system on mobility from owned housing under the recourse loan system because it is the most important government housing related tax subsidy aimed at increasing mobility in the Japanese housing market. We find that this tax stimulates residential mobility. We also find that switching from the recourse loan system to a non-recourse loan system stimulates household mobility.

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[5] Survey of Housing Market Dynamics 2006 (Juutaku Shijou Doukou Chousa Heisei 18,) Ministry of Land, Infrastructure and Transportation (Tokyo, MLIT, 2007).

[6] Gomi (2006), p.48.

[7] The values in this paragraph are all cited from *Housing Economy Databook 2005*, (*Juutaku Keizai Data-shu*,) (Tokyo: Housing Industry Newspaper Company, 2006) p.181.

3. Literature review

There are several theoretical studies focusing on the role of the equity constraint hypothesis related to the movements of prices and transaction volumes in the housing market. Stein (1995) presented a static model and demonstrated how extreme credit constraint distress may result in lower housing prices and fewer transactions because negative equity prevents some households from moving. Ortalo-Magne and Rady (2006) developed a life-cycle model of the housing market with a property ladder and a credit constraint.[8]

There are several empirical studies about the impact of equity constraints on residential moves based on mainly Western owner-occupied samples. For example, Henley (1998) investigated the impact of negative housing equity on residential moves using a single and competing risk discrete time duration model of residence duration based on a U.K. owner-occupied sample. He also analyzed whether labor market flexibility is impaired by a stagnant housing market. Chan (1996, 2001) empirically analyzed the impact of equity constraints on residential moves based on U.S. owner-occupied samples. Engelhardt (2003) examined the effect of equity constraints and nominal loss aversion on household mobility based on US data. Seslen (2003) examined the role of housing price dynamics in mobility decisions, asking whether households respond to prices in a forward- or backward-looking manner, and the extent to which high levels of leverage constrain moving behavior using PSID (the Panel Study of Income Dynamics). Lee and Ong (2005) empirically analyze the impact of equity constraints on residential moves based on Singapore owner-occupied samples using the probit model. Although those studies investigate the impact of housing equity constraints on residential moves, none of them explicitly examine the effects of government policies aimed at easing equity constraints on residential moves. Seko and Sumita (2007) investigate the effect of the tax deduction policy on residential mobility in Japan based on an owned-housing panel sample in Japan using a proportional hazard model. They found that the tax deduction policy has a strong impact on owners' residential mobility. Although Seko and Sumita (2007) investigate the impact of housing equity constraints on residential moves from owned housing in Japan, their analysis heavily depends on the retrospective nature of the KHPS panel data.

Our empirical analysis uses the conditional fixed effects logit model. There are several empirical studies using the conditional fixed effects logit model. Bjorklund (1985) studied the linkage between unemployment and mental health problems in Sweden using the Swedish Level of Living Surveys. Winkelmann and Winkelmann (1998) applied the conditional fixed effects logit approach to study the effect of unemployment on the level of satisfaction. Börsch-Supan (1987,

[8] Leung (2004) surveyed research focusing on the relationship between housing price cyclicality, volatility and the structure of the residential lending market in his survey paper.

1990) employed this model to analyze the choice of housing tenure and size using five waves of PSID. Andrew (2004) used this model to explain why home ownership rates among young adults fell in the early 1990s even as various indicators suggested it had become more affordable.

There are several studies examining the recent relationship between the housing and mortgage markets under the non-recourse loan systems. "Mortgages and the Housing Crash: A Symposium" in *Journal of Urban Economics* (Rosenthal and Strange, eds., 2008) focuses on the links between mortgages and housing markets in the United States. A special issue on sub-prime mortgage lending in the *Journal of Housing Economics* (Green, Sanders and Wachter, eds., 2008) also focuses on the importance of the housing and mortgage markets to the economy and analyzes the root causes of the "sub-prime crisis" in the United States. Leece (2004) covers the microeconomics of the mortgage market under the non-recourse system.

Our present study extends Seko and Sumita (2007) and attempts to shed light on the role of equity constraints under the recourse loan system, the effects of tax deduction policy addressing this constraint and the effects of changes in the housing loan systems on positive and negative equity households' owner-to-owner residential mobility using the conditional fixed effects logit model and the more reliable annual spot KHPS survey data information. The reason why we adopted the conditional fixed effects logit model is that the fixed effects specification captures the selection of a housing tenure and the timing of the move into it (see Börsch-Supan, 1990). This is the first rigorous econometric study to analyze the effects of government policy under the recourse loan system and housing loan system changes on the owner-to-owner residential moves in Japan based on the conditional logit panel data estimation method.

