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The Effect of Household Structure on the Employment Behavior of Elderly Male Workers

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Abstract This study is based on micro data from the *Employment Status Survey of the Elderly* (1983, 1988, 1992). The findings are twofold. First, the pension paid to elderly workers acts as a kind of employment subsidy. Firms are willing to employ an elderly male if he is receiving a pension because they can lower his wages by the pension amount. This means that the change in the payment schedule of pensions offered to elderly workers has a substantial effect on employment. Second, the structure of a household has a significant impact on employment behavior. Between 1988 and 1993 changes in household structure had a significant effect on elderly males' increased participation in the workforce. These changes had an even greater effect on employment than changes in pension benefits, which can explain almost all shifts in workforce participation before 1986.

1. Introduction

According to predictions made by the National Institution of Population and Social Security Research, the elderly (i.e., people over age 65) will exceed 25% of the total Japanese population by the year 2015. This implies a relative decline in the younger workforce. Encouraging the elderly to participate in the labor market is thus an important task of government.

Although the employment rate of Japanese males aged 60–64 had been declining before 1988, it demonstrated moderate growth between 1988 and 1993 (Figure 1). Determining the reasons for this upswing and applying them to the country's employment policy will increase the participation of this segment of the population in the workforce.

Previous research on employment of the elderly has found that

- The public pension benefit has a negative effect on workforce participation.
- Health status has a positive effect (i.e., a person who is in good health is likely to work).
- Wage rate has a positive effect.

Although these studies examined the effects of public pensions, most of them only examined the periods of unvarying decrease in the employment rate and

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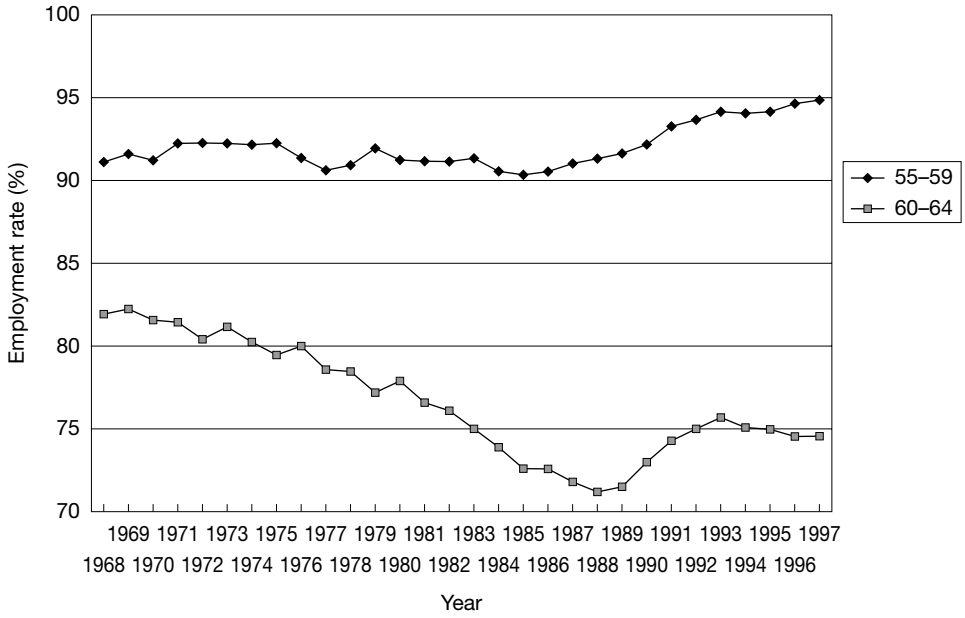

Source: Statistics Bureau, Management and Coordination Agency, *Labor Force Survey*.

Figure 1 Employment rate of men aged 55–59 and 60–64, 1968–1997

unvarying increase in the public pension benefit. This means that the effects of other factors might be overridden by the effects of public pensions. Yashiro, Ohishi, and Futagami (1995) investigated employment during the period 1988–93. Using the *Employment Status Survey of the Elderly* (*ESSE*) of 1988 and 1992, they concluded that increased employment was the result of changes in the preferences of the elderly, not changes in external factors such as public pensions.

In this study, I have utilized the pooled micro data from the *Employment Status Survey of the Elderly* 1983, 1988, and 1992. As this period includes 1986, when the Japanese public pension system was totally reformed, it is possible to distinguish between the effects of trends over time and the impact of public pensions. I have also incorporated household structure in the model to explain the employment behavior of elderly males. Although previous studies on the behavior of females used household structure as an explanatory variable, this study seeks to determine the effects of household structure on elderly males.

2. Employment Behavior and Public Pension Plans in Japan

There are three major public pension plans in Japan: (1) Kosei-Nenkin, (2) Kokumin-Nenkin, and (3) Kyosai-Nenkin. Each plan has its own benefit and

payment reduction rule for eligible elderly workers.

Kosei-Nenkin (employees' pension insurance) is for those who work in the private sector. The benefit has two tiers: the first tier provides a flat rate based on the insured period, whereas the second tier is earnings-related. The old-age benefit of Kosei-Nenkin is higher than that of Kokumin-Nenkin. If a person who is eligible to receive Kosei-Nenkin works in the private sector and is under age 65, the pension benefit is reduced by the rate defined by his or her wage income. And if the wage income exceeds a certain level (250,000 yen per month in 1992), no pension is paid. I will refer to this reduced pension benefit of Kosei-Nenkin as the RP.

