Evaluating Social Security Reforms in Japan
— Analysis of Generational Fiscal Burdens and Benefits Using Cohort Data —

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This paper evaluates lifetime public burdens and benefits of generations in Japan based on cohort data, and the paper also simulates how much social security reforms proposed by the Japanese government would change the generational gap in lifetime public benefits and burdens.

The experimental results clearly show that old generation receives much more public benefits than their public burdens. On the contrary, the results presents that young generations bear more public burdens than their public benefits. It is also revealed that the social security reform would hardly improve the generational gap in lifetime public benefits and burdens.

Keywords: generational account, social security, pension reform

1. Introduction

The population projection in Japan, carried out by the National Institute of Population and Social Security Research (NIPSSR) in January 2002, shows further rapid population aging because of the decline in fertility rates and the increase in life expectancies. The ratio of population above 65 years old reaches as high as 17.3%, while the ratio of population under 15 years old has declined to 14.6%. NIPSSR predicts that the ratio of the elderly (above 65) will be about 30% in 2030.[1]

Such a rapid population aging will certainly make management of public finance more difficult. The decline in labor force means less revenue,

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1 The National Institute of Population and Social Security Research (2002) "Population Projection for Japan: 2001-2050".

while the increase in the elderly indicates much more expenditure in social security. So in order to cope with population aging the Japanese government considers fundamental reforms in social security system, especially pension system. Council on Economic and Fiscal Policy (CEFP) and Ministry of Health, Labor, and Welfare in Japan announce officially their own reform plans and estimate the effects of their reform plans on the government finance. Their reports focused on the future social security contribution, social security expenditure, and fiscal deficit.[2]

It is also important to clear how much the social security reforms will change generational benefits and burdens. Social security reform plans discussed today intends to reduce future social security provision and increase social security contribution up to a certain level.[3] Such a plan will give younger generations less future social security benefit and imposes more burdens. That will certainly make the generational gap much larger.

In fact, however, there is little analysis on the effects of social security reforms on the generational gap. Therefore, this paper estimates lifetime public benefits and contributions of each generation and makes it clear how much social security reforms will change the difference in benefit-burden relationship among generations.

One of the typical ways to analyze generational issues is "generational accounting".[4] It is very useful to investigate the scale of future fiscal deficit. However, this paper makes another model for estimation based on life-cycle theory. Because such a model based on life-cycle theory enables us to deal with past benefits and burdens which "generational accounting" analyses don't consider explicitly. Accordingly, this paper uses a model based on life-cycle model and estimates generational benefits and burdens by using cohort data.[5]

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2 Their reports were distributed in the 12th meeting of CEFP, June 9, 2003.

3 For example, the Ministry of Health, Labor, and Welfare proposed to increase social security contribution rate up to 20% of annual employee' income. The social security contribution rate is 13.58% in 2003.

4 Auerhach, A. J. and L. Kotlikoff (1987), Auerbach, A. J., J. Gokhale, L. Kotlikoff (1991), Fehr, H. and L. Kotlikoff (1995). In Japan, there are some existing researches based on generational accounts such as Aso and Yoshida (1996), Hidata et al (1996), Iwamoto et al. (1996), Cabinet Office (2001).

5 The existing analysis based on cohort data in Japan are Hashimoto et al. (1991), and Homma et al. (1989).

2. Model and Data

This section explains first a model of this paper and then explaines how to estimate generational public burdens and benefits by using cohort data.

2.1 Model

In order to estimate public burdens and benefits of each generation, this paper set a life-cycle model in which a household maximize its own lifetime utility. A representative household of each generation in this model is assumed to begin to work at 23 years old, retires at 60, and dies at 80. It is also assumed that there is no uncertainty of life.

The generation-t household consumes private goods (c) in each year from 23 to 80 years old. The household also derives utility from social security (s) and public goods (g) provided equally by the government except social security. Therefore, lifetime utility of the generation-t household is written as

$$U^t = U^t\left(c_{23}^t, c_{24}^t, \cdots c_{80}^t, s_{23}^t, s_{24}^t, \cdots s_{80}^t \mid \overline{g}_{23}^t, \overline{g}_{24}^t, \cdots \overline{g}_{80}^t\right)$$

(1)

, where $c_{23}^t, c_{24}^t, \cdots, s_{23}^t, s_{24}^t, \cdots, \overline{g}_{23}^t, \overline{g}_{24}^t$ represent consumption, social security, and public good in each age (23-80) of the generation-t household.