4. Conditional Fixed Effects Logit model

We adopt a discrete dependent variable panel model for the estimation. In particular, we consider the following underlying latent model:

$$S_{it}^{*} = x_{it}^{'}\beta + \alpha_i + \varepsilon_{it,} \quad i = 1,...,N, \quad t = 1,\ldots,T, \tag{1}$$

where S_{it}^{*} is a continuous but unobserved index of residential mobility of owner-occupied household *i* in period *t*, x_{it} is a vector of explanatory variables, and α_i is an idiosyncratic fixed effect which accounts for inter-household differences in the factors affecting residential mobility and unobserved explanatory variables, as long as these differences are constant over time. ε_{it} is the stochastic error term.

Rather than observing S_{it}^{*}, we observe:

$$S_{it} = \begin{cases} 1 \text{ if } S_{it}^* > 0 \\ 0 \text{ otherwise} \end{cases}. \tag{2}$$

We assume that ε_{it} follows independently logistic distribution, that is:

$$P(S_{it} = 1 \mid x_{it}, \alpha_i) = \frac{\exp(\alpha_i + x_{it}^{'}\beta)}{1 + \exp(\alpha_i + x_{it}^{'}\beta)}. \tag{3}$$

Chamberlain (1980) shows that such a fixed effects logit model can be estimated by conditional maximum likelihood. This depends on the probability of a particular sequence:

$$(S_{i1}, \cdots, S_{iT}), \text{ conditional on } s_i = \sum_{t=1}^{T} S_{it},$$

$$P(S_{i1}, \cdots, S_{iT} \mid x_{i1}, \cdots, x_{iT}, \alpha_i, s_i) = \frac{\prod_{t=1}^{T} \exp(x_{it}^{'}\beta)}{\sum_{d \in D_i} \prod_{t=1}^{T} \exp(S_{it} x_{it}^{'}\beta)}, \tag{4}$$

where D_i is the set of all possible combinations of s_i ones and $T - s_i$ zeros, is independent of α_i . The estimator obtained by this estimation method is called the conditional fixed effect logit estimator and denoted as β_{CFML}. Use of this conditional fixed effect panel data logit model provides the opportunity to properly identify the dynamics of residential mobility adjustments, especially the impact of government policy on the timing of moves by distinguishing time-varying dynamic effects such as unanticipated policy changes from selection effects that are due to time-invariant characteristics of households such as family growth.

In order to test for the fixed individual household effect, one can perform a Hausman-type test based on the difference between the above conditional MLE and the pooled logit MLE, denoted as β_{ML}, ignoring the individual effects (where the constant is dropped to compute the statistic). The test-statistic:

$$H = (\hat{\beta}_{CFML} - \hat{\beta}_{ML})'(\widehat{V}_{CFML} - \hat{V}_{ML})^{-1}(\hat{\beta}_{CFML} - \hat{\beta}_{ML}) \tag{5}$$

is asymptotically χ^2 distributed with *k* degrees of freedom, where *k* is the number of parameters except for constant terms.

5. Data

5.1 Explanation of our main KHPS data

The KHPS started to collect data from 2004. The survey is conducted every January on an annual basis, and currently five waves are available. The details of the KHPS are as follows: The KHPS is collected by Keio University (the Faculties of Economics, and Business and Com-

merce). Respondents for the first wave were limited to men and women aged between 20 and 69 as of January 31, 2004 from the whole of Japan. The first wave (2004) has data on 4,005 households, the second wave (2005) has data on 3,314 of the 4,005 households in the first wave, the third wave (2006) has data on 2,884 households, the fourth wave (2007) has data on 2,643 households, that is, the attrition rate between the first wave and fourth wave is about 34%. In addition to these samples, in the fourth wave, a new sample of 1,419 households is added. The fifth wave (2008) has data on 3,691 households.

A little over 70% of the surveyed households are married couples. We collect information related to household characteristics, and detailed information on labor market and housing choices. Although the respondents to the survey were restricted to the 20-69 age group at the time of the first survey in early 2004, all other demographic characteristics are representative of Japanese households.

Theoretically, residential moves are determined by life-cycle factors over the whole life of households. In addition, there exist several institutional barriers to residential moves. Residential moves are determined by socioeconomic factors at the time of the move, past histories, future expectations, financial asset position, changing liquidity constraints, price of each tenure, rate of change of housing prices for each tenure, and government policies and/or systems. In the following section, we examine determinants that influence residential moves in Japan such as household attributes, housing attributes, labor market conditions, borrowing situation, the tax system, and regional characteristics.