Kokumin-Nenkin (national pension program) is for self-employed persons and spouses of employees. The single-tiered benefit of this plan is equal to Kiso-Nenkin and is much lower than Kosei-Nenkin.[1] The pension is not reduced if the person works. As the eligible age for this pension is 65, relatively few people aged 60–64 receive it.[2]

Kyosai-Nenkin is for employees in the public sector and private schools. The benefit level of this plan is higher than Kosei-Nenkin's because it contains a kind of occupational insurance. If a person who is eligible to receive Kyosai-Nenkin works in the private sector, the pension is also reduced. But the reduction is much less than Kosei-Nenkin's, and there is no income limit on the payment of pension benefits.

Kosei-Nenkin is the focus of this paper for three reasons: (1) it is the biggest public pension plan in Japan, (2) the relationship between employment behavior and the pension benefits of males aged 60–64 who are receiving Kosei-Nenkin is important, for the eligible age of Kosei-Nenkin is currently 60, and (3) the benefit reduction rate based on wages earned is highly income-sensitive under this plan.

2.1. The Effects of Pension Reform

The pension reform in 1986 totally restructured pension plans in Japan. The changes in Kosei-Nenkin benefits were as follows:

1. To reduce the earnings-related benefit based on the average monthly income of cohorts, the payment multiplier was decreased from 10/1,000 to 7.5/1,000. It was expected that this change would fix the proportion of earnings-related benefit to the average monthly income at about 30% and take 20 years to implement.

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[1] To prevent confusion, this paper refers to Kokumin-Nenkin as the pension of self-employed persons and spouses of employees and Kiso-Nenkin as the common first tier of the Japanese pension scheme, though the pension reform in 1986 designated Kiso-Nenkin as the successor of Kokumin-Nenkin.

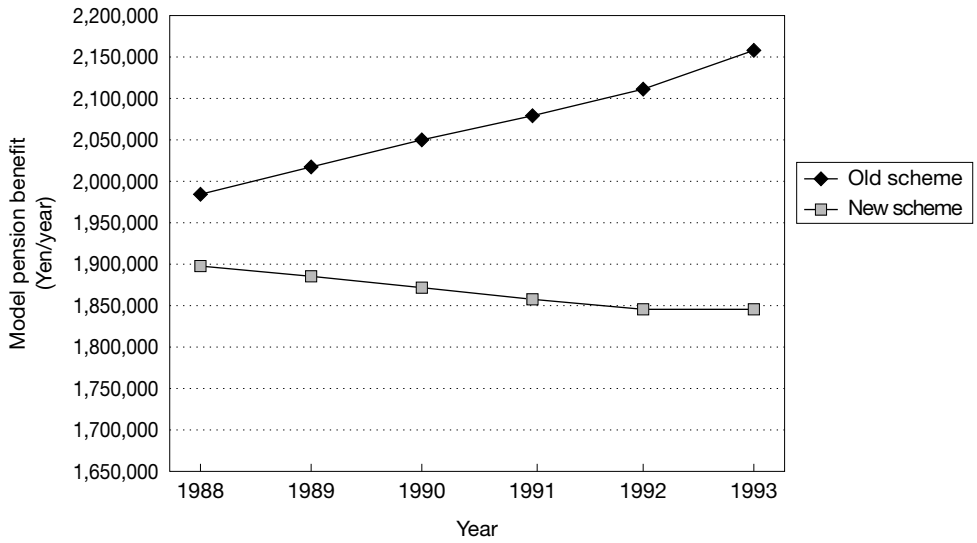
[2] It is possible to receive Kokumin-Nenkin at age 60, though the benefit is permanently reduced if it is paid before 65.

2. To adjust the flat-rate benefit to the level of Kiso-Nenkin's benefit, the flat-rate benefit has been gradually reduced.[3]

These benefit reductions are scheduled to keep the pension replacement rate at the level of 1986 assuming that the average insured period will be longer.

Figure 2 shows the real effect of the pension reform through 1993. The top line, representing the "old scheme," depicts the model pension benefit based on the average insured period and the average monthly income from 1988 to 1993. The bottom line, representing the "new scheme," gives the model pension benefit using the same data. The model pension benefit under the new scheme declines slightly over time, though it is intended to maintain the replacement rate at the 1986 level. This is because the insured period is not getting longer, as anticipated.

The decline of the benefit after the pension reform of 1986 can partially explain the increase in the employment rate during 1988–93, for a negative relationship between pension and employment was found in the previous studies. But the difference in this model pension between 1988 and 1992 was at most about 4,000 yen per month. This estimated –2.7% difference is not enough to account for the 3.9 point change in the employment rate, as the elasticity of



Source: Social Insurance Agency, *Annual Report of Social Insurance*, 1992.
Note: Calculated from average standard monthly income and average insured period.

Figure 2 The effects of the 1986 pension reform on benefits, 1988–1993

[3] Kiso-Nenkin is a virtual pension plan introduced by the pension reform in 1986. Although all Japanese public pensions are based on Kiso-Nenkin in theory, the actual benefits provided by Kosei-Nenkin and Kyosai-Nenkin are now independent of Kiso-Nenkin for historical reasons.

the employment rate in proportion to the public pension benefit estimated in previous studies was no more than –0.9% (Table 1). I believe that the figures listed in Table 1 are overestimated because these studies used the pension benefit as the independent variable. As described above, the Kosei-Nenkin benefit is reduced for ages 60–64 if the person is employed. Thus an employee's Kosei-Nenkin benefit is not independent of his or her work status but a function of it. This inter-relatedness will produce a negative bias on the part of the estimator, as noted in Seike (1989). Taking into account this bias, the changes in the employment rate explained by the pension benefit become smaller than would be expected based on Table 1.

