An Analysis of Employment Type and Retirement Behavior of Elderly Male Employees:

A Fixed Effects Logit Analysis Using *Longitudinal Survey of Middle-aged and Elderly Persons*[1]

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<Abstract >

This paper uses the *Longitudinal Survey of Middle-aged and Elderly Persons* to analyze what factors determine the employment choices and retirement behavior of male employees facing retirement. Employment type chosen includes full-time, part-time, contract/non-regular, self-employed, and unemployed. This paper is characterized by its incorporating into the analysis the amount of pension benefit given under employment types not chosen in real life, based on the wage, work hours, income, and old-age pension for active employees, in addition to the type actually chosen. The results indicate that university/graduate school graduates, those who are married, those who have savings, and those who have a dependent child at home tend to continue working full-time. Meanwhile, the subjective health condition of full-time workers is declining. The individuals who retired in the past year are likely to choose a part-time job or stay unemployed, suggesting it is difficult to regain full-time employment. The individuals who have a debt and those actively engaged in community activities, cultural activities, or elderly support activities are likely to choose self employment. The individuals who are caring for a relative tend to choose a part-time job, self-employment, or stay unemployed. The marginal rates of substitution calculated by converting an increase in each of wage, work hours, and income into the amount of pension benefit show that individuals choose an employment type to try to avoid a reduction in pension benefit.

Keywords: elderly employment, wage function, old-age pension for active employees, fixed effects logit, panel data analysis

1. Introduction

This paper uses a *Longitudinal Survey of Middle-aged and Elderly Persons*, the large-scale panel survey conducted by the Ministry of Health, Labor, and Welfare (MHLW), to analyze what factors determine employment choices and the retirement behavior among male employees facing retirement. The subjects of the analysis are male employees who have worked for a long period of time while being enrolled in the employees' pension. It is important to analyze the employment types chosen and retirement behaviors of males since there are many Japanese households in which the males are the main source of income. In this paper, we analyze the employment choice behavior by men facing retirement, using fixed effects logit models that take into consideration the differences in the wage rate, work hours, and income for the employment type, the amount of the old-age pension benefit for active employees, and other individual attributes. As employment types, we will consider full-time, part-time, contract/non-regular, self-employed, and unemployed. We will consider the reduction in pension benefit due to the old-age pension system for active employees, which depends on the employment type in cases where the householder is enrolled in an employees' pension scheme. Given that more than half of pensioners are enrolled in an employees' pension scheme and that the scale of pension benefits, premiums, and reserves is considerable, the benefit's impact on households and government is significant. This paper is characterized by its incorporating into the analysis the predicted amount of pension benefit for employment types not chosen in real life, based on the wage, work hours, income, and old-age pension for active employees under those employment types, in addition to the types actually chosen. The wage, work hours, income, and the amount of pension benefit are also estimated by using the *Longitudinal Survey of Middle-aged and Elderly Persons*.

There are numerous studies that analyze the employment type and retirement behavior of male employees, by taking the effect of public pension into consideration. For example, Seike (1993) and Ogawa (1997), using the individual data from the *Survey on Employment Conditions of Elderly Persons* conducted by MHLW, demonstrated that earned income is held down among individuals in their early 60s who are eligible to receive employees' pension benefit compared to those who are not. Higuchi and Yamamoto (2002) used the individual data from the *Survey on Employment Conditions of Elderly Persons* to analyze the employment situations among elderly male individuals and the mechanism of labor supply. They confirmed the following: Although the FY 1994 revision to the employees' pension system had the effect of increasing the supply of workers in their early 60s, it

also suppressed the motivation to work; full-time employment among those in their early 60s increased when the age at which pensioners became qualified to receive the employees' pension benefit was moved to 65; and although the probability of having full-time employment declines among those in their late 50s when the extent of seniority-based wage increase is reduced and the wage curve beyond 55 years old is flattened, the revision increased the probability of employment among those in their early 60s. Ohtake and Yamaga (2003) used the individual data from the *Survey on Employment Conditions of Elderly Persons* and showed that the 1995 revision to the old-age pension system for active employees had a complex impact on the employment situation. Higuchi et al. (2006) used the individual data from the *Survey on Employment Conditions of Elderly Persons* and estimated an employment choice model that considered the expected wage and the amount of pension benefit under each employment type. The results indicated that raising the eligible age to begin receiving the fixed component of the employees' pension benefit significantly increases the supply of labor; however, the old-age pension for active employees in their early 60s did not have a consistent effect. Kajitani (2011) used *Research on the Employment and Living Conditions Among Individuals Who Are Reaching Retirement Age, etc.* conducted by the Japan Organization for Employment of the Elderly, Persons with Disabilities, and Job Seekers (JEED), to analyze the effect of the old-age pension for active employees on their decision to work after retirement, while trying to understand how male employees change their occupations after retirement. Consequently, he found that the probability of re-employment differed according to the occupation the individual was engaged in before retirement and a reduction in the old-age pension benefit for active employees led to fewer elderly individuals being employed.

While this paper is similar to the previous studies in that it analyzes employment choices among elderly individuals by taking into consideration their wage and the old-age pension for active employees, it has the following unique characteristics: (1) It conducts the analysis by using large-scale panel data from the *Longitudinal Survey of Middle-aged and Elderly Persons*; (2) the analysis simultaneously considers the wage rate, work hours, income, and amount of pension benefit; (3) the analysis is more realistic because the method for estimating the old-age pension for active employees closely mimics the real system; and (4) it estimates the marginal rate of substitution, which allows us to analyze the extent of the impact of a reduction in pension benefit in terms of a

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change in wage, work hours, and income.

To describe the conclusion of this paper first, it is as follows (as a note, the analysis results are tentative since this is the first year of the study period): Households tended to choose an employment type with a higher wage, longer predicted work hours, a higher predicted income, and a higher predicted pension benefit, demonstrating reasonable choice behaviors. The individuals who were married, with a dependent child at home, whose household had savings, or who graduated from university/graduate school were likely to continue working full-time without retiring. Meanwhile, the results indicated that the subjective health among full-time workers was deteriorating. In contrast, the individuals who had retired in the past year tended to choose part-time employment or stay unemployed, indicating that it was difficult to regain full-time employment. The individuals who had a debt or were actively engaged in community activities, cultural activities, and elderly support activities were more likely to choose self-employment. The individuals who had to care for a relative were likely to choose part-time work, self-employment, or not to work.

The marginal rates of substitution calculated by converting an increase in each of wage, work hours, and income into a pension benefit amount show that the households seek a 1-yen increase in wage, or a 176-yen increase in monthly wage, when the amount of pension benefit decreases by 7 yen. Similarly, a 2,765-yen reduction in monthly pension benefit is translated into a 1-hour increase in monthly work hours. A 937-yen reduction in monthly pension benefit when converted to income would require a 10,000-yen increase. As described, households choose an employment type that would allow them to avoid a reduction in pension benefit as much as possible.

The paper is organized as follows: Section 2 describes the analysis method and Section 3 shows the analysis results. Section 4 gives the conclusion and issues for consideration.

2. Overview of the Data and Analysis Method

The data used in this paper are the panel data from the *Longitudinal Survey of Middle-aged and Elderly Persons*[6] by MHLW (hereinafter referred to as "Panel Data"). Panel A in Table 1 is an overview of the

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[6] The *Longitudinal Survey of Middle-aged and Elderly Persons*, which provides panel data, by tracking middle-aged and elderly males and females—including the baby boomers—throughout Japan to continuously study the changing process of their health,

Longitudinal Survey of Middle-aged and Elderly Persons, which surveyed males and females throughout Japan who were 50 to 59 years old as of October 31, 2005. In this paper, we analyze the sample populations of the first through sixth *Longitudinal Survey of Middle-aged and Elderly Persons* as shown in Panel A of Table 1. This paper includes screened data from 25,157 cases available for tabulation from the first to sixth survey.

In this paper, we conduct the analysis in the following manner: (1) Conduct data screening and append external data; (2) estimate wage, work hours, and income determinant models; (3) estimate the predicted wage, work hours, and income using those models; (4) estimate the predicted pension benefit by employment type; (5) estimate an employment type choice model by using a fixed effects logit model; and (6) estimate the marginal effects and marginal rates of substitution in the employment type choice model.

The outline of the analysis method is as follows: (1) The data screening eliminates everyone except male employees for this paper's analysis. The number of cases after the screening is 8,475 and the total number of data sets is 50,850. As for appending external economic data, we use the wage data from the *Basic Survey on Wage Structures* (Wage Census) by MHLW (2005) to estimate the amount of pension benefit, the unemployment rate by prefecture, and the inflation rate by prefecture for the wage, work hours, and income estimation models. (2) Pooled regression, fixed effects model, random effects model, and the Heckman's two-stage method are used to estimate the wage, work hours, and income determinant models. (3) These models are used in order to estimate predicted wage, work hours, and income. In order to estimate the employment type choice model, which is described later, the wage rate, work hours, and income under the employment types not chosen in reality are required, in addition to the employment type actually chosen. The real wage, work hours, and income under the employment type actually chosen are found in Panel Data; however, the data under the employment types not chosen do not exist. Therefore, using the models estimated in (2), the predicted wage, work hours, and income under all employment types—both the one chosen in reality and the ones not actually chosen—are estimated and used as explanatory variables in the employment-type choice model described later. In this paper, we compared the actual data to the predicted data and used the predicted values obtained from the pooled regression with the best fit.

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employment, and social activities. The main purpose of this study is to understand the changes in household behaviors and the relationship between events and obtain basic data for the MHLW to develop, plan, and implement its administrative measures for the elderly. The survey, which was launched in 2005, is conducted once every year around the first Wednesday of November. The MHLW's current survey method is to mail the questionnaire, which the respondents mail back after filling it out on their own.

As for the estimation of the predicted pension benefit in (4), the full amount of pension benefit as of 2005 was calculated by estimating the cross-sectional cumulative standard compensation by age, using the 2005 Wage Census data, and then multiplying it by the pension payment factor based on the date of birth. The amount of pension benefit for 2006 and after was calculated by adding estimated bonuses to the income recorded in Panel Data and adding that to the cumulative standard compensation in 2005. It was then re-evaluated by using the reevaluation rate. We estimated the amount of pension benefit for each year by multiplying this cumulative standard compensation by the pension payment factor. The predicted pension benefit for full-time and contract/non-regular employees who are enrolled in the employees' pension scheme was reduced by taking the old-age pension for active employees into consideration. In (5), we will estimate an employment type choice model by using a fixed effects logit model. The dependent variable is a dummy variable where 1 is the employment type actually chosen and 0 is the employment types not chosen. The predicted wage, work hours, income, and pension benefit are used as explanatory variables for both the employment type actually chosen and the ones not chosen. Individual attributes are also added as explanatory variables. This model is the same analysis method used in the choice experiment method, which is one of the stated preference methods. The estimation of the marginal effects in the employment type choice model in (6) is done to analyze what factors are influencing the choices of employment in reality. In addition, the marginal rates of substitution are estimated. A marginal rate of substitution is an estimated value to indicate how much change in pension benefit is represented by one unit of change in particular factor. This is intended to analyze the degree of preference regarding reduced pension benefits.

Panel B of Table 1 is the number of all pre-screened cases broken down by employment type. There are 25,157 cases with data available for tabulation from the first six surveys. The total number of data sets is 150,942. Since this paper analyzes male employees (male workers who have been enrolled in the employees' pension scheme for a long time), individuals will be screened in the following manner.

1. Must be male

2. Must have selected one of the following answers in the question (asked in 2005) regarding how they worked in the past:

(1) "I have (had) been working for the same company for 20 years or longer."

(2) "I have (had) been engaged in work in the same field for 20 years or longer."

(3) "Though (1) and (2) are not applicable, I have (had) been engaged in work (excluding self-employed work) for 20 years or longer."

3.   Had never selected "other" to answer the employment type question or left the question unanswered

The condition 2 is a qualifier to identify individuals who worked for a long period as an employee. We excluded individuals who did not choose 3 because it is not possible to determine what kind of employment type the "other" is. For the sake of simplifying the data analysis,   we also excluded individuals who had even one unanswered question. Panel C of Table 1, the results of the screening, shows the number of qualified cases broken down by employment type. The number of cases after the screening is 8,475 and the total number of data sets is 50,850.

[Insert Table 1 here]

3. Estimation of Predicted Wage, Predicted Work Hours, and Predicted Income

3-1. Estimation of the Wage Rate, Work Hours, and Income Determinant Models

The dependent variables used in the wage rate, work hours, and income determinant models are defined in the top section of Table 2.[7] Their explanatory variables include *Employment Type*, *Occupation*, *Company Size*, *Education*, *Age*, *Marital Status*, *Unemployment Rate by Area*, and *Inflation Rate by Area* (See the bottom section of Table 2 for the definition of each explanatory variable). Except for *Unemployment Rate by Area* and *Inflation Rate by Area*, the variables are created off Panel Data. Table 3 shows the descriptive statistics of each variable.

[Insert Tables 2 and 3 here]

Table 4 shows the estimation results of the wage rate determinant model. (1) is a pooled regression analysis, (2) is a pooled regression analysis that includes unemployed individuals in the data (the wage rate was set to zero for the unemployed individuals), (3) is a random effects model, (4) is a fixed effects model, and (5) is the estimation results based on the Heckman's two-stage method (only the second stage is shown) that includes the

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[7] Here, since the income data found in Panel Data include income other than those obtained by working, some "unemployed" cases have income. However, as explained below, we decided to use the results estimated by excluding "unemployed" in the estimation models for wage, work hours, and income. Therefore, the ratio of labor income to total income should be large and, even if there is income other than that obtained by working, its impact should be minimal.

data on unemployed individuals. *Employment type* represents the effect relative to "full-time employment." Similarly, *Occupation*, *Company Size*, and *Education* represent the effect relative to "professional," "1 to 5 employees," and "junior high school graduate," respectively. Looking at the results of the pooled regression analysis in (1), we see that, whereas the "part-time" and "contract/non-regular" employment types have significantly lower wage rates relative to "full-time," "self-employed" has significantly higher. In terms of occupation, whereas "managerial" has a significantly higher wage rate relative to "professional," all other occupation categories have significantly lower wage rates. Further, the wage rate significantly increases as the company size increases. *Education* shows that the wage rate significantly increases as the education level increases. With regard to the individual attributes, whereas *Age* was not significant, *Marital Status* was positive and significant. Regarding the economic data, the wage rate significantly decreases as *Unemployment Rate by Area* goes higher. Meanwhile, *Inflation Rate by Area* was not significant. The estimation results of (2), which included the unemployed cases, showed tendencies similar to (1) (here and in what follows, the model (2) is not considered). The estimation results of the random effects model in (3) also showed tendencies similar to (1). The results obtained by using a fixed effect model in (4) differ for many variables compared to (1) through (3). The coefficients were negative in all employment types ("self-employed" was positive and significant in the pooled regression models and the random effects model). Under *Occupation*, not all coefficients were significant (all were significant in the pooled regression and random effects models). As for *Company Size*, none of the coefficients was significant except for "government" (all were significant in the pooled regression and random effects models). Although *Age* was positive and significant, the coefficients for other individual attributes were not. In addition, the year dummy variables that showed significance differed. When the Hausman test was performed to determine whether to use the fixed effects model or the random effects model, the random effects model was rejected (here and in what follows, the random effects model (3) is not considered). Although the estimation results of the fixed effects model differ in many respects from other models, we would like to leave the detailed analysis to a future time. Column (5) shows the estimation results of the second stage of the Heckman's two-stage method, which takes into account the selection bias. The first stage estimates whether the individual is working or not (i.e., whether participating in the labor market or not) and the second stage estimates the wage rate of the individuals

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who are working. Column (5) shows that the estimation results in the second stage were similar to the results of the pooled regression in (1) and the random effects model in (3). The coefficient of the Mill's ratio was not significant.

