On Geographic Inequality in Japanese Regional Health Insurance

Narimasa KUMAGAI

Faculty of Economics
Kinki University

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Abstract

In Japan, economic stagnation due to the lack of aggregate demand has hit the regional health insurance system and this affects most retired pensioners. The fiscal state of insurers in rural areas deteriorated. This paper aims to investigate whether the regional disparities in medical levies per household make a contribution to income-related geographic inequalities in health care financing. Data of the central two regions of the Japanese National Health Insurance in 2005 were extracted. Their share of population was about 41.5 percent. Retired employees and self-employed individuals are covered by this insurance system.

We conducted the geographic decomposition using the concentration index. The within-area inequality in medical levies mainly accounted for geographic inequality in medical levies per household. The hypothesis that there was no between-area inequality in medical levies was not rejected. We revealed the differences in the within-area inequality in medical levies in the central Kanto. This means such proportionality was not built into the NHI system through near constant contribution rates across the distribution of living standards. It can be considered that the differences in the within-area inequality were caused by the inequality in income per household and the multiplier of income levies.

We found that income per household, the standard land price of residential districts and the size of an insurer are major determinants of the multiplier of income levies. The higher land price tends to greater the multiplier of income levies. The expansion of insurer's size increases the multiplier of income levies in most of districts. The inequality in the multiplier of income levies will reduce if local governments raise per-household levy in proportion to the size of an insurer and lower the multiplier of income levy.

Keywords: Decomposition, Inequality, Japan, Medical Levies, National Health Insurance

1 Introduction

Japan has an advanced social insurance system covering the entire population and family allowances for old age, for disabilities, sickness and maternity, work injuries, and unemployment (USDHH 2000). But, because of tightening budgetary constraints, benefits are likely to be reduced even as contributions rise. Total government debt was 170 percent of GDP at the end of 2008. This is the highest in the industrialized world, and twice what it was twelve years ago. Unless fiscal policy is tightened this ratio could rise to 200 percent by the end of 2010.[1]

[1] The Ministry of Health and Welfare (MHW 2000) reported gloomy prospects for the social security system. Social security pay-outs by the government will nearly triple by fiscal 2025 to 207 trillion yen based on the projected rate of benefit growth of the past decade. The ministry calculated that the

National health care expenditures (NHE) accounted for about 9.11 percent of national income (NI) in 2007. The rise in this ratio during the decade raised concerns that health care costs were out of control. After 1991 the Japanese economy declined sharply, while NHE increased at an annual rate of 4.9 percent compared to 0.46 percent for NI for the period 1990-1999. From 1987 to 1991, NHE grew at about the same rate as NI, so the ratio of NHE to NI remained below 6.5 percent.

Ikegami and Campbell (2004) pointed out that economic stagnation has hit the National Health Insurance (NHI) system, which covers most retired pensioners, in two ways.[2] First, declining incomes have meant that worker's premium contribution rates have had to be raised. Second, the fiscal state of NHI has become even more precarious as laid-off workers with low incomes have enrolled and as more people have been unable to pay premiums. For NHI, it is well known that the premium in the most expensive municipality is five times that of the least expensive municipality. The distribution of income and health can be altered by changing medical levies to health insurers under a situation of economic stagnation.