The budget constraint for a representative household of generation t is given by

$$(1 - t_{c23})p_{23}c_{23} + \frac{(1 - t_{c24})p_{24}c_{24}}{(1 + (1 - \tau_{r24}))r_{24}} + \cdots + \frac{(1 - t_{c80})p_{80}c_{80}}{\{(1 + (1 - \tau_{r80}))r_{80}\}^{57}}$$

$$= income_{23} - PB_{23} + \frac{income_{24} - PB_{24}}{(1 + (1 - \tau_{r24}))r_{24}} + \cdots + \frac{income_{60} - PB_{60}}{\{(1 + (1 - \tau_{r60}))r_{60}\}^{37}}$$

$$+ \frac{pen_{61}}{\{(1 + (1 - \tau_{r61})r_{61})\}^{38}} + \frac{pen_{62}}{\{(1 + (1 - \tau_{r62})r_{62})\}^{39}} + \cdots + \frac{pen_{80}}{\{(1 + (1 - \tau_{r80})r_{80})\}^{57}}$$

(2)

, where p_i is price of private good, r_i is interest rate, τ_{ri} is tax rate on interest, $income_i$ is annual income, PB_i is pubic burden including income tax, residence tax, and social security contribution (health insurance contribu-

tion and pension premium), and pen_i is pension at i- years old.

On the other hand, since the government spends their budget on producing public goods and distributing social security benefits, the budget constraint of the government is represented by

$$G_j + S_j = REV_j + B_j \qquad (3)$$

, where G_j is the spending for pubic goods except social security, S_j is the amount of social security, REV_j is the revenue from taxes and premiums, and B_j is the government borrowing at year j. The government revenue (REV) consists of revenue from premium for social security contributions (SOCIALREV), personal income tax (PTAX), corporation tax (CTAX), consumption tax (COMPTAX), and other taxes (OTHERTAX). Therefore, REV at year j is written as

$$REV_j = PTAX_j + CTAX_j + COMPTAX_j + OTHERTAX_j + SOCIALREV_j$$
$$(4).$$

The government activities represented by the equation (3) and (4) affect the household behavior described as the equation (1) and (2) through providing public goods and social security as well as by imposing taxes and premiums. The analysis of this paper bases on these equations to estimate lifetime public burdens and benefits of each generation.

2.2 Data

This section explains what kinds of data are used and how to estimate public burdens and benefits by using those data.

(1) Cohort data

The cohort data that the analysis uses is based on "Annual Report on the Family income and expenditure survey" in Japan from 1953 to 2000. The cohort data represents yearly average of income and expenditure per worker's household by age of household head. Especially the data used in the estimation are 'income,' 'consumption expenditure', 'number of household members', and 'social insurance premium' of each household head. That is, this analysis estimates how much a head of each household consumes and pays tax and social security premium in each year throughout

his life considering his family members. This paper focuses on 7 generations: the generation born in 1930, 1940, 1950, 1960, 1970, 1980, and 1990. The life of each generation begins at 23 years old and ends at 80. The data after 2001 is calculated by multiplying the data of 2000 by percentage change of nominal wage or by percentage change of price.

(2) Estimation of public benefits: 1953-2000

This paper regards as "public benefits" administrative service, public investment, and social securities benefits (pension, medical care, and nursing care for the elderly). The general government data in the "National Accounts" is used for representing those "public benefits". 'Final consumption expenditure' of the general government in the "National Accounts" is used for representing administrative service, 'public capital formation' is used for public investment, and 'Social security transfers' is used for social securities benefits.

The sample period is from 1953, when the generation born in 1930 becomes 23 years old, to 2070, when the generation born in 1990 is assumed to die at 80 years old. The available National Account data, however, is from 1953 to 2000. So it is necessary to make the data after 2001 like the cohort data. The summary of the estimation is as follows.

Social Security Benefits

Social security benefits in this analysis consist of public pension, medical care, nursing care for the elderly, and other social security transfers. The benefit of pension is calculated by using the income of each generation derived from the cohort data, because public pension in Japan is paid in proportion to the income of the insured. The pension, especially Employee's Pension Insurance, depends on average annual income during the insured period, the date of birth, and the number of months of insured period. The outline of calculating employee's pension is as follows.

The amount of pension = average estimated income per month
(during the insured period considering the change of wage)
× adjustment rate (depending on the birth date)
× number of months of insured period.   (5)

The average income of the salaried people during this period (1953-2000) is

available by using the annual income of the cohort data. The date of birth of each generation household is assumed to be April 1st, and the adjustment rate is already fixed by the government. The years of the insured period is assumed to be 38 years, from 23 years old to 60 years old, so the number of months of the insured period is 444 months.

