Review of Population and Social Policy, No. 7, 1998, 45–60.

The Employment Policy for Aged Workers and the Financing of Unemployment Insurance

Yoshihiro KANEKO*

Abstract In the reform of the Japanese public pension system and unemployment insurance in 1995, a wage subsidy for aged workers funded by unemployment insurance was introduced. According to time series data, the wage elasticity of the labor demand for aged employees is elastic, whereas that of the labor supply is inelastic. Hence, the subsidy increases the demand for older workers by enabling fiirms to reduce their labor costs. At the same time, it raises the take-home pay of aged workers and improves their economic welfare. This fact is confirmed by the estimated results of the augmented demand system for aged workers. However, because unemployment insurance is financially dependent on the aging population, the contribution rates of unemployment insurance will rise in the near future.

1. Introduction

The proportion of people over age 65 to the population as a whole has been rising more rapidly in Japan than in Western industrialized countries. To meet this challenge, the government has reduced public pension benefits by raising the pension age from 60 to 65. At the same time, to maintain the living standards of people between 60 and 64, it has encouraged their participation in the labor force so they can earn a living wage. In 1995 the Japanese public pension system and unemployment insurance were thus reformed to defer pension eligibility gradually until age 65 with the employment of these workers.

In this reform, the government introduced wage subsidies for workers aged between the ages of 60 and 64 who are continuously employed by the same company or reemployed by another company after the retirement age (age 60). The subsidies consist of "basic benefits for continuous employment of the elderly" and "benefits for reemployment of the elderly." From the viewpoint of income redistribution, these subsidies are paid to those employees whose wages from continuous work are under 85% of their final monthly salary before the retirement age at their company (i.e., the salary at the age of 59).

The government expects that these benefits will increase the opportunities of

---

This is the English version of an article in *Keizai Kenkyu* (*Economic Studies*), Vol. 49, No. 1, January, 1998.

* National Institute of Population and Social Security Research and Ochanomizu University.

aged workers to enter the labor force, because these subsidies will reduce the labor costs of the companies that employ aged workers and provide an economic incentive to hire older workers. But employment opportunities for these workers will depend on the overall economic condition of Japanese industries. During the recession following the collapse of the bubble economy in the late 1980s, the unemployment rate for male and female workers over age 55 increased faster than that of their younger counterparts (Table 1). Hence we should investigate the effects of these subsidies on the demand for elderly workers as well as on their participation in the labor force.

To this end, it is useful to examine the effects of these subsidies on the wage elasticity of the labor demand for and the supply of people in their early sixties. If the demand for aged workers with respect to wage rates is inelastic, the amount of the subsidies might be greater than it would in the case where the labor demand is elastic in order to maintain a certain level of job opportunities for elderly people. When the average subsidy for continuous employment is large, the total cost of these subsidies becomes larger and larger as the society is aging. Today we can rely on the employment stabilization fund to support unemployment insurance, but the increasing cost of these subsidies will affect the financial stability of the insurance in the long run.

Nevertheless, it is necessary to maintain coordination between the public pension system and the employment policy for aged workers because we must deal with the graying of our population in the next century. The aim of this essay is threefold.

Table 1 The labor force participation (LFP) rate, the share of employees on the labor force, and unemployment rates by age group (%)

	LFP rate			Percentage of employees*			Unemployment rate		
	Age group			Age group			Age group		
Year	a.v.	55–59*	60–64	a.v.	55–59	60–64	a.v.	55–59	60–64
1985	63.0	70.0	53.7	45.5	42.8	25.0	2.6	3.3	4.9
1986	62.8	69.7	53.8	45.6	43.0	25.2	2.8	3.4	4.9
1987	62.6	70.5	53.8	45.4	43.4	25.1	2.8	3.3	5.3
1988	62.6	70.7	53.8	46.0	44.4	25.9	2.5	2.8	4.7
1989	62.9	71.6	54.6	46.9	46.6	27.5	2.3	2.4	4.2
1990	63.3	72.7	55.5	47.9	48.7	28.8	2.1	2.0	3.5
1991	63.8	74.0	56.8	49.0	51.1	30.9	2.1	1.7	3.6
1992	64.0	74.2	57.2	49.7	52.5	32.4	2.2	1.7	3.7
1993	63.8	74.9	57.1	50.1	54.2	33.4	2.5	1.8	4.6
1994	63.6	74.8	56.6	50.1	54.5	33.2	2.9	2.4	5.3
1995	63.4	75.2	56.7	50.1	55.6	33.4	3.2	2.4	5.7

Source: Ministry of Labor (1996), *White Paper on Labor*.

* The percentage of employees to the total population classified by age group.

a.v. = average value of all age groups.

First, it will show the decreasing wage rates for continuous workers aged 60 to 64 compared with the final wage rate at age 59. Then, on the basis of this survey, it will compare the effects of the subsity for aged workers on their labor force participation and on the labor demand for them by estimating the wage elasticity for labor demand and supply. Second, it will examine the welfare gain of this subsidy to the aged workers' household. Finally, it will attempt to estimate the budget balance of unemployment insurance during future periods and consider appropriate changes in unemployment insurance fees over the long term.