Table 1 Overview of public pension variables and the elasticity of employment, 1980–1992

Study	Public Pension Variable	Elasticity of Pension	Data Source	Year
Shimono and Tachibanaki (1984)	Received pension amount	–0.136	*ESSE*	1980
Seike (1986)	Received pension amount	–0.204	*ESSE*	1980
		–0.224	*ESSE*	1983
Seike (1989)	Right to receive Kosei-Nenkin	NA	*ESSE*	1983
Takayama (1992a)	Received pension amount	–0.841~0.224	*National Survey of Family Income and Expenditures*	1984
Yashiro, Ohishi, and Futagami (1995)	Received pension amount	–0.864	*ESSE*	1988
		–0.640	*ESSE*	1992

2.2. Employment and Pension Reduction

Because the Kosei-Nenkin benefit is reduced or stopped if an employee is between 60 and 64 years old, payments to elderly workers are less than the benefits they would receive if they were unemployed. This means that the pension benefit and employment have bi-directional effects. The pension paid will affect employment behavior and employment behavior will affect the pension paid under Kosei-Nenkin's worker reduction system.

If the pension benefit is used as the explanatory variable of employment, this dependency will cause the two mixed biases of the estimator as stated in Seike (1989):

"paid" pension → employment = negative effect
employment → "paid" pension = negative effect

The studies listed in Table 1 are classified according to how they treated these biases:
1. Ignore these biases by using the pension benefit as the explanatory variable (Shimono and Tachibanaki 1984; Seike 1986; Takayama 1992a; Yashiro, Ohishi, and Futagami 1995)
2. Avoid these biases by using eligibility, rather than the pension benefit, as the explanatory variable (Seike 1989)

The studies that ignored these biases (category 1) overestimated the results. Only Seike (1989) (category 2) explicitly dealt with these biases. But Seike's research had two limitations: (1) only the 1983 *ESSE* included a question on eligibility, making it is impossible to make this determination for other years, and (2) because it treated eligibility as a dummy variable, this method could not examine the changes in benefits caused by the pension reform of 1986.

2.3. Definition of the Principal Pension

To avoid the biases described above, I have introduced the concept of the Principal Pension (PP). The PP is the virtual pension a person under age 64 who is eligible for Kosei-Nenkin benefits will receive when he or she is no longer employed. When a person decides whether to work or not, I think it more natural that he or she will use the Principal Pension as a benchmark, not the pension benefits examined in *ESSE*. As the PP is independent of working status, the biases will not occur if it is used as the explanatory variable in analyzing employment.

2.4. Estimation of the Principal Pension

Since there is an upper limit for wages when no Kosei-Nenkin benefits are paid, the PP can be estimated in one of two ways: Case 1, Estimating a positive RP, and Case 2, Estimating a zero benefit.

Case 1: "Paid" pension benefit > 0. As the reduction rate table is based on a person's average monthly income, this rate can be estimated using the monthly income found in *ESSE* as the wage income. It is easy to calculate the PP as a function of the working reduction rate using this formula:

PP = ("paid" pension benefit)/(1 – reduction rate)

Case 2: "Paid" pension benefit = 0. Here, estimation of the PP requires two steps: (1) determining why no Kosei-Nenkin benefit was paid, and (2) estimating the PP benefit for the person who was eligible to receive it. Regarding the first step, there are two possibilities: (a) the person was ineligible to receive the benefit, and (b) the

benefit was reduced to zero because the person's wages exceeded the upper limit. The 1983 survey asks whether the subject was "eligible to receive the benefit," so the data are straightforward. But as this question did not appear in the 1988 and 1992 surveys, I assigned a positive PP if the subject met all of these conditions:

- Had been employed in the private sector at age 55.
- Was currently employed in the private sector.
- Worked more than 32 hours per week in the current job.
- Was paid a wage that exceeded the upper limit of the particular survey year.

Use of this approach is not foolproof: there will be errors when, for instance, the insured period is insufficient and the person is ineligible to receive the pension. This reflects the limitation of data from surveys that did not include questions on the subjects' previous occupation and the type of firm that employed them. I tried to control by the number of employees, but this did not improve the 1983 data.

I tested for fit using the 1983 data as a benchmark. The method described above determines eligibility or ineligibility at a 90% level of accuracy for men who are aged 60–64 and receive no benefit.

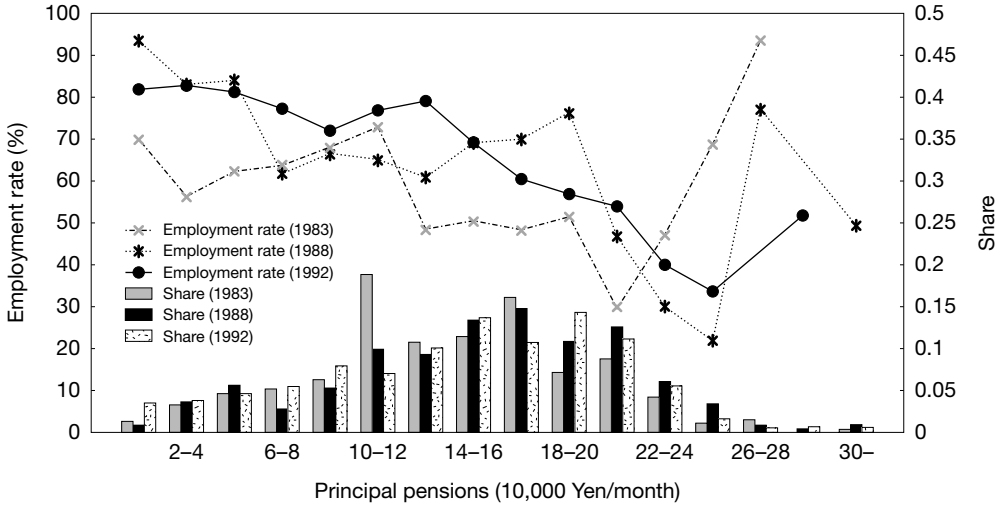
In the second step of Case 2, since the PP is based on the insured period and the average monthly income, I assume that the persons who were working in the same occupation and in the same type of company as at age 55 were receiving the same PP. Under this assumption, I can estimate the PP benefit by looking up the table giving the average pension paid to people who are not currently working.