Table 5 is the estimation results of the work hours determinant model. (1) is a pooled regression analysis, (2) is a pooled regression analysis that includes unemployed individuals in the data, (3) is a random effects model, (5) is a fixed effects model, and (6) is the estimation results based on the Heckman's two-stage method. The results of the pooled regression analysis in (1) show that the work hours of the "part-time" and "contract/non-regular" employment types are significantly shorter than those of "full-time." Meanwhile, the work hours of "self-employed" were not significantly different. In terms of occupation, whereas the "clerical," "agriculture/forestry/fisheries," "manufacturing," and "other" categories had significantly shorter work hours relative to "professional," the "sales," "service," "security," and "transportation/communication" categories had significantly longer work hours. The work hours significantly increase as *Company Size* becomes smaller and significantly decrease as *Company Size* becomes larger. Under *Education*, "junior high school graduate" and "university/graduate school graduate" have significantly shorter work hours compared to "junior high school graduate." *Age* was negative and significant and *Marital Status* was positive and significant. Regarding the economic data, whereas *Unemployment Rate by Area* was positive and significant, *Inflation Rate by Area* was negative and significant. The model in (2), which includes the data for the unemployed individuals; the random effects model in (3); and the estimation results of the Heckman's method showed similar results as for (1). Meanwhile, the fixed effects model in (4) had many other results that differed from model (1).

Table 6 shows the estimation results of the income determinant model: (1) is a pooled regression analysis, (2) is a pooled regression analysis that includes unemployed individuals in the data, (3) is a random effects model, (5) is a fixed effects model, and (6) is the estimation results based on the Heckman's two-stage method. The estimation results were similar to the results for the wage rate.[8]

[Insert Tables 4, 5, and 6 here]

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[8] The explanatory variables used in the wage rate, work hours, and income determinant model estimates are what we considered the minimum set. Since the model propensities did not change when other explanatory variables were added for estimation, these models that included the largest number of samples were selected.

3-2. Predicted Wage, Predicted Work Hours, and Predicted Income Used as Explanatory Variables in the Employment Type Choice Model

The employment type choice model in the next section will use *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income* calculated with the wage rate, work hours, and income estimation models described earlier. For the employment type choice model, we know the actual wage, work hours, and income under the employment type that is chosen in reality; however, we still need the wage, work hours, and income under the employment types not actually chosen. Let's say someone was working full-time. Panel Data contain this individual's wage, work hours, and income as a full-time employee. However, we would not know the hypothetical wage, work hours, and income should this individual choose part-time, contract/non-regular, or self-employed work. Therefore, we will use the *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income* under each employment type, as found by the wage rate, work hours, and income estimation models described earlier. Furthermore, we will use the *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income*, instead of the wage rate, work hours, and income recorded in Panel Data for the actual employment type as well. This is to ensure the consistency of the data being used.

The models to analyze the determinants of wage, work hours, and income used five methods for the estimations: (1) pooled regression, (2) pooled regression including the unemployed individuals, (3) random effects model, (4) fixed effects model, and (5) the Heckman's two-stage method.[9] In reality, it would be difficult to estimate the employment type choice model by utilizing all these methods. Therefore, this paper took (1) pooled regression, (4) fixed effects model, and (5) Heckman's method; compared the annual averages of *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income* estimated in each of those models to the actual wage, work hours, and income data; and determined how to estimate the employment type choice model discussed in the next section, using the predicted values from the (1) pooled regression with the best fit.

Specifically, it was examined as follows. Panel A in Table 7 shows the average and standard deviation of annual wage for each employment type actually chosen. For example, the average full-time wage in 2010 was 3,306 yen, and the average annual wage for all years was 2,740 yen. Panel C, *Predicted Wage* calculated by the

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[9] Since the pooled regression in (2) that included the data on the unemployed individuals had similar results to (1), it will not be considered here and in what follows. The random effects model in (3) will not be considered because it was rejected by the Hausman test.

pooled regression (1), shows only the average for the employment type actually chosen (i.e., although the data for the employment types not actually chosen are available, they are excluded from these averages). Similarly, Panel D is the average *Predicted Wage* calculated in the fixed effects model (4). Panel E is the statistics of *Predicted Wage* obtained by the Heckman method (5). Looking at this table, we see that the average values in the pooled regression model (1) in Panel C and the Heckman method in Panel E are close to the actual data in Panel A. On the other hand, although the predicted "full-time" wage obtained by the fixed effects model (4) in Panel D is close to the actual, this model's average predicted "part-time" and "contract/non-regular" wages would be higher than the actual, whereas the average for "self-employed" was inversely lower.

Table 8 shows the average work hours for each employment type actually chosen and the average *Predicted Work Hours* calculated by each estimation model. Table 9 compares *Predicted Income*. Both Table 8 and Table 9 show similar results as Table 7: the averages obtained by the pooled regression (1) come closest to the actual data. Considering the degree of deviation of these predicted values from the actual values, we will use the predicted values obtained from the pooled regression (1) in order to estimate the employment-type choice model, even though the analysis of panel data, in general, often uses a fixed effects model.[10]

[Insert Tables 7, 8, and 9 here]

4. Estimation of Predicted Amount of Pension Benefit

4-1. Estimation of the Full Amount of Pension Benefit

The predicted amount of pension benefit is estimated by using Wage Census and the data from the *Longitudinal Survey of Middle-aged and Elderly Persons* (hereinafter referred to as Panel Data). We will estimate the full amount of pension benefit first, estimate the amount of suspended payment based on the old-age pension system for active employees next, and then estimate the amount of pension benefit by subtracting the suspended payment from the full pension benefit. Specifically, the calculations will be done as follows.

The cumulative annual income as of 2004 for each age is estimated by using the 2005 Wage Census. As a note, the estimation of the cumulative annual income is based on the cross-sectional data of 2005, assuming that the

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[10] Issues such as the reason for the low accuracy of the fixed effects model's estimation will form part of our future research.

individuals received the annual income listed for each respective age in the 2005 Wage Census. Because *Income* is used here to calculate the amount of pension benefit, we will consider the upper and lower limits of the standard monthly compensation. Next, in order to find the individual's cumulative annual income in 2005 based on the Wage Census, we will calculate the ratio between the monthly income in the Wage Census and the individual's actual monthly income in 2005, as found in the Panel Data, and estimate the individual's cumulative annual income in 2005 by multiplying the Wage Census's cumulative annual income by this ratio. To estimate the annual pension benefit for 2005, the individual's cumulative annual income as of 2004 will be used. The pension benefit after 2005 is estimated by using *income* in the Panel Data for calculating the cumulative income. However, since *income* in the Panel Data represents monthly income that does not take bonuses into consideration, the annual income that includes the individual's annual bonus must be estimated. Therefore, we will use the 2005 Wage Census to estimate the bonus scaling factor (the ratio of bonus to monthly income) and then multiply the individual's monthly income found in Panel Data by this bonus multiplier to estimate the annual income including the bonus. In other words, annual income including bonus = monthly income in Panel Data × (12 + bonus scaling factor). Here, under normal circumstances, the bonus scaling factor is expected to change from year to year, but for the sake of simplicity, we will also use the 2005 bonus scaling factor after 2006. As a note, the upper and lower limits in the employees' pension are taken into consideration in determining the annual bonus.[11] The individual's cumulative annual income after 2006 is estimated by adding the actual annual income including the bonus for a given year to the cumulative annual income from the previous year and taking the annual revised rate into account. (However, an evaluation based on the revised rate is not necessary for the 2005 cumulative annual income because the 2005 figures were created using the 2005 Wage Census).

As for the fixed component of pension benefit (basic pension), the full benefit (the amount of the old-age pension for active employees without any deduction) is calculated first. The amount of the fixed component is determined by whether the individual is at or over the eligible age to begin receiving the benefit. The determination will be based on the unit of "academic year cohort,[12]" in accordance with the system. If the individual is at or over the eligible age to begin receiving the benefit, the full amount of basic pension are

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[11] Although the actual upper limit for a bonus is 1.5 million yen per payment, we are using 3 million yen as the upper limit.
[12] A cohort defined by birthdays falling between April 1 of one year and March 31 of the following year.

calculated. Next, the full amount of the earnings-related component is calculated. To determine whether the individual is at or over the eligible age to begin receiving the earnings-related component of the benefit, a variable to represent the eligible age to begin receiving the benefit is created per "academic year cohort"; if the individual is at or over the eligible age, the pension payment factor is applied to the cumulative annual income for each given year to calculate the full benefit of the earnings-related component.

4-2. Consideration of the Old-Age Pension for Active Employees

The calculation of the pension benefit (fixed component + earnings-related component) that takes into account the old-age pension for active employees is as follows. Individuals with the employment types other than "full-time" and "contract/non-regular" are assumed to be excluded from the old-age pension system for active employees, since only individuals whose employment type is "full-time" or "contract/non-regular" would be enrolled in the employees' pension scheme. The old-age pension for active employees is taken into consideration only for these latter employment types. Both the old-age pension systems for active employees—"the old-age pension for active employees in their early 60s" and "the old-age pension for active employees in their late 60s"—will be considered. The suspended (deducted) pension benefit under the old-age pension system for active employees in their early 60s is as described in Conditions 1 through 5 in Appendix 1. Likewise, the suspended pension benefit for the old-age pension for active employees in their late 60s is calculated as shown in Appendix 2.

The amount of pension benefit is determined by subtracting the deduction based on the old-age pension for active employees from the full pension benefit. Table 10 shows the comparison between the actual pension benefit for the individuals aged 60 or older (Panel Data contain only the available data, that is, from 2008 and later) and the average *Predicted Pension Benefit*. The *Predicted Pension Benefit* takes into account the deduction based on the old-age pension for active employees. The averages listed in the table are based only on the positive *Predicted Pension Benefit* in order to make a comparison with the actual amount of pension benefit.

[Insert Table 10 here]

5. Analysis Results

5-1. Estimation of the Employment Type Choice Model Using a Fixed Effects Logit Model

To estimate the fixed effects logit model[13], we assume the following linear random utility model:

$$U = \beta_1 \cdot x_1 + \beta_2 \cdot x_2 + \varepsilon$$

U is the utility of household, x_1 is a variable dependent on the employment type, x_2 is a variable dependent on individual attributes or year, β_1 and β_2 are regression coefficient vectors, and ε is the error term. Households choose an employment opportunity that will meet $U_i > U_j \forall j \neq i$. If the choice probabilities follow the i.i.d. extreme distribution, it has an analytical solution (See Chapter 2 in Train (2009)) and can be represented as a fixed effects logit model. Table 11 shows dependent and explanatory variables used in the employment choice model. Here, *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income* are the above-mentioned variables that are dependent on the employment type. The remaining explanatory variables are the ones dependent on individual attributes or year. The dependent variable is *Choice*. *Choice* is a dummy variable coded 1 when the choice matches the actual employment type recorded in Panel Data and 0 when the choice refers to other employment type. *Predicted Wage*, *Predicted Work Hours*, or *Predicted Income* becomes an explanatory variable along with *Predicted Pension Benefit* and variables that represent individual attributes. *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income* are variables estimated on the basis of Panel Data, as described in the previous section. Therefore, they include data for the employment types that were not chosen in real life. *Predicted Pension Benefit* is the amount of pension benefit estimated by using Panel Data and Wage Census as described in the previous section. The pension benefit deduction based on the old-age pension for active employees is taken into consideration for full-time employees and contract/non-regular employees, who are participants of the employees' pension scheme. As individual attributes, we have *Marital Status*, *Education*, *Have Retired in the Past Year*, *Have a Debt*, *Have Savings*, *Number of Dependent Children*, *Health Condition*, *Caring for a Relative*, and *Activities*. The cross terms between these variables and *Employment Type* are also used as explanatory variables. This model is intended to analyze what factors determine the actual employment type choice. Table 12 shows the estimation results of the fixed effects logit model. Columns (1) and (2) are the estimation results that include *Predicted Wage*

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[13] The fixed effects logit model (also known as the conditional logit model) is an estimation method typically used in the choice experiment method, which is a method that attempts to analyze the respondents' preference for products and services by presenting hypothetical products and services to the respondents from which they choose the one they want to purchase (See McFadden (1974), Louviere et al. (2000), Train (2009), etc.)

as an explanatory variable. The coefficients of *Predicted Wage* and *Predicted Pension Benefit* were positive and significant. The results are reasonable since they showed that the employment type with higher wage and pension benefit was more likely to be chosen. Columns (3) and (4) are the estimation results that include *Predicted Work Hours* as an explanatory variable. The coefficients of *Predicted Work Hours* and *Predicted Pension Benefit* were positive and significant. One would generally think that the employment type with shorter work hours would more likely be chosen; however, the results showed the opposite. This result may be because longer work hours increase the income. Columns (5) and (6) are the estimation results that include *Predicted Income* as an explanatory variable. The coefficients of *Predicted Income* and *Predicted Pension Benefit* were positive and significant. We will explain the effects of the explanatory variables that represent *Marital Status* and the rest of the individual attributes in the following section, as they are more intuitively understood as marginal effects.

