Who Bears the Burden of Social Insurance? :

Evidence from Japanese Health & Long-term Care Insurance Data

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Abstracts

Using the society-managed health insurance data, which is cross-sectional time-series and covers 1670 health insurance societies for seven years (FY1995-2001), we found for the first time in Japan that half of the employer's contribution to health insurance is shifting back to the employees in the form of wage reduction. On the other hand, we can not find such evidence for the contribution to long-term care insurance using a two-year (FY2000-01) panel data set.

1. Introduction

1. As the population ages, social expenditure has been rapidly increasing in Japan as in other OECD countries. Social security in Japan is mainly based on social insurance schemes; health insurance, pension, long-term care insurance, unemployment insurance, and work injuries insurance. The first three insurances cover the entire population and the other two cover all employees in Japan.

2. The contributions to these insurances are shared by both employers and employees and the proportion of the share is legislated by the government. Social insurance contributions levied on employers were around 28.3 billion yen in FY2000, which was equivalent to some 5.5% of the GDP in Japan[1].

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[1] The National Institute of Population and Social Security Research (2002) *The Cost of Social Security FY2000*.

3. Increasing burdens of social insurance shared by employers raises effective labour costs. This can shift forward to the product price, reduce employment, or shift backward to the employees by means of the wage reduction. Especially concerns about reduction in employment lead to the assertion that the statutory burdens of social insurance levied on employers should be reduced and instead employees should pay more.

4. However, as the well-known discussion of "tax incidence" in the economics field suggests, it is meaningless to discuss the statutory contribution rate of employers and employees in terms of its effective share rate, because it is determined by the elasticity of labour demand and supply.

5. With respect to social insurance, this view can be modified, if employees realize the contribution as a reasonable counter value of social benefit. Then, the employees may agree to pay the full cost of social insurance out of their wage regardless of the statutory contribution rate.

6. In this paper, we explored to what extent the employees bear the cost of employers' contribution on top of their own contribution, using the cross-sectional time-series data on health insurance societies in Japan.

2. Conceptual Framework

2.1 Incidence of Social Security Contribution[2]

7. It is well known that the standard partial equilibrium analysis of the tax incidence suggests that the employment or real wage rate is unrelated to how the social insurance contribution is statutorily shared by the employers and employees.

8. Suppose that the equilibrium point before the introduction of social insurance is A. Consider the case where the social contribution is now introduced and its statutory contribution rate is set at *tf*% of wage rate W to employers by legislation. This is a kind of pay-roll tax. In this case, the labour demand curve will shift to the left side, and the labour demand will decline. The new equilibrium point is now on B.

[2] We owe the explanation here to Filer, R., D. Hamermesh and A. Rees (1996).

[Figure 1: *The Incidence of Social Insurance Contribution***]**

9. Summers (1989) modified this basic framework of tax incidence, taking account of the relationship between social insurance contribution and benefit. With respect to Health Insurance, the contribution is balanced to benefit in the short-run. It means that the contribution is strictly connected to a current benefit (e.g. health services) compared with other insurances; pension and long-term care insurance. This implies that employees are more likely to regard the benefit as an increase of effective wage. Thus, the labour supply curve will be shifted to the left side up to *tf*% of nominal wage and then the new equilibrium point will be on C, not on B. The degree of these shifts depends on how employees value the current benefit, and therefore, is a matter of empirical analysis.

10. Most of the empirical analysis in the past was based on time-series data or cross country data. Holmlund (1983),using Swedish time-series data, showed that a half of payroll-tax had been shifted back to wages in the short run. Gruber & Krueger (1991) also concluded that contributions by employers to Workers' Compensation Insurance had also been shifted back to the insured (employees) in the form of wage reduction, based on industry level data in the United States. Additionally, Gruber (1997) showed that the reduction of payroll tax followed by the privatization of social security in Chile was shifted back to the employees' side. In the case of Japan, Tachibanaki & Yokoyama (2001), using the industry level data, concluded that employers contribution to social insurance was not shifted back to employees at all.

2.2 Description of Health and Long-term Care Insurance in Japan

11. In this paper, we used the data collected on an annual basis by the National Federation of Health Insurance Societies (*Kenporen*). In Japan shortly, it will be desirable to explain the role and position of health insurance societies in the whole health insurance system, and the related insurance (e.g. long-term care insurance).