5.2 Determinants of residential moves in Japan

Variables used as determinants of residential moves in Japan are presented in Table 1. In each survey conducted in January every year, household information of the previous year was asked. For example, the first wave (2004) contains household information in 2003. In order to assess household mobility, we use the previous year's information as determinants of residential moves. That is, if the household answered that they moved house in the 2005 survey, we rely on the information from the 2004 survey.

As for household and housing attributes, several variables are used. We explain some of these variables: *reg* signifies household head's employment status and this variable is 1 if he/she is working as a regular employee; *marr* is used to represent the household head's marital status. This dummy variable is 1 if the household head is married. The variable *roomstress* is defined as the difference between the actual number of rooms and the required number of rooms. The actual number of rooms is asked in the questionnaire (excluding bathrooms). The required number of rooms is calculated by a simple formula based on age and sex of household members (Clark,

1992). We define this variable as follows: one room for each person aged 18 or over, one room for every two boys under 18, and one room for every two girls under 18. If there is an odd number of girls and an odd number of boys, we pair those under ten years of age, regardless of sex.

For the housing price (*hprice*), we use prefecture-level real average prices for owned detached houses. The data is taken from the *Annual Report on the Borrowers Survey of the House for Installment Sale* issued by the former Government Housing Loan Corporation (GHLC) and the successor organization of the GHLC, the Japan Housing Finance Agency (JHF). This price data reflects the prefectural average purchase price for ready-built houses purchased by those who borrow funds from the GHLC and JHF. This data is converted to real terms by using the CPI such that the average value throughout Japan in 2000 is unity. In order to explain the residential move at time *t*, *hprice* at *t* is used. That is, *hprice* at 2005 is used to explain residential moves in 2005. This variable is considered to represent the expected future housing price based on rational expectations.

We construct the following variables to analyze the impact of housing equity constraints on residential moves under the recourse loan system. We construct the Extended Loan-to-Value ratio (*ELTV*) to reflect the characteristics of the recourse loan system. Ordinary Loan-to-Value ratio (*LTV*) is the ratio of loans outstanding to purchase price because households residing in owned housing may borrow funds for their housing purchase:

$$LTV = \frac{mortgage\ loan\ outstanding}{housing\ \ price}.$$

In our extended version of the *LTV*, the denominator of this ratio includes not only the housing price, but also the value of other assets, such as savings and securities the household has:

$$ELTV = \frac{mortgage\ loan\ outstanding}{housing\ \ price + saving + securities}.$$

Because the Japanese mortgage system is based on the recourse loan system, not only the housing value but also the value of other assets is regarded as collateral.

The *ELTV* reflects the characteristics of the Japanese mortgage system. Our *ELTV* is quite different from Chan's (2001, p.578) extended LTV. In our *ELTV*, "other asset values" is added in the denominator instead of being subtracted from the numerator as in Chan's paper because of the nature of the recourse loan system.[9]

The first part of the denominator, *housing price*, is calculated as follows: First, based on the owner-assessed price of the owner- occupied housing and housing attributes information, we

[9] Technically, our *ELTV* has an advantage in avoiding negative value in cases where the loan balance is smaller than the other assets.

estimate the hedonic price model with fixed effects. When households own both the land and housing structure, the total assessed value is used. The estimation result of the hedonic model is reported in Table A. Second, based on the estimated model, we predict the price of the existing owner occupied housing.[10]

For the numerator *Mortgage loan outstanding*, we use the figures reported in the questionnaire. This figure is the total amount of the housing loan at the end of the last year. If this figure is missing, we impute the missing values by calculating them on the assumption that the repayment amount in each year is equal to the repayment in January, 2008 based on the information about the loan outstanding and the repayment amount as of the fifth wave of the KHPS (January, 2008). In Japan, equal monthly payments including interest are the most widespread repayment method. In addition, the average repayment period on Japanese housing loans is fairly long (about 20 to 25 years), so that almost all households in our survey entering their residence with loans still have loans as of 2008. We set *ELTV* at zero for households that did not borrow funds.

Together with the *LTV*, Debt-to-Income ratio (*DTI*) is often considered when lenders (financial institutions) decide how much money they lend in the case of a residential mortgage. *DTI* is often defined as the ratio of the housing loan payment to income:

$$DTI = \frac{Annual\ \ housing\ loan\ \ payment}{Annual\ income}.$$

We also extend this ratio under the recourse loan system. We defined the extended *DTI* (*EDTI*) as follows:

$$EDTI = \frac{Annual\ \ housing\ loan\ \ payment + Other\ loan\ payment}{Annual\ income}.$$

In this *EDTI*, in addition to the annual housing loan payment, other loan payments are also included in order to reflect the recourse loan system. Because, for the borrower's total ability of repayment, human capital is as important as housing capital in the recourse loan system, total amount of loan payment needs to be asked.