[Insert Tables 11 and 12 here]

5-2. Estimation of the Marginal Effects

Table 13 shows the marginal effects on the employment type choice. A marginal effect represents the change in choice probability per unit of increase in the explanatory variable. This is to analyze which explanatory variable has an impact on the employment type in real life. Table 13 is the estimation results when the *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income* estimated in the pooled regression analysis were added separately as explanatory variables. Each explanatory variable listed under *Employment Type* represents the effect relative to "full-time." Columns (1) and (2) are the marginal effects when *Predicted Wage* is an explanatory variable. With regard to *Marital Status*, being married significantly reduces the choice probability in all employment types; in particular, the cross term with "unemployed" has the smallest value. When married, the individual is more likely to choose a full-time job and least likely to choose retirement. As for *Education*, the cross terms of "high school graduate" and "part-time," "high school graduate" and "contract/non-regular," and "high school graduate" and "self-employed" all reduced the choice probability significantly. Of these, the cross terms that most reduced the choice probability was "high school graduate" and "self-employed." The cross terms with "junior college/technical college/vocational college graduate" all significantly reduced the choice probability, except when

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it was crossed with "unemployed." With "university/graduate school graduate," all of its cross terms significantly reduced the choice probability. Of these, the one with "unemployed" reduced the probability most. As described, the probability that "unemployed" is chosen is relatively high at all education levels, except that of "university/graduate school graduate." On the other hand, "university/graduate school graduate" individuals were likely to choose "full-time" and less likely to choose "unemployed." It suggests that the individuals with higher education tend to continue working full-time. *Retired in the Past Year* significantly increased the choice probability in all cross terms. Of these, the largest marginal effect was observed for the cross term with "unemployed," followed by "part-time" and then "contract/non-regular"; this suggests that re-employment is difficult once the individual retires and that the individual is more likely to choose a part-time or contract/non-regular job instead of a full-time job even when re-employed. With *Have a Debt*, the marginal effect of the cross term with "self-employed" was positive and significant, whereas the ones with "part-time," "contract/non-regular," and "unemployed" were negative and significant. "Self-employed" suggests that the individual incurs a debt (or increases debts) when starting his own business. Regarding other employment types, it is suggested that the individual tends to continue working full-time when he has a debt. With *Have Savings*, the marginal effect of the cross terms with all employment types turned out to be negative and significant; whereas we expected that the probability to choose "unemployed" would increase, the result was the opposite. Since there may be a relationship between savings and the capability to work, it may be necessary to consider more sophisticated estimation methods such as utilizing the instrumental variables method. Column (2) is a model that added the explanatory variables *Number of Dependent Children*, *Health Condition*, *Caring for a Relative*, and *Activities* to (1). An examination of the added variables revealed that the marginal effect of the cross terms between *Number of Dependent Children* and each of the employment types was negative and significant. In particular, the marginal effect of *Number of Dependent Children* crossed with "unemployed" is the lowest, and the marginal effect of *Number of Dependent Children* crossed with "self-employed" is relatively high. There is a tendency for individuals with a dependent child to keep their stable, full-time jobs and postpone retirement. In addition, there is a tendency to choose self-employment, which offers relatively flexible work hours and a higher wage (income), when individuals change the employment type. Regarding *Health Condition*, "part-time" showed no significant

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difference in employees' health condition. The health conditions among "contract/non-regular" employees were relatively poor and the marginal effect was negative and significant. Under "self-employed" and "unemployed," the marginal effects of the cross terms with all health conditions were negative and significant. However, there was a tendency for the negative marginal effect to become small when an individual's health condition is good and become large when it is "very poor." In other words, individuals in poor health were less likely to choose "contract/non-regular," "self-employed," and "unemployed" (the health condition among "contract/non-regular," "self-employed," and "unemployed" is relatively good). On the other hand, there is a possibility that the subjective health condition of individuals with a full-time or part-time job declines because of the work and other circumstances. As regards *Caring for a Relative*, the marginal effects when crossed with "part-time" and "unemployed" were positive and significant. On the other hand, the marginal effects of "contact/non-regular" and "self-employed" were not significant, suggesting that the need to care for a relative is likely to lead the individual to choose "part-time," which provides more free time, or "unemployed" rather than "full-time," "contract/non-regular," or "self-employed." Looking at *Activities*, the marginal effect of the cross term between "hobbies" and "part-time" is negative and significant. This is probably because it is difficult to engage in hobby-related activities when the income and time to spend on those activities are not enough. Regarding *cultural activities, and elderly support activities,* the marginal effects of "sports,"were negative and significant when crossed with "part-time" or "self-employed." On the other hand, the marginal effect of "unemployed" was positive and significant. Although their causal relationship is unclear, it seems that the choice probability declines when an individual is engaged in sports activities, because he cannot earn enough income since he is in a part-time job; also, his work hours decrease with a self-employed job. In contrast, it may be that those who are retired and "unemployed" are actively engaged in sports activities because they have extra time and money. Regarding "cultural activities" and "elderly support activities," the coefficient of the cross terms with "self-employed" was positive and significant. Self-employed individuals seem to actively participate in such activities because these often involve interaction with the local community.

Columns (3) through (6) show the marginal effects when *Predicted Work Hours* or *Predicted Income* was used as an explanatory variable instead of *Predicted Wage*. These results were similar to the results in Columns (1) and

(2) where *Predicted Wage* was used as an explanatory variable.

[Insert Table 13 here]

5-3. Estimation of the Marginal Rate of Substitution

   Table 14 shows the marginal rates of substitution of *Predicted Wage*, *Predicted Work Hours*, and *Predicted Income* for *Predicted Pension Benefit*, that is, the change in *Predicted Pension Benefit* to maintain the probability of choosing the current employment type when each explanatory variable increases by one unit while all other conditions remain the same. This estimates by how much the amount of pension benefit can change with a change in each explanatory variable. In the parentheses are standard errors using the delta method. The marginal rate of substitution is estimated as follows, using the regression coefficients of the fixed effects logit model. The total differential equation for the variables dependent on the employment type, which is the utility function, is as follows:

$$dU = \sum_{k=1}^{K} \beta_k \cdot dx_\kappa$$

   Here, we focus on two variables, l and m. When the utility is fixed at the current level and the variables other than l and m are also fixed ($dx_k = 0 : \forall k \neq l, m$), the marginal rate of substitution for the variables l and m (one unit) would be

$$MRS \equiv \frac{dx_l}{dx_m} = -\frac{\beta_m}{\beta_l}$$

since $0 = \beta_l dx_l + \beta_m dx_m$, and calculated as the regression coefficient ratio estimated by the fixed effects logit model. The marginal rate of substitution of the pension benefit when *Predicted Wage* increases by one yen is -0.0007 (in ten thousands), or a 7-yen decrease. When we assume 8-hour workdays for 22 days per month, a 1-yen increase in wage requires a 176-yen increase in monthly income. In other words, the amount of monthly wage increase to compensate for a 7-yen reduction in pension benefit per month is 176 yen (1 yen per hour), which suggests that a reduction in pension benefit is really unwanted. Column (2) shows the marginal rate of substitution for *Predicted Work Hours*. The monthly reduction in *Predicted Pension Benefit* with the same choice probability

as a 1-hour increase in *Predicted Work Hours* per month is 2,765 yen. In other words, when *Predicted Pension Benefit* is cut by 2,765 yen per month, the probability of choosing the current employment type is maintained by increasing monthly *Predicted Work Hours* by one hour. We can interpret that the marginal hourly wage converted to pension benefit is 2,765 yen. Column (3) shows the marginal rate of substitution for *Predicted Income*. It implies the requirement to increase *Predicted Income* by 10,000 yen per month to compensate for a 937-yen reduction in monthly *Predicted Pension Benefit*, suggesting that reduction in pension benefit is most unwelcome. As described, we can presume that the individuals in this generation choose their employment to avoid the reduction in pension benefit; these individuals are expected to increase the amount of work when the pension benefit is indeed reduced. Assuming that the wage, work hours, and income determined by the labor market would be lower than the estimated amount required by the households, we can expect them to change the employment type because they cannot maintain the current one.

[Insert Table 14 here]

6. Conclusion and Tasks

In this paper, we looked at male employees and estimated the employment choice model that used a fixed effects logit model, in order to analyze employment and retirement behaviors among elderly individuals. This paper used the individual data from the *Longitudinal Survey of Middle-aged and Elderly Persons* conducted by the MHLW. In the employment choice model, we took into consideration the wage, work hours, income, and pension benefit under the employment types that were not chosen in real life, in addition to considering those factors under the actual employment type. These predicted values were estimated on the basis of the *Longitudinal Survey of Middle-aged and Elderly Persons*, as well as some external data. The results showed a reasonable choice behavior: individuals were likely to choose the employment type with higher predicted wage, work hours, income, and pension benefit. Individuals who were married, had a dependent child, had savings, or were university/graduate school graduates tended to continue working full-time. However, the subjective health of full-time workers may be declining. In contrast, individuals who retired in the past year tended to choose to stay unemployed or work part-time, suggesting that it is difficult to obtain full-time re-employment. Individuals with a debt or actively

engaged in community activities, cultural activities, or elderly support activities were likely to choose self-employment. When caring for a relative, individuals were likely to choose to work part-time, become self-employed, or stay unemployed.

Looking at the marginal rates of substitution that convert the increase in each of wage, work hours, and income to the amount of pension benefit, a 7-yen cut in monthly pension benefit is translated into a 1-yen increase in wage rate, or a 176-yen increase in monthly wage. Similarly, a 2,765-yen cut in pension benefit is translated into a 1-hour increase in monthly work hours. When choosing an employment type, households show strong aversion to reduced pension benefits by requiring a 10,000-yen increase in monthly income to substitute for a 937-yen reduction in pension benefit, and so on.

The analysis results indicated that reducing the amount of pension benefit largely lowered the preference of households. With the 2004 Pension Plan Revision, it has been determined that there will be a substantial reduction in benefit, based on the macroeconomic indexation. This paper's conclusion, hence, suggests that households will demand a quite large compensation in wage rate, work hours, and income when the amount of pension benefit is reduced. However, such demands cannot, in reality, be met in the current employment environment. Therefore, we can expect that the utility of households will be greatly reduced when the pension benefit is cut, because households cannot supplement their utility level by increasing work. Furthermore, we can expect that preference will increase for an employment environment with a higher wage rate, longer work hours, and a higher income, that is, full-time or self-employment over that of keeping the current employment environment before and after their retirement. If the demand for full-time workers declines due to deterioration of the economic environment, we can expect a shift to self-employment. Policy planning for the continued employment of elderly individuals should consider this type of household preferences.

References

MHLW (2005), *Basic Survey on Wage Structures.*

Ohtake, Fumio and Hisaki Yamaga. "在職老齢年金制度と男性高齢者の労働供給 (The Old-age Pension System for Active Employees and the Supply of Elderly Male Workers)." *選択の時代の社会保障 (Social Security in the Era of Choices).* Ed. National Institute of Population and Social Security Research. Tokyo: University of Tokyo Press, 2003 (Japanese script)

Ogawa, Hiroshi. "Empirical Study of the Labour Participation Behaviour of the Elderly—The Effect of Social Security System." *JILPT Research Report.* Tokyo: The Japan Institute for Labour Policy and Training, 1997. 461:52-64(Japanese script).

Seike, Atsushi. *高齢者就業の経済学 (The Economics of the Employment of the Elderly).* Tokyo: Toyo Keizai Inc., 1993(Japanese script).

Higuchi, Yoshio, and Isamu Yamamoto. "わが国男性高齢者の労働供給メカニズム－年金・賃金制度の効果分析と高齢者就業の将来像－ (The Labor Supply Mechanism: An Effect Analysis of the Pension and Wage Systems and the Future of Elderly Employment)." *IMES Discussion Paper Series.* Tokyo: Bank of Japan Institute for Monetary and Economic Studies, 2002. 2002.10: 31-78(Japanese script).

Higuchi, Yoshio et al. "年金制度改正が男性高年齢者の労働供給に与える影響の分析 (An Analysis of the Impact of the Pension Plan Revision on the Supply of Elderly Male Workers)." *RIETI Discussion Paper Series.* Tokyo: Research Institute of Economy, Trade & Industry, IAA, 2006. 06-J-033(Japanese script).

Kajitani, Shinya. "Old-age pension system for active employees and work decisions of elderly Japanese people." *JCER Economic Journal.* Tokyo: Japan Center for Economic Research, 2011. 64: 56-76(Japanese script).

Louviere. Jordan. J., David A. Hensher, and Joffre. D. Swait (2000). *Stated Choice Methods: Analysis and Application.* Cambridge University Press.

McFadden. Daniel (1974). "Conditional Logit Analysis of Qualitative Choice Behavior". In P. Zarembka, ed., *Frontiers in Econometrics.* Academic Press, New York.

Train. Kenneth E. (2009). *Discrete Choice Methods with Simulatio*n. Cambridge University Press

Table 1: Sample Sizes Before and After the Data Screening

Panel A: Overview of *Longitudinal Survey of Middle-aged and Elderly Persons*

Sample year	Age range	Num. of sample	Num. of sample who returned survey to MHLW	Response rate
2005	50～59 years old	40,877	34,240	83.8%
2006	51～60 years old	35,007	32,285	92.2%
2007	52～61 years old	32,195	30,730	95.4%
2008	53～62 years old	30,773	29,605	96.2%
2009	54～63 years old	29,548	28,736	97.3%
2010	55～64 years old	28,554	26,220	91.8%

Panel B: Sample Sizes before the Screening

Employment Type	2005	2006	2007	2008	2009	2010	合計
Full-time	10,577	9,974	9,178	8,386	7,425	6,613	52,153
Part-time	4,025	4,203	4,174	4,257	4,154	4,203	25,016
Contract/non-regular	951	1,072	1,409	1,667	1,859	1,974	8,932
Self-employed	2,999	2,948	2,986	3,041	3,051	2,983	18,008
Other	1,845	1,871	1,809	1,762	1,681	1,684	10,652
Unemployed	4,690	4,997	5,456	5,958	6,899	7,625	35,625
Data-missing	70	92	145	86	88	75	556
Sum	25,157	25,157	25,157	25,157	25,157	25,157	150,942

Panel C: Sample Sizes after the Screening

Employment Type	2005	2006	2007	2008	2009	2010	合計
Full-time	6,953	6,543	6,033	5,524	4,889	4,314	34,256
Part-time	183	250	319	403	507	640	2,302
Contract/non-regular	347	478	755	953	1,112	1,235	4,880
Self-employed	562	628	655	712	708	751	4,016
Unemployed	430	576	713	883	1,259	1,535	5,396
Sum	8,475	8,475	8,475	8,475	8,475	8,475	50,850

Table 2: Variables Used in the Wage Rate, Work Hours, and Income Determinant Models

Dependent Variable	Definition
Wage Rate	The value obtained by dividing *Income,* described below, by *Work Hours*.
Work Hours	The numerical value obtained by converting the average number of work hours per week to the number of work hours per month. The data points outside of 10 standard deviations from the mean are excluded.
Income	Monthly income (excluding bonus). However, the data points outside of 10 standard deviations from the mean are excluded.