12. Medical services in Japan are financed through a compulsory health insurance system. The system has been universal since 1961 and is organized by an occupational or regional basis. The former can be classified into three insurances; (1) Government-

managed health insurance, (2) Society-managed health insurances, and (3) Mutual aid associations: and the latter is managed by (4) municipal governments. Around 30%, 25%, 10%, and 35% of entire population is covered by each type of health insurance respectively. The data set used in this paper is of the second type of health insurance: society-managed health insurance.

13. Society-managed health insurances are organized on the basis of relatively large-sized companies, and they provide medical services to both regular workers and their families. Non-regular workers are excluded from the insurance unless their working hours exceed three fourths of regular workers. The contribution rates are set to cover the expenses of the medical services within a society-managed health insurance *and* the assessed contribution to the health service system for the aged. To some extent, this redistributes the financial resources all over the different types of health insurances to adjust the different dependency ratio in each health insurance.

14. The contributions to Society-managed health insurances are income-related. Or more precisely, it is set as a percentage of monthly remuneration. The legislation requires sharing the contribution by employers and employees equally; however, the proportion of the share can be changed under a collective agreement.

15. Mandatory long-term care insurance was introduced in April 2000. It is also financed by the contribution from employees aged over 40 who are covered by health insurance and their employer.

2.3 Theoretical Analysis

16. In this section, we explained our model based on Gruber (1997). Consider that labour demand and supply can be expressed by the following forms

labor demand; $L_d = f_d(W \times (1+tf))$,

labor supply; $L_s = f_s(W \times (1-a \times te) + q \times W \times tf)$,

where

W = the wage before the deduction for contribution to health insurance society;

tf = the contribution rate to health insurance society shared by employers;

te = the contribution rate to health insurance society shared by employees;

q = the extent to which employees value the employers' contribution relative to health services ($0 < q < 1$); and

a = the extent to which employees discount their contributions relative to health services ($0 < a < 1$).

17. The parameter a takes 1, if the employees regard their contributions as income tax. On the other extreme, it takes 0, if they regard their contribution as a counter value of health services for them. Solving this model, we obtain the equilibrium condition:

$$\frac{dW}{w} \Big/ dtf = -\frac{\eta^d \times q - \eta^s}{\eta^d - \eta^s \times (1 - a \times te)}$$

where η is an elasticity of labour demand or supply.

18. In terms of the combination of parameter q and a, there are four extreme cases. The first case is both parameters take value 0. In this case, employees do not value the employers' contribution at all, but do value their contributions fully as a counter value of health services. The second case is the parameter q = 0 and a = 1. In this case, employees do not value both their contributions and employer's contribution at all, as if aggregated contributions are a kind of income tax or pay-roll tax. The third case is the parameter q = 1 and a = 0, and it is the opposite case of the second. Employees fully value both employees' and employer's contributions, as if it is a price of private health insurance policy. The last case is the parameter q = 1 and a = 1. Here, employees do not value their contributions at all, but do value their employer's contribution fully as a counter value of health services.

19. In the third case (q = 1 and a = 0), note that

$$\frac{dW}{w} \Big/ dtf = -1.$$

As the q increases, the value noted the above will increase. Then, the equation for our econometric analysis will be

$$W = f(tf, X)$$

and our interest is on how the W is affected by the change of tf, controlling the individual characteristics: X.

20. With respect to society-managed health insurance in Japan, the third case could be applied, because the benefit is strongly linked with the benefit which is easily realised by the employees as it is organized on the basis of the corporations. Although long-term care insurance covers employees aged 40 and over, the main beneficiaries are people aged 65 and over. Therefore, in terms of the long-term care insurance, the second case, where the employees do not regard their contributions as a counter value of long-term care benefits, seems to be applied. According to the simple model, we expect to observe a (statistically) significant and relatively large effect of the changes in *tf* on the wages for society-managed health insurance even if some of the contributions are used for aged people to some extent, but not for the long-term care insurance.

3. Data and Empirical Framework

3.1 Data sets and their limitations

21. For our empirical analysis, we used *Present Status Report on Society-managed Health Insurances* (*Kenko Hoken Kumiai no Gensei*), and *Annual Report on Society-managed Health Insurance* (*Kenko Hoken Kumiai Jigyo Nenpo*). Both reports are published by the National Federation of Health Insurance Societies, and they cover the many kinds of variables related to the theoretical model: health insurance contribution rate for employer and employees, long-term care insurance contribution for employer and employees, numbers of the insured employees (regular workers) covered by society-managed health insurance and by long-term care insurance, average age of the insured, and the average monthly remuneration (bonuses are excluded) by each society-managed health insurance.