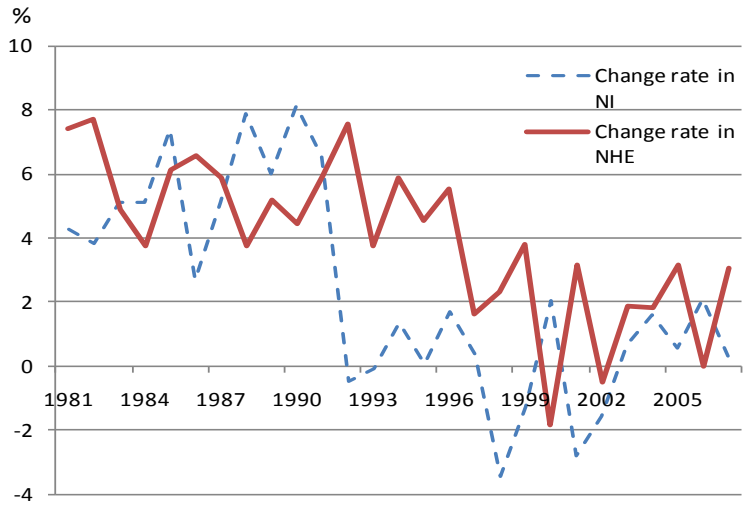

Figure 1. Trends in National Income and National Health Care Expenditures

Previous studies have shown horizontal inequity in health care utilization in Japan (Endo and Shinozaki 2003, Ohkusa and Honda 2003, Kumagai 2007, O'Donnell et al. 2008).[3] O'Donnell *et al.* (2008) estimated the Kakwani indices of 13 Asian territories and concluded that social insurance is slightly regressive and direct payments are regressive. Their results for Japan were derived from the 1998 Comprehensive Survey of Living Conditions, which covered the whole population.

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consumption tax of 5 percent would have to be increased to 25-41 percent to cover the 100 trillion yen needed for basic benefits a quarter century down the road.

[2] They paraphrased NHI as Citizens' Health Insurance.

[3] Kumagai (2007) found that the municipal subsidy showed almost horizontal equity for inpatients with a cerebrovascular disease. Based on estimation results of censored regression, Kumagai (2007) concluded that municipalities can gain hospital revenues by raising the utilization of beds slightly and then reduce the municipal subsidy.

However, they did not analyze disparities in the Japanese regional health insurance system.

It is believed that wealthier is healthier. But, are the distributions of medical levies to health insurers proportional to the insured's health? A purpose of this study is to examine the regional disparities in medical levies to health insurers contributing to income-related inequalities in health care financing. Previous studies have not revealed the extent of within-area income-related inequality in medical levies. This paper presents the first research to investigate the characteristics of Japanese National Health Insurance from the viewpoint of geographic inequality in health care financing. The structure of this paper is as follows. In Section 2, Japanese health insurance system is briefly summarized and recent changes to premium rates set that reflect differences in health care expenditures among prefectures are shown. Section 3 presents empirical results using concentration index. We analyze the determinants of the inequality in medical levies per household and consider local government's health policy to reduce income-related inequality in health care financing. Section 4 offers a conclusion.

2 Health Care Financing and Health Insurance System in Japan

Japan has a policy of universal health care and Japanese public health insurance covers the entire population. The compulsory health insurance system with income-based premiums has been universal since 1961 and is organized on an occupational-based system or regional-based (municipality-based) system. Social insurance schemes and taxation constitute the main sources of health funding in Japan. Approximately half of the NHE are financed by health insurance plans and the remainders are financed by subsidies from the government, co-payments, and other out-of-pocket expenses (See Figure 2 and Table 1). Medical services in Japan can be accessed freely and patients can visit medical institutions of their choice at any time. Payments for medical treatment are based on the medical and technical service fee.[4] Reimbursements to health care providers are uniform across regions with little concern for differences in type of facility or severity of illness because the government sets the fee schedule and drug prices. Many people in Japan obtain insurance via employer-related groups. For example, employees of large companies and their dependent family members enroll in plans for which occupation-based cooperatives are the insurers. Insurance societies or mutual aid societies are established within industries. Most employer-group plans require copayments for dependents. These plans also have a catastrophic cap feature that limits monthly out-of-pocket expenses.[5] Japanese public health insurance systems are classified roughly into [1] insurance for employees and their dependents, [2] insurance for the self-employed, retirees and their dependents, and [3] insurance for the elderly.

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[4] The fee schedule is decided through key biennial negotiations between insures and providers, and that forum —the Central Social Insurance Medical Care Council (Chuikyo) — has provided a mechanism for dealing with many recurring issues in a routinized way with very restricted participation. Proof of insurance is submitted when receiving health care and medical compensation is decided after the Ministry of Health, Labour and Welfare consults with the Chuikyo.

[5] When the monthly out-of-pocket amount was higher than the ceiling, the excess amount was paid back to the patient from insurance funds. A ceiling on patient cost-sharing was introduced for the first time in 1973.