2. The Decreasing Wage Rates of Aged Workers and the Level of Basic Benefits for Their Continuous Employment

One important function of the basic benefits for continuous employment is to maintain the income level of aged workers because the wage profile tends to diminish as people age. The Japanese wage system is often referred to as the seniority wage system, under which salaries and positions rise with the length of service within a company. But now that the economic growth has slowed, companies believe that middle-aged and older workers earn higher wages than younger workers who can adapt to the technological change necessary for more efficient production. As a result, the wage profile for middle-aged and older workers becomes flatter and the wage rates for their continuous employment tend to decrease during the final years of employment.

Hence the basic benefits for the continuous employment of the elderly are designed to be paid to those people aged 60 to 64 whose wages from continuous employment are under 85% of their final monthly salary at age 59 (See Figure 1). Since these benefits make the take-home pay larger than the wage rate offered by the company, it plays an important role in maintaining the income level of the elderly who are ineligible to receive their pension until they are 65.

To calculate the average value of the basic benefits for continuous employment by sex, we must estimate the decreasing rate of wages earned by male and female workers in their early sixties. By using the "Basic Survey of Wage Structure" in 1994 and 1995, we can estimate the decreasing rate of the salary of workers between ages 60 and 64 compared with those aged 59, the age before mandatory retirement. We regressed the monthly salary by age group in 1994 to an age variable and the dummy variable for the mandatory retirement age to get the parameters for wage profiles for male and female workers. According to the estimated parameters, we can obtain the estimated values of the monthly salary for male and female workers at age 59 in 1994. By comparing these values with monthly salaries of the 60 to 64 age group by the length of service given by the "Basic Survey of Wage Structure" in 1995, we can then determine the decreasing

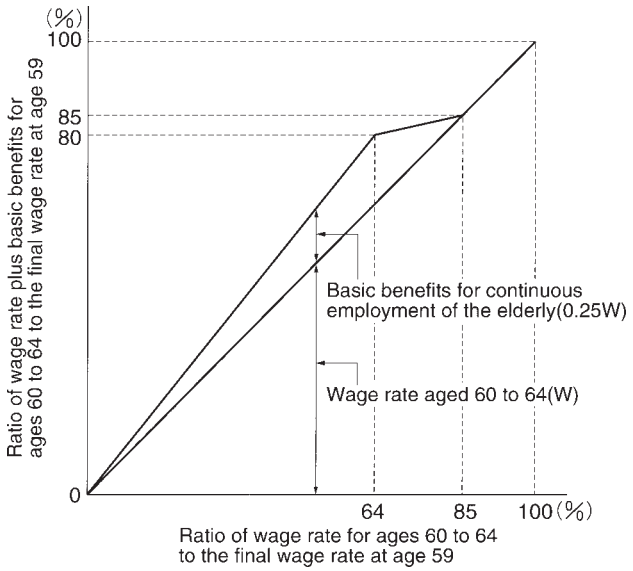


Figure 1 The basic benefits for the continuous employment of the elderly

rate of the monthly salary of the elderly who are continuously employed after the retirement age of 60. The outcomes are summarized in Table 2.

According to Table 2, the shorter the length of service of the aged workers in a company, the higher the decreasing rate becomes. Especially for those workers whose length of service is less than five years, the decreasing wage rate exceeds 15%. The ratio of those workers whose wage rate is under 85% of the final wage rate at age 59 to the total number of workers between 60 and 64 amounts to about 60% for males and 45% for females. The reason for the prevailing decrease in wage rates is that since a lot of workers between 55 and 59 are reemployed by the same company after mandatory retirement or by another company after their job search, their length of service is reduced to less than five years when they are continuously employed between ages 60 and 64.

Consequently, there is considerable room for applying the basic benefits for continous employment of the elderly. In fact, the average decreasing rates of wages of the male and female workers between 60 and 64 over that at age 59 amounts to 21.9% and 20.9% respectively. By applying these decreasing rates of male and female wages to the schedule for “basic benefits for continuous employment” proposed by the Ministry of Labor, we can obtain the monthly amount of the benefits for male and female workers, that is, ¥18,048 and ¥9,534 respectively. The increasing rate of the take-home pay by these amounts over the wage rates offered by the company becomes 6.8% and 5.7% respectively. In the next section, we consider the

Table 2 The wage rate (monthly salary) and the decreasing rate of wages between age 59 and ages 60–64

	Age of wage rate (%)		Wage rate by tenure group (%)		Decreasing rate		Share of workers	
Year	Group	Tenure	Male	Female	Male	Female	Male	Female
1995	60–64	a.v.	300.8	198.1	– 12.4	– 6.6	100.0	100.0
1995	60–64	0	234.3	164.5	– 31.8	– 22.4	8.1	4.6
1995	60–64	1	245.8	165.4	– 28.4	– 22.0	14.9	9.8
1995	60–64	3	266.4	171.9	– 22.4	– 19.0	12.2	8.8
1995	60–64	5	288.8	167.9	– 15.9	– 20.8	20.4	19.9
1995	60–64	10	286.6	187.3	– 16.5	– 11.7	9.7	17.9
1995	60–64	15	305.4	202.1	– 11.0	– 4.7	7.2	14.5
1995	60–64	20	327.4	221.9	– 4.6	4.6	6.7	11.0
1995	60–64	25	355.1	255.7	3.4	20.5	5.8	7.3
1995	60–64	30	409.1	253.9	19.2	19.7	15.1	6.2
1994	59 (age)	a. v.	343.3	212.1				

a.v. = average value.