Explanatory Variable	Definition
Employment Type	Dummy variables indicating an employment type, including "full-time," "part-time," "contract/non-regular," "self-employed," "other, " and "unemployed."
Occupation	Dummy variables indicating an occupation, including "professional," "managerial," "clerical," "sales," "service," "security," "agriculture/forestry/fisheries," "transportation/communication," "manufacturing," and "other."
Company Size	Dummy variables indicating the number of employees, including "1 to 5," "5 to 29," "30 to 99," "100 to 299," "300 to 499," "500 to 999," "1,000 to 4,999," and "5,000 or more," as well as "government."
Education	Dummy variables indicating education level, including "junior high school graduate," "high school graduate," "junior college/technical college/vocational college graduate," and "university/graduate school graduate."
Age	Age
Marital Status	A dummy variable coded 1 if the individual is married and 0 if not.
Unemployment Rate by Area	Unemployment rate by prefecture, obtained from the *Labor Force Survey*'s supplemental data, seen in Table 6: Total Unemployment Rate by Prefecture (Model Estimates).
Inflation Rate by Area	The rate of price increase by prefecture (in reality, by prefectural capital) based on the annual average obtained from the *2010-Base Explanation of the Consumer Price Index*.
Year Dummy	Dummy variables indicating year.

Table 3: Descriptive Statistics

		N	平均	標準偏差	最小値	最大値
	賃金率	44,888	2,247.55	(3541)	0.0	49,759.8
	労働時間	50,215	172.00	(76.013)	0.0	586.6
	収入	45,448	41.52	(64.572)	0.0	810.0
雇用形態	パートタイム	50,850	0.05	(0.208)	0.0	1.0
	派遣・嘱託	50,850	0.10	(0.295)	0.0	1.0
	自営	50,850	0.08	(0.270)	0.0	1.0
	無業	50,850	0.11	(0.308)	0.0	1.0
仕事内容	管理	50,565	0.17	(0.378)	0.0	1.0
	事務	50,565	0.08	(0.277)	0.0	1.0
	営業	50,565	0.07	(0.250)	0.0	1.0
	サービス	50,565	0.06	(0.244)	0.0	1.0
	保安	50,565	0.02	(0.156)	0.0	1.0
	農林水産	50,565	0.02	(0.133)	0.0	1.0
	運輸通信	50,565	0.07	(0.255)	0.0	1.0
	生産	50,565	0.13	(0.335)	0.0	1.0
	その他	50,565	0.04	(0.191)	0.0	1.0
	無業	50,565	0.11	(0.309)	0.0	1.0
企業規模	5－29人	44,840	0.20	(0.401)	0.0	1.0
	30－99人	44,840	0.16	(0.362)	0.0	1.0
	100－299人	44,840	0.14	(0.346)	0.0	1.0
	300－499人	44,840	0.06	(0.239)	0.0	1.0
	500－999人	44,840	0.07	(0.248)	0.0	1.0
	1000－4999人	44,840	0.11	(0.310)	0.0	1.0
	5000人以上	44,840	0.09	(0.283)	0.0	1.0
	政府	44,840	0.07	(0.248)	0.0	1.0
学歴	高校卒	50,304	0.49	(0.500)	0.0	1.0
	短大・高専・専門	50,304	0.08	(0.266)	0.0	1.0
	大学・大学院卒	50,304	0.29	(0.454)	0.0	1.0
	年齢	50,850	57.16	(3.229)	50.0	64.0
	地域別失業率	50,850	4.25	(0.950)	2.2	7.9
	地域別インフレ率	50,850	−0.16	(0.903)	−2.4	2.4
	既婚	50,814	0.90	(0.305)	0.0	1.0
	最近1年退職	49,885	0.08	(0.271)	0.0	1.0
	扶養子供数	50,772	0.29	(0.642)	0.0	6.0
	借入金あり	50,286	0.46	(0.498)	0.0	1.0
	借入金	47,765	4.55	(11.291)	0.0	240.0
	預貯金あり	49,256	0.79	(0.411)	0.0	1.0
	預貯金	46,615	9.63	(14.714)	0.0	190.0
	親族介護	48,672	0.08	(0.278)	0.0	1.0
健康状態	健康良い	50,484	0.03	(0.168)	0.0	1.0
	健康比較的良い	50,484	0.14	(0.349)	0.0	1.0
	健康比較的悪い	50,484	0.42	(0.494)	0.0	1.0
	健康悪い	50,484	0.33	(0.472)	0.0	1.0
	健康かなり悪い	50,484	0.06	(0.246)	0.0	1.0
活動	趣味	49,028	0.62	(0.484)	0.0	1.0
	スポーツ	49,015	0.52	(0.500)	0.0	1.0
	地域活動	49,052	0.34	(0.472)	0.0	1.0
	文化	48,968	0.03	(0.183)	0.0	1.0
	高齢者支援	48,979	0.04	(0.205)	0.0	1.0

Table 4: Determinants of Wage Rate

		(1)	(2)	(3)	(4)	(5)
	Dependent variable	Wage rate	Wage rate	Wage rate	Wage rate	Wage rate
	Regression model	Pooled	Pooled	Random effect	Fixed effect	Heckman
	Data	Employed only	Unemployed included	Employed only	Employed only	Unemployed included
Employment Type	Part-time	-959.33 ***	-949.39 ***	-952.77 ***	-921.63 ***	-890.1 ***
		(58.05)	(57.05)	(94.40)	(127.06)	(118.6)
	contract/non-regular	-881.97 ***	-867.38 ***	-835.61 ***	-723.02 ***	-813.9 ***
		(51.34)	(50.35)	(66.73)	(84.20)	(99.8)
	self-employed	521.44 ***	530.06 ***	363.75 ***	-288.39 *	529.14 ***
		(105.27)	(105.36)	(104.77)	(171.87)	(96.66)
	Unemployed		-2,396.4 ***			
			(87.2)			
Occupation	Managerial	495.17 ***	508.51 ***	392.43 ***	101.14	504.68 ***
		(63.25)	(63.13)	(62.94)	(91.48)	(57.71)
	Clerical	-195.63 ***	-188.34 ***	-178.17 **	-187.74	-191.89 ***
		(71.79)	(71.72)	(79.27)	(117.14)	(72.14)
	Sales	-552.34 ***	-549.56 ***	-446.22 ***	-59.26	-574.00 ***
		(67.55)	(67.51)	(88.05)	(143.06)	(81.59)
	Service	-542.34 ***	-553.56 ***	-448.09 ***	-81.81	-595.94 ***
		(79.27)	(79.12)	(86.19)	(118.79)	(97.65)
	Security	-471.57 ***	-485.84 ***	-385.34 ***	6.05	-461.36 ***
		(93.76)	(93.53)	(130.88)	(192.29)	(119.28)
	Agriculture/forestry/fisheries	-652.68 ***	-661.03 ***	-613.33 ***	-359.05	-686.61 ***
		(130.60)	(130.49)	(167.62)	(255.37)	(164.84)
	Transportation/communication	-691.37 ***	-719.37 ***	-571.55 ***	52.79	-706.47 ***
		(64.63)	(64.09)	(89.46)	(148.91)	(82.06)
	Manufacturing	-463.39 ***	-492.51 ***	-386.61 ***	-100.59	-472.64 ***
		(57.17)	(56.67)	(71.08)	(104.93)	(69.56)
	Other	-209.22 **	-222.57 **	-175.11 *	-5.87	-184.56 *
		(102.63)	(102.51)	(101.43)	(125.68)	(102.56)
Company Size	5 to 29	267.58 ***	271.95 ***	220.44 **	139.20	264.71 ***
		(88.68)	(88.74)	(92.87)	(139.58)	(89.92)
	30 to 99	315.91 ***	324.71 ***	285.16 ***	267.40 *	338.85 ***
		(93.53)	(93.55)	(100.09)	(154.96)	(94.30)
	100 to 299	370.22 ***	379.17 ***	314.63 ***	136.11	362.62 ***
		(95.28)	(95.23)	(102.69)	(164.20)	(94.89)
	300 to 499	577.46 ***	588.71 ***	499.31 ***	182.50	585.08 ***
		(117.40)	(117.37)	(118.64)	(182.25)	(110.29)
	500 to 999	611.76 ***	621.90 ***	528.57 ***	203.49	586.78 ***
		(115.52)	(115.49)	(117.57)	(185.37)	(110.23)
	1,000 to 4,999	584.26 ***	596.88 ***	534.00 ***	257.69	605.15 ***
		(101.50)	(101.41)	(107.47)	(176.50)	(101.48)
	5,000 or more	826.88 ***	835.62 ***	721.97 ***	245.76	825.61 ***
		(106.71)	(106.50)	(112.95)	(191.68)	(106.12)
	Government	472.48 ***	491.90 ***	474.71 ***	499.09 ***	488.08 ***
		(114.22)	(113.92)	(120.55)	(189.84)	(123.78)
Education	High school graduate	219.81 ***	168.06 ***	263.45 ***		263.78 ***
		(49.41)	(40.66)	(74.10)		(71.21)
	Junior college/technical college/vocational college	243.42 ***	181.09 **	287.48 ***		308.28 ***
		(80.16)	(70.68)	(107.06)		(104.92)
	University/graduate school graduate	787.58 ***	673.30 ***	850.86 ***		851.48 ***
		(62.20)	(52.40)	(82.70)		(97.37)
Age		6.33	3.36	4.83	128.24 ***	14.86
		(6.78)	(6.07)	(8.99)	(16.54)	(13.70)
Marital Status		179.36 ***	130.40 ***	221.41 ***	303.81	161.72 **
		(59.68)	(46.59)	(79.83)	(251.27)	(70.22)
Unempyment Rate by Area		-51.55 **	-46.75 **	-48.66 *	-63.57	-49.80 **
		(21.40)	(19.12)	(27.32)	(75.89)	(22.79)
Inflation Rate bu Area		-43.09	-40.01	-28.05	-8.15	-30.73
		(52.47)	(44.80)	(48.62)	(50.95)	(53.50)
Year Dummy	2006	206.07 ***	197.03 ***	200.60 ***	60.84	213.15 **
		(62.72)	(57.55)	(62.13)	(68.16)	(88.05)
	2007	-30.02	-17.54	-32.99	-299.02 ***	-8.17
		(56.55)	(51.92)	(62.87)	(83.79)	(81.98)
	2008	40.97	58.92	31.24	-367.30 ***	-130.23
		(109.83)	(95.60)	(106.21)	(128.21)	(283.36)
	2009	44.39	64.26	69.78	-399.81 ***	-76.08
		(81.99)	(71.89)	(81.60)	(62.57)	(234.85)
	2010	612.98 ***	525.75 ***	619.39 ***		591.40 ***
		(87.47)	(76.48)	(76.50)	.	(80.42)
Constant		1,594.16 ***	1,853.96 ***	1,624.08 ***	-4,615 ***	987.62
		(388.38)	(344.82)	(526.40)	(820)	(968.78)
Mill's ratio						579.6
						(1058.6)
N		38,554	43,891	38,554	38,554	46,470
F-value		60.6	641.2		8.7	1,664.2

(Note) ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The Heckman's two-stage method in (5) shows the results of the second stage.

Table 5: Determinants of Work Hours

		(1)	(2)	(3)	(4)	(5)
	Dependent variable	Work Hours	Work Hours	Work Hours	Work Hours	Work Hours
	Regression model	Pooled	Pooled	Random effect	Fixed effect	Heckman
	Data	Employed only	Unemployed included	Employed only	Employed only	Unemployed included
Employment Type	Part-time	-55.11 ***	-55.90 ***	-50.00 ***	-46.50 ***	-52.6 ***
		(1.25)	(1.24)	(1.10)	(1.24)	(3.1)
	contract/non-regular	-17.90 ***	-18.76 ***	-17.36 ***	-17.04 ***	-16.1 ***
		(0.73)	(0.75)	(0.72)	(0.82)	(2.3)
	self-employed	0.83	0.65	-2.28 *	-6.85 ***	0.40
		(1.51)	(1.51)	(1.30)	(1.63)	(3.07)
	Unemployed		-187.8 ***			
			(1.2)			
Occupation	Managerial	-0.14	-0.32	1.09	2.37 ***	-0.13
		(0.65)	(0.65)	(0.75)	(0.88)	(1.86)
	Clerical	-12.23 ***	-12.36 ***	-5.78 ***	-0.84	-11.98 ***
		(0.68)	(0.68)	(0.96)	(1.13)	(2.34)
	Sales	10.43 ***	10.35 ***	5.76 ***	1.15	10.60 ***
		(0.98)	(0.98)	(1.10)	(1.37)	(2.67)
	Service	5.18 ***	5.12 ***	1.23	-1.48	3.73
		(1.11)	(1.11)	(1.00)	(1.14)	(2.79)
	Security	0.49	0.41	0.16	0.23	0.03
		(1.45)	(1.45)	(1.58)	(1.86)	(3.87)
	Agriculture/forestry/fisheries	-4.96 **	-5.29 **	-10.59 ***	-10.08 ***	-8.33
		(2.47)	(2.47)	(2.00)	(2.39)	(5.74)
	Transportation/communication	10.95 ***	10.88 ***	6.66 ***	1.57	8.89 **
		(1.10)	(1.10)	(1.13)	(1.43)	(3.47)
	Manufacturing	-3.71 ***	-3.69 ***	-1.65 *	-0.29	-3.55
		(0.68)	(0.67)	(0.85)	(1.00)	(2.18)
	Other	-9.27 ***	-9.36 ***	-7.27 ***	-6.50 ***	-9.13 ***
		(1.30)	(1.30)	(1.11)	(1.20)	(3.25)
Company Size	5 to 29	10.70 ***	10.76 ***	8.24 ***	7.47 ***	9.77 ***
		(1.20)	(1.20)	(1.12)	(1.33)	(2.77)
	30 to 99	9.14 ***	9.22 ***	8.06 ***	9.92 ***	8.92 ***
		(1.23)	(1.23)	(1.22)	(1.48)	(2.95)
	100 to 299	5.40 ***	5.52 ***	6.93 ***	12.67 ***	4.71
		(1.24)	(1.24)	(1.26)	(1.57)	(3.03)
	300 to 499	2.75 **	2.88 **	5.78 ***	13.72 ***	2.05
		(1.36)	(1.36)	(1.43)	(1.75)	(3.52)
	500 to 999	-0.98	-0.80	3.49 **	13.44 ***	-0.81
		(1.35)	(1.34)	(1.43)	(1.77)	(3.57)
	1,000 to 4,999	0.11	0.28	4.28 ***	14.68 ***	0.16
		(1.24)	(1.24)	(1.33)	(1.69)	(3.29)
	5,000 or more	-2.62 **	-2.43 *	3.56 **	16.19 ***	-2.89
		(1.28)	(1.28)	(1.42)	(1.84)	(3.27)
	Government	-5.27 ***	-5.02 ***	1.74	13.34 ***	-5.47
		(1.33)	(1.32)	(1.49)	(1.84)	(3.55)
Education	High school graduate	-3.76 ***	-3.18 ***	-5.42 ***		-2.71
		(0.74)	(0.62)	(1.20)		(2.48)
	Junior college/technical college/vocational college	-0.99	-0.68	-2.64		0.40
		(1.05)	(0.93)	(1.76)		(3.53)
	University/graduate school graduate	-2.46 ***	-1.97 ***	-4.85 ***		-0.51
		(0.83)	(0.71)	(1.32)		(3.27)
Age		-2.38 ***	-2.13 ***	-2.43 ***	-2.50 ***	-2.36 ***
		(0.09)	(0.08)	(0.15)	(0.16)	(0.24)
Marital Status		4.57 ***	4.23 ***	3.59 ***	0.25	5.82 **
		(0.78)	(0.63)	(1.20)	(2.40)	(2.35)
Unempyment Rate by Area		0.76 ***	0.71 ***	0.43	-1.34 *	0.73
		(0.28)	(0.26)	(0.40)	(0.73)	(0.73)
Inflation Rate bu Area		-1.23 **	-1.04 *	-1.13 **	-1.12 **	-1.54
		(0.61)	(0.53)	(0.48)	(0.49)	(1.71)
Year Dummy	2006	1.18	0.87	1.20 *	0.96	0.27
		(0.83)	(0.77)	(0.64)	(0.67)	(2.68)
	2007	3.72 ***	3.18 ***	3.58 ***	2.95 ***	2.81
		(0.80)	(0.74)	(0.69)	(0.82)	(2.53)
	2008	4.67 ***	3.91 ***	4.47 ***	4.23 ***	5.04
		(1.32)	(1.17)	(1.09)	(1.22)	(3.60)
	2009	-2.02 **	-1.80 **	-1.46	0.27	-1.56
		(0.98)	(0.88)	(0.93)	(0.59)	(2.68)
	2010	-2.25 **	-1.61 *	-1.85 *		-1.06
		(0.92)	(0.82)	(0.98)		(2.66)
Constant		323.16 ***	309.44 ***	328.07 ***	333 ***	317.61 ***
		(5.25)	(4.73)	(8.47)	(8)	(15.38)
Mill's ratio						122.8
						(128.4)
N		43,658	48,995	43,658	43,658	46,470
F-value		197.7	23,718.3		128.4	900.7

(Note) ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The Heckman's two-stage method in (5) shows the results of the second stage.