The first type of insurance is Employee's Health Insurance, which consists of Government-managed Health Insurance (GHI), Society-managed Health Insurance (SHI), Mutual Aid Associations (MAA), and Seamen's Insurance (SI). MAA includes national and local public employees, and private school teachers and staff members. Self-employed individuals, farmers, and retired employees enroll in National Health Insurance (NHI) for which municipalities are the insurers. In general, an employee and his/her dependents are covered by a regional-based system after his/her retirement. The system is not an independent health insurance system for the retirees but is a financial support system for physician visits with small copayments at the time of a medical service is provided. Employees' Insurance contributes to NHI to cover retired employees. For most NHI insurers, the premium is supplemented by subsidies from national and local governments.

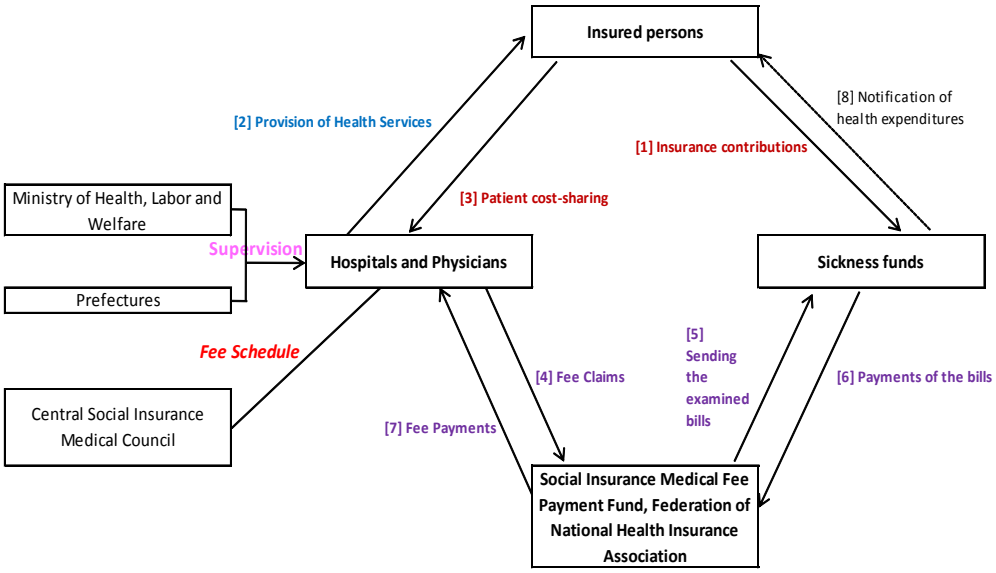

Figure 2. Flow of Funds in the Japanese Health Care System

GHI includes workers employed by small and medium-sized companies. The insurer of GHI was the national government as of September 2008. The GHI received around 8.3 percent of the insured's monthly income during the last two decades, evenly split between employer and employee. Because of regional differences in respective health care expenditures, the participation of the prefectures, which are responsible for health care systems, is needed to control health care expenditures in a systematic manner. To promote prefectural integration, GHI became a public corporation of the Japan Health Insurance Association in October 2008. It is able to set premium rates that reflect the relevant health care expenditures of the different prefectures, as well as offer health services according to the actual situation in the respective region. In SHI, large firms organize their own insurance group. The contributions to SHI are income-related. It is set as a percentage of monthly remuneration. The legislation requires the contributions of employers and employees to be shared equally. The proportion of the share can be changed by agreement. Casual and Part-time employees and most of dispatched workers are excluded from society membership and have to be covered by the other type of public health insurance unless their working hours exceed three quarters of regular workers. Those individuals who are not enrolled through their

job must enroll in the NHI Program through the government office in the city, town, or village in which they live. Insures are linked to a person's employer, occupation, or geographic location, and each insurer operates a different scheme. People are assigned to one or other scheme depending on their occupation or place of residence.

Table 1. Outline of Health Insurance System in Japan (As of March 2007)

