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or Non-regular Labor Market?

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Does House Rent Impede Mobility in the Temporary or Non-regular Labor Market?

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Abstract

This study analyzes whether house rent impedes labor mobility when there are job opportunities for temporary workers and non-regular employees at great distances. I also examine whether owned houses and public housing decrease labor mobility. The number of temporary workers has increased in many developed countries in recent years. The house rent and the related guarantee make it difficult to rent an apartment for temporary workers and non-regular employees. Little is known about the effect of house rent on the labor market, especially for temporary and non-regular employees, although empirical studies have analyzed the effect of the housing price or tenure of dwelling on labor mobility many times. Further, previous studies about labor mobility in Japan, not limited to house rent, use only macro data. Therefore, I use *quasi-individual data* to estimate the above issues.

House rent especially discourages migration when there are job opportunities for *arbeit* workers and temporary workers, but not for short-time workers. Further, this effect is greater in the case of migration from 2005 to 2010 than for migration from 1995 to 2000. However, providing housing assistance by way of public housing decreases migration mobility, especially in the case of houses owned by the Urban Renaissance Agency and housing corporations.

JEL Classification: J61, J69

Keywords: geographic labor mobility, house rent, temporary workers, public housing, owned house

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1. Introduction

When someone who desires a job finds a new job at a great distance, even if it is a job for a temporary worker or non-regular employee, will this person move? The house rent and guarantee for temporary workers or non-regular employees make it difficult to rent an apartment. The number of temporary workers has increased in many developed countries in recent years. Does this rental difficulty impede the mobility of unemployed people? The OECD Employment Outlook in 2005 argues that "Housing prices have increased substantially since the mid-1990s in a number of OECD countries, especially in growing regions, making it difficult for low-income people to move. The rising trend in temporary employment observed in a number of OECD countries (OECD 2002) is also hampering mobility; in a tight housing market it is very difficult that a landlord will rent his/her flat to someone who has only a temporary contract in hand…Little evidence is available on programmes possibly in place in some countries to alleviate this problem and it is unclear what type of measures would be appropriate."

Most empirical studies concerning labor mobility and housing analyze the effect of housing prices or tenure of dwelling on labor mobility (Vermeulen and Ommeren, 2009; Cannari et al., 2000; OECD, 2010; Ohta and Ohkusa, 1996; Toda and Ohta, 2009). Little is known about the effect of house rent on the labor market.[1] Moreover, previous studies have not focused on the cases where there are opportunities of jobs for temporary or non-regular employee at great distances.

Regarding Japan, on the one hand, the difficulty of renting an apartment for a temporary or non-regular employee is discussed; on the other hand, there is concern about an increasing level of vacant houses in the future caused by lower fertility and a

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[1] House rent does not have strong correlations with house price and residential land price in Japan. The correlation in 2011 between house price per a square meter and the house rent of a rented house owned by a private company in any prefectures except for Tokyo, Saitama, Chiba, Kanagawa, Aichi, Osaka, Kyoto, Hyogo is 0.30 and that in Metro Area (Saitama, Chiba, Kanagawa, Aichi, Osaka, Kyoto, and Hyogo excluding Tokyo) is 0.74; between residential land price and the house rent of a rented house owned by a private company in any prefectures except for Tokyo and Metro Area is 0.19 and that in Metro Area is 0.7. The data is obtained from Japan Housing Finance Agency.

decline in the population. Further, there is a proposed revision in laws about housing assistance provided by way of performance in kind rather than in money at a time when the amount of livelihood subsidies and the fiscal deficit are increasing. Rented houses owned by prefectures and municipal corporations and rented houses owned by the Urban Renaissance Agency and housing corporations (UR housing) assume the role of a housing safety net in Japan. Rented houses owned by prefectures and municipal corporations are provided for the low income population and UR housing is provided for the middle working classes. However, the existing renters of UR housing are mostly old people rather than the working population. The Urban Renaissance Agency has also been criticized for providing high rent housing in urban areas in recent years.

Although there are these concerns, unemployment rates and opportunities for non-regular employees are different among regions. Figure 1 shows the prefectural male unemployment rate in 2005[2]. Figure 2 shows the 2005 ratio of male permanent workers who work less than 35 hours per week ('non-regular workers' in this paragraph) at the prefecture where they reside to total male permanent workers who work at the prefecture where they reside plus males unemployed. When we compare these two figures, we can find three types of regions: 1) high unemployment rate and few regular and non-regular workers; 2) low unemployment rate but few regular workers; and 3) low unemployment rate and many regular workers—this is the first best. For example, *Iwate*, *North Kanto,* and *Kagoshima* are type 1 regions; *Aichi, Shizuoka, and Mie* and *Yamaguchi, Shimane, Hiroshima, and Fukuoka* are type 2 regions; *Yamagata* is a type 3 region. Some regions have high unemployment rates even if other regions have high levels of non-regular workers and low unemployment rates.

Are these differences in regions caused by less mobility that flows from high house rents for non-regular workers, or are they caused by other reasons, such as the preference of the unemployed to live near their birthplace or the employers' avoidance of hiring applicants who live at great distances?

Hence, this study analyzes the effect on labor mobility of house rent and job opportunities for a non-regular worker. Little is known about this effect from previous empirical studies. This study does not use only macro data, but also use micro data,

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[2]This study analyzes migration data from 2005 to 2010 and from 1995 to 2000.

although previous studies used only macro data. I construct "quasi-individual data", which is explained in detail in section 3. Moreover, this study examines the effect of tenure of dwelling because tenure of dwelling is related to housing policy, which affects the unemployed; previous studies analyzed this effect many times. In addition, I confirm the wage equation.

As a result, this study ascertains whether job opportunities for temporary or non-regular workers encourage mobility, depending on job types. Job opportunities for short-time workers and "*arbeit*"[3] workers encourage mobility. The rent of a house owned by a private company discourages mobility when there are job opportunities for *arbeit* workers and temporary workers. Further, the house rent effect increases more in the case of migration from 2005 to 2010 than was the case for migration from 1995 to 2000. However, I cannot find a clear negative effect of house rent on short-time workers. With regard to the rent of a house owned by prefectures and municipal corporations and UR housing, the magnitude of the negative effect diminishes but living in rented houses owned by prefectures and municipal corporations and UR housing discourages mobility.

The remainder of the paper is organized as follows. The next section reviews previous studies. Section 3 describes the model and explains the data set. Section 4 presents the empirical results and Section 5 concludes.

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[3]The data in employment status surveys is collected by contract period of permanent, temporary, or daily employees. The survey is further segmented by type of employment as follows: regular staff, part-time workers (this study calls them "short-time workers"), *arbeit* (the Statistics Bureau explains this term as "temporary workers"), dispatched workers from temporary labor agencies, contract employees, entrusted employees, or other. Temporary employees are defined by their contract period, which in 2007 included 1.8% regular staff, 44% part-time workers, 23% *arbeit*, 7% dispatched workers, 11% contract workers, 6% entrusted employees, and 7% other. Regional differences in respect of each type of worker indicate that the trend for *arbeit* and contract employees is similar.

2. Literature Review

Many previous studies analyze the relationship between labor mobility and the regional unemployment rate. For example, Pissarides and McMaster (1999) estimate the impact of differences in wages, the unemployment rate, and the regional dummy on the migration rate. Yugami (2005) analyzes the stickiness of regional differences in the unemployment rate. The OECD (2005) argues that a structural measure is needed when the unemployment is caused by national shock, and a regional measure is needed when the unemployment is caused by regional shock.

As for previous studies that analyze whether high house rents or high house prices impede labor mobility, Ohtake (1999) argues that the unemployment issue correlates strongly with the house issue in Japan. If a "fixed term house leasehold" is in place, unemployed people can rent out their owned house and thus provide house rental income to pay off their mortgage and move to a region where they can find a job more easily and live in a low rent apartment. Zhou (2007) shows that the level of rent of a house owned by a private company impedes the convergence of regional differences in efficiency at job centers in Japan.

Vermeulen and Ommeren (2009) argue the paradox, put forward by Blanchflower and Oswald (1994) that decreasing wage by one percent increases the unemployment rate by ten percent, must be reversed by labor mobility. But if the paradox is not reversed, the causes are that: 1) the primitive constitution of the house market impedes labor mobility; and 2) regional differences in the unemployment rate indicate differences in compensation. They made a theory model for the second cause and estimated it empirically using European Union and Netherlands data. They found a negative correlation between the unemployment rate and house prices and argued that regional differences in the unemployment rate indicate differences in compensation. Using Italian data, Cannari et al. (2000) find that house prices affect the migration rate negatively. However, house prices do not affect labor mobility for migration within the northern area; the rate of house ownership affects labor mobility negatively and the level of income affects it positively. Cameron and Muellbauer (1998) find higher house rent and unemployment rate than neighborhood decrease labor mobility in United Kingdom. They point to the estimation bias at the coefficient of the unemployment rate and income as a reason for adding house prices to the estimations. Therefore, it is important to include house rent variables in estimations but there is a need for care when evaluating the estimated coefficient because the coefficient may possibly include estimation bias. This study uses a two-step estimation. Cameron and Muellbauer also

indicate that a higher rate of house ownership results in more population inflow.

As for labor mobility and the tenure of dwelling, owned houses and public houses are discussed in particular. Oswald (1999) attracts great controversy by arguing that an owned house is costly to move and hampers land development because owners have a vote in respect of regional policy; thus, a higher rate of house ownership induces less mobility and increases the unemployment rate. Some subsequent studies reject this argument (Flatau et al., 2004; Green and Hendershott, 2001).

Some studies see public housing as a problem. The OECD (2005) argues that public housing hampers labor mobility and the OECD (2010), using United Kingdom 1980s data, confirms that the migration rate of people who live in public housing is lower than for people who live in rented houses owned by private companies. Battu's study in 2009 says that unemployed people living in public housing are less likely to take a distant job than people who live in rented houses owned by private companies.