Note: The wage rate indicates the average monthly salary for regular male and female workers classified by age group. The decreasing rate of wages is defined by the wage rate of those aged 60–64 minus the wage rate at age 59, divided by the wage rate at age 59. The estimation results of the male and female wage profiles that are used to obtain the wage rate at age 59 are:

male workers: $WAGM = 103153 + 17952 \times AGE - 253.23 \times (AGE^2) - 95385 \times DUM55.$
$(10.10)^{**}\ (15.95)^{**}\ (-10.10)^{**}\ (-4.81)^{**}$

female workers: $WAGF = 135167 + 6397.5 \times AGE - 105.65 \times (AGE^2).$
$(14.49)^{**}\ (7.39)^{**}\ (-6.62)$

where WAGM and WAGF indicate the average monthly salary for regular male and female workers respectively. The value in brackets indicate *t* statistics and ** shows that the parameter is significant at the level of 5%.

effect of these benefits on workers between 60 and 64 in terms of their labor force participation and economic welfare.

3. The Effect of Basic Benefits for Continuous Employment of the Elderly on Labor Demand and Supply

To estimate the wage elasticity of labor supply, we regressed the labor force participation rate of workers between ages 60 and 64 to their wage rate, to their social security benefits, and to the percentage of the population over 65 to the total population. Here we used the following time series data from 1965 to 1995: male and female labor force participation rates (LFPRM and LFPRF respectively) from the "Labor Force Survey," the average monthly salary for male and female workers in the 60–64 age group from the "Basic Survey of Wage Structure" in 1995 (WAGM and WAGF), employees' welfare pension benefits at the recipient age 60 from the "Annual Report of the Public Pension Agency" (BENM and BENF), and

the ratio of the population over 65 to the total population (POPR) from the "Annual Report of the Population Survey" in 1995.

The estimation results of the equation for labor force participation rates for aged male and female workers are expressed as:

$$\begin{aligned}(1)\quad &\mathrm{LFPRM} = -6.839 - 0.360 \times \mathrm{POPR} + 0.818 \times \mathrm{WAGM} - 0.462 \times \\ &\qquad (-3.557)^{**}\ (-1.456)\qquad (2.776)^{**}\qquad (0.409)^{**} \\ &\mathrm{BENM},\ R^2 = 0.758 \\ &\qquad \mathrm{D.W.} = 1.206 \\ (2)\quad &\mathrm{LFPRF} = -4.271 - 0.073 \times \mathrm{POPR} + 0.612 \times \mathrm{WAGF} - 0.487 \times \mathrm{BENF}, \\ &\qquad (-1.135)\ (-0.189)\qquad (1.738)^{*}\qquad (-2.518) \\ &R^2 = 0.758\end{aligned}$$

where all of the variables and the regressor are transformed to the natural logarism. R^2 and D.W. indicate R square and the Durbin-Watson statistic respectively, and * and ** indicate the level of confidence of estimated parameters for 10% and 5% respectively.

By combining the estimated parameters in Eqs. (1) and (2) with the average monthly salary at age 60 in 1995, the wage elasticity of the male and female labor supply with respect to the wage rate (monthly salary) is calculated as 0.204 and 0.102 respectively. This outcome implies that the aggregate responses of the male and female labor supply are inelastic with respect to wage rates.

On the other hand, in order to estimate the wage elasticity of labor demand for aged workers, we used an estimation result of the Cob-Douglas production function with three production factors: labor of workers over age 55, labor of workers younger than 54, and real capital stock. The sources of these time series data were the "Economic Lookout of Japanese Economy" and the "Labor Force Survey."

The estimation result of this production function is summarized as:

$$\begin{aligned}(3)\quad &\log(\mathrm{GNP}) \\ &= 2.811 + 0.018 \times \mathrm{T} - 0.021 \times \mathrm{DUM} + 0.247 \times \log(\mathrm{K}) + 0.682 \times \log(\mathrm{Ly}) \\ &\quad (4.2)^{**}\ (1.35)^{*}\quad (-0.34)\qquad (3.51)^{**}\qquad (1.28) \\ &\quad + 0.071 \times \log(\mathrm{L55}) \\ &\qquad (2.15)^{*} \\ &\qquad\qquad R^2 = 0.991,\ \mathrm{D.W.} = 1.276\end{aligned}$$

where GNP is the gross national product in real terms (the base year is 1985), T is the time trend for technical changes, DUM is the dummy variable for Oil Crises, K is the real capital stock, Ly is the number of workers under age 54, and L55 is the number of workers over 55. The estimation period is between 1965 and 1995. The two-stage least-squares method for estimating Eq. (3) was used to deal with the autocorelated disturbance terms.

By using the estimated parameter for L55 and the average wage rate (monthly salary) for workers at age 60, we can calculate the wage elasticity of labor demand for aged workers. The outcome of this elasticity is 1.535, which implies that the labor demand for aged workers is elastic. This estimated value of the wage elasticity of labor demand implies that, assuming the company can reduce the wage rate by 5% or 10% (while the take-home pay for the aged workers is compensated by the benefits of their continuous employment), the labor demand for the aged workers would be increased by 7.67% and 15.35% respectively.