	Employer-based health insurance			National Health Insurance	Long life medical care system
	Government managed	Society managed	Mutual Aid Associations		
Insured Persons	Mainly employees at small and medium-sized companies	Mainly employees at large companies	National and local public service employees, and Private school teachers and staff members	Farmers, self-employed, and so on	Persons aged 75 and over as well as disabled persons aged 65-74
Insurer	National Government	Health insurance societies: 1514	Mutual aid associations: 76 (21, 54, 1)	Municipalities: 1818, NHI associations: 165	Long life medical care partial-affairs association
Number of subscribers (Total, Insured, Dependents) 1000 people	35938, 19501, 16437	30474, 15456, 15018	9437, 4399, 5038	51268 (Municipalities: 47380) →	13000 (FY2008 estimate)
Population Covered (%, 127.3million people)	28.2%	23.9%	7.4%	40.3%	
Partial cost-sharing (%)	30% (After entering school age to 69 years old), 20% (Before entering school age), 20% (People aged 70 to 74, 30% for those earning full salaries)				10% (30% for those earning full salaries)
Premium rate (%)	8.2%	---	---	---	10%
Government subsidy	13% of benefit costs	Fixed amount	None	Municipalities: 43% of benefit costs, NHI associations: 32-55% benefit costs	Support coverage 40%, Public fund 50% (National: Prefecture: Municipality = 4:1:1)

Note: The arrow implies that the transition of the elderly from NHI to Long life medical care system.
Source: White Paper on Health, Labour and Welfare 2009 Edition.

Table 1 shows that the outline of the health insurance system in Japan. For simplicity, it excludes SI. The rate of subscribers in NHI is almost 40 percent (the

highest) and the rate of government subsidy for municipalities is almost 43 percent of benefit costs.[6]

The NHI account is under financial pressure as most of the insured are elderly. NHI fiscal revenues are primarily derived from insurance premiums and the central government subsidy, although money is transferred from employer-based insurance to NHI to help cover the costs of retired employees. The focus of reforming health insurance for the elderly is always to provide appropriate nursing and care services, as well as health services, and ensure the long-term stability of the system (Fukawa 2002).

3 Empirical Analyses

Imai (2002) argued that uneven geographical distribution of resources and treatments largely reflects different needs in different prefectures, because there are good correlations between need and access rates variously measured, i.e., doctors and beds per capita, consultations and admissions per capita, and health expenditure per capita if the crude mortality rate of each prefecture is taken as a proxy for the need for healthcare.[7] In this section, we examine the regional differences in medical levies because previous studies have not revealed the income-related geographic inequality in medical levies.

3-1. Data

As the level of geographic aggregation influences the extent to which income inequalities exist, the choice of the level of analysis (country, state, county, urban versus rural, census tract, block level) will influence conclusions about the distribution of ill health (Starfield 2006). We use data for each municipality, because a local government basically calculates NHI premiums for a given year by estimating the expected cost of health care per member of the municipality. Insurance premiums are paid monthly under NHI. The per capita levy is reduced by 70 percent or 50 percent when the insured person's annual income falls below a specified amount. The maximum annual premium for medical insurance is about AU$6600 (AU$=80yen). 70 percent of medical treatment costs being paid by the NHI Program, with the remaining 30 percent paid by the insured. Copayment rate of persons under 3 years of age is 20 percent, and 10 percent or 30 percent for persons 70 years or older.

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[6] In 1982, the Health Care System for the Elderly (HCSE) was established. Elderly was defined as aged 70 and over in the 1990s. The definition of the elderly changed in the 2000s. Since October 2002, the minimum eligibility age has been increased by one year each year and continued to rise until it reached 75 in October 2007. Seniors aged 75 and older enrol in HCSE and receive benefits through contributions from other insurance plans. It is well known that one of the major causes of the financial difficulties of health insurers is the Contribution for the HCSE (Sienkin), which is imposed on insurers to finance the health care expenditures of the elderly.

[7] Good correlations among health variables do not imply horizontal equity in health. Kumagai (2009) investigated the relationships among the need for inpatient care, the amount of inpatient care services provided, and money transfers to Japanese municipal hospitals in the Kansai region from the viewpoint of vertical equity. It was found that allotments (municipal subsidy) showed vertical inequity in the number of inpatients per day after taking into account the overall social welfare regarding the distribution of allotments.

A portion of health care costs is levied on the tax base as medical insurance. Income levy is determined according to household income.[8] Asset levy is excluded in many large cities and per-household levy is excluded in some cities. In such a setting, contribution rates are fixed by law, and the risk profile and per capita revenue depend on the profile of the scheme's members.[9] It is highly likely in this scenario that the benefit package differs across schemes, with low-income high-risk schemes being unable to offer a very generous package, and high-income low-risk schemes being able to offer a more generous package (Wagstaff 2009).