22. Based on both reports, we constructed cross-sectional and time-series data (panel data) sets, which cover from FY1995 to 2001. As the introduction of long-term

care insurance was in April 2000, the data set related to variables of long-term care insurance[3] becomes two-year panel data. In terms of seven-year panel data set, it has 16, 690 observations of 1,670 health insurance societies. The two-year panel data set has 3,286 observations of 1,643 health insurance societies. In the appendix, we showed the key statistics of these two data sets.

23. The data includes only the insured in terms of numbers of employees and average monthly remuneration. Because the temporary workers or part-time workers are not covered by the society-managed health insurance even if they work in the same corporation. This restricts our analysis of incidence on wages only, rather than both wages and employment.

3.2 Empirical Framework

24. As we discussed in section 2.3, we estimate the wage equation to investigate the effect of employers' contribution rate on wages. According to the theoretical framework, we should expect a negative co-efficient for the employers' contribution rate. Consider the fitting wage equation of the form

$$w_{it} = \alpha + x_{it}\beta + v_i + \varepsilon_{it}$$

where

w_{it} = average remuneration of the insured covered by the health insurance society (i) in the year (t) ;

x_{it} = average age of the insured, employer's contribution rate (%), and a number of insured employees (ln), by the health insurance society (i) in the year (t);

v_t = the unit-specific residual of each health insurance society (i); and

ε_{it} = the usual residual with the usual properties (mean 0, uncorrelated with itself, uncorrelated with x, uncorrelated with v, and homoskedastic).

[3] There are two unavailable variables in the original report, which are related only to the long-term care insurance. The average age of the insured of long-term care insurance is not available. We reuse the same variable of the health insurance. The second variable is the ratio of contribution rate, which is paid by the employer. To obtain the equivalent variable of health insurance, we make an assumption that the total contribution rate is shared in the same proportion of the health insurance by employers.

25. A choice of possible estimation model of the above is (1) pooled OLS model, (2) random-effects model, or (3) fixed-effects model. We do not know whether the unit-specific residual of each health insurance society actually exists or whether it correlated with dependent variables, and therefore we can not identify which empirical model should be applied *a priori*. Using the Breusch-Pagan Lagrangian multiplier test and the Hausman specification test, we will explore which model is the most plausible.

4. Empirical Results

4.1 Employers' contribution to Society-managed Health Insurance

26. Figure 2 and 3 shows the distribution of contribution rate to health insurance societies and average monthly remuneration of regular employees covered by the insurance. Figure 4 shows the scatter plot between the contribution rate and log of average monthly remuneration. Based on the scatter plot, it is not quite clear whether the employers' contribution rate has a negative impact on wages.

[Figure 2: *Distribution of Employers' Contribution Rate to Health Insurance***]**

[Figure 3: *Distribution of Average Monthly Remuneration of Employees***]**

[Figure 4: *Employers' contribution rate of health insurance and monthly average remuneration***]**

27. Table 1 shows the results of our estimation. By the Breusch-Pagan test and the Hausman test, we now know *ex post facto* that we should apply the random-effects model in this case. It means that there are unit-specific residuals of each health insurance society, but the unit-specific residuals are not correlated with independent variables.

[Table 1: *Estimates of Equations of Average Remuneration and Employers' Contribution to Health Insurance***]**

28. The random-effects model suggested the 1% increase of employers' contribution rate to health insurance society result in 0.5% reduction of the wage. It is

also (statistically) significant. In other words, the incidence rate of employers' contribution on the wage is around 50%.

4.2 Employers' contribution to Long-term Care Insurance

29. Figure 5 and 6 shows the distribution of contribution rate to long-term care insurance and average monthly remuneration of the regular employees, who are aged 40 and over and covered by the insurance. Figure 7 shows the scatter plot between the contribution rate and a log of average monthly remuneration. The scatter plot shows a clear negative relationship between the employers' contribution rate and the average wage remuneration.

[Figure 5: *Distribution of Employers' Contribution Rate to Long-term Care Insurance***]**

[Figure 6: *Distribution of Average Monthly Remuneration of Employees***]**

[Figure 7: *Employers' contribution rate of long-term care insurance and monthly average remuneration***]**

30. The next table shows the results for the employers' contribution to the long-term care. The Breusch-Pagan test and Hausman test suggested that there are unit-specific residuals but the coefficients that are estimated by random-effects model and fixed-effects model are not the same. It indicated we should apply the fixed-effects model, here.