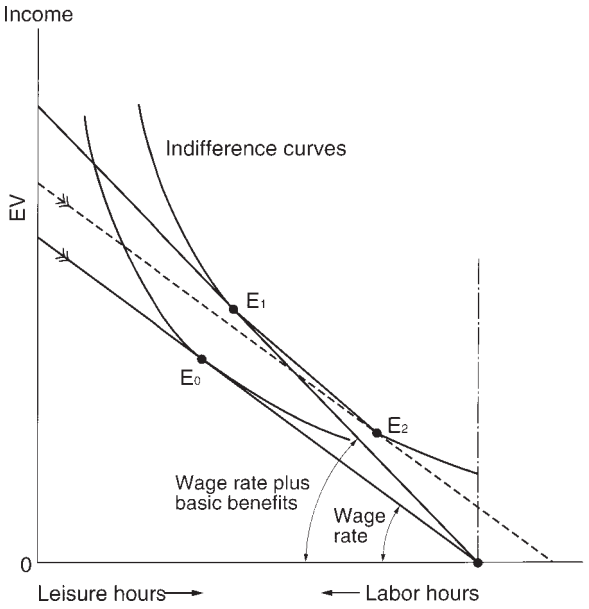
According to these estimation results based on time series data, the wage elasticity of labor demand for aged employees is elastic, whereas that for labor supply (work force participation) is inelastic. Since the basic benefits for continuous employment for the elderly are designed to increase take-home pay when the wage rate offered by a company for continuous work is under 85% of the final monthly salary, this subsidy enables the company to reduce the wage rate without loosing work incentives for the aged employees. Under the severe economic constraints imposed by the recession following a bubble economy, companies are urged to reduce labor costs, while they have to cope with controlling dismissals and maintaining the employment of aged workers under the Law on the Stabilization of Employment of Older People. Hence companies tend to offer decreased wage rates for aged workers who are reemployed after the retirement age. As a result, the wage elasticity of labor demand for the aged workers becomes elastic. This fact makes the effect of the basic benefits for the continuous employment of the elderly on labor demand much larger than that on their labor supply, which is inelastic to wage rates.

4. The Welfare Effect of Basic Benefits for Continuous Employment of the Elderly

The basic benefits for the continuous employment of the elderly affect not only labor demand and supply but also the economic welfare of the households whose income comes from aged workers who are continuously employed. The economic gain accrues from the increased take-home pay by this subsidy.

In this section, we shall calculate the economic gains from these benefits using the estimation results of the augmented demand system of aged workers' households. The demand system used here is the augmented linear expenditure system. This system was utilized to estimate the excess burden of taxes (Atkinson and Stern, 1980) and the child care costs (Blundel, Walker, and Walker, 1994). From this demand system, we can easily obtain the expenditure function:

$$(4) \quad e(p, w(1-\tau), v) = b_0 w(1-\tau) + \Sigma_{i=1}^{6} b_i p_i + w(1-\tau)\, a_0 \Pi p_i^{a_i},$$



Note: E_0 and E_1 indicate the optimal point of aged workers without and with basic benefits respectively. E_2 is the point on a budget constraint whose slope is a wage rate tangent to the indifference curve which aged workers could attain with wage rate plus basic benefits.

Figure 2 The equivalent variation (EV) for measuring the welfare gain from the basic benefits for continuous employment of the elderly

and the equivalent variation (See Figure 2). We will adopt the equivalent variation (EV) as the measurement of the economic welfare accruing from the basic benefits for continuous employment of the elderly.

According to Abbot and Ashenfelter (1976) and Deaton and Muelbauer (1980), the equations of the augmented linear expenditure system are:

$$(5)\quad p_i q_i = b_i p_i + a_i \left[M - b_0 w\,(1-\tau) - \Sigma_{i=1}^{6}\, b_i p_i\right] + \mu_{ij} + u_{ijt},\quad (i = 1, \ldots 6)$$

$$(6)\quad w\,(1-\tau)\, q_0 = b_0 w\,(1-\tau) + a_0 \left[M - b_0 w\,(1-\tau)\, \Sigma_{i=1}^{6}\, b_i p_i\right] + \mu_{0j} + u_{0jt}.$$

where p_i is the price of the i-th goods, q_i is the quantity of the i-th goods, w is the wage rate, τ is the labor income tax rate, and M is the total income that is calculated by $w \times T$. T is a fixed total time. The labor hours (h) are calculated by a fixed total time (T) minus leisure hours (q_0), that is, $h = T - q_0$. Goods are defined as: (1) foods, (2) alcohol and other beverages, (3) housing, fuel, and water, (4) clothes and footwear, (5) furniture and automobiles, (6) other goods, and (0) leisure, μ_{ij} is the disturbance term for the unknown elements of the demand function for i-th goods in j-th prefecture and u_{ijt} is the disturbance term of the demand function for i-th goods in j-th prefecture at time t.