National Health Insurance Premium=Medical Insurance + Long-term (Nursing) Care Insurance

Medical Insurance = Income Levy (or Taxes from income) + Asset Levy (or Taxes from fixed asset) + Poll taxes

Poll taxes=Per-Capita Levy (insured persons) + Per-Household Levy

Table 2. Characteristics of Health Variables

Kansai	SMRs	Income	Medical Levies	Kanto	SMRs	Income	Medical Levies
Osaka	101.7	833353.1	156042.6	Tokyo	96.9	825167.2	122485.2
	(11.7)	(114551.4)	(12851.8)		(16.5)	(246000.1)	(16433.9)
Hyogo	100.4	651898.6	137437.4	Kanagawa	97.7	858481.3	156147.8
	(7.5)	(142691.7)	(15604.4)		(11.8)	(163492.4)	(15697.2)
Nara	99.9	567091.6	129882.8	Saitama	100.6	907080.8	152051.6
	(9.2)	(168517.3)	(24506.6)		(8.9)	(188168.9)	(20014.9)
Kyoto	97.1	639306.3	130340.8	Chiba	102.4	927352.8	163586.8
	(10.7)	(178314.1)	(21246.5)		(9.2)	(181362.9)	(19061.3)
Total	100.0	679869.5	139591.0	Total	99.6	882762.2	147632.9
	(9.9)	(180529.2)	(21515.7)		(12.0)	(203488.1)	(24144.2)

Note: Standard deviations are shown in the parentheses.

Data of the central two regions of the Japanese National Health Insurance in 2005 were extracted. The total number of municipalities in the central Kansai was 149 (Osaka 43, Hyogo 41, Nara 39, and Kyoto 26) and the total population was about 18.48 million (Osaka 8.82, Hyogo 5.59, Nara 1.42, and Kyoto 2.65). Their share of municipalities was about 8.2 percent and their share of population was about 14.5 percent in the end of FY2005. The total number of municipalities in the central Kanto was 223 (Tokyo 62, Kanagawa 35, Saitama 70, and Chiba 56) and the total population was about 34.48 million (Tokyo 12.57, Kanagawa 8.79, Saitama 7.05, and Chiba 6.06). Their share of municipalities was about 12.3 percent and their share of population was about 27.0 percent in the end of FY2005.

Table 2 summarizes both mean and standard deviation of health variables in the central two regions. We can read the difference in male' Standardized Mortality

[8] If a portion of health care costs were levied as medical insurance, the burden of medical insurance would be regressive to lower income people. This requires a reduction of the per capita levy.

[9] By 2008, about 21% of households that were covered by NHI failed to pay the premium. It is important to reduce this share by improving compliance.

Ratios (SMRs) among prefectures and must doubt that wealthier is healthier because a higher income does not necessarily imply lower need for health care. It is noted that the standard deviation of medical levies in Nara prefecture was the largest and the magnitude was about 18.9 percent of the mean. Medical levies in Nara prefecture have a heavy-tailed distribution.

Income per household (actual taxable income per household) was used as the living standards variable and male' SMRs as the representative indicator of the need for health care of the elderly. The variance of male' SMRs is larger than that of female' SMRs. Actual taxable income per household is derived from Equation 1. This calculation is basically after the procedure of Kadota *et al.* (1989). It is noted that medical levy per household in Equation 1 includes the unpaid rate of contribution to NHI in each municipality. The existence of this variable differs from Kadota *et al.* (1989). The medical levy per household is the product of the assessment based on income per household and the inverse of (1－unpaid rate). The multiplier of income levy is the ratio of assessment based on income to total assessment.

Income per household
＝medical levy per household × the multiplier of income levy
／income tax rate × the number of households (1)

Unpaid rate= the amount of unpaid levies / total medical levies in the previous period

Each insurer operates different schemes and has a different income tax rate. However, some of the series of income tax rates are rectified when municipalities merged and a proxy variable does not exist. Therefore, income tax rate in all municipalities is 0.1, which is considered to be in the neighborhood of the mean income tax rate. For the municipalities merged in 2005, we cannot make weighted series of the multiplier of income levies because the series of the number of households in previous municipalities are not publicly reported. We used the multiplier of income levy of the municipality with the largest insured households in the previous region as the representative variable of the municipality merged.