Regarding previous Japanese studies, Inoki and Suruga (1981) examine migration from 38 prefectures to seven metro areas using the 1970 population census. They indicate that considering the effects of the unemployment rate and the labor supply at the destination on labor migration, as well as wages, are new points. They find that the rate of migration declines with age and increases with education; the deterrent effect of distance does not necessarily apply for migrants of older age groups and people with higher wages.

Montgomery (1993) compares Japan and the United States. He finds that high house rents decrease net population inflow, that the coefficient of wages is not significant, and that the unemployment rate increases labor mobility in Japan. His results indicate that, in common with the United Kingdom, interregional labor migration is not efficient at solving unemployment in Japan.

Ohta and Ohkusa (1996) use a population census in the same way as this study but use migration data from 1975 to 1980 and from 1985 to 1990. They clear the negative correlation between regional wage differences and unemployment differences, excluding amenities differences. One of the amenities estimated in their study is the rate of house ownership. In their estimation, they consider a simultaneous decision of wage and labor migration and argue that increasing differences in unemployment induces increasing gross labor migration. They also indicate that equalization of unemployment takes a long time when an unemployment shock occurs in a specific region. They say that there is no micro data to analyze this problem in Japan at the time of their study. One of the new techniques in this study is using quasi-individual data as well as estimating the house rent effect on job opportunities for non-regular

workers. Toda and Ohta (2009) re-examine Ohta and Ohkusa (1996) using population censuses and analyze migration from 1985 to 1990 and from 1995 to 2000. They show that regional differences in wages and differences in the unemployment rate decide gross population outflows. They argue that the effect of decreasing wage levels when the unemployment rate is high does not strongly encourage labor mobility. This study mostly follows the estimation variables of Toda and Ohta (2009).

The result of Tamada (2003) indicates labor migration diminishes regional differences in unemployment rates, but wage levels do not encourage labor mobility. Her study uses reports on internal migration in Japan for every five years from 1960 to 1995. However, these reports do not provide age information, therefore migration of children and old people, which seems to not be caused by the labor matter, is included. She already points to this problem in her study.

As mentioned above, there are few previous Japanese studies that analyze the effects of house rents or tenure on dwellings. In particular, the effect of house rents on migration when unemployed people find job opportunities for temporary or non-regular work at great distances is not considered. This study tries to analyze this issue.

3. Model and Data

3.1 Model

Assuming that a person lives in i and the latten destination is j, here, $j \in J = \{1, 2 \cdots, N\}$. The utility of workers who find a job characterized by θ_i depends on the wage and house rent h_i and is denoted as $u(w(\theta_i, z_i), h_i)$. z_i is a condition of region i. The utility of unemployed is denoted as $u(b(\theta_i), h_i)$. $b(\theta_i)$ and this indicates the total value of unemployment benefits and leisure. When the probability of hiring in region i is $p_i(\theta_i, z_i)$, the expected utility of a person staying in region i is:

$$EU_i(\theta_i) = p_i(\theta_i, z_i)u(w(\theta_i, z_i), h_i) + [1 - p_i(\theta_i, z_i)]u(b(\theta_i), h_i) \quad (1)$$

As well as the above, the expected utility of moving into region j is:

$$EU_j(\theta_j) = p_j(\theta_i, z_j)u(w(\theta_i, z_j), h_j) + [1 - p_j(\theta_i, z_j)]u(b(\theta_i), h_j) \quad (2)$$

Assuming $T_{i,j}(\theta_i)$ is the financial and psychological migration cost, a person will stay or move into the particular region where the net expected utility is maximized. Therefore, choosing destination j_o is:

$$j_o = \arg\max_{j \in J} EU_j(\theta_i) - EU_i(\theta_i) - T_{i,j}(\theta_i) \qquad (3)$$

Let the denoted indicator function I be 1 when a mover goes to region k and otherwise 0:

$$I_{i,k}(\theta_i) = \left\{ \begin{array}{ll} 1 & if\ k = j_o \\ 0 & otherwise \end{array} \right. \qquad (4)$$

Assuming distribution θ_i is $f(\theta_i)$, the rate of mobility from region i to region k is denoted as:

$$r_{i,k} = \int I_{i,k}(\theta_i) f(\theta_i)\, d\theta_i \qquad (5)$$

Equation (5) indicates that a higher wage and higher probability of hiring in region i decreases the rate of mobility. An increased wage and probability of hiring in region k increases the rate of mobility. Therefore, I estimate the following equation using macro data:

$$\log(r_{i,k,t}) = \beta'(logX_{i,t} - logX_{k,t}) + \delta_{i,k} + \gamma_t \qquad (6)$$

$logX_{i,t} - logX_{k,t}$ indicates a difference in variables such as wage, house rent, industrial structure, and, among others, between region i and region k. This study uses a two-step estimate fixed effect estimation method, then, $\delta_{i,k}$ indicates the fixed effect of migration from region i to region k. γ_t, which indicates the effect of time. For the instrument variables, I use the wage, unemployment rate, and house rent of the previous period.

I confirm the wage curve using the equation below because the condition of region i, z_i affects not only the probability of hiring, but also the wage. A higher unemployment rate decreases the wage. Previous studies (Blanchflower and Oswald, 1994; Ohta and Ohkusa, 1996; Toda and Ohta, 2009) estimate wage curves and find negative correlations in studies abroad but do not find clear correlations in Japan. Toda and Ohta (2009) argue that the wage curve does not correct regional differences in Japan.

$$\log(w_{i,t}) - log(w_{k,t}) = \tilde{\beta}'(log\tilde{X}_{i,t} - log\tilde{X}_{k,t}) + \tilde{\delta}_{i,k} + \tilde{\gamma}_t \qquad (7)$$

As for individual behavior, equation (3) is observed by individual decision factors

as the following equation:

$$j_o = \alpha_0 + \alpha_l X_{l,m} + \epsilon_l \quad l = 1,2 \cdots n \quad (8)$$

The probability of choosing 1 in equation (4) is determined function F. Function F is a cumulative distribution function of $-\epsilon_l$, and a cumulative distribution function of ϵ_l if the distribution of ϵ_l is symmetric about the origin. Therefore, the likelihood function is:

$$L(\alpha_0, \alpha_1 \cdots \alpha_n) = \prod_{I_{i,k,m}=1} F(\alpha_0 + \alpha_l X_{l,m}) \prod_{I_{i,k,m}=0} [(1 - F(\alpha_0 + \alpha_l X_{l,m}))] \quad (9)$$

To maximize the log likelihood function of (9), I use the probit method.

3.2 Data

My data is based on the population censuses. There are two kind of population census – large-scale and simplified. The former have been conducted every ten years and the latter have been taken in the fifth years after the large-scale censuses. The data about migration from region i to region k is surveyed only at large-scale censuses. The latest large-scale census was conducted in 2010. Following previous studies (Ohta and Ohkusa, 1996; Toda and Ohta, 2009) I use estimates only for males over 15 and less than 65 years old because I focus on migration caused by work. Frequent migration reasons for females and other age groups are related to their familys' economic circumstances. Following are explanations about macro and micro data used in my estimations.

3.2.1 Data for Macroscopic Phenomenon

The rate of mobility from region i to region k is calculated as follows: "male population aged over 15 years old and less than 65 years old who moved from region i to region k from t-5 year to t year" divided by "male population aged over 15 years old and less than 65 years old in region i in t-5 year". Hence, the number of migration pairs is 47 prefectures $\times$ 46 prefectures. I estimate the migration from 2005 to 2010 and the migration from 1995 to 2000. The number of observations are 47 prefectures $\times$ 46 prefectures $\times$ 2 periods = 4,324.

Explanation variables, denoted as X in equation (6), are real wage, unemployment rate, house rent, rate of temporary worker/non-regular employee, rate of

house by tenure of dwelling, average age, rate of college grad., rate of primary activity, rate of secondary activity, and distance between prefectural capital of origin and that of destination. As mentioned in section 3.1, an estimation variable is a difference of variable; a variable of origin (region i) minus a variable of destination (region k). Wage is taken from the Basic Survey on Wage Structure. House rent is obtained from the Housing and Land Survey. Rate of non-regular employee is obtained from the Employment Status Survey. Rate of primary and secondary activity is taken from the System of Regional Account and distance is obtained from the Geospatial Information Authority of Japan. Others are obtained from the population censuses.

Real wages is calculated by dividing "contractual monthly cash earnings" plus "annual special earnings divided by 12 months" by the consumer price index (CPI) and multiplied by 100. I use wage data of male workers aged over 15 years old and less than 65 years old that are averages weighted according to the number of male workers in each age group. In addition, the data are averaged during 1995-2000 and 2005-2010.

The unemployment rate is the ratio of male unemployed aged over 15 years old and less than 65 years old divided by the male labor force population aged over 15 years old and less than 65 years old in 1995 and 2005.

House rent is the rent for one tatami (the size of a bed), including an administrative maintenance fee, in 1998 and 2008.

The rate of a temporary worker and non-regular employee is calculated as fallows. I use short-time workers and *arbeit* workers in Employment Status Survey as a proxy for non-regular employees. The rate of non-regular employee is the ratio of these male workers divided by "persons engaged in work plus persons not engaged in work but wishing to work". The data are collected in 1997[4] and 2007. I also obtain data from population census. I use temporary workers in 2000[5] and dispatched workers, short-time workers, *arbeit* and others[6] in 2010.

The rate of house by tenure of dwelling is the ratio of private households for each tenure of dwelling (owned houses, rented houses owned by the prefecture and municipal corporation, rented houses owned by UR housing, rented houses owned by private companies, housing for company employees and civil servants, and rented rooms) divided by private households in 1995 and 2005.

The average age is the average age among people aged over 15 and less than 65

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[4] Including short-time and *arbeit* workers aged over 65 years old
[5] Including temporary workers aged over 65 years old
[6] The data of population census in 2000 was collected by permanent or temporary, but the data in 2010 was collected by dispatched workers, short-time workers, *arbeit* and others.

years old in each prefecture in 1995 and 2005.

The rate of college grad. is the ratio of the number of people who graduate from college, university, or graduate courses to the total number of people graduated from schools on average between 1990 and 2000 and between 2000 and 2010.