To estimate the demand system for aged workers' households, we will construct the cohort data of Japanese workers' households from the monthly income and expenditures per household classified by the age of the household head and by prefectures reported in the *National Survey of Family Income and Expenditures* (Management and Coordination Agency, 1974, 1979, and 1984). Since the survey tables contain data on expenditures for five age groups, we reconstructed them into ten age groups by combining the columns of the five age classes. The pairs of the combined age groups are as follows: ages 35 to 39 and 40 to 44 in 1974; ages 40 to 44 and 45 to 49 in 1979; and ages 45 to 49 and 50 to 54 in 1984. Thus we can obtain the expenditure data of the cohort who became middle-aged and older workers in 1995, when the basic benefits for continuous employment for the elderly were introduced.

We used the price index reported in the "Subgroup Index" of the *Consumer Price Index*. Using the weights in the table, we reconstructed the price indexes according to the division of the goods for the demand system in 1974, 1979, and 1984, and we made the indexes equal to one in 1980. The wage rate was calculated as follows: first we obtained the index of a household's ability to earn income by the ratio of income classified by age group and by prefectures to the average income reported in the *National Survey of Family Income and Expenditures*. Next, we obtained the wage rate by calculating the average monthly salary divided by the monthly labor hours reported in the *Monthly Survey of Wages and Labor Hours* (Ministry of Labor, 1996). Combining the index of the heads of households' ability with the above wage rate gave us the wage rates of the heads of households classified by age group and by prefectures.

In order to satisfy the adding-up condition for the demand system, we excluded the demand function for leisure hours — Eq. (6). For the estimation of the demand system of Eq. (5), we imposed conditions of symmetry and homogeneity. Since we used data for ten age groups that were reconstructed by combining the columns of the five age classes, we applied the error component model for estimating Eq. (5). In the demand function for goods i, μ_{ij} denotes invariant effects in the j-th cohort that are unobserved and may be correlated with the regression variables in Eq. (5). To test $E(u_{ijt}|X_{ijt}) = 0$, we used Hauseman's specification test. Since Eq. (5) has 13 parameters under the imposed restraints, we have to compare the kai squares statistic with 13 dimensions of slope vector with the outcome of the Hausman test static for the error component model. Following this method, summarized in Baltagi (1995), the null hypothesis for $E(u_{ijt}|X_{ijt}) = 0$ was rejected. Then we made within transformation for the variables in Eq. (5). Furthermore, according to the outcome of Breusch-Pagan test, the null hypothesis of homoscedasticity in disturbance terms was rejected, and we applied the generalized method of moment estimator for the within transformation regression of Eq. (5). The estimation results

Table 3 Estimation results of the Augmented Linear Expenditure System of aged workers' households

	(1)	(2)	(3)	(4)	(5)	(6)	(0)
a_i	0.0031	0.0164	0.0429	0.0213	0.0344	– 0.1627	1.044
	(4.83)**	(16.60)**	(18.31)**	(17.33)**	(16.14)**	(– 18.42)**	
b_i	21.995	22.842	24.719	29.768	60.468	6.031	– 80.550
	(41.07)**	(32.04)**	(20.16)**	(27.41)**	(24.71)**	(12.81)**	(– 10.56)**
R^2	0.351	0.332	0.281	0.130	0.151	0.368	

Note: The values in brackets indicate *t* statistics; ** shows that the parameter is significant at the level of 5%.

are summarized in Table 3.

By using the parameter estimates of the demand system, we can calculate the equivalent variation. We regard the ratio of the equivalent variation to the amount of the basic benefits for continuous employment of the elderly as the index of economic welfare from this wage subsidy. Since the equivalent variation amounts to ¥20,239 for male workers who are over age 60 while the amount of the subsidy for them is ¥18,048, the ratio of the welfare gain to the subsidy is 1.12. This outcome implies that the net welfare gain has reached 12% of the wage subsidy for continuous employment and that it can improve the economic welfare of aged workers' households.

5. The Effect of Basic Benefits for Continuous Employment of the Elderly on the Financial Status of Unemployment Insurance

The major objectives of the basic benefits for continuous employment of the elderly are two-fold: first, to increase the demand for aged workers since this subsidy enables companies to reduce the wages they are paying workers aged between 60 and 64, and thus create a demand for them; and second, to improve the economic welfare of aged workers' households through an increase in take-home pay provided by the subsidy. But we cannot forget the cost of this subsidy for continuous employment. Since it is financed by unemployment insurance, we should increase the employees' rate of contribution to this insurance to avoid exhausting its funds. However, this would defeat the purpose of controlling tax burdens and social insurance contributions in an aging society.

The financial status of unemployment insurance is based not only on the payment of basic benefits for continuous employment but also on the total amount of benefits for unemployed people. The amount of the total unemployment insurance benefits depends on the unemployment rate. To estimate the financial status of unemployment insurance in the long run, we have to estimate (1) the future benefits for continuous employment of the elderly and (2) the future unemployment rate.

To estimate the future unemployment rate, we constructed and estimated a macroeconomic model consisting of the consumption function, the investment function, the net export function, the tax function determining disposable income, and the Philip's curve that connects the price level with the unemployment rate. (The outcomes of the estimated parameters of this model are summarized in the Appendix.) By using the regression output of this macroeconomic model, we can forecast the long-term change in the unemployment rate. The results are described in Table 4. This table estimates two unemployment trends: a moderate increase in the unemployment rate (Case 1), and a relatively high increase in the unemployment rate (Case 2).