3-2. Geographic Decomposition of the Concentration Index

Lower income groups generally have poorer health status and therefore higher needs for health care. We expect medical levies are concentrated more among the poor households. These inequalities can be measured using the concentration index, equal to twice the area between the line of equality and the concentration curve (See Figure 3, L(s)). A concentration curve plots the cumulative proportion of the health variable in question against the cumulative proportion of the population (from low income to high income). The health concentration index is defined as twice the area between the concentration curve and the diagonal, and is bounded by -1 and 1. The larger the index is in the absolute size, the greater the degree of inequality. When it is negative, it indicates that health variable in question is concentrated more among the poor (pro-poor inequality). When it is positive, it indicates pro-rich inequality.

We examine the regional disparities in medical levies to health insurers contributing to income-related inequalities in health care financing. Following

Wagstaff (2005), we can write Equation 2 by analogy with the geographic decomposition.

$$C = C_B + \sum_{i=1}^{N} \alpha_i C_i + R \qquad (2)$$

where C is the concentration index calculated on the full sample, C_B is the between-areas concentration index. α_i is the ith area's population share, C_i is the concentration index of the ith area, and R is a reranking term.[10] C_B is computed by assigning all households in a given area the mean value of health variable in that area, lining up areas by their mean per household income, and computing the corresponding concentration index for health variable. C_i indicates the extent of income-related inequality in health variable in ith area. The weighted sum of these N concentration indices captures the fact that within areas the poor systematically have smaller or larger values of health variable.

Because the magnitude of R depends on both the extent of reranking in the move from within-area concentration curve to the concentration curve of health variable in question and the size of the covariance between income and heath variable, R is a mixture of within-area and between-area income-related inequality in health variable.

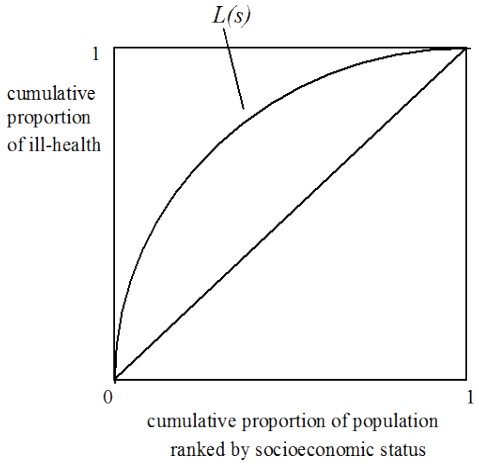

Figure 3. Concentration Curve

Both h_i and b_i in Equation 3 are variables concerned when we analyze the inequality in health care financing. When h_i is medical levy per household and b_i is income per household, the OLS estimate of β in Equation 3 represents the extent of inequality in health care financing.

$$2\sigma_R^2 [\frac{h_i}{h^*} - \frac{b_i}{b^*}] = \delta + \beta R_i + u_i \qquad (3)$$

[10] We do not take into account the share of health variable such as the ith area's physician share.

where R_i the fractional rank by income per household, σ_R^2 its variance, δ the constant term, u_i error term, h^* the mean of h_i and b^* the mean of b_i.

Table 3 summarizes the results of geographic decomposition of the health concentration index. Table 4 shows the estimates of within-area inequality in health and health care financing. They are Newey-West estimates that modified the serial correlation in Equation 3 (Wagstaff and Doorslaer 2000). The value of C of -0.086 in Table 3 indicates that there were subject to a pro-poor distribution of health care financing in the central Kansai. In the central Kanto, there were subject to a pro-poor distribution of health care financing, too. Table 3 implies that the within-area inequality in medical levies mainly accounted for geographic inequality in medical levies per household (0.837=0.072/0.086, 1.253=0.089/0.071). For both regions, the hypothesis that there was no between-area inequality in medical levies was not rejected. The difference in sign of R was caused by the extent of the inequality in the prefecture with the largest proportion of households. By comparison between the estimates of Osaka prefecture and that of Tokyo metropolis, we can confirm it (See Table 4, Ins-I).

Table 3. Geographic Decomposition of the Health Concentration Index

Kansai	Needs-I	Ins-I	Kanto	Needs-I	Ins-I
C	-0.160	-0.086	C	-0.141	-0.071
	(-16.28)	(-23.90)		(-14.71)	(-11.32)
$\alpha_i C_i$	-0.115	-0.072	$\alpha_i C_i$	-0.152	-0.089
C_B	0.065	0.029	C_B	-0.018	0.033
	(1.36)	(0.98)		(-4.82)	(1.08)
R	-0.045	-0.014	R	0.029	0.018

Note: T-values are in the parentheses. 'Ins' means medical levies per household.