2.5. Changes in the Principal Pension and Employment Rate over Time

Here I consider changes in the relationship between the PP and the employment rate over time. Figure 3 shows the PP and employment rate in 1983, 1988, and 1992 calculated from *ESSE* data. The rates were similar in 1988 and 1992, and the rate for 1983 was almost the same in cases where the pension shares were high (100,000–220,000 yen per month). This means that the relationship between the PP and the employment rate was stable from 1983 to 1992, and it is appropriate to pool the data from the three surveys.

3. Household Structure and Employment Behavior

As noted in section 2.1, the impact of the 1986 reform on public pension benefits was insufficient to explain the increased participation of males aged 60–64 in the workforce during 1988–93. More important, I will show, were the changes in household structure.



Source: Ministry of Labor, *Employment Status Survey of the Elderly*, 1983, 1988, 1992.
Notes: Males, age 60–64, who have a positive PP and receive no Kokumin-Nenkin or Kyosai-Nenkin. The line of the employment rate is omitted if the share of the PP bracket is less that 0.5%.

Figure 3 Changes in the relationship between the PP and the labor participation rate, 1983, 1988, and 1992

3.1. Review of Previous Research

Household structure has commonly been used to account for the employment behavior of married females. For example, Shimono and Tachibanaki (1984) used *ESSE* micro data of 1980 to estimate the effects of household structure and degree of dependency on elderly females. But they did not analyze the influence of these factors on the behavior of elderly males because their dependency status was consistent with that of their age group—i.e., in the 1980 survey about 70% of the respondents indicated that they were "mainly supported by my own income" at any age. Accordingly, Shimono and Tachibanaki assumed that all dependent elderly males had the same employment preferences. I think that this assumption is too strong.

Table 2, quoted from Takayama and Arita (1996), shows the income status of elderly males by household structure. The values listed in the first row are for single men and those in the second row are for married men. According to this table, the income status of an elderly male will vary depending on whether or not he has a spouse. Shimono and Tachibanaki (1984) used the responses from the *ESSE* question "What is your main source of support?" as the variable for dependency status. In response to this question in the 1992 survey, about 80% of single elderly males said that they were "mainly supported by my own income."

Table 2 Annual income of elderly males, by household structure

Household Structure	Share (%)	Share of Annual Income (%)		Annual Income (10,000 Yen)	
		Zero	Over 4,800,000 Yen	Average	Median
Singles	4.4	NA	8.5	233	182
Couples	37.1	0.3	21.1	394	295
With unmarried (Type A) children	38.0	27.8	10.6	209	124
With married (Type B) children	16.3	2.5	28.4	430	321
Others	4.2	1.7	25.5	400	315
Total	100.0	11.1	17.9	323	250

Source: Takayama and Arita (1996), 166, Table 7-4.

Takayama and Arita (1996) also tell us that when the husband was receiving a public pension, he provided about 80% of a couple's total income. These findings imply that the dependency status of single elderly males and married elderly males was the same. Yet the distribution of their income was not the same, although it should have been if Shimono and Tachibanaki's assumptions were correct. Thus it is worth examining the effects of household structure on the employment of elderly males.

3.2. Estimating Household Structure from *ESSE* Data

The *Employment Status Survey of the Elderly* is a survey of people; few items on the questionnaires relate explicitly to household structure. The 1992 survey sought only four types of data on this subject: (1) the number of persons living with the respondent, (2) the number of persons living with the respondent who received an income, (3) the person on whose income the respondent depends (not the source of income), and (4) total income of the persons living in the household. The *ESSE* gives no information about the relationship of the persons living with the respondent, and thus it is impossible to determine the structure of the household directly from the limited survey data.

On the basis of certain assumptions, however, I have divided households into five categories (as described above the categories in Table 2 and Section 3.2 is not the same):

1. Singles (single men)
2. Couples (husband and wife only)
3. Couples with Dependent Children—Type A

4. Couples with Independent Children—Type B
5. Others

As there is no information on the relationship of the other persons living in the household, such as married or unmarried children, my assumptions may be incorrect. Nevertheless, the economic status of the categories I describe fit well with the ones identified by Takayama and Arita.

3.2.1. Singles

Estimation of single households is straightforward inasmuch as they contained only the survey respondents.

3.2.2. Couples

Selecting households containing a two persons is insufficient, for such a household might also have included friends or a parent and a child. Therefore, I added another condition: that the respondent or his spouse was the household's main source of support.

3.2.3. Couples with Dependent Children—Type A

This category refers to households that (1) contained three or more persons—the respondent, his spouse, and his dependent children, and (2) whose main source of support was the respondent or his spouse. Here the term "Couples" refers to the elderly parents canvassed by *ESSE*, though parents of "parents" might have been part of the household. I suspect that this category corresponds to "Parents with unmarried children" in Takayama and Arita (1996), though the survey does not provide the marital status of household members.

3.2.4. Couples with Independent Children—Type B

This category includes households in which (1) the respondent was living with two or more persons, and (2) his child or children were his main source of support. Although these conditions would also match the households of couples who were not living with their children but were supported by them, such cases were probably rare, since the proportion of couples receiving income from their children was, according to Takayama and Arita (1996), less than 5%. Moreover, some households may have been misclassified due to the lack of data in *ESSE*, as stated for Type A.

3.2.5. Others

This category includes all other households. Their support was unknown, and there was no direct correspondence between them and the categories listed in Table 2.