The rate of primary/secondary activity is the ratio of primary/secondary activity to total production in each prefecture in 1995 and 2005.

The distance between region i and region k is not used at the fixed effect estimation of equation (6) but it is used at the estimation of equation (6) by the period instead of panel data to assess changes over time. In this case, I use μ_i, which indicates the fixed effect of origin i instead of $\mu_{i,k}$.

3.2.2 Data for Individual Behavior

In order to analyze individual behavior, I use "quasi-individual data". I use data by prefecture, type of employment, age, place of living 5 years ago (the same prefecture or other prefecture with current living prefecture), graduated school, tenure of dwelling, and working industrial sector as proxy for a quasi individual. For example, a person living in Hokkaido prefecture who is a permanent worker working over 35 hours per week in the service sector, male, classified as over 30 years old and less than 35 years old, living in another prefecture 5 years ago, graduated from high school, and living in an owned house is used as proxy for one person. The number of people who correspond to each specific category is used as weight when I estimate the log likelihood function.

I use population census data customized to order in 2000 because customized date cannot be supplied for 2010. Tenure of dwelling is obtained from the population census in 2000. As for estimation using micro data, this paper includes persons living quarters other than dwelling houses such as dormitories, boardinghouses, hospitals, schools, hotels, firms, factories and offices. House rent is obtained from the Housing and Land Survey in 1998. I do not use the data in 2000 for avoid an endogeneity problem. Wage is obtained from the contractual monthly cash earnings of the Basic Survey on Wage Structure in 1995. Others are obtained from the population census. For probit estimation, 1 is chosen in equation (4) in section 3.1 for people who come from a prefecture other than where they are currently living, otherwise it is 0. I do not have information about wage in quasi-individual data, therefore, I use the wage that is in the data of the prefecture where they are currently living and corresponding to their age group. For consumer prices, I use the general regional difference index of consumer prices, excluding rent, for 2000. I do not use difference in wages between region i and

region k such as estimation for macroscopic phenomenon. Therefore I use the general regional difference index of consumer prices rather than the more broadly base consumer price index. The unemployment rate in 1995 is also from the data of the prefecture where they are currently living and corresponding to their age group.

For type of employment, I can obtain data that is classified into permanent workers who work over 35 hours per week, permanent workers who work less than 35 hours, and temporary workers. As mentioned, the information about origin of migration is not available. Table 1 shows the descriptive statistics.

4. Results

4.1. Results of Macroscopic Phenomenon

The upper part of Table 2 shows the results of equation (6) using a two-step estimate panel fixed effect estimation. When the house rent in the origin prefecture is higher than that of the destination, the rate of mobility increases. A higher rate of temporary and non-regular employee at the destination than the original prefecture increases the rate of mobility when I use short-time workers and *arbeit* workers as proxy for non-regular employees. One point higher non-regular employees at the destination increases 1.24 or 2.34 point labor mobility. However, the coefficients are insignificant when I use temporary workers. This means that even if there are opportunities of jobs for temporary workers and non-regular employees, it does not encourage migration when the jobs are for temporary employees. In contrast, even if the rate of temporary employment is high, people do not stay in their original prefecture.

This study focuses on whether house rent discourages labor mobility when there is a job opportunity for a temporary worker or non-regular employee at a great distance. I predict that the cross-term coefficient is negative because of the following. First, when "the destination house rent is higher than at the original prefecture, in other words, the difference house rent is negative" and "there is a higher rate of temporary and non-regular employees at the destination than at the original prefecture, in other words, the difference rate of temporary and non-regular employees is negative", these produce a positive cross term. In these circumstances, the coefficient is negative when higher house rent discourages labor mobility. Second, when "difference house rent is positive" and "difference rate of temporary and non-regular employees is negative", these produce a negative cross term. In these circumstances, the coefficient is negative

when a person moves for lower house rent and takes a job. Third, when "house rent is negative" and "rate of temporary and non-regular employee is positive", these produce a negative cross term. In these circumstances, the coefficient is negative when a person stays in their original prefecture to engage in work and benefit from low house rent. Fourth, when "house rent is positive" and "rate of temporary and non-regular employee is positive", these produce a positive cross term. In these circumstances, the coefficient is negative when a person stays at their original prefecture to benefit from low house rent even if job opportunities for temporary and non-regular employees are low[7].

Regarding the cross term coefficient in Table 2, it is negative when I use the *arbeit* workers as proxy for non-regular employees and temporary workers. High house rent discourages labor mobility, especially when there are job opportunities for temporary workers, but it does not affect labor mobility when there are job opportunities for short-time workers.

The lower part of Table 2 shows the results using fixed effect estimation. The coefficients of wage are positive although the expectation is negative. As well as above results, when I do not use two-step estimation house rent discourages labor mobility when there are job opportunities for *arbeit* workers and temporary workers, and it does not discourage labor mobility when there are job opportunities for short-time workers. The cross term coefficient also indicates negative as well as a two-step estimate. House rent discourages labor mobility when there are job opportunities for *arbeit* workers and temporary workers.

Table 3 shows the results of equation (6) using two-step estimate panel fixed effect estimation as well as Table 2, but I use the house rent of prefecture and municipal corporation at the upper part of Table 3 and the UR housing at the lower part of Table 3. The cross term coefficient shows that the house rent of a rented house owned by a prefecture and municipal corporation and a rented house owned by UR housing discourage labor mobility less than the house rent of a rented house owned by a private company in Table 2.

Table 4 compares the results for labor mobility from 1995 to 2000 and from 2005 to 2010. The results use a two-step estimate, but use μ_i instead of $\mu_{i,k}$ in equation (6). In other words, these estimations include the effect of the original region and distance, but excludes the pair (pair of original prefecture and destination).

The magnitude of the house rent coefficient of 2005-2010 is greater than that of

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[7]It is possible that a person could move to take a job even if their house rent increases. In that case, the coefficient is positive.

1995-2000, or become significant and positive. The magnitudes of cross term coefficients decrease in rates of *arbeit* workers and temporary workers. The decreasing effect of job opportunities for *arbeit* workers and temporary workers might be consistent with decreasing total labor mobility.[8] As for the effect of house rent on labor mobility when there are job opportunities for temporary workers and non-regular employees, the effect increases in recent years.

However, the number of dispatched workers and contract workers increase as well as that of short-time and *arbeit* workers recently. Moreover, the definition of temporary workers of population census in 2000 is different from that in 2010. Therefore, I also use 1) dispatched workers; 2) *arbeit* workers, contract workers and entrusted employees and 3) sum of short-time, dispatched, *arbeit,* contract workers and entrusted employees as proxy for a non-regular workers for migration from 2005 to 2010. The data of employment status survey only in 2007 are segmented by these detail type of employment. Further, I use 4) temporary workers in employment status survey. The magnitudes of cross term and rate of non-regular employees increase for *arbeit* and contract workers than that for *arbeit* workers. Regarding the result using dispatched workers as proxy for non-regular employees, the magnitude of cross term is not negative. House rent does not negatively affect labor mobility when there are job opportunities for dispatched workers. As for temporary workers, the results are not different from that for estimation using population census data.

Therefore, does public housing solve the problem that high house rent decreases mobility in the labor market for temporary workers and non-regular employees? Table 5 shows the effect of tenure dwelling when I use temporary workers for rate of non-regular employees and temporary workers. The coefficient of a rented house owned by UR housing is insignificant in column 2 while the coefficient of a rented house owned by a prefecture and municipal corporation is positive. The coefficient of a rented house owned by UR housing is negative in column 5. This means that increasing private households who live in rented houses owned by UR housing causes these people to move less to other prefectures. Previous studies argue that public housing decreases the rate of mobility. I find such an effect in UR housing in particularly. Against the prediction, increasing private households who live in owned houses causes them to move more. Ohta and Ohkusa (1996) and Toda and Ohta (2009) found the same result as this study. Toda and Ohta (2009) argue that more population inflows to a region result in a lower rate of owned houses. Note that in common with Toda and Ohta (2009),

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[8] The ratio of migration from other prefecture to population aged over 5 years old was 28.1% in 2000 and that was 22.8% in 2010.

this study uses data from a starting year of migration (data in 1995 for migration from 1995 to 2000 and data in 2005 for migration from 2005 to 2010). For the argument of Toda and Ohta (2009) to have meaning, it is necessary to assume that the same trend of population inflow exists before the migration that the researchers analyze. The results of when I use *arbeit* workers as proxy for non-regular employees are similar to above results.

Finally, it is necessary to confirm the wage equation. Table 6 shows the result of equation (7). An increasing unemployment rate decreases the relative wage. This is consistent with previous studies abroad (Blanchflower and Oswald, 1994). Toda and Ohta (2009) and Ohta and Sugiura (2006) argue that their study finds the effect of the unemployment rate on wage increases and becomes negative due to controlling the age structure. However, this study finds a negative effect of the unemployment rate on the relative wage even if the age structure is not controlled. High house rent decreases the relative wage compared with a positive correlation between house rent and the relative wage when I do not control other factors such as education background, age structure, industrial structure, and the rate of a non-regular employee. The rate of a temporary worker produces little increase in the wage. This might indicate that a high rate for a temporary worker demonstrates a good economic performance in the prefecture. A higher owned house rate at a specific prefecture shows a higher wage at that prefecture. The results of when I use *arbeit* workers as proxy for non-regular employees are similar to above results.

4.2 Results of Individual Behavior

Table 7 shows the result of estimating the log likelihood function of equation (9). I focus on males aged over 15 and less than 65 years old. The first question of this study is whether high house rents discourage mobility and job opportunities for temporary and non-regular workers encourage mobility. Table 7 indicates that people working less than 35 hours per week (as proxy for non-regular workers in the estimation for individual behavior), temporary workers, the unemployed, housekeepers, and others (who are not unemployed, housekeepers, or students) more move than regular workers. [9] It is possible to say that non-regular workers and temporary workers found their current job and moved from other prefectures to their current living prefecture. As for the unemployed, they moved from other prefectures to find a job but not

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[9] Percentage of movers in regular workers is 26.52% and that in non-regular workers is 17.64%.

successfully[10]. The marginal effect indicates that if an individual is a non-regular worker, their migration probability increases by about 0.0045%. The magnitude is much larger in the case of the unemployed; if an individual is unemployed, the migration probability increases by about 0.012%.