Table 4. Within-Area Inequality in Health and Health Care Financing

	Household	Proportion	Needs-I	Ins-I
Kansai				
Osaka	1810306	0.498	-0.069	-0.060
Hyogo	1080479	0.297	-0.141	-0.085
Nara	256252	0.070	-0.191	-0.079
Kyoto	488441	0.134	-0.188	-0.082
Kanto				
Tokyo	2868114	0.409	-0.187	-0.104
Kanagawa	1671962	0.239	-0.122	-0.100
Saitama	1298529	0.185	-0.140	-0.056
Chiba	1169440	0.167	-0.122	-0.075

Note: 'Ins' means medical levies per household. All estimates are statistically significant.

We can find the value of 0.048 of the differences in the within-area inequality in medical levies in the central Kanto.[11] On the contrary, there were little differences in the within-area inequality in medical levies in the central Kansai although there were large differences in the within-area inequality in health (See Table4, Needs-I). It can be considered that the following two factors caused the differences in the within-area inequality in health care financing. First, there are large differences in inequality in income per household among prefectures. Table 5 shows that the inequality in income per household in Tokyo metropolis was the largest.[12] Second, the multiplier of income levies in the central Kanto is relatively higher than that of the central Kansai. The weighted average of the multiplier of income levies in the central Kanto and that in the central Kansai are 0.661 and 0.578, respectively. The number of households was used as the weight variable.

Table 5 also presents that the regional differences in the inequality in medical levies per household were mainly derived from income-related inequality per household. However, we should notice that the proportion of the inequality in the inverse of the multiplier of income levies to the inequality in medical levies per household (B/A). We can see that the proportion in Nara prefecture was the smallest among the eight prefectures. It may indicate that the inequality in the multiplier of income levies in Nara prefecture was the largest. Nara prefecture does not have large city and the proportion of households whose payment of premium was reduced in Nara prefecture is higher than that of the other prefectures. Increasing this proportion tends to decrease the multiplier of income levy.

Table 5. Inequality in Medical Levies

	Osaka	Hyogo	Nara	Kyoto
Medical levies per household (A)	0.003	0.006	0.021	0.014
Income per household	1.712	1.396	0.942	0.851
The inverse of the multiplier of income levies (B)	0.003	0.014	0.011	0.014
B/A	1.0	2.2	0.5	1.0
	Tokyo	Kanagawa	Saitama	Chiba
Medical levies per household (A)	0.009	0.005	0.008	0.006
Income per household	2.043	0.973	0.815	0.655
The inverse of the multiplier of income levies (B)	0.024	0.020	0.008	0.014
B/A	2.6	4.1	0.9	2.1

When we examine the inequality in the multiplier of income levies, land price should be taken into consideration. Because the coefficients of correlation between

[11] There were regional differences in medical levies to health insurers from the view point of geographic inequality. This means such proportionality was not built into the NHI system through near constant contribution rates across the distribution of living standards.

[12] Following the procedure of Cheng and Li (2006), a decomposition of medical levies was conducted. We obtain the following relationship; Inequality in medical levies = Inequality in income per household + Inequality in the inverse of the multiplier of income levies + Residual.

Theil's criterion is composed of n_i weight of the region, μ mean of medical levies and z_i medical levies of ith region. Democratic weight ($1/N$) was used. $T(Z)=\sum_{i=1}^{N} n_i \ln(\frac{\mu}{z_i})$

the multiplier of the asset levies and the multiplier of income levies were negative except Chiba prefecture, we use the data of the standard land price of residential districts in each region to analyze the determinants of the multiplier of income levies.[13] The standard land prices of residential districts were not publicly reported in some municipalities in 2005. We can use the data of 288 districts from the Survey of Land Price by Ministry of Land, Infrastructure and Transport.[14]

By Weighted Least Squares regression for correcting the heteroscedasticity, we estimated three regression equations. The results of estimation are summarized in Table 6. As the results of Breusch-Pagan-Godfrey test, we could not reject the null hypothesis of no heteroscedasticity at the 5 percent significance level. This implies that the standard errors of the parameter estimates were correct.[15] For type A and type B equations, the natural logarithm of the number of the households was used as the weight variable. For type C equation, the natural logarithm of the number of the enrolment rate of NHI was used as the weight variable. Dependent variable is the natural logarithm of the multiplier of income levies.