3.3. Overview of Household Status by Structure

Figures 4 and 5 show the employment rate and changes in household structure over time. In both figures the data are for males aged 60–64 whose Principal Pension was greater than zero. The employment rate of Couples was higher than that of Singles (Figure 4). This finding is consistent with Table 2 and indicates that the analytic method used here—drawing on *ESSE* to estimate household structure—is reliable.

The proportionate increase in Couples and Couples with Dependent Children—Type A is shown in Figure 5. The household structural change, which was not taken into account in their work that Yashiro, Ohishi, and Futagami (1995) left as residuals.

3.4. The Causality of Household Structure and Employment

In considering the causality of household structure and employment, I formulated this hypothesis:

> Hypothesis H: A change in working status will directly cause a change in household structure.

Let us suppose that there are no such things as pensions or savings. In such a world, elderly males in Singles, Couples, and Type A households would have to work to support themselves. Thus their status would be either "Singles, Working," "Couples, Working," or "Type A, Working."[4] If for some reason a person should become unable to work, his household structure would change to "Type B, Not working," for this is the only household category in which he can be a dependent. If I observe this transition in the data, it means that Hypothesis H is supported and that using household structure to explain the employment rate will produce reverse causality.

On the other hand, suppose a world where pension benefits are large enough to permit elderly men to be self-supporting. Here, "Singles, Not working," "Couples, Not working," or "Type A, Not working" are feasible categories even if the person becomes unable to work and Hypothesis H is rejected. I therefore can use household structure to explain the change in working status.

Table 3 shows the proportionate changes in three household structure/working status combinations over time. I have used the combination in the [Couples, Type A, Type B] × [Working, Not working] matrix to calculate the proportionate changes.[5]

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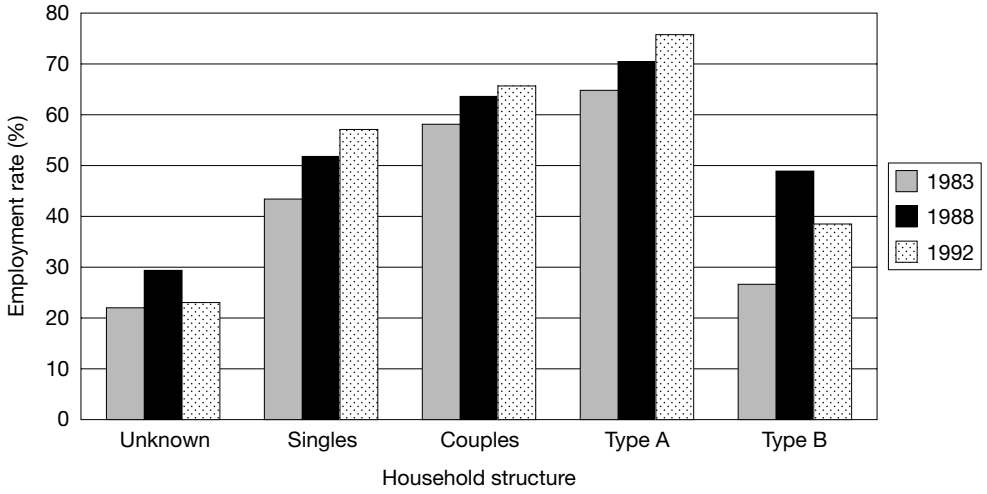
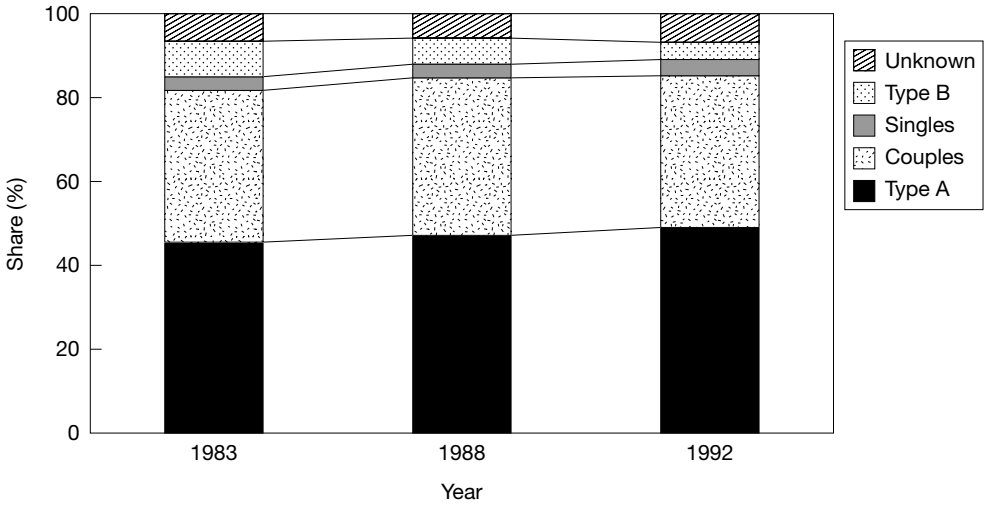
[4] The abbreviation denotes household structure and working status.

[5] "Singles" are omitted because their share of household structure is so small. "Others" are omitted because I could not evaluate their household structure and could not predict changes in their composition.



Source: Ministry of Labor, *Employment Status Survey of the Elderly*, 1983, 1988, 1992.
Note: Males, age 60–64, who have a positive PP.

Figure 4 Employment rate by household structure, 1983, 1988, and 1992



Source: Ministry of Labor, *Employment Status Survey of the Elderly*, 1983, 1988, 1992.
Note: Males, age 60–64, who have a positive PP.

Figure 5 Changes in household structure, 1983, 1988, and 1992

From 1983 to 1988 both the employment rate and the percentage of "Couples, Working," "Type A, Working," and "Type B, Not working" decreased. An increase in the "Type B, Not working" proportion, which should be observed if Hypothesis H holds, was not found.