[Table 2: *Estimates of Equations of Average Monthly Remuneration and Employers' Contribution to Long-term Care Insurance***]**

31. Contrary to the clear negative relationship shown by figure 7, the coefficient of the employer's contribution rate is not statistically significant. It implies that the employers' contributions to long-term care insurance would not result in the wage change and employees do not regard the employer's contribution as a counter value of the long-term care.

4.3 Discussion

32. While Tachibanaki and Yokoyama (2001) concluded that the employers' contributions to social security in Japan are not shifting back to their employees, our empirical results suggested the opposite; the employers' contributions to health insurance society are shifting back to their employees. Where does this difference come from?

33. The variable of employers' contribution used by Tachibanaki and Yokoyama (2001) was the aggregated level contributions to the entire social security (e.g. pension, health insurance, unemployment insurance and work injuries insurance) by 10 industries for 27 years. On the other hand, we used the health insurance society data sets. Because of the nature of the society-managed health insurance, its budget must be balanced within the society on the annual basis, and employees are more likely to realise that the employer's contribution is a counter value of their benefits compared with the other social benefits like pension benefits.

34. Interestingly enough, our estimation of the incidence of employers' contributions to long-term care insurance failed to show that the contributions were shifting back to employees. A plausible explanation is that the employees aged 40 and over are not able to realise the employer's contribution as a counter value of long-term care services, because the majority of beneficiaries of long-term care insurance are the oldest old.

35. However, the statistically significant evidence of shifting back observed in society-managed health insurance may gradually deteriorate in the future. As we explained in section 2.2, the contributions to society-managed health insurance are not only for covering the cost of the medical services within a health insurance society but also paying the assessed contribution to the health service system for the aged. This assessed contribution to the health service system has increased constantly as the population has aged. If this trend continues, the employees will start realising that the contributions to society-managed health insurance are a kind of income tax, and the shifting back to their wage will be diminished slightly.

5. Concluding Remarks

36. Using the society-managed health insurance data, which is cross-sectional time-series and covers 1670 health insurance societies for seven years, we found for the first time in Japan that half of the employer's contribution to health insurance is shifting back to the employees in the form of wage reduction. On the other hand, we can not find such evidence for the contribution to long-term care insurance using a two-year panel data set.

37. The difference between health insurance and long-term care is likely to be caused by the difference of the nature of two insurances. In terms of society-managed health insurance, the employees realise the very strong linkage between their benefits and contributions, and therefore the parameter q in the theoretical model is close to 1. It means the employees may agree to reduce wages in line with the increase of employer's contributions to health insurance society.

38. Contrary to the society-managed health insurance, the contribution paid by the insured aged 40 and over and their employer is not closely related to long-term care services, as most of the benefits are used by the oldest old. Thus, the employees regard the contributions as a kind of income tax, and the parameter q in the theoretical model would be very small. This may explain why we could not observe the incidence of contributions in terms of long-term care insurance.

39. The extent of the incidence of employers' contributions to social security in the form of wage reduction depends not only on the elasticity of labour supply/demand, but also on how employees value the contribution relative to social security benefits they enjoy. As the population is rapidly ageing, the apparent employers' contributions rate has been increased; however, the real rate may be different from the statutory rate depending on the type of social insurance.

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Tachibanaki, T., and Y. Yokoyama [2001]
"The Estimation of the Incidence of Employer Contributions to Social Security in Japan," *KIER Discussion Paper*, no.528.