To represent the repayment period of the housing loan, duration of living in the current owned housing until a move to the other owned housing (*spell*) is used. We assume that the repayment of the housing loan started from the time of living in the current housing. Based on this assumption, we consider that the duration of living in the owned housing is equal to the length of the repayment period of the housing loan. In order to consider the nonlinear relationship between mobility and duration of residence, we transform the duration into natural logs.

In this paper, we examine the effects of the tax deduction system on residential mobility. We construct a dummy variable to represent the "establishment of an income tax deduction sys-

[10] These fitted values from the hedonic model are based on the fixed effects estimator (See Ballie and Baltagi, 1999).

tem regarding the carrying over of capital losses on replacement of residential property in January 1, 2004 (*taxdedc*)". This tax deduction dummy variable is 1 if this system is applicable to the household and is zero otherwise.

The details of this tax deduction rule are as follows: When the household sells its owned housing after living there more than five years and buys a new residence, if the purchase price of the previously owned housing is greater than the selling price, then this capital loss can be deducted from the owner's income tax for three years, beginning in the tax year following the purchase. To be eligible to apply for this tax deduction, the annual income of the household in the selling year must be less than 30,000,000 JPY.

Theoretically, this tax deduction dummy is expected to have a positive effect on residential moves. We construct the regional dummies by dividing Japan into 8 regions to capture regional differences.

< Table 1 around here >

5.3 Descriptive statistics of the sample

In this section, we discuss the descriptive statistics of the variables. Table 2 shows the descriptive statistics for the whole sample and the sub-samples, classified by the sequence of own-to-own moves during our observation period (2005-2008).

About 1.3% of the whole sample is classified as recent movers (i.e. households that moved once during the observation period).

Based on the household and housing characteristic variables, average age of the household heads (*hage*) of the total sample is about 53 years old. The age of the household head that experienced the residential movement is from 41 to 55 years old; 69% of the household heads are working as regular employees and the 82% of them are married. The average number of the household members (*hmember*) is about four. Most of the households are living in larger houses since the average of *rmstress* shows a positive mean in all the cases. Regarding the regional dummies, we can see that over half of the households are living in the Kanto and Kinki regions: about 34% of the households in the whole sample are living in the Kanto region, and 22% of the households are living in the Kinki region.

About the housing loan variables, the mean of the *LTV* for the whole sample is 38.1%. *ELTV* has a similar value as the *LTV* for the total sample. As for the *DTI*, the mean of this value for the whole sample is 7.8%. *EDTI*, in general, is larger than *DTI*, as expected. For the full sample, the average *EDTI* is 11.6%.

Based on the mean of *taxdedc*, 53% of households experienced a capital loss and are eligible

to claim the tax deductions for capital losses on replacement of residential property. Given that such a large percentage of households suffered capital losses and meet the eligibility criteria for the tax deduction policy, it is worth examining its impact more rigorously using econometric analysis.

< Table 2 around here >

6. Estimation results of the conditional fixed effects logit model for residential moves

6.1 Estimation results

Estimation results of the logit models are presented in Table 3. In this table, estimation results of the two models are tabulated. Model (1) is the estimation results for the conditional fixed effect model. Model (2) is the estimation results for the pooled logit model in which the fixed effects α_i are omitted from equation (1).

When looking at the regression results, one has to keep in mind that the fixed effects estimator does not use information provided by stayers. As a consequence, identification is based on individuals who change their residence during the period. In fact, in the fixed effects logit model all households with unchanged residences drop out of the conditional likelihood function. In our sample, we observe 219 households who change their residence once during the 2004-2007 period. Hence the number of useful observations is substantially lower than the total sample size, but in the presence of individual heterogeneity α_i, the pooled logit model ignoring α_i gives inconsistent estimates of β in equation (1).

A comparison between the fixed effects and pooled logit models leads to the following conclusions. First, the conditional fixed effect model is the better model. The Hausman test statistic of 29.0 leads to a rejection of the model without fixed effects and the conditional fixed effect logit models are better. Second, the substantive conclusion with respect to the tax deduction policy aimed at addressing the housing equity constraints under the recourse loan system on residential moves persists after fixed effects are taken into account. We can say that individual heterogeneity represented in the fixed effects are important and thus the pooled logit model ignoring individual heterogeneity produces inconsistent estimates.