From 1988 to 1992 the employment rate increased whereas the share of "Type B, Not working" decreased (–1.84 points), as would be expected based on Hypothesis H. The share of "Type B, Working" also decreased but to a greater extent (–2.18 points). H cannot explain this decrease in "Type B, Working."

Based on these findings, Hypothesis H is rejected for the period covered in this paper. That is, using household structure to explain the changes in employment rates will not bring the violation of causality.

Table 3 Percentage of changes in household structure, by work status, 1983–1988 and 1988–1992

1983–1988	Couples	Type A	Type B
Working	–0.06	–3.07	1.11
Not working	2.42	1.93	–2.33
1988–1992	Couples	Type A	Type B
Working	2.55	3.85	–2.18
Not working	–0.82	–1.55	–1.84

Source: Calculated by the Author from *ESSE* 1983, 1988, 1992.

4. Analysis of Employment Behavior Using Principal Pension and Household Structure

4.1. Framework of the Analysis

Here I have used the simple working–not working binary selection model. In most studies this model of employment has been based on a comparison of the market wage (W_m) and the reservation wage (W_r). That is,

Working if $W_m > W_r$
Not working if $W_m < W_r$

The binary selection model can explain the behavior of people who receive an income only while working, but it does not fully account for the employment behavior of elderly males in Japan. Takayama (1992b) and Tachibanaki and Shimono (1994) pointed out that it was common to pay elderly males a lower

wage so they could receive as much public pension as possible. As the reduced Kosei-Nenkin pension benefit (RP) is sensitive to market wages, it is better to add RP to W_m to account for this wage control. That is,

Working	if $W_m + RP > W_r$
Not working	if $W_m + RP < W_r$

If I use the willingness to work as a dependent variable, there is no reason to add W_m and RP to the estimation model separately, for both variables have the same effect on the supply side. On the other hand, if I use the dependent variable whether the person was working or not, the effects on labor demand would not be the same. Under normal conditions W_m and labor demand are negatively related, but the RP will increase the labor demand because it has the effect of lowering wages, as described in Tachibanaki and Shimono (1994). If I use W_m + RP as the explanatory variable, these effects, which will reverse the employment rate, will result in an inadequate estimation of the model.[6]

4.2. Data Source and Independent Variables

As indicated earlier, this analysis draws on the data provided by the *Employment Status Survey of the Elderly* for 1983, 1988, and 1992. The sample includes observations of men aged 60–64 that have been extracted from each *ESSE* data set and pooled. The relationship between the employment rate and the PP was stable over time, as indicated in section 2.5, so pooling the data will not change the result. I used the reply to the question "Are you doing work for which you are paid?" as the dependent variable. If the respondent was working, this was coded as 1; if not, it was coded as 0. The independent variables are listed in Table 4. I can retrieve most variables in this table directly from the *ESSE* data except the virtual monthly wage and the RP for nonworking individuals (i.e., the wage and the RP that they would receive if they worked).

4.2.1. Estimating the Monthly Wage

It is well known that assigning a virtual wage to an individual who does not work using the actual wage observed in the labor market will cause sample selection bias (Heckman 1979; Seike 1989). This bias is inevitable if I use wages to explain participation in the workforce.

Table 5 shows the methods for virtual wage assignment employed by previous

[6] I tried using W_m + RP as a single variable, but the result of the estimation was not good as expected here.

Table 4 Explanatory variables

Variable	Description	Expected Sign
Age	Age at time of survey	–
D_HC	Dummy of health condition: 0 if "Good," 1 otherwise	–
R_PP	Sum of monthly real principal pension amount in 10,000 Yen (1990 price)	–
R_PRV	Sum of monthly real private pension amount in 10,000 Yen (1990 price)	–
D_MR	Dummy of mandatory retirement: 1 if experienced mandatory retirement, 0 otherwise	–
D_TKY	Dummy of "Living in Tokyo": 1 if lives in Tokyo, 0 otherwise	+
D_HS*	Dummy of household structure	
D_HS1	Dummy of Singles: 1 if Singles, 0 otherwise	+
D_HS2	Dummy of Couples: 1 if Couples, 0 otherwise	+
D_HS3	Dummy of Type A: 1 if Type A, 0 otherwise	+
D_HS4	Dummy of Others: 1 if Others, 0 otherwise	–
R_MW	Real monthly wage in 10,000 Yen (1990 price). Gives the virtual wage assigned if not currently working.	+
R_WS	Real monthly working subsidy in 10,000 Yen (1990 price): Received (reduced) public pension if working, virtual reduced pension if not working	+

studies. All of the studies listed in Table 5 used only current attributes of the elderly people surveyed. Yet the employment behavior of an elderly male is affected not only by his present circumstances but also by his previous career.[7] Here I have drawn on the information available in the *Employment Status Survey of the Elderly* to assign the virtual market wage. The survey asked for certain facts about previous employment, including some characteristics of the job the person held at age 55, the type of firm where he was employed, and his occupation. Using these data and other information from the *ESSE*, I assembled two sets of data to look up the mean wage table:

Case 1: Employee at age 55. This data set has five components: (1) year of the survey, (2) sex, (3) age at the time of the survey (in a category of 60–64), (4)

[7] While attending a meeting of the Ohita Prefecture Employers Association in June 1995, I heard someone say that "elderly men do not want to work if they are paid less than in previous jobs. That is the supply side problem that our programs try to counteract by encouraging the employment of the elderly."