Figures and Tables

Figure 1: Incidence of Social Insurance Contribution

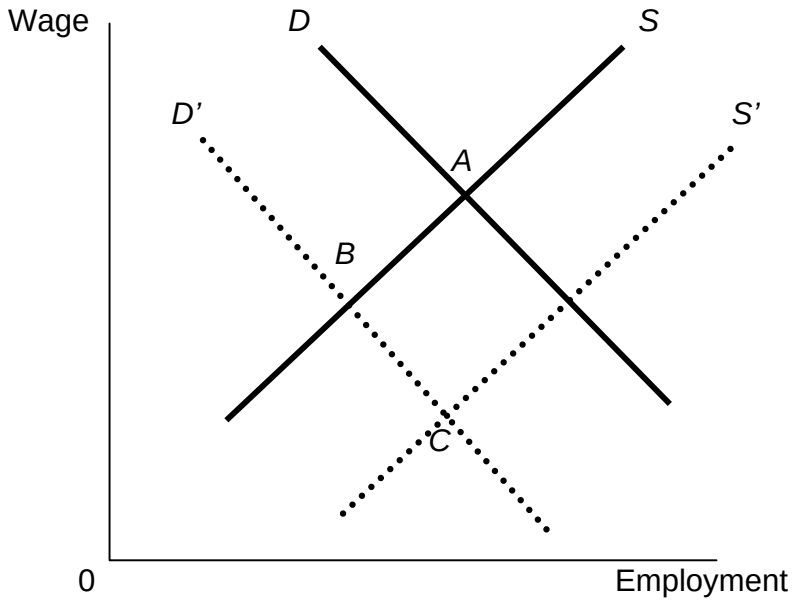
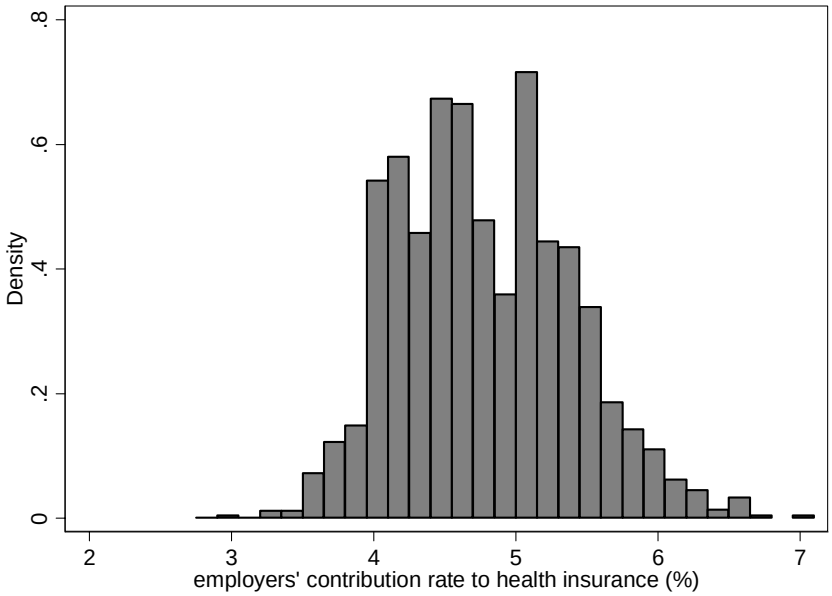
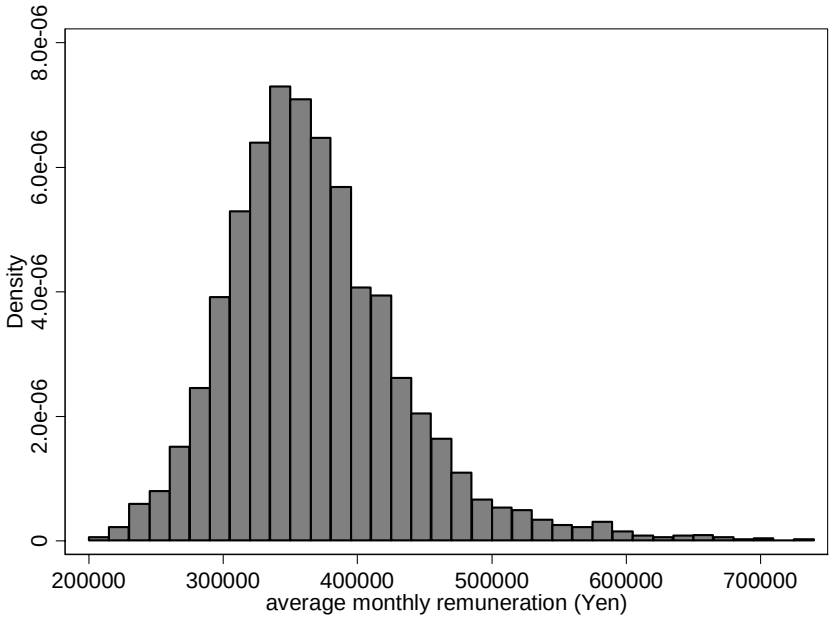


Figure 2: Distribution of Employers' Contribution Rate to Health Insurance (seven-year pooled data: FY1995-2001)