From the conditional fixed effect estimate of Model (1) in Table 3, the estimated coefficients, as a whole, have the expected coefficients. Since the *ELTV* has a significant negative sign, we can say that a large *ELTV* deters owner-to-owner moves. *EDTI* also has a significant negative impact on mobility. The magnitude of the coefficient is larger than that of the *ELTV.*

We consider that these results reflect the fact that bankers are now paying more attention to the Debt-to-Income ratio rather than the Loan-to-Value ratio under the recourse loan system.[11] *EDTI* is much more important than *ELTV* under the recourse loan system especially during the asset deflation period.

On the other hand, from the coefficient of *taxdedc*, it is clear that income tax deductions from capital losses stimulate owner-to-owner moves.

<Table 3 around here>

6.2 Simulation results

Simulation analysis is conducted using the estimation result of the conditional fixed effect estimate of Model (1). If the conditions of the tax deduction were relaxed, how might the probability of owner-to-owner mobility change? We change the residential requirement from 5 years to 1 year without relaxing the other criteria (see section 5.2 for details of the tax deduction rules). These simulation results are described in Table 4. The probability of mobility increases from about 10% (with the 5 year requirement) to 25.2% (with the 1 year requirement). In the case of households with an *ELTV* larger than 1, the probability of mobility is smaller than the whole sample since the negative effect of the large *ELTV* is larger than the positive effect of the tax deduction. On the other hand, in the case of households with an *ELTV* equal to or less than 1, the mobility probability is larger than the whole sample. In sum, shortening the residential criteria from 5 years to 1 year greatly enhances the mobility for both positive and negative equity households.

<Table 4 around here>

For the next simulation, we conduct a simulation based on changing the housing loan system from recourse loans to non-recourse loans. For this simulation, (i) we change the *ELTV* into the ordinary *LTV*, (ii) change the *EDTI* into the ordinary *DTI*, and, (iii) change both the *ELTV* and *EDTI* into the *LTV* and *DTI*. From this simulation, as a whole, simulation (iii) has the most impact on the probability of mobility, especially for households with an *ELTV* equal to or less than 1.

This may be because in the case of positive equity households, their collateral value is greater than the housing loan, and if the housing loan system switches from a recourse to non-recourse system, they need not worry about the seizure of their other assets like savings and

[11] Orui and Rating and Investment Information, Inc. (2006), p. 31.

stocks. When they want to move into other housing, as far as they have positive equity, once they sell their own housing and relocate, they will be able to begin their new life without any fear of seizure. That is, changing the housing loan system to a non-recourse system increases the mobility of positive equity households. In addition, even for negative equity households, if the housing loan system switches from recourse loans to non-recourse loans, they also need not worry about the seizure of their other assets like savings and stocks. It means they need not sell their own house in a hurry when market conditions are unfavorable. They may anticipate future appreciation in the value of their own house, and thus wait and continue to reside in the present house. Even if the price of their house will not increase in the future, once they sell their house and repay the housing loan at that time, even if it is insufficient they will be able to begin their new life without any fear of seizure or loan repayment regarding their previous house. Thus, even owners with negative equity need not move out immediately. Alternatively, owners with negative equity may move out from the previous owned houses to new rented houses even if they cannot repay the whole principle and interest once they sell their previous owned housing. If we take into consideration this possibility, the overall mobility rate for negative equity households may also increase under the non-recourse system because at present we tend to only focus on the mobility from owned housing to another owned housing. In sum, simulation analysis of switching from the present recourse loan system to the non-recourse loan system shows an increase in the owners' mobility to another owner-occupied housing, especially for positive equity households, but under certain circumstances also may boost mobility for some negative equity households.

<Table 5 around here>

7. Conclusion

Japan is known as a low residential mobility society. The contemporary Japanese economic environment, involving severe asset price deflation, reinforces this tendency. This paper draws on five waves of Japan household longitudinal data (Keio Household Panel Survey, KHPS) and estimates a conditional fixed effects logit model to investigate the effects of housing equity constraints and income shocks on owner-to-owner residential moves in Japan. By looking at contemporaneous extended Loan-to-Value (ELTV) and extended Debt-to-Income (EDTI) ratios under the recourse loan system, we examine whether housing equity constraints and negative income shocks deter owner-to-owner residential mobility and whether government policy aimed at addressing this equity constraint under the recourse loan system has a timely impact on residential moves. The policy we examined is the income tax deduction reform that permits the

carrying over of capital losses for owner-occupied households. These tax policies were devised to cope with the severe equity constraints caused by Japan's asset value implosion in the early 1990s. We find that housing equity constraints deter residential moves and that government policy has an impact on residential mobility.