The coefficient of house rent is positive against the prediction. However, house rent is data at destination rather than relative house rent in the estimation for individual behavior because the information about origin of migration is not available. Therefore, it is possible that high house rent demonstrates good economic performance. The wage is the average wage at destination in this section and its coefficient is negative.

Regarding the cross term, for temporary workers, the unemployed, housekeepers, and others, increasing house rent discourages their migration. However, for non-regular workers, increasing house rent encourages their migration, which is contrary to the prediction. However, this is consistent with the result of the macroscopic phenomenon; a higher rate for a non-regular employee at a destination relative to their original prefecture does not encourages migration significantly when I use short-time workers as a proxy for non-regular employees. Short-time workers are usually not temporary workers and their working hours are less than 35 hours per week in Japan.

As for the tenure of dwelling, individuals who live in an owned house, a rented house owned by a prefecture or municipal corporation, UR housing, or rented rooms move less than individuals who live in a rented house owned by a private company. This low migration probability is consistent with previous studies abroad. This result for an owned house is consistent with the prediction, although the result of the macroscopic phenomenon is in contrast to the prediction. An individual living in an owned house moves less than a person who lives in a rented house owned by a private company, but an increasing difference in the rate of owned houses between the original prefecture and the destination indicates high migration. The rate of owned houses in the countryside is higher than for metro areas in Japan. People who live in their parents' owned house in the countryside move to a metro area and people who own their house at destination move less than people who live in a rented house.

Regarding other coefficients, an increasing unemployment rate at the destination decreases the migration probability. Better educated individuals move more. Individuals less than 40 years old move more than those over 40 and less than 45 years old. In contrast, individuals over 45 years old move less than individuals over 40 and

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[10]As for housekeepers and others, they might come from other prefectures for reasons not job related.

less than 45 years old.

Table 8 shows the result when I use house rent of a rented house owned by a prefecture and municipal corporation. Except for the coefficients of house rent and the cross term, the results are almost the same as those for Table 7. The magnitudes of the coefficients of the cross term in Table 8 are greater than those in Table 7 for non-regular workers, the unemployed, housekeepers, and others, but the magnitude is smaller than that of Table 7 for temporary workers. This means that the house rents of rented houses owned by prefectures and municipal corporations are important for non-regular workers and the unemployed in order for them to move. When non-regular workers find job opportunities at a great distance, their migrations are discouraged by high house rents. However, house rents of rented houses owned by prefectures and municipal corporations do not affect temporary workers greatly because if there are job opportunities for temporary workers, the unemployed do not migrate well to other prefectures in order to take temporary jobs.

Overall, this study indicates that job opportunities for short-time workers and *arbeit* workers encourage labor mobility. The higher rate of short-time workers and *arbeit* workers at destination increases the rate of mobility in the estimation using macro data. Using micro data in the estimation shows the migration probability of the unemployed is higher than that of regular workers.

Does house rent discourage their mobility? The results of the macroscopic phenomenon do not reject the assertion that high house rent at destination discourages migration even if there are job opportunities for *arbeit* workers and temporary workers. This has particularly been the case recently. However, house rent does not affect migration significantly for short-time workers in both estimations using macro and quasi-individual data.

Is providing public housing in order to solve the high house rent problem a better solution? Nowadays there is a proposition that housing assistance that is provided by way of performance in kind should be considered. UR housing has been criticized for providing high rent housing in urban areas in recent years. This study indicates that rented houses owned by UR housing decrease the migration probability. Housing assistance provided by way of performance in kind might be an effective utilization of exciting public housing but there is a possibility that it would discourage labor mobility when there are job opportunities at great distances.

5. Conclusion

This study analyzes whether house rent decreases labor mobility when there are job opportunities for temporary workers and non-regular employees at great distances. My estimations use macro and quasi-individual data and find that house rent discourages migration when there are job opportunities for *arbeit* workers and temporary workers, but not for short-time workers. However, housing assistance provided by public housing decreases migration mobility, especially in the case of houses owned by UR housing.

Like all previous studies, mine contains some limitations. I cannot obtain data for the estimation of individual behavior separated between rented houses owned by prefectures and municipal corporations and rented houses owned by UR housing. Hence, I cannot confirm the result of macro estimations that indicate rented houses owned by UR housing decrease the migration rate but rented houses owned by prefectures and municipal corporations do not decreases labor mobility significantly. High house rent is not the only factor hampering mobility. Credit levels required by landlords, key money, and a deposit are also a factor hampering mobility because they make it difficult to rent a house at a destination.

Despite these limitations, the findings of this study will contribute to clarifying the negative effect of house rent on labor mobility and the differences relevant to the various employment types. House rent especially discourages migration when there are job opportunities for *arbeit* workers and temporary workers.

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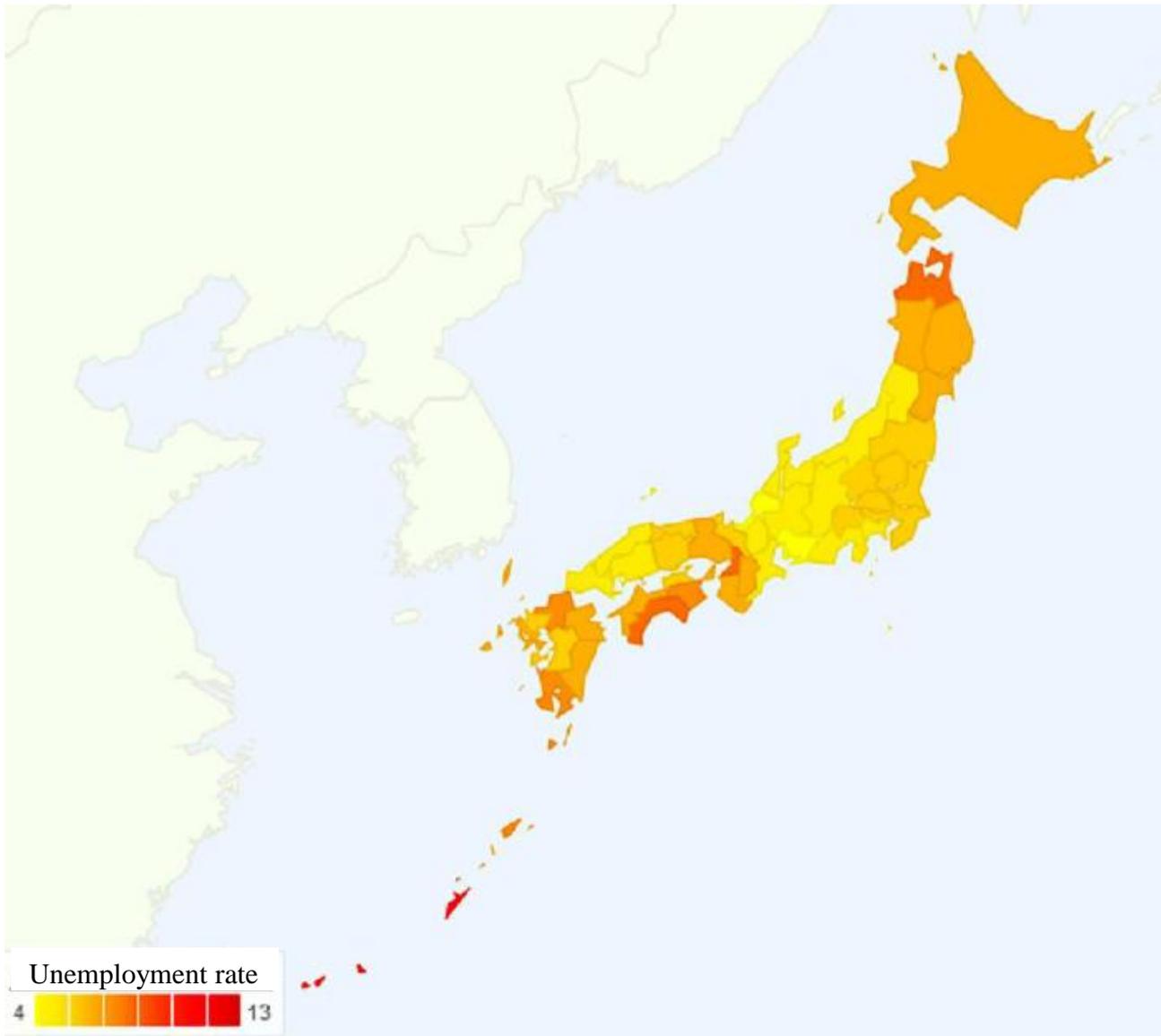
Figure1 Unemployment rate