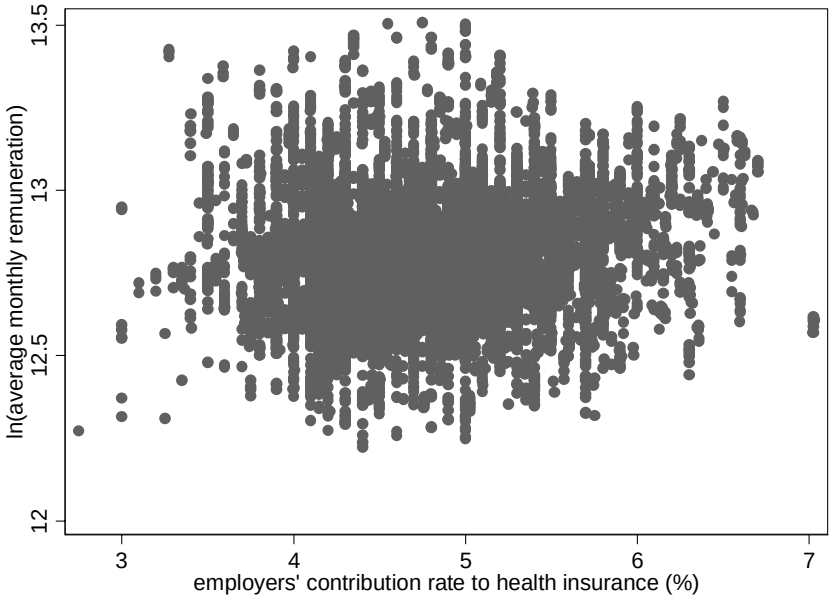
Source: Authors' calculation based on National Federation of Health Insurance Societies (1996-2002)

Figure 3: Distribution of Average Monthly Remuneration of Employees Covered by Health Insurance (seven-year pooled data: FY1995-2001)



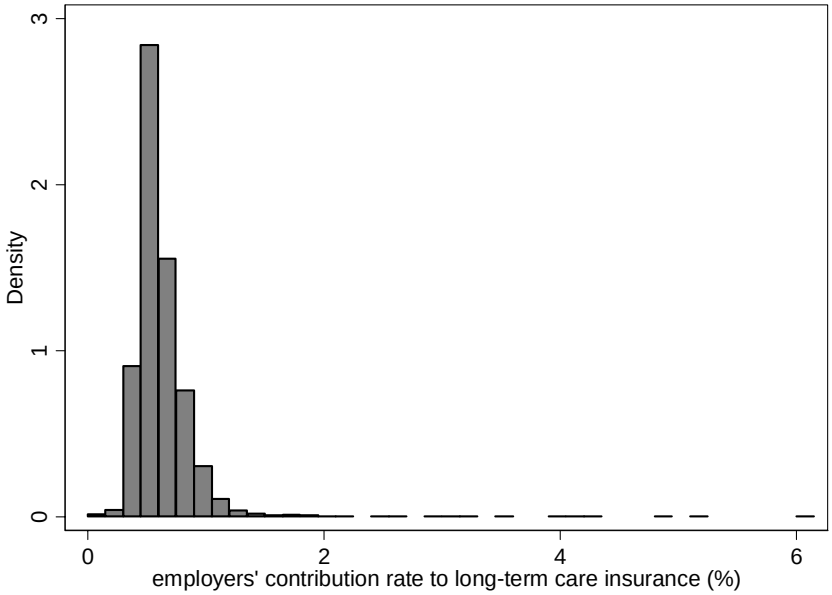
Source: Authors' calculation based on National Federation of Health Insurance Societies (1996-2002)

Figure 4: Employers' contribution rate of health insurance and monthly average remuneration (seven-year pooled data: FY1995-2001)



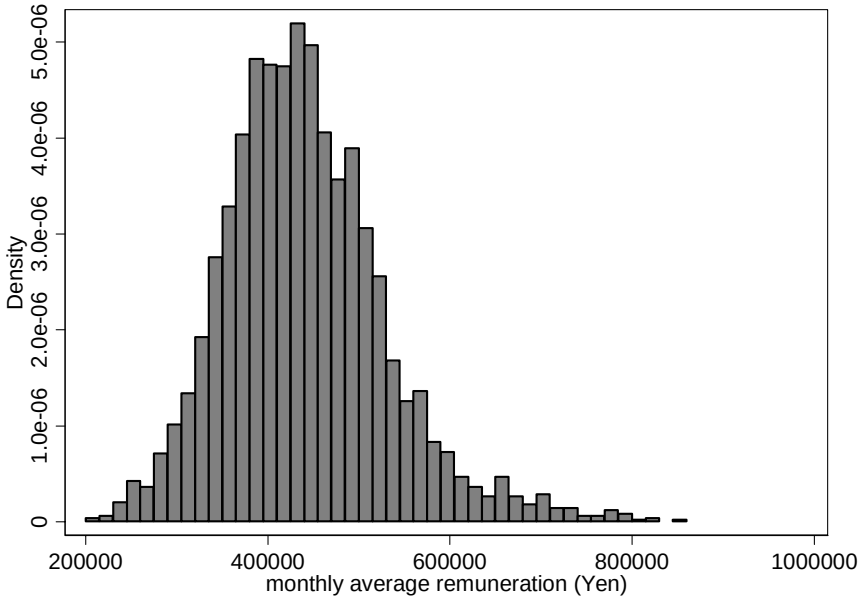
Source: Authors' calculation based on National Federation of Health Insurance Societies (1996-2002)