To estimate the amounts of basic benefits for continuous employment during future periods, we assumed that all workers between ages 60 and 64 will receive the

Table 4 Estimated trends in the rate of labor force participation and unemployment

(%)

Year		1995	2000	2005	2010	2015	2020	2030	2040	2050	2060
LPF rate		63.20	62.40	62.40	60.50	60.50	58.50	58.50	58.50	58.50	58.50
Unemployment rate	Case 1	3.20	3.32	3.43	3.54	3.65	3.74	3.94	4.14	4.34	4.54
	Case 2	3.20	3.36	3.52	3.68	3.84	4.00	4.32	4.64	4.96	5.28

The author's estimation.

Table 5 The number of insured persons and the financial status of unemployment insurance

Year	Number of the insured persons			Total benefits*			Total Contributions	Statute Expenditures	Balance	
	Male	Female	Total	Male	Female	Total			B1	B2
2000	2,293	1,138	3,431	14,071	6,040	23,809	17,141	4,761	– 4,496	30,373
2005	2,261	1,082	3,343	17,932	7,213	29,768	19,450	5,953	– 7,303	0
2010	2,173	1,016	3,189	22,079	8,442	36,132	21,630	7,226	– 10,544	0
2015	2,076	969	3,045	24,800	9,675	40,814	23,922	8,162	– 12,343	0
2020	2,007	955	2,962	27,041	11,643	45,797	27,145	9,159	– 13,594	0
2025	1,974	955	2,929	31,145	13,361	52,688	30,982	10,537	– 15,849	0
2030	1,941	934	2,875	39,689	16,133	66,084	34,888	13,216	– 23,250	0
2035	1,879	888	2,767	47,845	18,052	78,012	38,475	15,602	– 29,748	0
2040	1,801	838	2,639	54,089	20,621	88,445	42,464	17,689	– 34,708	0
2045	1,723	802	2,525	56,045	22,539	93,030	47,658	18,606	– 33,966	0
2050	1,676	791	2,467	61,765	26,458	104,442	54,414	20,888	– 37,361	0
2055	1,655	792	2,447	68,737	30,354	117,308	62,743	23,461	– 40,583	0
2060	1,640	786	2,426	85,580	36,786	144,862	71,797	28,972	– 54,941	0

* 100 million yen.

Note: The total benefits include the basic benefits for continuous employment for the elderly and the unemployment benefits for unemployed persons. B1 indicates the difference between the total benefits and the total contributions, while B2 indicates the balance of the fund including interest income of the unemployment insurance. The contribution rate is assumed to be constant at the current rate of 1.15%.

average wage subsidy estimated in §2. The number of male and female workers between 60 and 64 was calculated by multiplying the male and female population of this age group by the rate of their labor force participation. The benefits for unemployed persons classified by age group is calculated by multiplying the average amount of male and female unemployment benefits reported in the Ministry of Labor's *Annual Report on the Unemployment Insurance* (1995) by the number of male and female unemployed persons in future periods. The latter numbers are obtained by multiplying the estimated male and female labor force by the estimated unemployment rates in the macroeconomic model. The ratio of the future male and female labor force to the future population classified by the age group is assumed to be the same as the labor force participation rate classified by the age group in 1995. Hence the future total contributions for unemployment insurance are calculated by multiplying the number of male and female workers in the age group by the rates of their contribution to unemployment insurance. These rates are set to construct a variety of schedules for increasing these rates, which enable us to examine the effects of the population structure and unemployment rates on the budget of unemployment insurance.

Table 6 Projected financial status of unemployment insurance, Cases A and B

Year	Total Benefits*	Case A				Case B			
		Total Contributions	Statutory Expenditures	B1	B2	Total Contributions	Statutory Expenditures	B1	B2
2000	23,809	17,141	4,761	– 4,496	37,998	17,141	4,761	– 4,496	37,998
2005	29,768	19,450	5,953	– 7,303	17,580	24,524	7,442	– 1,507	23,375
2010	36,132	21,630	7,226	– 10,544	0	27,272	9,033	– 3,947	16,311
2015	40,814	30,162	10,203	– 5,005	0	38,483	12,244	2,332	3,593
2020	45,797	34,226	11,449	– 5,292	0	43,668	13,739	3,008	22,121
2025	52,688	39,064	13,172	– 6,354	0	49,841	15,806	3,141	48,067
2030	66,084	43,990	16,521	– 12,220	0	56,125	19,825	– 1,189	72,359
2035	78,012	48,512	19,503	– 17,327	0	61,895	23,403	– 4,905	74,390
2040	88,445	53,542	22,111	– 20,881	0	68,313	26,533	– 7,055	66,220
2045	93,030	60,091	23,257	– 18,761	0	76,668	27,909	– 3,555	58,015
2050	104,442	68,610	26,110	– 20,088	0	87,537	31,332	– 2,816	64,799
2055	117,308	79,111	29,327	– 20,823	0	100,935	35,192	– 1,063	76,221
2060	144,862	90,526	36,215	– 31,798	0	115,499	43,458	– 8,655	80,965

* 100 million yen.