Ratio of non-regular workers at the prefecture where they reside to total male permanent workers who work at the prefecture where they reside plus males unemployed
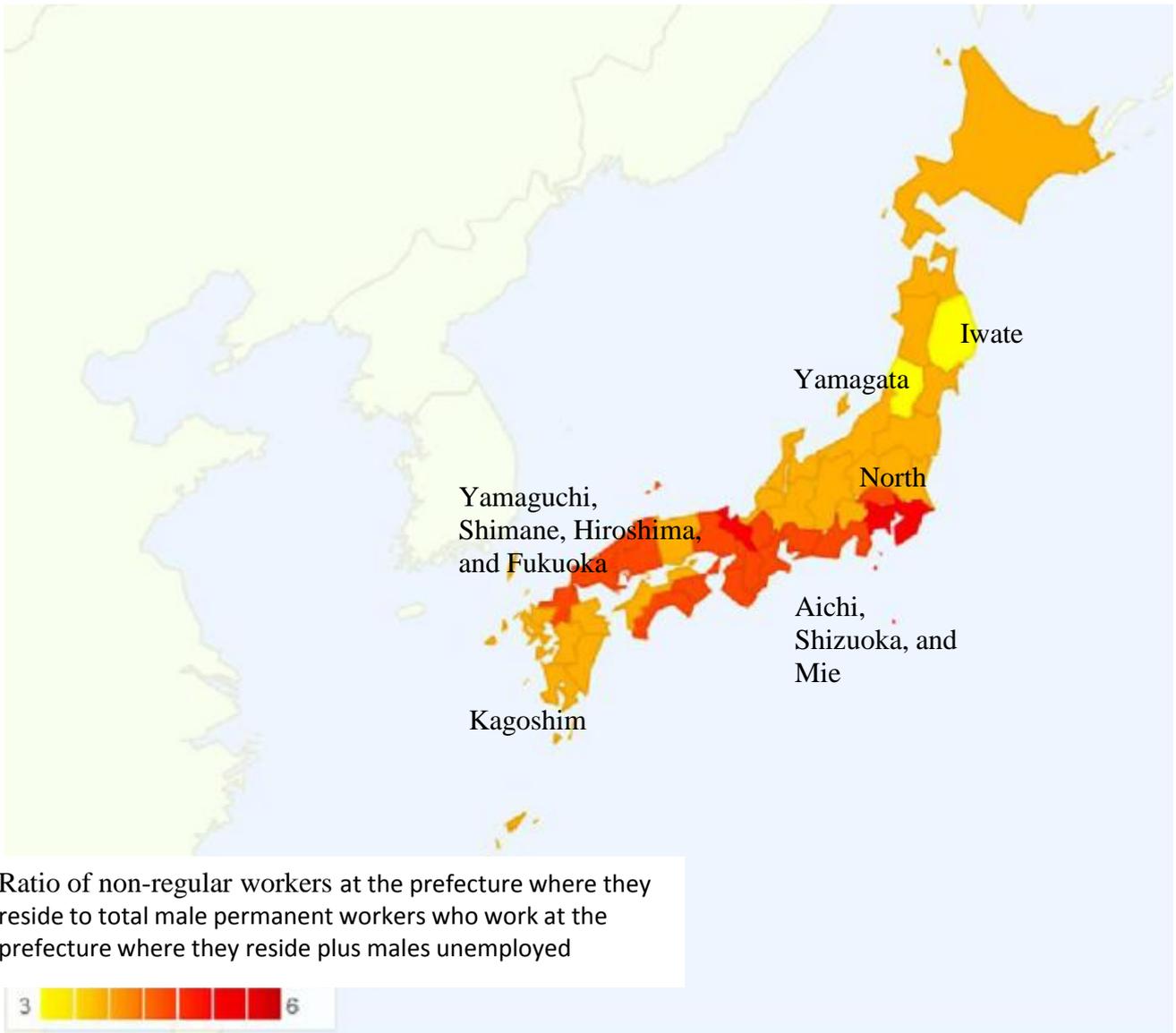
Figure2 Ratio of non-regular workers

Table1 Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Rate of mobility	-2.670	1.432	-8.328	1.383
Wage	0.000	0.161	-0.594	0.594
Wage of previous period	0.000	0.163	-0.518	0.518
Unemployment rate	0.000	0.330	-1.439	1.439
Unemployment rate of previous period	0.000	0.364	-1.497	1.497
House rent of rented house owned by private company	0.000	0.250	-1.074	1.074
House rent of rented house owned by private company of previous period	0.000	0.298	-1.242	1.242
House rent of rented house owned by prefecture and municipal corporation	0.000	0.285	-0.986	0.986
House rent of rented house owned by prefecture and municipal corporation of previous period	0.000	0.314	-1.135	1.135
House rent of rented house owned by the urban renaissance agency and housing corporations	0.000	0.330	-1.209	1.209
House rent of rented house owned by the urban renaissance agency and housing corporations of previous	0.000	0.377	-1.293	1.293
Rate of primary activity	0.000	1.365	-4.787	4.787
Rate of secondary activity	0.000	0.373	-1.271	1.271
Average age	0.000	0.024	-0.079	0.079
Rate of college grad	0.000	0.330	-1.091	1.091
Distance	519.653	355.059	10.500	2243.800
Year dummy	0.500	0.500	0.000	1.000
Short time workers	0.000	0.288	-1.135	1.135
Arbeit workers	0.000	0.397	-1.247	1.247
Temporary worker	0.000	0.171	-0.726	0.726
Rate of owned house	0.000	0.169	-0.650	0.650
Rate of rented house owned by prefecture and municipal corporation	0.000	0.530	-1.642	1.642
Rate of rented house owned by the urban renaissance agency and housing corporations	0.000	1.381	-3.995	3.995
Rate of rented house owned by private company	0.000	0.341	-1.212	1.212
Rate of housing for company employee and civil servant	0.000	0.314	-0.944	0.944
Rate of rented rooms	0.000	0.335	-1.219	1.219
Number of observations[*]	4324			

Variables are differences of logarithm of variables excluding rate of mobiliyu, year dummy, and distance; a logarithm of variable of origin (region i) minus a logarithm of variable of destination (region k).

*As for house rent of rented house owned by the urban renaissance agency and housing corporations and that of previous period are 4052.

Table1 Descriptive statistics (continue)

	Mean	Std. Dev.	Min	Max
Migration	0.233	0.423	0.000	1.000
Owned house	0.343	0.475	0.000	1.000
Rented house owned by prefecture, municipal corporation, the urban renaissance agency and housing corporations	0.141	0.348	0.000	1.000
Rented house owned by private company	0.266	0.442	0.000	1.000
Housing for company employee and civil servant	0.119	0.324	0.000	1.000
Rented rooms	0.055	0.229	0.000	1.000
All living quarters other than dwelling houses	0.076	0.265	0.000	1.000
Permanent workers working over 35 hours	0.562	0.496	0.000	1.000
Permanent workers working less than 35 hours	0.154	0.361	0.000	1.000
Temporary worker	0.160	0.367	0.000	1.000
Unemployment	0.058	0.233	0.000	1.000
Housekeeper	0.017	0.129	0.000	1.000
Others[1]	0.049	0.217	0.000	1.000
Consumer prices[2]	102.705	2.275	97.800	107.500
House rent of rented house owned by private company	8.212	0.215	7.734	8.808
House rent of rented house owned by prefecture and municipal corporation	7.030	0.234	6.468	7.454
Wage of previous period	5.760	0.262	4.977	6.312
Unemployment rate of previous period	1.410	0.584	0.327	3.625
Elementary school, junior high school	0.215	0.411	0.000	1.000
Senior high school	0.365	0.482	0.000	1.000
Junior college, higher professional school	0.143	0.350	0.000	1.000
College, university, graduate course	0.239	0.427	0.000	1.000
Persons attending school	0.034	0.181	0.000	1.000
Persons never attended school	0.004	0.062	0.000	1.000
Mining	0.007	0.085	0.000	1.000
Construction	0.129	0.336	0.000	1.000
Manufacturing	0.143	0.350	0.000	1.000
Electricity, gas, heat supply and water	0.032	0.176	0.000	1.000
Transport, information and communications	0.104	0.305	0.000	1.000
Wholesale and retail trade	0.134	0.340	0.000	1.000
Finance and insurance	0.040	0.197	0.000	1.000
Real estate	0.025	0.155	0.000	1.000
Service	0.163	0.369	0.000	1.000
Government	0.066	0.248	0.000	1.000
Industries unable to classify	0.033	0.178	0.000	1.000
15-19 age group	0.050	0.218	0.000	1.000
20-24 age group	0.123	0.329	0.000	1.000
25-29 age group	0.137	0.344	0.000	1.000
30-34 age group	0.122	0.327	0.000	1.000
35-39 age group	0.108	0.311	0.000	1.000
40-44 age group	0.100	0.300	0.000	1.000
45-49 age group	0.099	0.299	0.000	1.000
50-54 age group	0.098	0.298	0.000	1.000
55-59 age group	0.086	0.280	0.000	1.000
606-64 age group	0.076	0.264	0.000	1.000
Number of observations		222996		

1. Others are not unemployment, not housekeeper nor students.
2. General regional difference index of consumer prices excluding rent

Table2 Results of macroscopic phenomenon

mobility	Two-step estimate panel fixed effect estimation							
			Short-time workers		Arbeit workers		Temporary workers	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Wage	-41.364 *	21.999	-28.819 **	11.310	-55.592 **	26.479	-81.788 *	49.461
Unemployment rate	1.574 ***	0.543	1.942 ***	0.539	5.282 ***	2.000	2.764 **	1.366
House rent			6.248 ***	1.575	10.030 **	4.251	1.044	2.240
Rate of primary activity	-1.198 **	0.553	-1.387 ***	0.384	-1.663 **	0.722	-1.564 **	0.767
Rate of secondary activity	1.983 *	1.150	0.327	0.463	1.934 *	1.109	3.396	2.086
Rate of non-regular/temporary workers			-1.238 ***	0.221	-2.342 **	0.974	2.470	1.982
Rate of non-regular/temporary workers×house rent			0.585 ***	0.199	-1.066 †	0.660	-5.878 ***	1.107
Average age	5.842	8.972	4.056	7.469	35.795 *	20.945	11.801	13.173
Rate of college grad	-9.035 ***	2.304	-12.079 ***	1.967	-10.051 ***	2.671	-14.553 **	6.227
Year dummy	0.028	0.029	0.025	0.024	0.023	0.041	0.015	0.048
Constant	-2.684 ***	0.020	-2.689 ***	0.017	-2.635 ***	0.042	-2.627 ***	0.035
R-sq: between	0.140		0.089		0.114		0.139	
overall	0.129		0.084		0.105		0.128	
Wald chi2	34559.5		49085.1		17056.5		12549.2	

Explained variable: rate of	Fixed effect estimation							
			Short-time workers		Arbeit workers		Temporary workers	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Wage	6.332 ***	0.650	4.022 ***	0.663	6.560 ***	0.670	7.348 ***	0.614
Unemployment rate	0.388 ***	0.107	0.307 ***	0.114	0.490 ***	0.126	0.384 ***	0.109
House rent			0.255	0.216	0.347	0.226	0.001	0.209
Rate of primary activity	-0.088	0.096	-0.289 ***	0.092	-0.090	0.096	-0.338 ***	0.091
Rate of secondary activity	-0.533 ***	0.128	-0.749 ***	0.123	-0.561 ***	0.129	-0.278 **	0.120
Rate of non-regular/temporary workers			-0.609 ***	0.043	-0.039	0.087	-1.119 ***	0.119
Rate of non-regular/temporary workers×house rent			0.585 ***	0.113	-1.066 ***	0.232	-5.878 ***	0.304
Average age	-12.637 ***	1.940	-20.637 ***	2.120	-11.566 ***	2.178	-6.785 ***	1.982
Rate of college grad	-3.885 ***	0.289	-6.768 ***	0.345	-3.852 ***	0.290	-3.211 ***	0.272
Year dummy	0.028 **	0.014	0.025 *	0.014	0.023	0.014	0.015	0.013
Constant	-2.684 ***	0.010	-2.689 ***	0.010	-2.635 ***	0.015	-2.627 ***	0.010
R-sq: within	0.176		0.255		0.185		0.322	
between	0.029		0.014		0.066		0.146	
overall	0.018		0.017		0.048		0.106	
F value	65.5		73.7		48.7		102.4	

*** significant at the 1 percent level, **significant at the 5 percent level, * significant at the 10 percent level.
† significant at the 10.6 percent level.
This study use the wage, unemployment rate, and house rent of the previous period as the instruments variables.