Table 6. Determinants of the Multiplier of Income levies

ln(Multiplier of Income Levies)	A	B	C
Intercept	-5.84	-6.28	-5.72
	(-15.84)	(-17.11)	(-14.36)
ln(Enrolment rateof NHI)	0.15		
	(3.72)		
ln(Age65/Pop)		0.09	
		(2.65)	
1/ln(Land Price)	-10.91	-10.58	-7.85
	(-12.85)	(-12.26)	(-8.07)
ln(Income)	0.47	0.50	0.48
	(19.97)	(19.39)	(21.16)
ln(Number of Households)			-0.17
			(-4.45)
ln(Number of Households)^2			0.01
			(5.00)
Adjusted R2	0.796	0.792	0.803
Probability F-statistic [BPG]	0.053	0.074	0.481

Note) Weight: ln(Number of Households) [A][B], ln(Enrolment rate of NHI) [C]

BPG: Breusch-Pagan-Godfrey test (Heteroscedasticity test)

Table 6 shows that the elasticity of income per household was almost the same among three equations and the fitness of type C equation is slightly better than the other equations. Using the quadratic term of the number of households, type C equation explained the effect of the increase in the number of households. We therefore give an economic interpretation on type C equation. The quadratic

[13] The coefficients of correlation between the two variables were less than -0.7 in prefectures with large population (Tokyo -0.72, Osaka -0.75).

[14] We could not obtain the data of all 43 municipalities in Osaka prefecture.

[15] We reject the hypothesis of no heteroscedasticity if the independent variables are jointly significant.

function of the number of households took the minimum value where the natural logarithm of the number of households was 8.455, which locates in the lower 30 percent of the distribution of 288 districts.[16] It suggests that the expansion of insurer's size increases the multiplier of income levies in most of districts.

The series of the multiplier of income levies were inverse proportional to the standard land prices of residential districts. The elasticity of the inverse of the standard land price is less than -7. The estimate indicates that the higher land price tends to greater the multiplier of income levies.

It was found that the size of an insurer and the standard land price of residential districts are major determinants of the multiplier of income levies. In a prefecture where the inequality in the multiplier of income levies is large, what local governments should do? If local governments raise per-household levy in proportion to the size of an insurer and lower the multiplier of income levy, the inequality in the multiplier of income levies will reduce. On the contrary, if local governments aim to reduce the regional differences in contribution rates of the insured, they should introduce the transfer system from the high-income low-risk schemes to the low-income high-risk schemes.

4 Conclusions

This paper investigated whether the regional disparities in medical levies per household made a contribution to income-related geographic inequalities in health care financing. Data of the central two regions of the Japanese National Health Insurance in 2005 were extracted. Their share of municipalities was about 20.5 percent and their share of population was about 41.5 percent in the end of FY2005. Retired employees and self-employed individuals are covered by this insurance system.

We conducted the geographic decomposition using the concentration index. The within-area inequality in medical levies mainly accounted for geographic inequality in medical levies per household. For both regions, the hypothesis that there was no between-area inequality in medical levies was not rejected. We revealed the differences in the within-area inequality in medical levies in the central Kanto. This means such proportionality was not built into the NHI system through near constant contribution rates across the distribution of living standards. It can be considered that the differences in the within-area inequality were caused by the inequality in income per household and the multiplier of income levies.

Because the coefficients of correlation between the multiplier of the asset levies and the multiplier of income levies were negative except Chiba prefecture, we used the data of the standard land price of residential districts in each region. As the results of the estimation by Weighted Least Squares regression, we found that the standard land price of residential districts and the size of an insurer are major determinants of the multiplier of income levies. The higher land price tends to greater the multiplier of income levies. The expansion of insurer's size increases the multiplier of income levies in most of districts. The inequality in the multiplier of income levies will reduce if local governments raise per-household levy in proportion to the size of an insurer and lower the multiplier of income levy.

[16] Exp (ln8.455) =4697. Mean and median of the number of households were 27566 and 11337, respectively.

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