Figure 5: Distribution of Employers' Contribution Rate to Long-term Care Insurance (two-year pooled data: FY2000-2001)



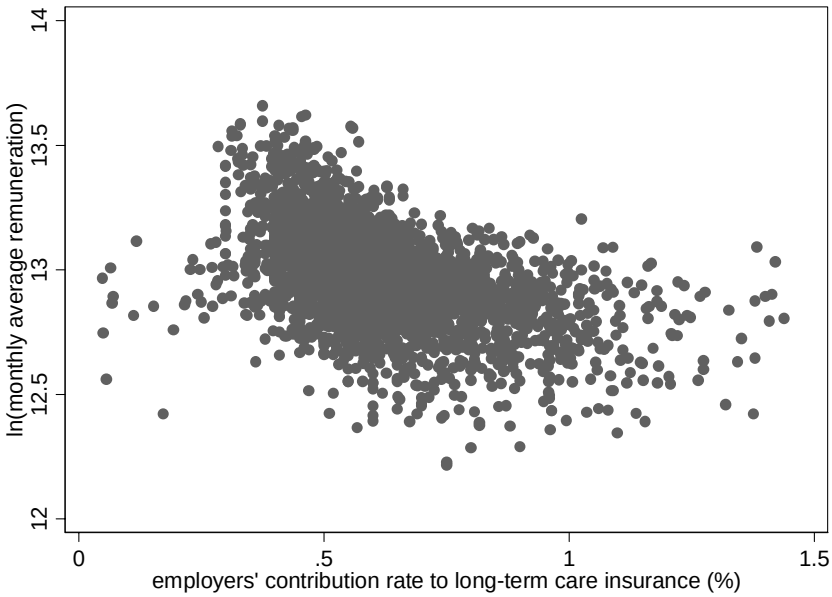
Source: Authors' calculation based on National Federation of Health Insurance Societies (2001-2002)

Figure 6: Distribution of Average Monthly Remuneration of Employees Covered by Long-term Care Insurance (two-year pooled data: FY2000-2001)



Source: Authors' calculation based on National Federation of Health Insurance Societies (2001-2002)

Figure 7: Employers' contribution rate of long-term care insurance and monthly average remuneration (two-year pooled data: FY2000-2001)



Source: Authors' calculation based on National Federation of Health Insurance Societies (2001-2002)

Table 1: Estimates of Equations of Average Remuneration and Employers' Contribution to Health Insurance

Average Monthly Remuneration (ln)	**Pooled OLS Model**			**Random-effects Model**			**Fixed-effects Model**		
	coef.	*std. Error*		*coef.*	*std. Error*		*coef.*	*std. Error*	
age	0.013	[0.000]	***	0.010	[0.000]	***	0.010	[0.000]	***
employer's contribution rate (%)	-0.006	[0.003]	**	-0.005	[0.002]	***	-0.006	[0.002]	***
no.of insured employees (ln)	0.011	[0.001]	***	0.009	[0.002]	***	0.006	[0.003]	**
cehmical industry	0.059	[0.005]	***	0.026	[0.011]	**			
ceramic industry	0.021	[0.011]	*	0.035	[0.020]	*			
spinning industry	-0.186	[0.009]	***	-0.055	[0.012]	***			
other manufacturing	-0.034	[0.006]	***	-0.018	[0.010]	*			
metal mining	-0.030	[0.030]		-0.031	[0.078]				
transportation industry	-0.017	[0.006]	***	-0.015	[0.015]				
whole sale/retail trade industry	-0.061	[0.005]	***	-0.039	[0.010]	***			
financing and insurance	0.068	[0.005]	***	0.058	[0.013]	***			
energy, printing, and constructing	0.107	[0.005]	***	0.056	[0.010]	***			
education and municipal authorities	0.124	[0.007]	***	0.082	[0.015]	***			
coal mining	-0.032	[0.059]		-0.028	[0.155]				
constant	12.211	[0.023]	***	12.325	[0.028]	***	12.378	[0.033]	***
Adjusted R^2									
within				0.073			0.078		
between				0.197			0.059		
overall	0.209			0.193			0.059		
Observation	11690			11690			11690		
Units				1670			1670		
				Breusch-Pagan test			*Hausman test*		
chi^2				32380.98	***		**5.5**		