Table3 Results of macroscopic phenomenon -House rent of public housing

Explained variable: rate of mobility	House rent of rented house owned by prefecture and municipal corporation					
	Short-time workers		Arbeit workers		Temporary workers	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Wage	-1.156	5.489	-22.476 **	10.638	-167.307	295.483
Unemployment rate	0.248	0.178	2.114 ***	0.526	6.244	9.190
House rent	0.590	0.517	4.441 ***	1.400	13.500	19.801
Rate of primary activity	-0.369 **	0.152	-0.195	0.197	-1.011	1.742
Rate of secondary activity	-0.491 *	0.293	1.461 **	0.684	8.810	14.863
Rate of non-regular/temporary workers	-0.708 ***	0.111	-0.950 ***	0.336	6.515	12.718
Rate of non-regular/temporary workers ×house rent	0.536 ***	0.107	-0.451	0.312	-3.476 *	1.988
Average age	-20.530 ***	2.376	2.832	5.896	49.428	88.703
Rate of college grad	-7.730 ***	1.106	-8.587 ***	1.526	-30.260	44.118
Year dummy	0.031 **	0.014	0.022	0.024	0.008	0.098
Constant	-2.693 ***	0.010	-2.663 ***	0.022	-2.640 ***	0.073
within	0.231					
R-sq: between	0.058		0.118		0.136	
overall	0.059		0.110		0.125	
Wald chi2	146918.2		51126.8		3029.9	

Explained variable: rate of mobility	House rent of rented house owned by the urban renaissance agency and housing corporations					
	Short-time workers		Arbeit workers		Temporary workers	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Wage	11.669 ***	2.588	12.784 ***	2.268	17.943 ***	2.888
Unemployment rate	-0.016	0.217	0.135	0.291	0.176	0.229
House rent	-0.837 **	0.356	-2.306 ***	0.504	-1.773 ***	0.466
Rate of primary activity	-0.032	0.128	0.168	0.131	-0.163	0.127
Rate of secondary activity	-1.268 ***	0.265	-1.380 ***	0.293	-1.007 ***	0.277
Rate of non-regular/temporary workers	-0.561 ***	0.068	0.094	0.157	-1.544 ***	0.190
Rate of non-regular/temporary workers ×house rent	0.147	0.096	-0.611 ***	0.223	-4.155 ***	0.318
Average age	-21.711 ***	2.306	-9.286 ***	2.575	-3.712	2.610
Rate of college grad	-5.230 ***	0.714	-1.835 **	0.735	-1.065	0.659
Year dummy	0.040 **	0.017	0.026	0.020	0.008	0.017
Constant	-2.677 ***	0.012	-2.622 ***	0.025	-2.616 ***	0.013
R-sq: between	0.052		0.106		0.149	
overall	0.037		0.085		0.129	
Wald chi2	120429.6		94423.3		107582.0	

*** significant at the 1 percent level, **significant at the 5 percent level, * significant at the 10 percent level.
This study use the wage, unemployment rate, and house rent of the previous period as the instruments variables.

Table4 Labor mobility from 1995 to 2000 and that from 2005 to 2010

1995-2000

Explained variable: rate of mobility	Coef.	Std. Err.	Short time workers Coef.	Std. Err.	Arbeit workers Coef.	Std. Err.	Temporary workers Coef.	Std. Err.
Wage	-5.058 ***	0.501	-4.143 ***	0.551	-4.119 ***	0.531	-6.413 ***	0.537
Unemployment rate	-0.168 *	0.092	-0.464 ***	0.121	0.170	0.125	0.041	0.112
House rent			-0.537 **	0.258	-0.445	0.281	1.163 ***	0.288
Rate of primary activity	0.064	0.040	0.017	0.045	-0.005	0.044	-0.036	0.043
Rate of secondary activity	1.931 ***	0.121	1.854 ***	0.145	1.522 ***	0.142	1.597 ***	0.137
Distance	-0.003 ***	0.000	-0.003 ***	0.000	-0.003 ***	0.000	-0.003 ***	0.000
Rate of non-regular/temporary			-0.409 ***	0.094	-1.556 ***	0.140	-3.086 ***	0.188
Rate of non-regular/temporary workers×house rent			0.560 **	0.261	0.256	0.189	0.694 *	0.417
Average age	23.181 ***	1.415	22.214 ***	1.429	11.215 ***	1.805	12.571 ***	1.521
Rate of college grad	0.828 ***	0.157	0.520 ***	0.174	1.331 ***	0.162	0.101	0.151
Constant	0.273 *	0.148	0.253 *	0.153	0.729 ***	0.158	1.778 ***	0.183
R-squared	0.713		0.716		0.728		0.746	
Wald chi2	5387.8		5486.2		5830.5		6352.5	

2005-2010

Explained variable: rate of mobility	Coef.	Std. Err.	Short time workers Coef.	Std. Err.	Arbeit workers Coef.	Std. Err.	Temporary workers Coef.	Std. Err.
Wage	-5.730 ***	0.394	-6.174 ***	0.451	-6.199 ***	0.445	-6.315 ***	0.461
Unemployment rate	-0.485 ***	0.135	0.071	0.175	0.566 ***	0.195	-0.168	0.180
House rent			0.779 ***	0.259	0.966 ***	0.253	0.595 **	0.262
Rate of primary activity	0.003	0.040	0.106 **	0.043	0.102 **	0.041	0.054	0.043
Rate of secondary activity	1.207 ***	0.098	1.296 ***	0.121	1.315 ***	0.119	1.403 ***	0.127
Distance	-0.002 ***	0.000	-0.003 ***	0.000	-0.003 ***	0.000	-0.003 ***	0.000
Rate of non-regular/temporary			-1.073 ***	0.225	-1.288 ***	0.176	-0.643 *	0.343
Rate of non-regular/temporary workers×house rent			-1.647 ***	0.446	-0.641 ***	0.243	-1.829 ***	0.680
Average age	29.259 ***	1.568	24.079 ***	1.762	20.610 ***	1.870	25.795 ***	2.074
Rate of college grad	0.838 ***	0.168	1.036 ***	0.176	1.673 ***	0.198	0.930 ***	0.179
Constant	-0.027	0.157	0.284 *	0.172	0.456 ***	0.167	0.144	0.174
R-squared	0.634		0.647		0.660		0.638	
Wald chi2	3819.5		4000.4		4174.5		3875.9	

Including original prefecture dummy

*** significant at the 1 percent level, **significant at the 5 percent level, * significant at the 10 percent level.

This study use the wage, unemployment rate, and house rent of the previous period as the instruments variables.

Table4 Labor mobility from 1995 to 2000 and that from 2005 to 2010 (continue)

Explained variable: rate of mobility				Sum of short time workers, dispatched workers, arbeit workers, contract workers and entrusted employees			Dispatched workers			Arbeit workers, contract workers and entrusted employees			Temporary workers		
	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Wage	-5.730	***	0.394	-6.211	***	0.456	-6.234	***	0.457	-6.318	***	0.434	-6.328	***	0.458
Unemployment rate	-0.485	***	0.135	-0.119		0.164	-0.217		0.158	0.805	***	0.172	-0.262		0.160
House rent				0.731	***	0.252	0.501	**	0.236	1.518	***	0.254	0.535	**	0.240
Rate of primary activity	0.003		0.040	0.079	*	0.042	0.060		0.043	0.142	***	0.040	0.049		0.043
Rate of secondary activity	1.207	***	0.098	1.418	***	0.122	1.411	***	0.145	1.225	***	0.116	1.376	***	0.123
Distance	-0.002	***	0.000	-0.003	***	0.000	-0.003	***	0.000	-0.003	***	0.000	-0.003	***	0.000
Rate of non-regular/temporary				-0.942	***	0.226	-0.009		0.072	-2.790	***	0.216	0.066		0.166
Rate of non-regular/temporary workers×house rent				-1.410	***	0.514	0.742	***	0.160	-0.852	**	0.355	-1.821	***	0.390
Average age	29.259	***	1.568	23.498	***	1.948	29.333	***	1.804	14.349	***	1.834	27.777	***	1.707
Rate of college grad	0.838	***	0.168	0.912	***	0.177	1.049	***	0.183	1.588	***	0.176	0.978	***	0.179
Constant	-0.027		0.157	0.221		0.170	0.083		0.164	0.900	***	0.169	0.002		0.169
R-squared	0.634			0.641			0.640			0.678			0.638		
Wald chi2	3819.5			3925.3			3902.1			4518.0			3886.9		

The table header spans 2005-2010.