Simulation analysis of relaxing tax deduction conditions by shortening the residential requirement from 5 years to 1 year greatly enhances mobility for both positive and negative equity households. Finally, simulation analysis of switching from the present recourse loan system to the non-recourse loan system promotes an increase in the owners' mobility to another owner-occupied housing, especially for positive equity households.

In order to address regulatory related disequilibrium in the housing market it is important to lessen regulatory barriers to residential mobility. Enhancing the residential mobility rate would help limit housing price volatility in Japan by encouraging adjustments in the pricing and supply of housing available. This recent tax reform on capital losses is a step in the right direction, but we should reconsider the eligibility criteria carefully to enhance the impact. In addition, switching from recourse to non-recourse loans would also promote residential mobility.

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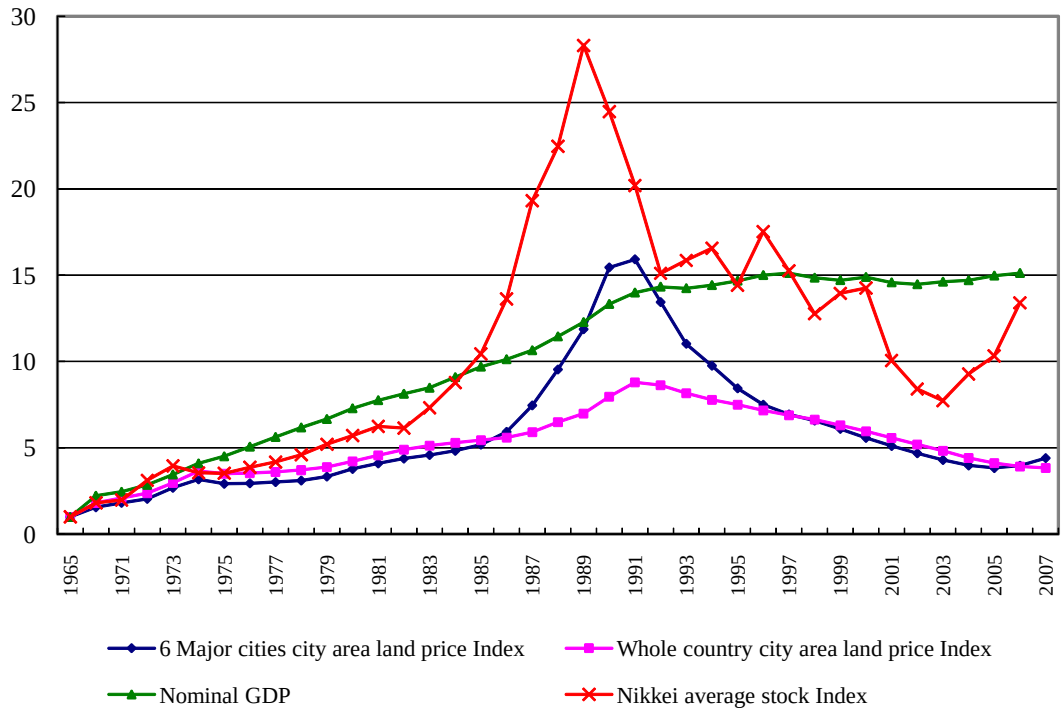
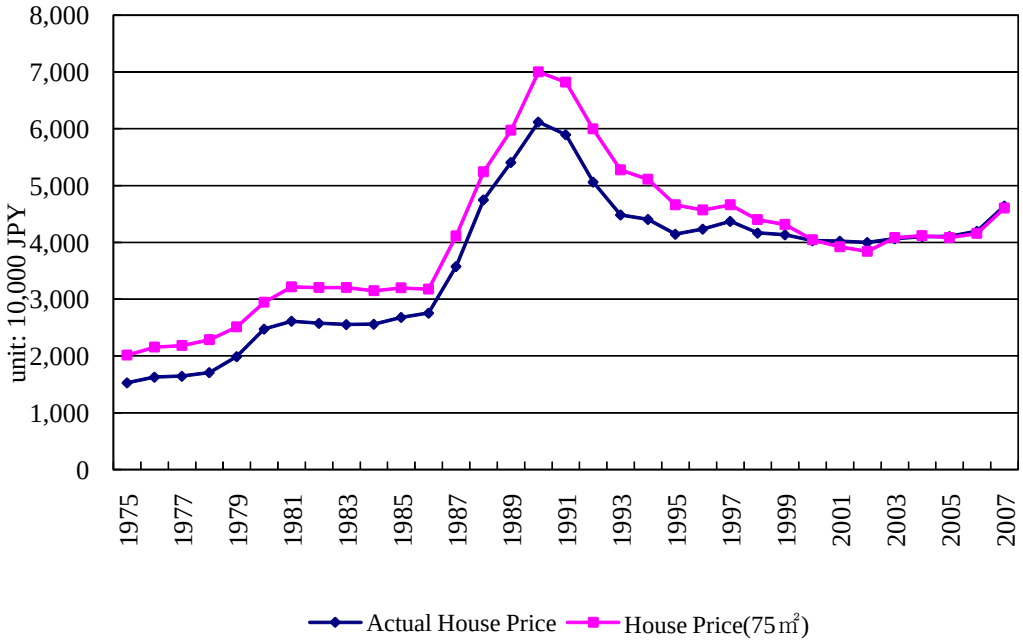
Figure 1: Trends of land price index etc (1965=1)