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Table 6: Determinants of Income

		(1)	(2)	(3)	(4)	(5)
	Dependent variable	Income	Income	Income	Income	Income
	Regression model	Pooled	Pooled	Random effect	Fixed effect	Heckman
	Data	Employed only	Unemployed included	Employed only	Employed only	Unemployed included
Employment Type	Part-time	-26.93 ***	-26.86 ***	-26.44 ***	-24.48 ***	-23.8 ***
		(0.82)	(0.80)	(1.69)	(2.29)	(2.0)
	contract/non-regular	-19.44 ***	-19.31 ***	-18.90 ***	-17.16 ***	-16.4 ***
		(0.94)	(0.92)	(1.20)	(1.52)	(1.6)
	self-employed	7.83 ***	7.95 ***	4.00 **	-12.68 ***	7.95 ***
		(2.03)	(2.03)	(1.87)	(3.08)	(1.71)
	Unemployed		-43.5 ***			-53.87 ***
			(1.7)			(6.83)
Occupation	Managerial	9.18 ***	9.39 ***	8.06 ***	4.73 ***	9.34 ***
		(1.15)	(1.15)	(1.13)	(1.66)	(1.02)
	Clerical	-5.98 ***	-5.88 ***	-4.77 ***	-1.44	-5.77 ***
		(1.27)	(1.27)	(1.42)	(2.12)	(1.28)
	Sales	-8.10 ***	-8.08 ***	-6.43 ***	-0.29	-9.16 ***
		(1.29)	(1.29)	(1.58)	(2.59)	(1.42)
	Service	-9.93 ***	-10.13 ***	-8.27 ***	-1.42	-11.52 ***
		(1.45)	(1.45)	(1.54)	(2.14)	(1.55)
	Security	-9.31 ***	-9.56 ***	-7.07 ***	2.57	-9.49 ***
		(1.64)	(1.64)	(2.35)	(3.48)	(2.11)
	Agriculture/forestry/fisheries	-12.75 ***	-12.93 ***	-12.30 ***	-6.97	-13.48 ***
		(2.45)	(2.45)	(2.99)	(4.58)	(2.79)
	Transportation/communication	-12.00 ***	-12.48 ***	-10.08 ***	0.19	-12.78 ***
		(1.20)	(1.19)	(1.60)	(2.68)	(1.42)
	Manufacturing	-9.45 ***	-9.93 ***	-7.90 ***	-2.39	-10.64 ***
		(1.02)	(1.01)	(1.27)	(1.89)	(1.21)
	Other	-7.38 ***	-7.62 ***	-6.11 ***	-1.50	-7.33 ***
		(1.64)	(1.64)	(1.82)	(2.27)	(1.79)
Company Size	5 to 29	7.54 ***	7.63 ***	5.44 ***	-0.37	7.66 ***
		(1.76)	(1.77)	(1.66)	(2.50)	(1.54)
	30 to 99	8.10 ***	8.26 ***	6.57 ***	3.80	8.55 ***
		(1.85)	(1.85)	(1.79)	(2.78)	(1.63)
	100 to 299	8.64 ***	8.81 ***	6.89 ***	2.70	8.59 ***
		(1.86)	(1.86)	(1.83)	(2.95)	(1.67)
	300 to 499	12.06 ***	12.27 ***	9.79 ***	3.06	12.22 ***
		(2.21)	(2.21)	(2.12)	(3.28)	(1.96)
	500 to 999	11.83 ***	12.03 ***	9.66 ***	3.79	11.35 ***
		(2.17)	(2.17)	(2.10)	(3.34)	(1.92)
	1,000 to 4,999	11.50 ***	11.75 ***	9.96 ***	5.46 *	11.88 ***
		(1.95)	(1.95)	(1.92)	(3.17)	(1.74)
	5,000 or more	15.85 ***	16.03 ***	13.83 ***	7.93 **	16.13 ***
		(2.04)	(2.03)	(2.01)	(3.45)	(1.82)
	Government	8.59 ***	8.95 ***	8.09 ***	9.28 ***	9.54 ***
		(2.14)	(2.13)	(2.15)	(3.42)	(2.01)
Education	High school graduate	2.96 ***	2.23 ***	3.46 ***		3.34 ***
		(0.90)	(0.75)	(1.31)		(1.07)
	Junior college/technical college/vocational college	3.09 **	2.20 *	3.65 *		4.01 **
		(1.43)	(1.26)	(1.90)		(1.58)
	University/graduate school graduate	12.75 ***	10.96 ***	13.45 ***		13.20 ***
		(1.10)	(0.93)	(1.47)		(1.26)
Age		-0.41 ***	-0.41 ***	-0.44 ***	2.37 ***	-0.18
		(0.12)	(0.11)	(0.16)	(0.30)	(0.15)
Marital Status		4.38 ***	3.37 ***	5.00 ***	6.81	2.71 **
		(1.08)	(0.84)	(1.42)	(4.49)	(1.25)
Unempyment Rate by Area		-1.08 ***	-0.97 ***	-1.02 **	-1.42	-0.99 **
		(0.39)	(0.35)	(0.49)	(1.37)	(0.39)
Inflation Rate bu Area		-0.73	-0.68	-0.52	-0.23	-0.49
		(0.97)	(0.83)	(0.88)	(0.92)	(0.90)
Year Dummy	2006	3.60 ***	3.44 ***	3.57 ***	0.63	4.78 ***
		(1.11)	(1.02)	(1.12)	(1.23)	(1.41)
	2007	1.03	1.13	1.04	-4.81 ***	2.13 *
		(1.00)	(0.92)	(1.14)	(1.52)	(1.29)
	2008	2.64	2.78	2.58	-6.15 ***	-2.75
		(2.02)	(1.76)	(1.92)	(2.32)	(3.03)
	2009	2.84 *	3.03 **	3.32 **	-7.12 ***	-0.36
		(1.49)	(1.31)	(1.47)	(1.13)	(2.28)
	2010	13.70 ***	11.91 ***	13.81 ***		10.99 ***
		(1.60)	(1.39)	(1.38)		(1.65)
Constant		59.21 ***	60.67 ***	60.62 ***	-84 ***	42.73 ***
		(7.13)	(6.35)	(9.35)	(15)	(9.88)
Mill's ratio						24.9 **
						(11.8)
N		38,989	44,326	38,989	38,989	46,470
F-value		134.0	706.9		12.7	2,608.8

(Note) ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The Heckman's two-stage method in (5) shows the results of the second stage.

Table 7: Mean Comparison between the Actual Wage Rate and Predicted Wage Rate

Panel A Actual Wage Mean	2005	2006	2007	2008	2009	2010	Avg
Full-time	2,607	2,791	2,539	2,621	2,714	3,306	2,740
Part-time	1,315	1,435	1,431	1,136	1,337	1,456	1,360
Contract/non-regular	1,740	1,750	1,798	1,572	1,621	2,071	1,782
Self-employed	2,389	2,470	2,528	2,539	2,539	3,364	2,663
Unemployed							
Avg	2,383	2,468	2,204	2,055	1,970	2,345	2,248

Panel B Actual Wage Std	2005	2006	2007	2008	2009	2010	Avg
Full-time	3,268	3,726	2,882	3,540	3,855	5,653	3,814
Part-time	2,173	1,689	1,423	1,399	2,485	2,189	2,002
Contract/non-regular	2,601	1,608	2,018	2,325	2,762	3,611	2,748
Self-employed	2,780	2,844	3,438	3,871	3,748	5,674	3,937
Unemployed							
Avg	3,162	3,477	2,788	3,236	3,408	4,752	3,541

Panel C Predicted Wage (1) Pooled	2005	2006	2007	2008	2009	2010	Avg
Full-time	2,594	2,790	2,587	2,597	2,677	3,239	2,723
Part-time	1,085	1,281	1,090	1,159	1,227	1,804	1,351
Contract/non-regular	1,422	1,698	1,545	1,558	1,649	2,227	1,750
Self-employed	2,543	2,731	2,529	2,529	2,599	3,141	2,685
Unemployed	0	0	0	0	0	0	0
Avg	2,375	2,486	2,213	2,131	2,044	2,369	2,269

Panel D Predicted Wage (4) Fixed effect	2005	2006	2007	2008	2009	2010	Avg
Full-time	2,592	2,772	2,526	2,533	2,554	3,044	2,656
Part-time	1,616	1,907	1,758	1,830	1,881	2,377	1,974
Contract/non-regular	1,905	2,215	2,072	2,122	2,156	2,645	2,248
Self-employed	2,071	2,299	2,096	2,125	2,181	2,679	2,249
Unemployed	0	0	0	0	0	0	0
Avg	2,376	2,490	2,208	2,152	2,045	2,336	2,267

Panel E Predicted Wage (5) Heckman	2005	2006	2007	2008	2009	2010	Avg
Full-time	2,596	2,782	2,585	2,604	2,684	3,236	2,724
Part-time	1,087	1,281	1,097	1,137	1,211	1,807	1,346
Contract/non-regular	1,428	1,709	1,565	1,534	1,634	2,240	1,750
Self-employed	2,536	2,712	2,517	2,536	2,602	3,130	2,679
Unemployed	0	0	0	0	0	0	0
Avg	2,377	2,479	2,213	2,133	2,045	2,369	2,268

Table 8: Mean Comparison between the Actual Work Hours and Predicted Work Hours

Panel A Actual Work Hours Mean	2005	2006	2007	2008	2009	2010	Avg
Full-time	201.17	200.07	200.90	199.18	195.12	193.48	198.76
Part-time	159.61	150.21	146.63	139.37	131.59	128.20	138.23
Contract/non-regular	186.82	181.65	177.46	173.90	170.04	167.60	173.62
Self-employed	204.00	200.08	201.79	196.33	190.44	183.04	195.34
Unemployed							
Avg	189.58	183.78	179.69	172.27	158.41	148.46	172.00

Panel B Actual Work Hours Std	2,005.00	2,006.00	2,007.00	2,008.00	2,009.00	2,010.00	Avg
Full-time	44.84	45.09	41.64	41.75	42.13	41.57	43.14
Part-time	58.81	56.78	57.17	57.56	54.37	54.98	56.92
Contract/non-regular	49.75	52.24	42.48	41.22	43.41	45.19	45.05
Self-employed	71.03	71.67	73.57	72.89	76.89	75.47	74.09
Unemployed							
Avg	64.37	69.17	71.32	74.99	81.37	84.58	76.01

Panel C Predicted Work Hours (1) Pooled	2005	2006	2007	2008	2009	2010	Avg
Full-time	201.76	200.47	201.20	199.09	194.71	192.15	198.77
Part-time	147.53	144.40	144.13	140.53	135.45	132.41	138.61
Contract/non-regular	183.48	179.26	177.97	174.93	170.64	167.91	173.65
Self-employed	202.57	200.63	200.71	197.46	191.61	188.55	196.51
Unemployed	0	0	0	0	0	0	0
Avg	189.29	183.63	179.71	172.34	158.29	147.85	171.83

Panel D Predicted Work Hours (4) Fixed effect	2005	2006	2007	2008	2009	2010	Avg
Full-time	203.56	202.18	202.67	200.23	195.82	193.00	200.17
Part-time	151.20	147.94	147.61	144.49	139.56	136.61	142.53
Contract/non-regular	183.06	179.76	179.15	176.60	172.18	169.73	174.99
Self-employed	185.15	183.36	182.93	179.90	174.49	171.08	179.07
Unemployed	0	0	0	0	0	0	0
Avg	189.80	183.93	179.68	172.06	158.01	147.47	171.80

Panel E Predicted Work Hours (5)Heckman	2005	2006	2007	2008	2009	2010	Avg
Full-time	201.77	200.39	201.19	199.10	194.73	192.20	198.76
Part-time	147.80	144.74	144.37	140.66	135.48	132.23	138.66
Contract/non-regular	183.39	179.05	177.87	174.88	170.65	168.09	173.63
Self-employed	202.39	200.71	200.83	197.46	191.45	188.06	196.39
Unemployed	0	0	0	0	0	0	0
Avg	189.28	183.53	179.71	172.34	158.29	147.85	171.80

Table 9: Mean Comparison between the Actual Income and Predicted Income

Panel A Actual Income Mean		2005	2006	2007	2008	2009	2010	Avg
	Full-time	48.81	51.92	48.69	50.27	51.80	62.89	51.87
	Part-time	16.71	18.23	17.74	13.77	14.34	16.97	16.10
	Contract/non-regular	30.98	28.57	30.89	26.05	26.15	34.32	29.66
	Self-employed	44.21	44.74	46.34	43.85	44.29	58.02	47.28
	Unemployed							
	Avg	44.35	45.38	41.48	38.14	35.95	42.67	41.52