Table 5 Effect of tenure dwelling

Explained variable: rate of mobility	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Wage	-13.174	**	5.762	-10.345	**	5.100	-7.517	*	4.049	-100.996		80.795	-65.418	**	31.346
Unemployment rate	0.455	*	0.246	-0.023		0.324	0.444	**	0.219	2.472	*	1.499	1.899	**	0.820
House rent				-1.581	*	0.813	-0.680		0.683	-0.212		3.617	0.408		1.808
Rate of primary activity	-0.163		0.114	-0.258	**	0.112	-0.122		0.112	-1.785		1.145	-0.786	**	0.317
Rate of secondary activity	0.295		0.329	0.203		0.279	0.439	*	0.237	4.302		3.513	2.795	**	1.374
Rate of temporary workers				-0.044		0.221	-0.470	***	0.179	3.452		3.424	1.523		1.140
Rate of temporary workers×house rent				-5.878	***	0.337	-5.878	***	0.335	-5.878	***	1.304	-5.878	***	0.879
Rate of owned house	11.091	***	1.388	8.986	***	0.968	5.505	***	0.876						
Rate of rented house owned by prefecture and municipal corporation	0.155		0.244	0.588	**	0.288				1.698		2.293			
Rate of rented house owned by the urban renaissance agency and housing	-0.119		0.139	-0.060		0.110							-1.487	**	0.728
Rate of housing for company employee and civil servant	2.147	***	0.219	2.209	***	0.208									
Rate of rented rooms	-0.313	***	0.092	-0.332	***	0.092									
Rate of rented house owned by private															
Average age	-15.792	***	3.804	-14.934	***	4.115	-23.624	***	4.006	12.733		15.885	5.537		9.002
Rate of college grad	-4.423	***	0.434	-4.953	***	0.633	-3.314	***	0.464	-17.010	*	10.114	-13.000	***	4.212
Year dummy	0.028	*	0.016	0.015		0.015	0.015		0.014	0.015		0.056	0.015		0.038
Constant	-2.684	***	0.011	-2.627	***	0.011	-2.627	***	0.011	-2.627	***	0.042	-2.627	***	0.028
R-sq.: between	0.176			0.166			0.165			0.142			0.151		
overall	0.167			0.160			0.161			0.131			0.140		
Wald chi2	111745.8			135352.9			137097.5			9044.7			19919.5		

This study use two-step estimate panel fixed effect estimation.

*** significant at the 1 percent level, **significant at the 5 percent level, * significant at the 10 percent level.

Table 5 Effect of tenure dwelling (continue)

Explained variable: rate of mobility	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Wage	-34.537	***	11.018	-56.118	*	29.933	-37.441	***	14.354
Unemployment rate	1.383	***	0.400	1.648	**	0.758	1.350	***	0.440
House rent	0.691		1.147	1.670		1.701	-2.584	*	1.452
Rate of primary activity	-0.511	***	0.196	-1.061	**	0.459	-0.439	**	0.209
Rate of secondary activity	1.856	***	0.626	2.347	*	1.284	2.157	***	0.798
Rate of non-regular/temporary workers	0.456		0.418	1.675		1.244	0.392		0.499
Rate of non-regular/temporary workers× house rent	-5.878	***	0.575	-5.878	***	0.803	-5.878	***	0.604
Rate of owned house									
Rate of rented house owned by prefecture and municipal corporation									
Rate of rented house owned by the urban renaissance agency and housing									
Rate of housing for company employee and civil servant	-1.938	***	0.649						
Rate of rented rooms				-0.846	***	0.263			
Rate of rented house owned by private							-3.138	***	0.954
Average age	-19.320	***	7.405	0.442		7.607	-26.189	***	8.126
Rate of college grad	-6.678	***	1.022	-11.952	***	3.913	-8.517	***	1.730
Year dummy	0.015		0.025	0.015		0.035	0.015		0.026
Constant	-2.627	***	0.018	-2.627	***	0.026	-2.627	***	0.019
R-sq.: between	0.141			0.138			0.162		
overall	0.131			0.128			0.151		
Wald chi2	46489.6			23885.0			42160.6		

Table6 Wage equation

Explained variable: wage	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Unemployment rate	-0.047	***	0.003	-0.051	***	0.003	-0.043	***	0.003	-0.058	***	0.004	-0.073	***	0.004
Rate of college grad				0.011		0.009	-0.012		0.010	-0.036	***	0.010	-0.025	**	0.010
Average age				-0.074		0.060	0.123	*	0.064	-0.297	***	0.069	-0.786	***	0.072
Year dummy	0.000		0.001	0.000		0.001	0.000		0.000	0.000		0.000	0.000		0.000
Rate of primary activity							-0.028	***	0.003	-0.019	***	0.003	0.006	**	0.003
Rate of secondary activity							0.030	***	0.004	0.026	***	0.004	0.031	***	0.004
House rent										-0.074	***	0.007	-0.036	***	0.008
Rate of temporary workers										0.026	***	0.004	0.048	***	0.004
Rate of temporary workers×house rent										0.000		0.011	0.000		0.009
Rate of owned house													0.173	***	0.018
Rate of rented house owned by prefecture and municipal corporation													0.049	***	0.005
Rate of rented house owned by the urban renaissance agency and housing													-0.019	***	0.002
Rate of housing for company employee and civil servant													0.006		0.005
Rate of rented rooms													-0.020	***	0.002
Constant	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000		0.000
R-sq: within	0.121			0.123			0.198			0.259			0.470		
between	0.081			0.247			0.695			0.165			0.260		
overall	0.079			0.237			0.686			0.162			0.247		
F value	149.3			75.7			88.7			83.8			136.0		

This study use fixed effect estimation.

*** significant at the 1 percent level, **significant at the 5 percent level, * significant at the 10 percent level.

Table7   Results of Individual Behavior

	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Owned house[3]	-0.890	***	0.001	-0.890	***	0.001	-0.890	***	0.001	-0.891	***	0.001
Rented house owned by prefecture, municipal corporation, the urban renaissance agency and housing corporations	-0.727	***	0.002	-0.726	***	0.002	-0.726	***	0.002	-0.726	***	0.002
Housing for company employee and civil servant	0.490	***	0.001	0.492	***	0.001	0.492	***	0.001	0.491	***	0.001
Rented rooms	-0.098	***	0.003	-0.102	***	0.003	-0.102	***	0.003	-0.103	***	0.003
All living quarters other than dwelling houses	0.790	***	0.002	0.789	***	0.002	0.788	***	0.002	0.787	***	0.002
Permanent worker working less than 35 hours	0.040	***	0.002	-0.921	***	0.056	0.036	***	0.002	0.036	***	0.002
Temporary worker	0.066	***	0.002	0.063	***	0.002	1.943	***	0.045	0.063	***	0.002
Unemployment	0.103	***	0.002	0.095	***	0.002	0.096	***	0.002	4.156	***	0.051
Housekeeper	0.180	***	0.005	0.165	***	0.005	0.166	***	0.005	0.165	***	0.005
Others[1]	0.114	***	0.002	0.103	***	0.002	0.103	***	0.002	0.103	***	0.002
Consumer prices	-0.022	***	0.000	-0.039	***	0.000	-0.039	***	0.000	-0.038	***	0.000
House rent				0.473	***	0.003	0.501	***	0.003	0.505	***	0.003
House rent ×permanent worker working less than 35 hours				0.115	***	0.007						
House rent ×temporary worker							-0.226	***	0.005			
House rent ×unemployment										-0.489	***	0.006
House rent ×housekeeper												
House rent ×others												
Wage of previous period	0.329	***	0.005	-0.382	***	0.006	-0.402	***	0.006	-0.382	***	0.006
Unemployment rate of previous period	-0.099	***	0.002	-0.128	***	0.002	-0.131	***	0.002	-0.134	***	0.002
Senior high school[2]	0.241	***	0.001	0.239	***	0.001	0.239	***	0.001	0.241	***	0.001
Junior college, higher professional school	0.438	***	0.002	0.431	***	0.002	0.432	***	0.002	0.433	***	0.002
College, university, graduate course	0.784	***	0.001	0.779	***	0.001	0.779	***	0.001	0.780	***	0.001
Persons attending school	0.935	***	0.003	0.925	***	0.003	0.930	***	0.003	0.927	***	0.003
Persons never attended school	0.096	***	0.021	0.098	***	0.021	0.098	***	0.021	0.100	***	0.021
15-19 age group[4]	0.494	***	0.005	-0.007		0.006	-0.019	***	0.006	0.002		0.006
20-24 age group	0.644	***	0.003	0.257	***	0.004	0.248	***	0.004	0.263	***	0.004
25-29 age group	0.485	***	0.002	0.227	***	0.003	0.220	***	0.003	0.230	***	0.003
30-34 age group	0.273	***	0.002	0.127	***	0.002	0.123	***	0.002	0.127	***	0.002
35-39 age group	0.141	***	0.002	0.082	***	0.002	0.080	***	0.002	0.081	***	0.002
45-49 age group	-0.091	***	0.002	-0.048	***	0.002	-0.046	***	0.002	-0.048	***	0.002
50-54 age group	-0.123	***	0.002	-0.063	***	0.002	-0.062	***	0.002	-0.063	***	0.002
55-59 age group	-0.084	***	0.002	-0.082	***	0.002	-0.081	***	0.002	-0.080	***	0.002
60-64 age group	0.110	***	0.003	-0.039	***	0.003	-0.041	***	0.003	-0.029	***	0.003
Constant	-1.080	***	0.022	1.029	***	0.025	0.908	***	0.025	0.734	***	0.025
LR chi2	4502319.0			4534683.7			4536143.4			4540852.0		

*** significant at the 1 percent level, **significant at the 5 percent level, * significant at the 10 percent level.

Including industry dummy

Rented house owned by private company, permanent workers working over 35 hours, elementary school, junior high school and 40-44 age group are references.