Source: Authors' calculation based on National Federation of Health Insurance Societies (1996-2002)

Table 2: Estimates of Equations of Average Monthly Remuneration and Employers' Contribution to Long-term Care Insurance

Average Monthly Remuneration (ln)	**Pooled OLS Model**			**Random-effects Model**			**Fixed-effects Model**		
	coef.	*std. Error*		*coef.*	*std. Error*		*coef.*	*std. Error*	
age	-0.003	[0.001]	***	-0.012	[0.001]	***	-0.018	[0.001]	***
employer's contribution rate (%)	-0.144	[0.011]	***	-0.005	[0.002]	**	-0.002	[0.002]	
no.of insured employees (ln)	0.001	[0.003]		0.001	[0.003]		-0.011	[0.006]	**
cehmical industry	0.074	[0.012]	***	0.060	[0.016]	***			
ceramic industry	0.027	[0.024]		0.037	[0.034]				
spinning industry	-0.168	[0.020]	***	-0.098	[0.024]	***			
other manufacturing	-0.039	[0.013]	***	-0.043	[0.018]	**			
metal mining	-0.030	[0.062]		-0.036	[0.089]				
transportation industry	-0.042	[0.013]	***	-0.041	[0.018]	**			
whole sale/retail trade industry	-0.075	[0.010]	***	-0.069	[0.014]	***			
financing and insurance	0.091	[0.011]	***	0.085	[0.015]	***			
energy, printing, and constructing	0.114	[0.011]	***	0.098	[0.015]	***			
education and municipal authorities	0.146	[0.015]	***	0.155	[0.021]	***			
coal mining	-0.085	[0.124]		-0.091	[0.178]				
constant	13.146	[0.044]	***	13.419	[0.047]	***	13.798	[0.070]	***
Adjusted R^2									
within				0.063			0.101		
between				0.172			0.012		
overall	0.228			0.171			0.012		
Observation	3286			3286			3286		
Units				1643			1643		
				Breusch-Pagan test			*Hausman test*		
chi^2				1428.27	***		**21.41**	***	

Source: Authors' calculation based on National Federation of Health Insurance Societies (2001-2002)

Appendix: Key Statistics of Data Sets

	Health Insurance				Long-term Care Insurance			
	mean	*std. dev.*	*min*	*max*	*mean*	*std. dev.*	*min*	*max*
average monthly remuneration (Yen)	368680	67498	203681	734485	441350	89021	202452	854551
age	39.878	3.571	22.900	54.000	40.555	3.400	24.600	53.200
employer's contribution rate (%)	4.775	0.607	1.5845	7.029	0.631	0.306	0.048	6.141
no.of insured employees	8680	16821	24	231351	3939	7461	21	104804
cehmical industry	0.098	0.298	0.000	1.000	0.098	0.297	0.000	1.000
ceramic industry	0.018	0.134	0.000	1.000	0.018	0.134	0.000	1.000
spinning industry	0.027	0.163	0.000	1.000	0.026	0.159	0.000	1.000
other manufacturing	0.072	0.259	0.000	1.000	0.074	0.261	0.000	1.000
metal mining	0.002	0.049	0.000	1.000	0.002	0.049	0.000	1.000
transportation industry	0.079	0.270	0.000	1.000	0.077	0.267	0.000	1.000
whole sale/retail trade industry	0.148	0.355	0.000	1.000	0.148	0.355	0.000	1.000
financing and insurance	0.128	0.334	0.000	1.000	0.129	0.335	0.000	1.000
energy, printing, and constructing	0.132	0.339	0.000	1.000	0.134	0.341	0.000	1.000
education and municipal authorities	0.054	0.226	0.000	1.000	0.054	0.225	0.000	1.000
coal mining	0.001	0.024	0.000	1.000	0.001	0.025	0.000	1.000
Year	FY1995-2001				FY2000-2001			
Observation	11690				3286			
Units	1670				1643			

Source: Authors' calculation based on National Federation of Health Insurance Societies (1996-2002)