Panel B Actual Income Std		2005	2006	2007	2008	2009	2010	Avg
	Full-time	54.14	66.51	52.03	66.13	74.00	107.22	69.78
	Part-time	15.48	19.93	12.58	14.14	17.95	26.59	19.81
	Contract/non-regular	56.42	25.29	42.33	38.28	41.63	63.06	47.88
	Self-employed	53.37	58.63	65.51	62.28	66.45	102.29	71.46
	Unemployed							
	Avg	53.52	62.62	51.30	59.24	63.02	88.86	64.57

Panel C Predicted Income (1) Pooled		2005	2006	2007	2008	2009	2010	Avg
	Full-time	49.02	52.11	49.79	49.92	50.89	61.20	51.68
	Part-time	11.63	14.38	12.02	13.05	13.62	24.13	16.14
	Contract/non-regular	23.89	27.88	26.05	26.14	27.31	37.90	29.38
	Self-employed	45.66	48.52	46.02	45.86	46.31	56.16	48.20
	Unemployed	0	0	0	0	0	0	0
	Avg	44.42	45.78	41.75	39.89	37.50	43.14	42.06

Panel D Predicted Income (4) Fixed effect		2005	2006	2007	2008	2009	2010	Avg
	Full-time	49.45	52.21	48.96	48.84	48.78	57.50	50.70
	Part-time	22.22	27.17	25.61	27.00	27.42	36.21	29.10
	Contract/non-regular	32.11	37.56	36.40	37.19	37.43	46.18	39.08
	Self-employed	31.61	35.23	32.71	33.08	33.73	42.61	34.98
	Unemployed	0	0	0	0	0	0	0
	Avg	44.50	45.87	41.58	40.06	37.43	42.29	41.94

Panel E Predicted Income (5)Heckman		2005	2006	2007	2008	2009	2010	Avg
	Full-time	49.20	52.00	49.90	50.10	51.02	60.63	51.70
	Part-time	12.15	14.74	12.57	12.76	13.49	23.60	16.07
	Contract/non-regular	24.37	28.43	26.77	25.81	27.22	37.45	29.38
	Self-employed	45.59	48.14	45.91	45.89	46.28	55.43	47.99
	Unemployed	0	0	0	0	0	0	0
	Avg	44.61	45.70	41.90	39.96	37.55	42.69	42.05

Table 10: Comparison between the Actual Pension Benefit and Predicted Pension Benefit

Actual Pension Benefit

Age	2008	2009	2010	Avg
60	7.82	7.81	7.50	7.73
	(5.19)	(5.48)	(5.17)	(5.29)
	406	444	345	1,195
61	8.79	8.45	8.68	8.64
	(5.55)	(5.22)	(5.51)	(5.43)
	658	659	681	1,998
62	8.67	8.98	9.39	9.05
	(6.13)	(5.52)	(5.86)	(5.80)
	450	710	657	1,817
63	.	11.28	11.86	11.63
	.	(7.16)	(6.74)	(6.92)
	0	508	731	1,239
64	.	.	15.84	15.84
	.	.	(7.49)	(7.49)
	0	0	501	501
Avg	8.55	9.12	10.74	9.68
Std	(5.65)	(5.93)	(6.86)	(6.36)
N	1,595	2,381	2,978	6,954

Predicted Pension Benefit

Age	2006	2007	2008	2009	2010	平均
60	6.88	6.67	6.84	6.38	6.87	6.70
	(4.30)	(4.11)	(3.89)	(3.63)	(3.67)	(3.90)
	236	417	421	467	315	1,856
61	.	7.03	7.39	7.30	7.16	7.24
	.	(4.49)	(4.12)	(3.87)	(3.76)	(4.04)
	0	342	492	498	417	1,749
62	.	.	7.54	7.57	7.53	7.55
	.	.	(4.54)	(4.30)	(4.08)	(4.29)
	0	0	346	526	443	1,315
63	.	.	.	12.95	10.81	11.78
	.	.	.	(6.23)	(6.00)	(6.20)
	0	0	0	425	519	944
64	.	.	.	.	14.02	14.02
	.	.	.	.	(6.10)	(6.10)
	0	0	0	0	384	384
Avg	6.88	6.83	7.25	8.41	9.38	8.25
Std	(4.30)	(4.29)	(4.17)	(5.18)	(5.60)	(5.10)
N	236	759	1,259	1,916	2,078	6,248

Table 11: Definition of the Variables in the Employment Choice Model

Dependent and Explanatory Variables	Definition
Choice (d)	A dependent variable, dummy coded 1 if the employment type was the one actually chosen and 0 if not.
Predicted Wage	Wages that are estimated by using the pooled regression model out of all wage rate determinant models. As a note, when estimating the wages of currently unemployed individuals under hypothetical employment types, *Occupation* and *Company Size* were set as "professional" and "1 to 4," respectively. *Predicted Wage* for "unemployed" was set as "0."
Predicted Work Hours	Work hours that are estimated by using the pooled regression model out of all work hours determinant models. As a note, when estimating the work hours of currently unemployed individuals under hypothetical employment types, *Occupation* and *Company Size* were set as "professional" and "1 to 4," respectively. *Predicted Work Hours* for "unemployed" was set as "0."
Predicted Income	Incomes that are estimated by using the pooled regression model out of all income determinant models. As a note, when estimating the incomes of currently unemployed individuals under hypothetical employment types, *Occupation* and *Company Size* were set as "professional" and "1 to 4," respectively. Predicted Income for "unemployed" was set as "0."
Employment Type (d)	Dummy variables, each indicating an employment type, including "full-time," "part-time," "contract/non-regular," and "unemployed."
Marital Status (d)	A dummy variable coded 1 if the individual is married and 0 if not.
Education (d)	Dummy variables indicating education level, including "junior high school graduate," "high school graduate," "junior college/technical college/vocational college graduate," and "university/graduate school graduate."
Retired in the Past 1 Year (d)	A dummy variable coded 1 if the individual has retired from the company in the past year and 0 if not.
Number of Dependent Children	The number of children aged 25 and under without income who live with the individual.
Have a Debt (d)	A dummy variable coded 1 if the individual has a debt and 0 if not.
Have Savings (d)	A dummy variable coded 1 if the individual has savings and 0 if not.
Caring for a Relative (d)	A dummy variable coded 1 if the individual is caring for a relative and 0 if not.
Health Condition (d)	Dummy variables indicating individuals' health condition level, including "very good," "good," "relatively good," "relatively poor," "poor," and "very poor."
Activities (d)	Dummy variables created on the basis of the multiple choice responses to a question regarding whether the individual is engaged in hobbies, sports, community activities, cultural activities, or elderly support activities.

Table 12: Estimation Results of the Employment Choice Model Using a Fixed Effects Logit Model

Dependent variable	Choice(1=Actually Chosen, 0=Not Chosen))					
Regression model	Fixed Effect Logit Model					
Predicted Wage	0.0001 ***	0.0001 ***				
	(0.000)	(0.000)				
Predicted Work Hours			0.031 ***	0.030 ***		
			(0.001)	(0.001)		
Predicted Income					0.010 ***	0.011 ***
					(0.001)	(0.001)
Predicted Pension Benefit	0.106 ***	0.102 ***	0.111 ***	0.106 ***	0.106 ***	0.102 ***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Employment Type						
Part-time	-1.825 ***	-1.869 ***	-0.206 *	-0.276	-1.633 ***	-1.673 ***
	(0.094)	(0.453)	(0.109)	(0.457)	(0.097)	(0.453)
contract/non-regular	-2.169 ***	-1.614 ***	-1.696 ***	-1.152 ***	-2.042 ***	-1.489 ***
	(0.083)	(0.289)	(0.083)	(0.290)	(0.084)	(0.289)
self-employed	-2.631 ***	-1.368 ***	-2.614 ***	-1.326 ***	-2.672 ***	-1.405 ***
	(0.090)	(0.271)	(0.089)	(0.271)	(0.089)	(0.271)
Unemployed	-2.419 ***	-0.373	3.497 ***	5.338 ***	-2.219 ***	-0.186
	(0.101)	(0.263)	(0.238)	(0.352)	(0.102)	(0.263)
Marital Status						
Married	0.274 ***	0.198 *	0.170 *	0.101	0.249 **	0.171
	(0.101)	(0.111)	(0.102)	(0.111)	(0.101)	(0.111)
Part-time ×Married	-0.596 ***	-0.413 ***	-0.598 ***	-0.418 ***	-0.595 ***	-0.412 ***
	(0.079)	(0.085)	(0.079)	(0.085)	(0.079)	(0.085)
contract/non-regular ×Married	-0.173 ***	-0.035	-0.178 ***	-0.041	-0.172 ***	-0.035
	(0.064)	(0.068)	(0.065)	(0.068)	(0.064)	(0.068)
self-employed ×Married	-0.417 ***	-0.397 ***	-0.420 ***	-0.399 ***	-0.418 ***	-0.397 ***
	(0.072)	(0.076)	(0.072)	(0.076)	(0.072)	(0.076)
Unemployed ×Married	-0.737 ***	-0.595 ***	-0.706 ***	-0.589 ***	-0.698 ***	-0.558 ***
	(0.074)	(0.079)	(0.074)	(0.079)	(0.074)	(0.079)
Education						
Part-time ×High school	-0.850 ***	-0.765 ***	-0.861 ***	-0.774 ***	-0.849 ***	-0.763 ***
	(0.066)	(0.072)	(0.066)	(0.072)	(0.066)	(0.072)
contract/non-regular ×High school	-0.513 ***	-0.396 ***	-0.524 ***	-0.405 ***	-0.511 ***	-0.395 ***
	(0.102)	(0.109)	(0.102)	(0.109)	(0.102)	(0.109)
self-employed ×High school	-1.607 ***	-1.353 ***	-1.625 ***	-1.369 ***	-1.604 ***	-1.351 ***
	(0.082)	(0.089)	(0.082)	(0.089)	(0.082)	(0.089)
Unemployed ×High school	-0.035	0.059	-0.044	0.051	-0.035	0.059
	(0.057)	(0.062)	(0.057)	(0.062)	(0.057)	(0.062)
Part-time ×Junior colleg	-0.151 *	-0.003	-0.158 *	-0.008	-0.152 *	-0.004
	(0.086)	(0.091)	(0.087)	(0.091)	(0.086)	(0.091)
contract/non-regular ×Junior colleg	-0.424 ***	-0.193 ***	-0.436 ***	-0.203 ***	-0.425 ***	-0.195 ***
	(0.063)	(0.069)	(0.063)	(0.069)	(0.063)	(0.069)
self-employed ×Junior colleg	-0.327 ***	-0.279 ***	-0.334 ***	-0.285 ***	-0.327 ***	-0.279 ***
	(0.062)	(0.067)	(0.062)	(0.067)	(0.062)	(0.067)
Unemployed ×Junior colleg	0.057	0.117	0.048	0.111	0.058	0.118
	(0.087)	(0.093)	(0.088)	(0.093)	(0.088)	(0.093)
Part-time ×University	-0.698 ***	-0.555 ***	-0.708 ***	-0.562 ***	-0.698 ***	-0.555 ***
	(0.069)	(0.075)	(0.069)	(0.075)	(0.069)	(0.075)
contract/non-regular ×University	-0.428 ***	-0.373 ***	-0.577 ***	-0.535 ***	-0.396 ***	-0.346 ***
	(0.068)	(0.073)	(0.068)	(0.074)	(0.067)	(0.073)
self-employed ×University	-0.936 ***	-0.911 ***	-0.958 ***	-0.952 ***	-0.895 ***	-0.876 ***
	(0.116)	(0.124)	(0.117)	(0.125)	(0.116)	(0.124)
Unemployed ×University	-1.005 ***	-0.829 ***	-1.191 ***	-1.057 ***	-0.899 ***	-0.734 ***
	(0.080)	(0.087)	(0.077)	(0.084)	(0.080)	(0.087)
Retired in the Past 1 Year						
Retired	-2.414 ***	-2.387 ***	-2.347 ***	-2.335 ***	-2.402 ***	-2.374 ***
	(0.047)	(0.049)	(0.047)	(0.050)	(0.047)	(0.049)
Part-time ×Retired	3.077 ***	3.048 ***	3.098 ***	3.069 ***	3.078 ***	3.049 ***
	(0.077)	(0.082)	(0.077)	(0.082)	(0.077)	(0.082)
contract/non-regular ×Retired	2.859 ***	2.840 ***	2.882 ***	2.859 ***	2.861 ***	2.843 ***
	(0.066)	(0.069)	(0.066)	(0.069)	(0.066)	(0.069)
self-employed ×Retired	1.563 ***	1.572 ***	1.579 ***	1.592 ***	1.565 ***	1.575 ***
	(0.096)	(0.101)	(0.096)	(0.101)	(0.096)	(0.101)
Unemployed ×Retired	5.265 ***	5.217 ***	5.180 ***	5.147 ***	5.246 ***	5.198 ***
	(0.062)	(0.066)	(0.063)	(0.067)	(0.062)	(0.066)
Have a Debt						
Debt	0.521 ***	0.492 ***	0.439 ***	0.414 ***	0.524 ***	0.496 ***
	(0.034)	(0.036)	(0.034)	(0.036)	(0.034)	(0.036)
Part-time ×Debt	-0.865 ***	-0.806 ***	-0.866 ***	-0.806 ***	-0.866 ***	-0.807 ***
	(0.056)	(0.059)	(0.056)	(0.059)	(0.056)	(0.059)
contract/non-regular ×Debt	-0.978 ***	-0.914 ***	-0.979 ***	-0.915 ***	-0.979 ***	-0.914 ***
	(0.040)	(0.042)	(0.040)	(0.042)	(0.040)	(0.042)
self-employed ×Debt	0.123 ***	0.129 ***	0.115 ***	0.123 ***	0.123 ***	0.128 ***
	(0.044)	(0.046)	(0.044)	(0.046)	(0.044)	(0.046)
Unemployed ×Debt	-1.286 ***	-1.254 ***	-1.187 ***	-1.171 ***	-1.283 ***	-1.251 ***
	(0.054)	(0.057)	(0.054)	(0.058)	(0.054)	(0.057)

Table 12: Estimation Results of the Employment Choice Model Using a Fixed Effects Logit Model (contd. 1)