Table 5 The method for virtual wage assignment in previous studies

Study	Wage Assignment Method
Shimono and Tachibanaki (1984)	Average income of part-time employees
Seike (1986)	Wage table from *Basic Survey on Wage Structure* indexed by the property of employees
Takayama (1992a)	Hourly average wage by prefectures
Yashiro, Ohishi, and Futagami (1995)	Average scheduled cash earnings of males in a firm of 10–99 employees by prefecture

occupation at age 55, and (5) type of firm that employed the respondent at age 55. With these data, I was able to calculate the average wage of men who were employed at age 55, were working at the time of the survey, and had experienced retirement at least once.

Case 2: Not an employee at age 55. I used four components to assemble this data set. As the *ESSE* did not solicit information on the past status of individuals who fell into this category, it contains only current data: (1) year of the survey, (2) sex, (3) prefecture, and (4) age at the time of the survey (in five-year step). From this data set, I calculated the average wage for all men who had been unemployed at age 55 but were working at the time of the survey.

Using these two data sets, I also assigned virtual working hours.

The validity of this assignment procedure depends on whether or not the occurrence of wage control with a reduced pension benefit, as described in Tachibanaki and Shimono (1994), was influenced by the person's previous job—i.e., by the type of firm that employed him and his occupation at age 55.

There is evidence that this assumption is correct. Table 24 in the 1992 *ESSE* report shows that the current occupation of an elderly male who had experienced mandatory retirement heavily depended on his occupation at age 55. If he could not get a job at the same level after his mandatory retirement, he would receive a lower wage in his new position, as the experience and skills he had acquired during his previous job would not count. Such a situation would result in a controlled wage with a reduced pension benefit.

Another finding from the 1992 survey is that the probability of "working in the same occupation as before mandatory retirement" will vary according to the person's position and the type of firm that employed him at age 55. For example, there was a 70% probability that an elderly male who at age 55 worked as a specialist at a firm with more than 1,000 employees would get the same kind of

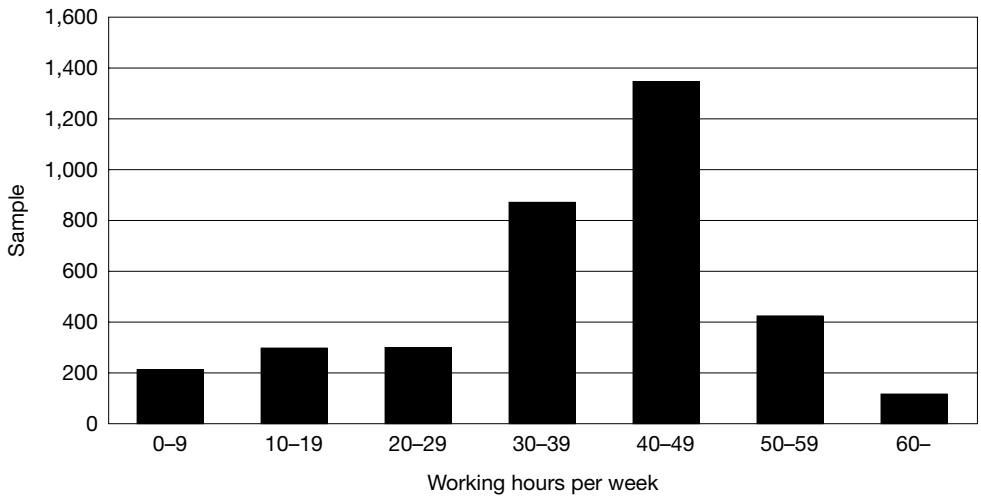
job if he reentered the labor market after his mandatory retirement. The probability that this would be possible for a blue-collar worker was only about 40%.

These facts demonstrate the feasibility of the wage assignment method used in this study, which emphasizes the importance of previous employment in determining the current wage table. It is also a better estimator of wages than approaches used in previous studies, such as scheduled cash earnings of small firms or the mean wage of part-time workers.

Unlike previous analyses, the present study used the wage amount itself—not the wage rate—as a wage variable. There are two reasons for this. First, the reduction rate of the RP was based on monthly earnings, not on wage rates. And second, the largest number of 60-to-64-year-old males with a positive PP worked 40 to 49 hours per week (Figure 6). This shows that the Japanese labor market did not provide enough part-time jobs for elderly males; the 1992 survey reported that more than 60% of those wanting to work requested part-time jobs but were not permitted to determine how many hours they would work. Thus in this case wage amount and wage rate had the same effect on employment.

4.2.2. Estimating Pension Benefits after the Working Deduction (RP)

It is simple to determine the RP for a person who is currently employed, as I can use his current pension benefit as the RP. But for a person who is unemployed, a little estimation will be needed. Here I have used the wage and working hours



Source: Ministry of Labor, *Employment Status Survey of the Elderly*, 1983, 1988, 1992.
Note: Males, age 60–64, who have a positive PP and are currently working.

Figure 6 Distribution of the working hours of elderly males, 1983, 1988, and 1992

estimated above to calculate the average monthly income and then the reduction rate. If the man was working more than 32 hours per week, I estimated the RP based on the Kosei-Nenkin benefit (it would be the PP for unemployed people by definition) and reduction rate. If he worked less than 32 hours per week, I treated him as "not insured" and made no deduction.[8]

4.3. The Model

To determine what factors affected the probability that a person would be *out of the workforce* or *working*, I used a simple binary selection model. Formally, I assumed that individual i chose to work if the market wage (W_m) was higher than his reservation wage (W_r). For each individual i, I defined a variable Y_i to denote the working status of i. If individual i was employed, $Y_i = 1$ and if not, $Y_i = 0$. I assumed a vector of observable variables, x_i, which explained both W_m and W_r, and a stochastic error term e_i. Finally, I used probit estimation to determine the estimate of parameter β:

$$Y_i = 1 \text{ if } W_m - W_r = x_i'\beta + e_i > 0$$
$$Y_i = 0 \text{ if } W_m - W_r = x_i'\beta + e_i \leq 0$$

Table 5 shows the independent variables used here. As I wanted to determine the factors that increased the employment of males aged 60–64 who were observed between 1988 and 1993, it was desirable to use the data set that encompassed the period 1988–93. The *ESSE* data set included the results of the 1983, 1988, and 1992 surveys, so I pooled these three surveys to estimate the model.