Source:"Real Estate Related Statistics," Mitsui Fudosan Co., Ltd.

Figure 2: House prices, 1975-2007 (Tokyo metropolitan area)



Source: "Housing Economy Databook", Housing Industry Newspaper Company

Table 1 : Variables and definitions

Variables	Definitions
Om	1: household moved from owner occupied housing to other owner occupied housing during 2005-2008
Household and housing characteristics	
hage	age of the household head (in years)
hmember	number of the household member
reg	1: household head is working as a regular employee, 0: otherwise
marr	1: household head is married, 0: otherwise
rmstress	difference between the number of rooms and the required number of rooms
hprice	real prefecture level owned detached house average price (ten thousand yen, in 2000 price)
Loan	
ELTV	Extended loan to value ratio
EDTI	Extended debt to income ratio
spell	residential spell (in years)
Tax system	
taxdedc	1: if the tax deduction system regarding the carrying over of capital losses on replacement of residential property in Januray 1, 2004 is applicable, 0: otherwise
Regional dummies	
hokkaido	1: Hokkaido area, 0: otherwise
tohoku	1: Tohoku area, 0: otherwise
kanto	1: Kanto area, 0: otherwise
chubu	1: Chubu area, 0: otherwise
kinki	1: Kinki area, 0: otherwise
chugoku	1: Chugoku area, 0: otherwise
shikoku	1: Shikoku area, 0: otherwise
kyushu	1: Kyushu area, 0: otherwise
Survey year dummies	
year04	1: 2004, 0: otherwise
year05	1: 2005, 0: otherwise
year06	1: 2006, 0: otherwise
year07	1: 2007, 0: otherwise

Table 2: Descriptive statistics

Variable	Total		2005-2006-2007-2008									
			Os-Os-Os-Os		Om-Os-Os-Os		Os-Om-Os-Os		Os-Os-Om-Os		Os-Os-Os-Om	
	Mean	Std.Dev.	Mean	Std. Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Om	0.013	0.112	0.000	0.000	0.203	0.403	0.263	0.444	0.306	0.466	0.250	0.444
(Household and housing characteristics)												
hage	53.2	11.763	53.6	11.598	41.6	11.060	49.1	11.845	48.3	10.047	55.6	11.763
hmember	3.7	1.433	3.7	1.444	3.7	1.236	3.6	1.164	3.2	1.099	4.3	1.525
reg	0.693	0.461	0.689	0.463	0.850	0.359	0.667	0.476	0.816	0.391	0.400	0.503
marr	0.820	0.384	0.820	0.384	0.876	0.331	0.754	0.434	0.878	0.331	0.400	0.503
rmstress	2.424	2.127	2.490	2.132	1.072	1.387	1.579	1.927	1.776	1.794	0.550	1.761
hprice	3372.6	541.4	3363.4	540.5	3537.4	570.3	3569.8	476.1	3455.1	487.3	3615.9	488.2
(Loan)												
LTV	0.381[a]	0.877	0.370[b]	0.885	0.728	0.696	0.478	0.632	0.470[c]	0.675	0.050[d]	0.132
ELTV	0.381	0.875	0.372	0.885	0.663	0.649	0.437	0.604	0.491	0.700	0.051	0.129
DTI	0.078	0.181	0.076	0.154	0.090	0.152	0.180	0.923	0.108	0.155	0.030	0.062
EDTI	0.116	0.243	0.114	0.214	0.110	0.157	0.213	1.080	0.228	0.503	0.056	0.072
spell	18.7	13.3	19.3	13.3	5.3	5.6	15.9	12.7	10.2	5.4	22.7	13.3
(Tax)												
taxdedc	0.530	0.499	0.553	0.497	0.039	0.195	0.158	0.368	0.245	0.434	0.500	0.513
(Regional dummies)												
hokkaido	0.044	0.205	0.045	0.207	0.052	0.223	0.000	0.000	0.000	0.000	0.000	0.000
tohoku	0.064	0.245	0.066	0.249	0.007	0.081	0.053	0.225	0.082	0.277	0.000	0.000
kanto	0.337	0.473	0.337	0.473	0.346	0.477	0.351	0.481	0.286	0.456	0.300	0.470
chubu	0.161	0.368	0.164	0.370	0.111	0.315	0.123	0.331	0.020	0.143	0.350	0.489
kinki	0.218	0.413	0.214	0.410	0.229	0.421	0.298	0.462	0.551	0.503	0.150	0.366
chugoku	0.051	0.220	0.051	0.221	0.046	0.210	0.053	0.225	0.000	0.000	0.100	0.308
shikoku	0.035	0.183	0.033	0.179	0.098	0.298	0.053	0.225	0.000	0.000	0.000	0.000
kyushu	0.090	0.286	0.090	0.286	0.111	0.315	0.070	0.258	0.061	0.242	0.100	0.308
(Survey year dummies)												
year04	0.221	0.415	0.222	0.415	0.203	0.403	0.211	0.411	0.245	0.434	0.100	0.308
year05	0.250	0.433	0.250	0.433	0.242	0.430	0.263	0.444	0.265	0.446	0.350	0.489
year06	0.273	0.445	0.272	0.445	0.281	0.451	0.263	0.444	0.306	0.466	0.300	0.470
year07	0.256	0.437	0.257	0.437	0.275	0.448	0.263	0.444	0.184	0.391	0.250	0.444
N	5197		4918		153		57		49		20	