		(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable	Choice(1=Actually Chosen, 0=Not Chosen))					
	Regression model	Fixed Effect Logit Model					
Have a Savings	Savings	0.288 ***	0.287 ***	0.321 ***	0.317 ***	0.285 ***	0.284 ***
		(0.037)	(0.041)	(0.038)	(0.041)	(0.037)	(0.041)
	Part-time ×Savings	-1.002 ***	-0.919 ***	-1.003 ***	-0.923 ***	-1.002 ***	-0.919 ***
		(0.060)	(0.066)	(0.060)	(0.066)	(0.060)	(0.066)
	contract/non-regular ×Savings	-0.404 ***	-0.430 ***	-0.410 ***	-0.436 ***	-0.403 ***	-0.430 ***
		(0.048)	(0.052)	(0.048)	(0.052)	(0.048)	(0.052)
	self-employed ×Savings	-0.619 ***	-0.625 ***	-0.622 ***	-0.629 ***	-0.619 ***	-0.626 ***
		(0.051)	(0.055)	(0.051)	(0.055)	(0.051)	(0.055)
	Unemployed ×Savings	-0.225 ***	-0.210 ***	-0.370 ***	-0.330 ***	-0.212 ***	-0.200 ***
		(0.064)	(0.071)	(0.064)	(0.072)	(0.063)	(0.071)
Dependent Children	Dependent Children		0.544 ***		0.401 ***		0.554 ***
			(0.043)		(0.044)		(0.043)
	Part-time ×Dependent Children		-0.866 ***		-0.873 ***		-0.866 ***
			(0.086)		(0.086)		(0.086)
	contract/non-regular ×Dependent Children		-1.106 ***		-1.107 ***		-1.107 ***
			(0.059)		(0.059)		(0.059)
	self-employed ×Dependent Children		-0.473 ***		-0.482 ***		-0.472 ***
			(0.059)		(0.059)		(0.059)
	Unemployed ×Dependent Children		-1.258 ***		-1.091 ***		-1.250 ***
			(0.085)		(0.087)		(0.086)
Health Condition	Good		0.341 **		0.299 *		0.343 **
			(0.173)		(0.175)		(0.173)
	Relatively Good		0.633 ***		0.578 ***		0.636 ***
			(0.164)		(0.166)		(0.164)
	Relatively Poor		0.752 ***		0.689 ***		0.756 ***
			(0.163)		(0.165)		(0.163)
	Poor		0.745 ***		0.673 ***		0.750 ***
			(0.164)		(0.166)		(0.164)
	Very Poor		0.715 ***		0.616 ***		0.723 ***
			(0.171)		(0.173)		(0.171)
	Part-time ×Good		0.380		0.347		0.384
			(0.470)		(0.470)		(0.470)
	Part-time ×Relatively Good		0.165		0.128		0.169
			(0.447)		(0.447)		(0.447)
	Part-time ×Relatively Poor		-0.025		-0.063		-0.021
			(0.444)		(0.444)		(0.444)
	Part-time ×Poor		0.008		-0.028		0.012
			(0.445)		(0.445)		(0.445)
	Part-time ×Very Poor		-0.158		-0.190		-0.153
			(0.459)		(0.459)		(0.459)
	contract/non-regular ×Good		-0.237		-0.264		-0.235
			(0.302)		(0.303)		(0.302)
	contract/non-regular ×Relatively Good		-0.527 *		-0.553 **		-0.525 *
			(0.281)		(0.282)		(0.281)
	contract/non-regular ×Relatively Poor		-0.583 **		-0.608 **		-0.581 **
			(0.277)		(0.278)		(0.277)
	contract/non-regular ×Poor		-0.511 *		-0.534 *		-0.509 *
			(0.278)		(0.279)		(0.278)
	contract/non-regular ×Very Poor		-0.569 **		-0.589 **		-0.567 **
			(0.287)		(0.288)		(0.287)
	self-employed ×Good		-0.633 **		-0.641 **		-0.632 **
			(0.284)		(0.284)		(0.284)
	self-employed ×Relatively Good		-1.225 ***		-1.232 ***		-1.224 ***
			(0.261)		(0.262)		(0.262)
	self-employed ×Relatively Poor		-1.360 ***		-1.368 ***		-1.360 ***
			(0.257)		(0.257)		(0.257)
	self-employed ×Poor		-1.267 ***		-1.275 ***		-1.266 ***
			(0.257)		(0.258)		(0.257)
	self-employed ×Very Poor		-0.906 ***		-0.914 ***		-0.905 ***
			(0.267)		(0.267)		(0.267)
	self-employed ×Good		-1.035 ***		-0.980 ***		-1.035 ***
			(0.271)		(0.272)		(0.271)
	Unemployed ×Relatively Good		-1.762 ***		-1.704 ***		-1.757 ***
			(0.249)		(0.250)		(0.248)
	Unemployed ×Relatively Poor		-2.334 ***		-2.277 ***		-2.329 ***
			(0.244)		(0.245)		(0.244)
	Unemployed ×Poor		-2.536 ***		-2.480 ***		-2.531 ***
			(0.246)		(0.247)		(0.246)
	Unemployed ×Very Poor		-2.449 ***		-2.383 ***		-2.444 ***
			(0.263)		(0.264)		(0.263)

Table 12: Estimation Results of the Employment Choice Model Using a Fixed Effects Logit Model (contd. 2)

		(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable	Choice(1=Actually Chosen, 0=Not Chosen))					
	Regression model	Fixed Effect Logit Model					
Caring for Relative	Caring for Relative		-0.162 ***		-0.127 **		-0.161 ***
			(0.050)		(0.051)		(0.050)
	Part-time ×Caring for Relative		0.363 ***		0.365 ***		0.363 ***
			(0.096)		(0.096)		(0.096)
	contract/non-regular ×Caring for Relative		0.012		0.012		0.012
			(0.076)		(0.077)		(0.076)
	self-employed ×Caring for Relative		0.206 **		0.206 **		0.206 **
			(0.082)		(0.082)		(0.082)
	Unemployed ×Caring for Relative		0.501 ***		0.471 ***		0.500 ***
			(0.085)		(0.086)		(0.085)
Activities	Hobbies		0.022		0.039		0.021
			(0.030)		(0.031)		(0.030)
	Part-time ×Hobbies		-0.200 ***		-0.205 ***		-0.199 ***
			(0.060)		(0.060)		(0.060)
	contract/non-regular ×Hobbies		-0.053		-0.055		-0.052
			(0.044)		(0.044)		(0.044)
	self-employed ×Hobbies		-0.068		-0.068		-0.068
			(0.050)		(0.050)		(0.050)
	Unemployed ×Hobbies		0.060		0.016		0.064
			(0.057)		(0.058)		(0.057)
	Sports		0.015		0.051		0.012
			(0.031)		(0.031)		(0.031)
	Part-time ×Sports		-0.329 ***		-0.328 ***		-0.329 ***
			(0.060)		(0.060)		(0.060)
	contract/non-regular ×Sports		-0.034		-0.035		-0.034
			(0.042)		(0.043)		(0.042)
	self-employed ×Sports		-0.241 ***		-0.243 ***		-0.242 ***
			(0.048)		(0.048)		(0.048)
	Unemployed ×Sports		0.276 ***		0.216 ***		0.281 ***
			(0.055)		(0.055)		(0.055)
	Community Activities		-0.130 ***		-0.078 **		-0.136 ***
			(0.032)		(0.032)		(0.032)
	Part-time ×Community Activities		0.237 ***		0.239 ***		0.237 ***
			(0.060)		(0.060)		(0.060)
	contract/non-regular ×Community Activities		0.049		0.048		0.049
			(0.044)		(0.044)		(0.044)
	self-employed ×Community Activities		0.296 ***		0.296 ***		0.295 ***
			(0.048)		(0.048)		(0.048)
	Unemployed ×Community Activities		0.041		0.011		0.042
			(0.055)		(0.056)		(0.055)
	Cultural Activities		-0.151 **		-0.118		-0.156 **
			(0.073)		(0.074)		(0.073)
	Part-time ×Cultural Activities		0.196		0.194		0.195
			(0.161)		(0.161)		(0.161)
	contract/non-regular ×Cultural Activities		-0.006		-0.008		-0.006
			(0.120)		(0.121)		(0.120)
	self-employed ×Cultural Activities		0.509 ***		0.508 ***		0.509 ***
			(0.110)		(0.110)		(0.110)
	Unemployed ×Cultural Activities		0.124		0.116		0.125
			(0.148)		(0.150)		(0.148)
	Elderly Support		-0.172 ***		-0.142 **		-0.177 ***
			(0.063)		(0.064)		(0.064)
	Part-time ×Elderly Support		0.236 *		0.246 *		0.236 *
			(0.135)		(0.135)		(0.135)
	contract/non-regular ×Elderly Support		0.194 *		0.202 **		0.194 *
			(0.102)		(0.103)		(0.102)
	self-employed ×Elderly Support		0.323 ***		0.323 ***		0.323 ***
			(0.106)		(0.107)		(0.106)
	Unemployed ×Elderly Support		0.167		0.178		0.173
			(0.121)		(0.122)		(0.121)
N		222,363	204,575	222,363	204,575	222,363	204,575
chi2		90,351	84,997	91,111	85,604	90,403	85,049
p		0.000	0.000	0.000	0.000	0.000	0.000
r2_p		0.461	0.475	0.465	0.478	0.461	0.475
ll		-52,833	-47,024	-52,453	-46,720	-52,807	-46,998

(Note) ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The estimation was done by

STATA/MP (12.1).

Table 13: Marginal Effects of the Employment Choice Using a Fixed Effects Logit Model

		(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable	Choice(1=Actually Chosen, 0=Not Chosen))					
	Regression model	Fixed Effect Logit Model					
Predicted Wage		0.00001 ***	0.00002 ***				
		(0.000)	(0.000)				
Predicted Work Hours				0.001 ***	0.001 ***		
				(0.000)	(0.000)		
Predicted Income						0.001 ***	0.002 ***
						(0.000)	(0.000)
Predicted Pension Benefit		0.010 ***	0.016 ***	0.003 ***	0.002 ***	0.012 ***	0.018 ***
		(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
	Part-time	−0.116 ***	−0.207 ***	−0.006	−0.005	−0.134 ***	−0.228 ***
		(0.011)	(0.039)	(0.004)	(0.010)	(0.012)	(0.046)
	contract/non-regular	−0.131 ***	−0.186 ***	−0.081 ***	−0.030 *	−0.157 ***	−0.209 ***
Employment		(0.012)	(0.028)	(0.020)	(0.015)	(0.013)	(0.031)
Type	self-employed	−0.149 ***	−0.165 ***	−0.174 ***	−0.036 **	−0.187 ***	−0.200 ***
		(0.014)	(0.027)	(0.035)	(0.017)	(0.017)	(0.030)
	Unemployed	−0.141 ***	−0.054 *	0.054 ***	0.050 ***	−0.166 ***	−0.033
		(0.013)	(0.033)	(0.010)	(0.012)	(0.014)	(0.043)
	Married	0.023 **	0.029 *	0.005 *	0.002	0.026 **	0.030
		(0.010)	(0.018)	(0.003)	(0.002)	(0.012)	(0.020)
	Part-time ×Married	−0.048 ***	−0.059 ***	−0.020 ***	−0.008 ***	−0.059 ***	−0.069 ***
		(0.007)	(0.014)	(0.005)	(0.003)	(0.009)	(0.016)
Marital	contract/non-regular ×Married	−0.015 ***	−0.005	−0.005 **	−0.001	−0.019 ***	−0.006
Status		(0.006)	(0.010)	(0.002)	(0.001)	(0.007)	(0.012)
	self-employed ×Married	−0.035 ***	−0.057 ***	−0.013 ***	−0.008 ***	−0.043 ***	−0.067 ***
		(0.007)	(0.013)	(0.004)	(0.003)	(0.008)	(0.015)
	Unemployed ×Married	−0.057 ***	−0.082 ***	−0.024 ***	−0.013 ***	−0.068 ***	−0.092 ***
		(0.007)	(0.015)	(0.006)	(0.004)	(0.009)	(0.016)
	Part-time ×High school	−0.060 ***	−0.098 ***	−0.034 ***	−0.019 ***	−0.075 ***	−0.116 ***
		(0.007)	(0.015)	(0.008)	(0.006)	(0.008)	(0.017)
	contract/non-regular ×High school	−0.039 ***	−0.055 ***	−0.018 ***	−0.009 **	−0.049 ***	−0.064 ***
		(0.007)	(0.015)	(0.006)	(0.004)	(0.009)	(0.017)
	self-employed ×High school	−0.088 ***	−0.143 ***	−0.092 ***	−0.045 ***	−0.110 ***	−0.173 ***
		(0.009)	(0.022)	(0.020)	(0.014)	(0.011)	(0.025)
	Unemployed ×High school	−0.003	0.009	−0.001	0.001	−0.004	0.011
		(0.005)	(0.010)	(0.002)	(0.001)	(0.006)	(0.012)
	Part-time ×Junior colleg	−0.013 *	−0.000	−0.005	−0.000	−0.016 *	−0.001
		(0.007)	(0.014)	(0.003)	(0.002)	(0.009)	(0.016)
	contract/non-regular ×Junior colleg	−0.034 ***	−0.029 ***	−0.014 ***	−0.004 **	−0.042 ***	−0.034 ***
Education		(0.005)	(0.010)	(0.004)	(0.002)	(0.006)	(0.012)
	self-employed ×Junior colleg	−0.027 ***	−0.040 ***	−0.010 ***	−0.006 **	−0.034 ***	−0.047 ***
		(0.005)	(0.010)	(0.003)	(0.002)	(0.006)	(0.012)
	Unemployed ×Junior colleg	0.005	0.019	0.001	0.002	0.007	0.022
		(0.008)	(0.016)	(0.002)	(0.002)	(0.010)	(0.018)
	Part-time ×University	−0.051 ***	−0.074 ***	−0.026 ***	−0.013 ***	−0.063 ***	−0.088 ***
		(0.006)	(0.013)	(0.007)	(0.004)	(0.007)	(0.015)
	contract/non-regular ×University	−0.035 ***	−0.053 ***	−0.020 ***	−0.012 ***	−0.040 ***	−0.058 ***
		(0.005)	(0.011)	(0.005)	(0.004)	(0.007)	(0.013)
	self-employed ×University	−0.061 ***	−0.106 ***	−0.042 ***	−0.027 ***	−0.074 ***	−0.124 ***
		(0.007)	(0.018)	(0.012)	(0.009)	(0.009)	(0.021)
	Unemployed ×University	−0.066 ***	−0.102 ***	−0.055 ***	−0.030 ***	−0.077 ***	−0.111 ***
		(0.007)	(0.016)	(0.013)	(0.009)	(0.008)	(0.017)
	Retired	−0.110 ***	−0.198 ***	−0.178 ***	−0.121 ***	−0.138 ***	−0.239 ***
		(0.011)	(0.031)	(0.033)	(0.032)	(0.013)	(0.034)
	Part-time ×Retired	0.605 ***	0.642 ***	0.028 ***	0.018 ***	0.632 ***	0.633 ***
		(0.021)	(0.012)	(0.006)	(0.005)	(0.016)	(0.016)
Retired in the	contract/non-regular ×Retired	0.558 ***	0.610 ***	0.028 ***	0.018 ***	0.590 ***	0.607 ***
Past 1 Year		(0.021)	(0.011)	(0.006)	(0.005)	(0.017)	(0.013)
	self-employed ×Retired	0.248 ***	0.340 ***	0.023 ***	0.015 ***	0.285 ***	0.362 ***
		(0.027)	(0.032)	(0.005)	(0.004)	(0.028)	(0.027)
	Unemployed ×Retired	0.858 ***	0.796 ***	0.030 ***	0.019 ***	0.841 ***	0.758 ***
		(0.006)	(0.027)	(0.007)	(0.006)	(0.009)	(0.032)
	Debt	0.049 ***	0.077 ***	0.012 ***	0.007 ***	0.061 ***	0.091 ***
		(0.006)	(0.012)	(0.003)	(0.002)	(0.007)	(0.012)
	Part-time ×Debt	−0.061 ***	−0.102 ***	−0.034 ***	−0.020 ***	−0.076 ***	−0.121 ***
		(0.007)	(0.016)	(0.008)	(0.006)	(0.008)	(0.017)
Have a Debt	contract/non-regular ×Debt	−0.067 ***	−0.112 ***	−0.040 ***	−0.024 ***	−0.084 ***	−0.134 ***
		(0.007)	(0.017)	(0.009)	(0.007)	(0.008)	(0.018)
	self-employed ×Debt	0.012 ***	0.021 ***	0.003 **	0.002 **	0.015 ***	0.024 ***
		(0.004)	(0.008)	(0.001)	(0.001)	(0.005)	(0.009)
	Unemployed ×Debt	−0.080 ***	−0.141 ***	−0.053 ***	−0.034 ***	−0.101 ***	−0.168 ***
		(0.008)	(0.021)	(0.012)	(0.010)	(0.010)	(0.023)