1. Others are not unemployment, not housekeeper nor students.   3. Rented house owned by a private company is reference.

2. Elementary school, junior high school is reference.   4. 40-44 age group is reference.

Table7 Results of Individual Behavior (continue)

	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Owned house	-0.890	***	0.001	-0.890	***	0.001	-0.893	***	0.001
Rented house owned by prefecture, municipal corporation, the urban renaissance agency and housing corporations	-0.726	***	0.002	-0.726	***	0.002	-0.725	***	0.002
Housing for company employee and civil servant	0.492	***	0.001	0.491	***	0.001	0.490	***	0.001
Rented rooms	-0.102	***	0.003	-0.102	***	0.003	-0.104	***	0.003
All living quarters other than dwelling houses	0.788	***	0.002	0.787	***	0.002	0.783	***	0.002
Permanent worker working less than 35 hours	0.037	***	0.002	0.037	***	0.002	-0.272	***	0.056
Temporary worker	0.063	***	0.002	0.063	***	0.002	2.411	***	0.045
Unemployment	0.095	***	0.002	0.096	***	0.002	4.554	***	0.051
Housekeeper	4.152	***	0.181	0.169	***	0.005	4.801	***	0.181
Others[1]	0.103	***	0.002	4.322	***	0.061	4.787	***	0.061
Consumer prices	-0.039	***	0.000	-0.039	***	0.000	-0.038	***	0.000
House rent	0.480	***	0.003	0.490	***	0.003	0.545	***	0.003
House rent ×permanent worker working less than 35 hours							0.037	***	0.007
House rent ×temporary worker							-0.282	***	0.005
House rent ×unemployment							-0.537	***	0.006
House rent ×housekeeper	-0.482	***	0.022				-0.559	***	0.022
House rent ×others				-0.509	***	0.007	-0.565	***	0.007
Wage of previous period	-0.381	***	0.006	-0.355	***	0.006	-0.362	***	0.006
Unemployment rate of previous period	-0.128	***	0.002	-0.131	***	0.002	-0.140	***	0.002
Senior high school	0.239	***	0.001	0.241	***	0.001	0.245	***	0.001
Junior college, higher professional school	0.431	***	0.002	0.433	***	0.002	0.436	***	0.002
College, university, graduate course	0.779	***	0.001	0.781	***	0.001	0.783	***	0.001
Persons attending school	0.925	***	0.003	0.926	***	0.003	0.932	***	0.003
Persons never attended school	0.097	***	0.021	0.092	***	0.021	0.093	***	0.021
15-19 age group	-0.005		0.006	0.021	***	0.006	0.027	***	0.006
20-24 age group	0.258	***	0.004	0.276	***	0.004	0.282	***	0.004
25-29 age group	0.227	***	0.003	0.239	***	0.003	0.241	***	0.003
30-34 age group	0.127	***	0.002	0.133	***	0.002	0.132	***	0.002
35-39 age group	0.082	***	0.002	0.084	***	0.002	0.082	***	0.002
45-49 age group	-0.048	***	0.002	-0.050	***	0.002	-0.049	***	0.002
50-54 age group	-0.063	***	0.002	-0.066	***	0.002	-0.065	***	0.002
55-59 age group	-0.082	***	0.002	-0.081	***	0.002	-0.078	***	0.002
606-64 age group	-0.039	***	0.003	-0.032	***	0.003	-0.022	***	0.003
Constant	0.963	***	0.025	0.726	***	0.025	0.274	***	0.026
LR chi2		4534881.3			4539224.1			4549719.9	

Table8 Results of Individual Behavior-House rent of public housing

	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.	Coef.		Std. Err.
Owned house[3]	-0.889	***	0.001	-0.889	***	0.001	-0.891	***	0.001	-0.889	***	0.001
Rented house owned by prefecture, municipal corporation, the urban renaissance agency and housing corporations	-0.726	***	0.002	-0.726	***	0.002	-0.726	***	0.002	-0.726	***	0.002
Housing for company employee and civil servant	0.492	***	0.001	0.492	***	0.001	0.491	***	0.001	0.492	***	0.001
Rented rooms	-0.097	***	0.003	-0.097	***	0.003	-0.098	***	0.003	-0.097	***	0.003
All living quarters other than dwelling houses	0.789	***	0.002	0.789	***	0.002	0.787	***	0.002	0.789	***	0.002
Permanent worker working less than 35 hours	-0.947	***	0.052	0.039	***	0.002	0.039	***	0.002	0.040	***	0.002
Temporary worker	0.066	***	0.002	0.981	***	0.042	0.065	***	0.002	0.065	***	0.002
Unemployment	0.103	***	0.002	0.103	***	0.002	3.738	***	0.045	0.103	***	0.002
Housekeeper	0.179	***	0.005	0.180	***	0.005	0.180	***	0.005	4.021	***	0.151
Others[1]	0.114	***	0.002	0.114	***	0.002	0.114	***	0.002	0.114	***	0.002
Consumer prices	-0.026	***	0.000	-0.026	***	0.000	-0.026	***	0.000	-0.026	***	0.000
House rent	0.170	***	0.002	0.186	***	0.002	0.206	***	0.002	0.178	***	0.002
House rent ×permanent worker working less than 35 hours	0.138	***	0.007									
House rent ×temporary worker				-0.128	***	0.006						
House rent ×unemployment							-0.511	***	0.006			
House rent ×housekeeper										-0.542	***	0.021
House rent ×others												
Wage of previous period	0.082	***	0.006	0.076	***	0.006	0.081	***	0.006	0.084	***	0.006
Unemployment rate of previous period	-0.108	***	0.002	-0.108	***	0.002	-0.110	***	0.002	-0.108	***	0.002
Senior high school[2]	0.242	***	0.001	0.242	***	0.001	0.243	***	0.001	0.242	***	0.001
Junior college, higher professional school	0.437	***	0.002	0.437	***	0.002	0.438	***	0.002	0.437	***	0.002
College, university, graduate course	0.785	***	0.001	0.784	***	0.001	0.786	***	0.001	0.785	***	0.001
Persons attending school	0.934	***	0.003	0.936	***	0.003	0.935	***	0.003	0.934	***	0.003
Persons never attended school	0.098	***	0.021	0.098	***	0.021	0.101	***	0.021	0.096	***	0.021
15-19 age group[4]	0.318	***	0.006	0.313	***	0.006	0.319	***	0.006	0.320	***	0.006
20-24 age group	0.509	***	0.004	0.506	***	0.004	0.510	***	0.004	0.510	***	0.004
25-29 age group	0.394	***	0.003	0.392	***	0.003	0.395	***	0.003	0.395	***	0.003
30-34 age group	0.222	***	0.002	0.220	***	0.002	0.221	***	0.002	0.222	***	0.002
35-39 age group	0.120	***	0.002	0.119	***	0.002	0.120	***	0.002	0.120	***	0.002
45-49 age group	-0.076	***	0.002	-0.075	***	0.002	-0.076	***	0.002	-0.076	***	0.002
50-54 age group	-0.102	***	0.002	-0.101	***	0.002	-0.102	***	0.002	-0.102	***	0.002
55-59 age group	-0.083	***	0.002	-0.083	***	0.002	-0.082	***	0.002	-0.083	***	0.002
60-64 age group	0.057	***	0.003	0.056	***	0.003	0.060	***	0.003	0.057	***	0.003
Constant	-0.368	***	0.024	-0.455	***	0.024	-0.619	***	0.024	-0.434	***	0.024
LR chi2	4508480.8			4508591.2			4514537.9			4508757.0		

*** significant at the 1 percent level, **significant at the 5 percent level, * significant at the 10 percent level.

Including industry dummy

Rented house owned by private company, permanent workers working over 35 hours, elementary school, junior high school and 40-44 age group are references.

1. Others are not unemployment, not housekeeper nor students.   3. Rented house owned by a private company is reference.

2. Elementary school, junior high school is reference.   4. 40-44 age group is reference.

Table8   Results of Individual Behavior-House rent of public housing (continue)

	Coef.		Std. Err.	Coef.		Std. Err.
Owned house	-0.890	***	0.001	-0.892	***	0.001
Rented house owned by prefecture, municipal corporation, the urban renaissance agency and housing corporations	-0.726	***	0.002	-0.726	***	0.002
Housing for company employee and civil servant	0.492	***	0.001	0.491	***	0.001
Rented rooms	-0.097	***	0.003	-0.099	***	0.003
All living quarters other than dwelling houses	0.787	***	0.002	0.785	***	0.002
Permanent worker working less than 35 hours	0.040	***	0.002	-0.423	***	0.052
Temporary worker	0.066	***	0.002	1.402	***	0.042
Unemployment	0.104	***	0.002	4.020	***	0.045
Housekeeper	0.182	***	0.005	4.517	***	0.151
Others[1]	4.004	***	0.053	4.341	***	0.053
Consumer prices	-0.027	***	0.000	-0.027	***	0.000
House rent	0.194	***	0.002	0.241	***	0.002
House rent ×permanent worker working less than 35 hours				0.065	***	0.007
House rent ×temporary worker				-0.187	***	0.006
House rent ×unemployment				-0.550	***	0.006
House rent ×housekeeper				-0.611	***	0.021
House rent ×others	-0.547	***	0.007	-0.594	***	0.008
Wage of previous period	0.103	***	0.006	0.104	***	0.006
Unemployment rate of previous period	-0.108	***	0.002	-0.110	***	0.002
Senior high school	0.244	***	0.001	0.246	***	0.001
Junior college, higher professional school	0.438	***	0.002	0.440	***	0.002
College, university, graduate course	0.786	***	0.001	0.788	***	0.001
Persons attending school	0.935	***	0.003	0.938	***	0.003
Persons never attended school	0.092	***	0.021	0.095	***	0.021
15-19 age group	0.336	***	0.006	0.338	***	0.006
20-24 age group	0.521	***	0.004	0.524	***	0.004
25-29 age group	0.402	***	0.003	0.403	***	0.003
30-34 age group	0.225	***	0.002	0.225	***	0.002
35-39 age group	0.121	***	0.002	0.121	***	0.002
45-49 age group	-0.077	***	0.002	-0.077	***	0.002
50-54 age group	-0.104	***	0.002	-0.104	***	0.002
55-59 age group	-0.083	***	0.002	-0.083	***	0.002
606-64 age group	0.059	***	0.003	0.061	***	0.003
Constant	-0.628	***	0.024	-0.962	***	0.024
LR chi2		4513390.4			4522324.4	