Note: Os: Stay and Owner occupied housing, Om: Move and Owner Occupied housing, a: Number of obs is 5165. b: Number of obs is 4889. c: Number of obs is 48. d: Number of obs is 19.

Table 3: Logit Regression Results for Binary Residential Mobility Variable: Two Models

Explanatory variables	(1) conditional fixed effect logit model (panel data)			(2) pooled logit model (cross-section data)		
	Coef.	z		Coef.	z	
(Household and housing characteristics)						
reg	-0.854	-0.89		0.180	0.54	
marr	0.352	0.03		-0.266	-0.7	
rmstress	-0.510	-1.92	*	-0.349	-4.96	***
hprice	-0.002	-1.05		0.001	1.73	*
(Loan)						
ELTV	-1.581	-1.8	*	-0.913	-2.36	**
EDTI	-6.639	-1.7	*	-2.468	-1.66	*
ln *spell*	1.822	2.16	**	-0.553	-3.63	***
(Tax)						
taxdedc	5.737	4.01	***	-0.079	-0.2	
Regional dummies	Yes			Yes		
Time dummies	Yes			Yes		
Fixed effects	Yes			No		
log L	-30.22			-307.86		
Hausman test						
stat	29.049					
P-value	0.004					

Notes:

1. No. of observations: 5197
2. No. of groups: Model(1) 63, Model (2) 1701
3. Statistics of Hausman test follows the chi-saured distributuion under the null of no fixed effects. Degrees of freedom of the distribution is 13.
4. ***, ** and * indicate that the estimated coefficient is significant at 1%, 5%, and 10% levels, respectively.

Table 4: Probability of mobility due to shortening the income tax deduction residential requirement from 5 years to 1 year

Year	Sample		
	Total	ELTV>1	ELTV<=1
5	10.0%	7.2%	10.7%
4	8.4%	7.1%	8.8%
3	16.1%	7.5%	18.3%
2	20.1%	8.1%	23.1%
1	25.2%	11.4%	28.5%

Table 5: Probability of mobility by changing from a recourse to non-recourse housing loan system

Sample	Recourse ELTV& EDTI	(i) Nonrecourse ELTV→LTV	(ii) Nonrecourse EDTI→DTI	(iii) Nonrecourse ELTV & EDTI →LTV & DTI
Total	10.0%	10.1%	10.3%	10.4%
ELTV>1	7.2%	6.7%	7.2%	6.7%
ELTV<=1	10.7%	11.0%	11.0%	11.4%

Table A: Estimation results of owner assessed value model

Explained variable	ln(Owner assessed value)	
Explanatory variables	Coef.	t
hage	-0.020	-10.45 ***
rooms	0.029	2.72 ***
detach	0.560	4.89 ***
constant	7.171	42.32 ***
Regional dummies	Yes	
Purchase year dummies	No	
Survey year dummies	Yes	
Individual fixed effects	Yes	
S_u	0.884	
S_e	0.439	
F test for all u_i=0 [P-value]	7.4	
R-squared	0.0445	
N	9863	

Note: ***, ** and * indicate that the estimated coefficient is significant at 1%, 5%, and 10% levels, respectively.