Table 13: Marginal Effects of the Employment Choice Using a Fixed Effects Logit Model (contd. 1)

		(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable	Choice(1=Actually Chosen, 0=Not Chosen))					
	Regression model	Fixed Effect Logit Model					
	Savings	0.025 ***	0.042 ***	0.010 ***	0.006 ***	0.031 ***	0.049 ***
		(0.004)	(0.008)	(0.002)	(0.002)	(0.005)	(0.009)
	Part-time ×Savings	−0.072 ***	−0.117 ***	−0.039 ***	−0.023 ***	−0.089 ***	−0.139 ***
		(0.008)	(0.018)	(0.009)	(0.007)	(0.009)	(0.020)
Have a Savings	contract/non-regular ×Savings	−0.034 ***	−0.061 ***	−0.013 ***	−0.009 ***	−0.042 ***	−0.072 ***
		(0.005)	(0.011)	(0.003)	(0.003)	(0.006)	(0.012)
	self-employed ×Savings	−0.049 ***	−0.085 ***	−0.021 ***	−0.014 ***	−0.061 ***	−0.101 ***
		(0.006)	(0.014)	(0.005)	(0.004)	(0.007)	(0.015)
	Unemployed ×Savings	−0.020 ***	−0.031 ***	−0.011 ***	−0.006 ***	−0.023 ***	−0.035 ***
		(0.006)	(0.011)	(0.003)	(0.002)	(0.007)	(0.013)
	Dependent Children		0.093 ***		0.006 ***		0.108 ***
			(0.014)		(0.002)		(0.014)
	Part-time ×Dependent Children		−0.104 ***		−0.023 ***		−0.125 ***
			(0.017)		(0.007)		(0.019)
Dependent Children	contract/non-regular ×Dependent Children		−0.124 ***		−0.033 ***		−0.149 ***
			(0.019)		(0.010)		(0.021)
	self-employed ×Dependent Children		−0.064 ***		−0.011 ***		−0.076 ***
			(0.011)		(0.003)		(0.012)
	Unemployed ×Dependent Children		−0.135 ***		−0.032 ***		−0.162 ***
			(0.021)		(0.010)		(0.023)
	Good		0.058		0.005 **		0.067
			(0.037)		(0.002)		(0.041)
	Relatively Good		0.113 ***		0.008 ***		0.128 ***
			(0.043)		(0.002)		(0.045)
	Relatively Poor		0.121 ***		0.012 ***		0.140 ***
			(0.040)		(0.003)		(0.043)
	Poor		0.124 ***		0.011 ***		0.144 ***
			(0.041)		(0.003)		(0.045)
	Very Poor		0.132 ***		0.008 ***		0.151 ***
			(0.047)		(0.002)		(0.049)
	Part-time ×Good		0.066		0.005		0.076
			(0.089)		(0.006)		(0.100)
	Part-time ×Relatively Good		0.027		0.002		0.032
			(0.076)		(0.007)		(0.087)
	Part-time ×Relatively Poor		−0.004		−0.001		−0.004
			(0.068)		(0.008)		(0.080)
	Part-time ×Poor		0.001		−0.001		0.002
			(0.069)		(0.008)		(0.081)
	Part-time ×Very Poor		−0.023		−0.004		−0.027
			(0.066)		(0.010)		(0.077)
	contract/non-regular ×Good		−0.034		−0.005		−0.040
			(0.042)		(0.007)		(0.050)
	contract/non-regular ×Relatively Good		−0.070 *		−0.013		−0.083 *
			(0.036)		(0.008)		(0.042)
Health Condition	contract/non-regular ×Relatively Poor		−0.078 **		−0.014 *		−0.092 **
			(0.037)		(0.008)		(0.043)
	contract/non-regular ×Poor		−0.069 *		−0.012		−0.082 *
			(0.037)		(0.008)		(0.043)
	contract/non-regular ×Very Poor		−0.074 **		−0.014		−0.088 **
			(0.036)		(0.009)		(0.042)
	self-employed ×Good		−0.080 **		−0.015 *		−0.096 **
			(0.034)		(0.009)		(0.041)
	self-employed ×Relatively Good		−0.130 ***		−0.040 ***		−0.157 ***
			(0.031)		(0.015)		(0.036)
	self-employed ×Relatively Poor		−0.147 ***		−0.044 ***		−0.177 ***
			(0.033)		(0.016)		(0.038)
	self-employed ×Poor		−0.138 ***		−0.040 ***		−0.166 ***
			(0.032)		(0.015)		(0.038)
	self-employed ×Very Poor		−0.106 ***		−0.025 **		−0.127 ***
			(0.031)		(0.011)		(0.037)
	self-employed ×Good		−0.115 ***		−0.028 **		−0.138 ***
			(0.031)		(0.013)		(0.036)
	Unemployed ×Relatively Good		−0.159 ***		−0.070 ***		−0.193 ***
			(0.031)		(0.023)		(0.036)
	Unemployed ×Relatively Poor		−0.199 ***		−0.113 ***		−0.240 ***
			(0.036)		(0.033)		(0.040)
	Unemployed ×Poor		−0.200 ***		−0.140 ***		−0.242 ***
			(0.035)		(0.039)		(0.040)
	Unemployed ×Very Poor		−0.177 ***		−0.143 ***		−0.216 ***
			(0.031)		(0.043)		(0.036)

Table 13: Marginal Effects of the Employment Choice Using a Fixed Effects Logit Model (contd. 2)

		(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable			Choice(1=Actually Chosen, 0=Not Chosen))			
	Regression model			Fixed Effect Logit Model			
Caring for Relative	Caring for Relative		−0.024 ***		−0.002 *		−0.028 ***
			(0.008)		(0.001)		(0.009)
	Part-time ×Caring for Relative		0.063 ***		0.005 ***		0.072 ***
			(0.019)		(0.002)		(0.021)
	contract/non-regular ×Caring for Relative		0.002		0.000		0.002
			(0.012)		(0.001)		(0.014)
	self-employed ×Caring for Relative		0.034 **		0.003 **		0.039 **
			(0.015)		(0.002)		(0.017)
	Unemployed ×Caring for Relative		0.090 ***		0.007 ***		0.101 ***
			(0.020)		(0.002)		(0.021)
Activities	Hobbies		0.003		0.001		0.004
			(0.005)		(0.001)		(0.006)
	Part-time ×Hobbies		−0.030 ***		−0.004 **		−0.035 ***
			(0.009)		(0.002)		(0.011)
	contract/non-regular ×Hobbies		−0.008		−0.001		−0.009
			(0.007)		(0.001)		(0.008)
	self-employed ×Hobbies		−0.010		−0.001		−0.012
			(0.008)		(0.001)		(0.009)
	Unemployed ×Hobbies		0.009		0.000		0.012
			(0.009)		(0.001)		(0.011)
	Sports		0.002		0.001		0.002
			(0.005)		(0.001)		(0.006)
	Part-time ×Sports		−0.047 ***		−0.007 ***		−0.055 ***
			(0.010)		(0.002)		(0.011)
	contract/non-regular ×Sports		−0.005		−0.001		−0.006
			(0.007)		(0.001)		(0.008)
	self-employed ×Sports		−0.035 ***		−0.005 ***		−0.042 ***
			(0.008)		(0.002)		(0.009)
	Unemployed ×Sports		0.046 ***		0.004 ***		0.054 ***
			(0.011)		(0.001)		(0.012)
	Community Activities		−0.020 ***		−0.001 *		−0.024 ***
			(0.005)		(0.001)		(0.006)
	Part-time ×Community Activities		0.039 ***		0.004 ***		0.045 ***
			(0.011)		(0.001)		(0.013)
	contract/non-regular ×Community Activities		0.008		0.001		0.009
			(0.007)		(0.001)		(0.008)
	self-employed ×Community Activities		0.050 ***		0.005 ***		0.057 ***
			(0.010)		(0.002)		(0.011)
	Unemployed ×Community Activities		0.006		0.000		0.008
			(0.009)		(0.001)		(0.010)
	Cultural Activities		−0.022 **		−0.002		−0.027 **
			(0.011)		(0.002)		(0.013)
	Part-time ×Cultural Activities		0.032		0.003		0.037
			(0.028)		(0.003)		(0.032)
	contract/non-regular ×Cultural Activities		−0.001		−0.000		−0.001
			(0.019)		(0.002)		(0.022)
	self-employed ×Cultural Activities		0.091 ***		0.007 ***		0.104 ***
			(0.024)		(0.002)		(0.026)
	Unemployed ×Cultural Activities		0.020		0.002		0.023
			(0.025)		(0.002)		(0.029)
	Elderly Support		−0.026 ***		−0.003 *		−0.031 ***
			(0.010)		(0.001)		(0.011)
	Part-time ×Elderly Support		0.039		0.004 *		0.045
			(0.025)		(0.002)		(0.028)
	contract/non-regular ×Elderly Support		0.032 *		0.003 *		0.037 *
			(0.018)		(0.002)		(0.021)
	self-employed ×Elderly Support		0.055 ***		0.005 **		0.063 ***
			(0.021)		(0.002)		(0.023)
	Unemployed ×Elderly Support		0.027		0.003		0.033
			(0.021)		(0.002)		(0.024)
N		222,363	204,575	222,363	204,575	222,363	204,575
chi2		90,351.2	84,996.7	91,111.0	85,604.4	90,402.5	85,049.2
p		0.000	0.000	0.000	0.000	0.000	0.000
r2_p		0.461	0.475	0.465	0.478	0.461	0.475
ll		−52,833	−47,024	−52,453	−46,720	−52,807	−46,998

(Note) ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The estimation was done by

STATA/MP (12.1).

Table 14: Marginal Rates of Substitution Estimated by the Employment Choice Model

	Marginal Rate of Substitution for Predicted Pension Benefit		
	(1)	(2)	(3)
Predicted Wage(+1 JPY)	-0.0007 ***		
	(0.0002)		
Predicted Working Hours(+1 Hour)	***	-0.2765 **	
		(0.0113)	
Predicted Income(+10000 JPY)			-0.0937 ***
			(0.0121)
N	222,363	222,363	222,363

(Note) ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. The estimation was done by STATA/MP (12.1).

Appendix 1: Calculation of the Amount of Suspended Pension Payment in the Old-Age Pension for Active Employees in Their Early 60s

The amount of suspended (reduced) pension payment in the old-age pension for active employees in their early 60s is calculated by dividing cases according to the Conditions 1 through 5, shown below, in the same manner as the actual system. As a note, the amount for initiating the payment suspension adjustment is set at 280,000 yen. The amount at which the payment suspension adjustment is revised was 470,000 yen up to 2009 and 460,000 yen in 2010. The amount equivalent to the gross monthly compensation is defined as the monthly income including bonus (= standard compensation) that is estimated using Panel Data and Wage Census.

Condition 1

When

The fixed component + earnings-related component + the amount equivalent to the gross monthly compensation

≦ the amount at which the payment suspension adjustment is initiated,

then

the amount of suspended pension payment = 0.

Condition 2

When

the amount equivalent to the gross monthly compensation ≦ the pension amount adjusted for suspended payment,

and

the fixed component + earnings-related component

≦ the amount at which the payment suspension adjustment is initiated,

then

the amount of suspended pension payment = (the amount equivalent to the gross monthly compensation + the basic monthly benefit – the amount at which the payment suspension adjustment is initiated) ÷ 2.

Condition 3

When

the amount equivalent to the gross monthly compensation ≦ the pension amount adjusted for suspended payment

and

the fixed component + earnings-related component

> the amount at which the payment suspension adjustment is initiated,

then

the amount of suspended pension payment = the amount equivalent to the gross monthly compensation ÷ 2.

Condition 4

When

the amount equivalent to the gross monthly compensation > the pension amount adjusted for suspended payment

and

the fixed component + earnings-related component

$\leqq$ the amount at which the payment suspension adjustment is initiated,

then

the amount of suspended pension payment = (the pension amount adjusted for suspended payment + the basic

monthly benefit – the amount at which the payment suspension adjustment is initiated) ÷ 2 + (the amount

equivalent to the gross monthly compensation – the pension amount adjusted for suspended payment).

Condition 5

When

the amount equivalent to the gross monthly compensation > the pension amount adjusted for suspended payment

and

the fixed component + earnings-related component

> the amount at which the payment suspension adjustment is initiated,

then

the amount of suspended pension payment = the pension amount adjusted for suspended payment ÷ 2 + (the

amount equivalent to the gross monthly compensation – the pension amount adjusted for suspended payment).

However, regardless of which reduction listed above applies,

when

the amount of suspended pension payment > the fixed component + earnings-related component,

then

the amount of suspended pension payment = the fixed component + earnings-related component

or the entire pension payment is suspended.

Appendix 2: Calculation of the Amount of Suspended Pension Payment in the Old-Age Pension for Active Employees in Their Late 60s

The amount of suspended payment in the old-age pension for active employees in their late 60s is calculated in the same manner as the actual system's, as follows.

When

The earnings-related component + the amount equivalent to the gross monthly compensation

> the amount at which the payment suspension adjustment is revised,

41

then

the amount of suspended pension payment = (the basic monthly benefit + the amount equivalent to the gross

monthly compensation – the amount at which the payment suspension adjustment is revised) ÷ 2,

and when

the amount of suspended pension payment > the earnings-related component,

then

the amount of suspended pension payment = the earnings-related component

or the entire pension payment is suspended.