4.4. Results of the Estimation

Table 6 presents a probit analysis of the employment rate in 1983–92, and Table 7 shows the effects of each factor on that rate in 1983–88 and 1988–92. With the exception of age, all of the parameters met the expectations listed in Table 5 and were significant at the 1% level. The parameter of age was significant at the 5% level. Table 8 lists the five individual factors that had the greatest effect on the employment rate during the periods 1983–88 and 1988–92. This table shows that (1) during 1983–88 the negative effect of the Principal Pension was so large that it overrode the other factors' positive effects, but (2) during 1988–92, as a result of the pension reform in 1986, the PP now had a positive effect, as did the other four individual factors.

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[8] A person who works less than 32 hours per week need not join the Kosei-Nenkin plan.

This model explains the 1.86 point change (out of 4.06 points, or 45.8%) in the employment rate of elderly males between 1988 and 1992. It also shows that market wages (W_m) had the largest effect on their increased participation in the workforce. As the Japanese economy experienced a "Bubble" during this period and market wages rose, this large positive effect of W_m could be expected.

The reduction of the PP through pension reform in 1986 produced about a 0.11 point increase in the employment rate; the total effect of changes in household structure was about a 0.66 point increase. Thus, the new finding presented in this paper is that household structure affects the employment behavior of elderly males. The shifts between 1983 and 1988 were in the same direction, as workforce participation of Type A and Couples households increased, but the negative effect of the increase in the Principal Pension overrode this small effect of changes in household structure and it was impossible to observe it.

Table 6 Probit analysis of employment rate, 1983–1992

Variable	Marginal Probability	t-value	Elasticity[a]	Average
CONST	1.9243[b]**	3.13	—	—
Age	–0.0072*	–2.30	–0.6424	61.9132
H_HC	–0.2819**	–30.02	—	0.2911
R_PP	–0.0290**	–38.06	–0.4184	10.0372
R_PRV	–0.0094**	–6.07	–0.0101	0.7487
R_MW	0.0060**	13.48	0.1691	19.6086
R_WS	0.0219**	31.47	0.1741	5.5308
D_MR	–0.0975**	–9.43	—	0.3910
D_TKY	0.0612**	3.44	—	0.0775
D_HS1	0.1121**	4.57	—	0.0364
D_HS2	0.2448**	16.10	—	0.3193
D_HS3	0.3033**	20.67	—	0.4861
D_HS4	–0.0951**	–4.53	—	0.0593

Number of samples	12,402
Log likelihood	10,809
Madalla's pseudo R-square	0.3
% correctly predicted[c]	80.62

[a] Measured at sample mean
[b] Probit coefficient
[c] Correctly predicted samples/total samples

* Significant at 5% level
** Significant at 1% level

Table 7 Effects of individual factors on employment rate, 1983–1988 and 1988–1992

Variables	Changes in Sample Average		Marginal Probability × Changes in Sample Average	
	1988 Average – 1983 Average	1992 Average – 1988 Average	1983–1988	1988–1992
Employment rate	–0.0343	0.0406	–0.0476	0.0186
Age	–0.0016	0.1145	0	–0.0009
H_HC	–0.0304	–0.0049	0.0080	0.0014
R_PP	2.9310	–0.0358	–0.0794	0.0011
R_PRV	0.0072	–0.0426	–0.0001	0.0004
R_MW	0.5087	2.8476	0.0029	0.0178
R_WS	1.0822	–0.2314	0.0221	–0.0053
D_MR	0.0363	0.0305	–0.0033	–0.0031
D_TKY	–0.0021	0.0069	–0.0001	0.0004
D_HS1	–0.0013	0.0149	–0.0001	0.0017
D_HS2	0.0361	0.0096	0.0083	0.0025
D_HS3	–0.0214	0.0109	–0.0061	0.0035
D_HS4	–0.0020	0.0104	0.0002	–0.0010

Table 8 The five most influential factors in employment, 1983–1988 and 1988–1992

Order of Effect	1983–1988		1988–1992	
1	Principal pension	–0.0794	Market wage	0.0178
2	Working subsidy	0.0221	Total household structure effect	0.0066
3	Health condition	0.0080	Working subsidy	–0.0053
4	Market wage	0.0029	Health condition	0.0014
5	Total household structure effect	0.0022	Principal pension	0.0011

5. Conclusion

The purpose of this study has been to explain the increase in the employment rate of males aged 60–64 who were observed between 1988 and 1993. The findings are as follows:

1. Household structure affects the employment behavior of elderly males. Whereas previous studies used household structure only to explain the behavior of married females, I found that the behavior of elderly males is also affected by this factor. The increase in households composed of Couples or Couples with Dependent Children—Type A had a more positive effect on the employment rate than the decrease in the Principal Pension. This effect was overridden by the PP's negative effect while the PP benefit was increasing. As I analyzed the period that included both an increase and a decrease in the PP, this effect of household structure becomes clear.
2. The rise in market wages that Japan experienced during the "Bubble" explains in large part the increased employment rate within the cohort group.
3. The pension reform in 1986 lowered the Kosei-Nenkin benefit slightly, but not enough to affect this change in employment.

These findings were obtained based on three factors introduced in this study:

1. Analysis of household structure, which was not previously used to explain the employment behavior of elderly males.
2. Inclusion of the Kosei-Nenkin's decreasing years in the estimation period.
3. Analysis of the Principal Pension, by which I could distinguish the negative effect of the PP and the positive effect of the RP.

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