Note: The total benefits include the basic benefits for continuous employment for the elderly and the unemployment benefits for the unemployed persons. B1 indicates the difference between the total benefits and the total contributions, while B2 indicates the balance of the fund including interest income of the unemployment insurance. In Case A, the contribution rate is increased from 1.15% to 1.45% and the statutory expenditure from 20% to 25% in 2015. In Case B, the contribution rate is increased from 1.15% to 1.45% in 2005 and 1.45% to 1.75% in 2015, while the statutory expenditure is increased from 20% to 25% in 2005 and from 25% to 30% in 2015.

Table 7 Projected financial status of unemployment insurance, Cases C and D

Year	Total Benefits*	Case C				Case D			
		Total Contributions	Statutory Expenditures	B1	B2	Total Contributions	Statutory Expenditures	B1	B2
2000	24,066	17,141	4,813	– 47,021	37,792	17,141	4,813	– 4,702	37,792
2005	30,455	24,524	7,613	– 20,228	21,561	26,215	7,613	– 587	22,997
2010	37,372	27,272	9,343	– 48,777	10,457	29,153	9,343	– 3,280	20,867
2015	42,681	36,403	128,042	10,258	0	40,563	12,804	4,557	14,939
2020	48,649	41,308	145,948	10,113	0	46,029	14,594	5,019	49,877
2025	55,952	47,147	167,855	8,560	2,306	52,535	16,785	5,430	96,582
2030	71,758	53,091	215,272	– 51,615	0	59,159	21,527	– 10	147,828
2035	84,613	58,549	253,847	– 95,261	0	65,241	25,384	– 3,846	179,135
2040	97,979	64,620	293,935	– 137,298	0	72,005	29,393	– 7,459	207,662
2045	103,100	72,524	309,308	– 106,041	0	80,812	30,930	– 3,567	241,796
2050	117,969	82,805	353,907	– 122,853	0	92,268	35,390	– 4,252	304,410
2055	132,540	95,479	397,621	– 117,258	0	106,391	39,762	– 2,462	381,640
2060	166,268	109,256	498,806	– 236,395	0	121,742	49,880	– 13,040	468,423

* 100 million yen.

Note: The total benefits include the basic benefits for continuous employment for the elderly and the unemployment benefits for unemployed persons. B1 indicates the difference between the total benefits and the total contributions, while B2 indicates the balance of the fund including interest income of the unemployment insurance. In Case C, the contribution rate is increased from 1.15% to 1.45% and the statutory expenditure from 20 % to 25% in 2015. In Case D, the contribution rate is increased from 1.15% to 1.45% in 2005 and from 1.45% to 1.95% in 2015, while the statutory expenditure is increased from 20 % to 25% in 2005 and from 25% to 30% in 2015.

Forecasts of the financial status of unemployment insurance during the period from 2000 to 2060 are summarized in Tables 5, 6, and 7. Because we have a baby boom generation, the financial status of the insurance will depend on both the population structure and the timing of increasing the rate of contribution to the insurance. If we maintain the contribution rate at the current rate (Table 5), or if we postpone increasing the contribution rate until after the baby boomer (the cohort born between 1948 and 1950) is over age 60 (Case A in Table 6), the unemployment insurance will fall into deficit spending. To avoid exhausting these funds, the government should increase the contribution rate in the near future (Case B in Table 6). Furthermore, if the unemployment rate is rising to reach more than 4% after 2020 (Case 2 in Table 4), the government should increase both the contribution rate and the statutory expenditures for the insurance more rapidly than if the increase in the unemployment rate is moderate (Case 1 in Table 4). We can see this result by comparing Case C with Case D in Table 7.

6. Conclusion

In Japan, coordination of the public pension system with unemployment insurance means that the government controls the burden of the pension contribution rates by raising the pension age and maintains aged workers' income by providing wage subsidies for their continuous employment. However, this coordination depends on the population structure and on the future level of unemployment. To ensure the availability of funds for this benefit, it will be necessary to increase the contribution rates of and the statutory expenditures for unemployment insurance in the near future. And we should recognize that the contribution rate of the insurance increases further when the unemployment rate is rising. But this will defeat the purpose of controlling tax burdens and social insurance contributions in an aging society.

The employment policy of generating employment opportunities for aged workers by providing basic benefits for continuous employment is a short-term method for dealing with aging of the Japanese society. But to maintain the financial stability of unemployment insurance and to control the burdens of taxes and social insurance contributions in the long run, the employment policy for aged workers should be harmonized with macroeconomic policies to cope with increasing unemployment rates and with family policies to avoid a further decrease in the younger labor force.

Appendix: Outcomes of the estimated parameters of the macroeconomic model

The estimation results of the macroeconomic model are as follows:

(1) $\mathrm{CONS} = 24012 + 0.4822 \times \mathrm{GNPD} + 0.4008 \times \mathrm{WELTH},\ R^2 = 0.896$
$(0.896)\quad (2.10)^{**}\qquad (1.118)$

(2) $\mathrm{INV} = -3279 + 0.2799 \times \mathrm{GNP\_1} - 0.2476 \times \mathrm{GNP\_2} + 0.8638 \times \mathrm{INV\_1},$
$(-1.503)\ (3.581)^{**}\qquad (-3.231)^{**}\qquad (8.941)^{**}$
$R^2 = 0.962$

(3) $\mathrm{INVH} = 1603 + 0.017 \times \mathrm{GNP\_1} - 0.0077 \times \mathrm{GNP\_2} + 0.8055 \times \mathrm{INV\_1},$
$(1.394)\ (0.571)\qquad (-0.256)\qquad (6.307)^{**}$
$R^2 = 0.885$

(4) $\mathrm{GNPD} = 17758 + 0.7436 \times \mathrm{GNP},\ R^2 = 0.991$
$(4.320)^{**}\ (51.373)^{**}$

(5) $\mathrm{MONEY} = -99102 + 1.3710 \times \mathrm{GNP} - 2362.62 \times \mathrm{IRATER},\ R^2 = 0.925$
$(-4.252)^{**}\ (15.674)^{**}\qquad (-1.348)$

(6) $\mathrm{NEXPO} = -45236 + 0.0815 \times \mathrm{GNP} - 97.3519 \times \mathrm{DEXRATE}$
$(-4.221)^{**}\ (5.615)^{**}\qquad (-1.427)$

$$+ 0.0324 \times \text{GNPU}, \quad R^2 = 0.686$$
$$(3.764)^{**}$$

(7) $$\text{DPGNP} = 8.3388 - 2.9459 \times \text{UNEMPS} + 0.4977 \times \text{DPGNP\_1},$$
$$(2.262)^{**} \quad (-1.864)^{*} \quad (2.932)^{**}$$
$$R^2 = 0.395$$

(8) $$\ln(\text{Un}) = -1.358 + 0.411 \times \text{DUM} + 0.959 \times \ln(\text{KOY})$$
$$(-0.098) \quad (5.940)^{**} \quad (1.601)^{*}$$
$$- 0.0589 \times \ln(\text{LFP60}) - 0.388 \times \ln(\text{GNP85GP})$$
$$(-0.514) \quad (-0.823), \quad R^2 = 0.946$$

where GNP = gross national product in real terms; CONS = real private consumption expenditures; WELTH = real private total asset holdings; INV = real private investment expenditures; INVH = real private investment expenditures for housing; GNPD = real disposable income; IRATER = real interest rate; NEXPO = real amount of net export; DEXRATE = annual rate of change in exchange rate; GNPU = gross national product in the United States in real terms; DGNP = annual rate of change in GNP deflator; UNEMPS = unemployment rate in the short term; Un = unemployment rate in the long term; KOY = ratio of employees to total population; LFP60 = labor force participation rate between ages 60 and 64; GNP85GP = GNP gap between GNP in each period and GNP in 1990. _1 and _2 indicate the lag variable of one period and two periods respectively. The base year for real variables is 1985. The estimation method is the limited maximum likelihood method and the estimation period is between 1965 and 1995. Sources of these time series data: Economic Planning Agency (1996); Bank of Japan (1996).

References

Abbot, M., and O. Ashenfelter. 1976. "Labor Supply, Commodity Demand, and the Allocation of Time." *Review of Economic Studies*, 43: 398–411.

Asano, A. 1996. "Joint Allocation of Leisure and Consumption Commodities: Japanese Extended Consumer Demand System, 1979–90." *Japanese Economic Review*. December.

Atkinson, A. B., and N. H. Stern. 1980. "On the Switch from Direct to Indirect Taxation," *Journal of Public Economics*, 14: 195–224.

Auerbach, A. J. 1985. "The Theory of Excess Burden and Optimal Taxation." In *Handbook of Public Finance*, ed. M. Feldstein. Amsterdam: Elsevier.

Baltagi, B. H. 1995. *Econometric Analysis of Panel Data*. New York: John Wiley & Sons.

Bank of Japan. 1996. *The Annual Report of Economic Statistics.*

Blundel, R. P. 1988. "Consumer Behavior: the Theory and Empirical Evidence-A Survey." *Economic Journal*, 98: 16–65.

Blundel, R., P. Walker, and I. Walker. 1994. *The Measurement of Household Welfare*. Cambridge: Cambridge University Press.

Deaton, A., and J. Muellbauer. 1980. *Economics and Consumer Behavior*. Cambridge: Cambridge University Press.

Economic Planning Agency. 1996. *The Outlook of the Japanese Economy*.
Kaneko, Y. 1989. "Augmented Demand Systems and their Application to Estimating the Dead Weight Loss of Income Taxes" (in Japanese), *Hitotsubashi Ronsou* (Review of Hitotsubashi Academy), 101 (6).
Management and Coordination Agency. 1996. *Survey on Labor* (in Japanese).
———. 1985. *The Consumer Price Index* (in Japanese).
———. 1974, 1979, 1984. *The National Survey of Family Income and Expenditures*, vol. 4 (in Japanese).
Ministry of Labor. 1985. *The Monthly Survey of Wages and Labor Hours* (in Japanese).
———. 1992. *Survey of Aged Persons' Employment Status* (in Japanese).
———. 1995, 1996. *The Annual Report of Unemployment Insurance* (in Japanese).
———. 1996, 1997. *The Basic Survey on Wage Structure* (in Japanese).
———. 1996, 1997. *White Paper on Labor* (in Japanese).
Social Insurance Agency. Ministry of Health and Welfare. 1996. *The Annual Report of Social Insurance*. Tokyo (in Japanese).