The medical care, nursing care for the elderly, and other social security transfers are estimated by calculating per-capita benefit of each service. That is, those transfers are estimated by dividing the total amount of each transfer by the number of people who receive it. The data of medical care has been divided into two groups, general medical care and medical care fore the elderly, since 1982. So the estimation of the per-capita general medical care has been calculated by dividing the amount of general medical care expenditure by the number of people who are younger than 70 years old (equation (6)). The per-capita medical care and nursing care for the elderly are calculated by dividing the total amount of each expenditure by the number of people who are older than 70 years old (equation (7), (8)).

The per-capita transfer of other social security transfers except pension, medical care and elderly dare is calculated by dividing total amount of those transfers by the number of people who are younger than 70 years old (equation (9)).

Per-capita benefit of medical care$_j$ = amount of general medical
care expenditure$_j$/population$_j$ (0-69 years old) (6)

Per-capita benefit of medical care for the elderly$_j$ = amount of
medical care expenditure for elderly$_j$/population$_j$
(older than 70 years old) (7)

Per-capita benefit of nursing care for the elderly$_j$ = amount of
nursing care expenditure for the elderly$_j$/population$_j$
(older than 70 years old) (8)

Per-capita benefit of other social security transfers$_j$ = total
amount of other social security transfers$_j$/population$_j$
(0-69 years old) (9)

, j in the equations above indicates the data at year j. It is also the same in

the equations below.

Public Investment

This paper uses "gross public fixed investment" in the National Account for representing the benefit of public investment.[6] The benefit is calculated by dividing total annual amount of "gross public fixed investment" by total population in Japan at the same time (equation (10)). This calculation assumes that everyone receives the benefit of public investment equally. The gross data is used in the estimation because the depreciation can be considered as repairing expenses that the government pays for.

Per-capita benefit of public investment$_j$
= amount of gross public fixed investment$_j$/total population$_j$ (10)

Final Consumption Expenditure

This paper considers "final consumption expenditure" of the general government as one of the public benefits besides social security and public investment. The "final consumption expenditure" consists of "general public service", "defense", "public order and safety", "economic affairs", "environment protection", "housing and community amenities", "health", "recreation, culture, and region", "education", and "social protection". The per-capita "final consumption expenditure" is used as the benefit of administrative service.[7]

Per-capita benefit of administrative service$_j$
= amount of final consumption expenditure of general
government$_j$/total population$_j$ (11)

(3) Estimation of future public benefits: 2001-2070

In order to estimate future public benefits, it is important to assume economic circumstances; economic growth rate, price index, interest rate, population, and so on. Table 1 presents the assumption in the analysis.

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6   Although it is important to estimate the benefit of social capital (stock) as well as public investment (flow), this paper focuses on the benefit of public investment.

7   In fact, "Education" benefit depends on the number of children and their ages. The cohort data which the analysis bases on, however, tells us nothing about that information. Therefore, "Education" benefit is distributed equally to each household.

Those assumptions are the same as those in the reports of the Ministry of Health, labor, and welfare in Japan, which the estimation of this paper, especially that of the future social security benefits is based on

Table 1 Assumptions for future economic circumstances in Japan

	Until 2007	After 2008
Increase of nominal wage (annual change rate from previous year)	1.0%	2.5%
Increase of consumer price (annual change rate from previous year)	0.0%	1.5%
Interest rate	2.5%	4.0%
Growth of nominal national income (annual change rate from previous year)	1.0%	2.5% (~2010) 2.0% (2011~)
Population	"Population Projection for Japan: 2001-2050" by National Institute of Population and Social Security Research	

As mentioned above, the estimation of the future social security benefits is done so that the estimated benefits are the same as those presented in the reports of Ministry of Health, labor, and welfare in Japan. Those reports are called "The 1999 Actuarial Valuation of the Employees' Pension Insurance and the National Pension", and "Review of the future social security benefits and burdens — Revised October 2000 —", which are the basic reports when the Japanese government decides the budget of social security and reforms the social security systems.[8]

The social security benefits estimated in the analysis consist of pension, general medical care (0~69 years old), medical care for the elderly (older than 70 years old), nursing care for the elderly, and other social security transfers. First, the estimation of future pension is summarized as follows. The way of calculating future pension is the same as the equation (5). But it is necessary to estimate "average estimated income per month" after 2001 with considering the change of wage. So the future "average estimated income per month" is estimated by increasing the average annual income of a head of each generation household in 2000 by annual incorease rate of nominal wage presented in table 1. This estimation is expressed like the

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8   The detailed ways of estimation are not announced officially. Therefore, the estimated benefits are the same as those of the ministry reports although the estimation ways might be different.

equation (12).

> Average estimated income per month since 2001 = the average
> annual income in 2000/12 × (1 + annual increase rate of
> nominal wage)   (12)

Secondly, the future benefit of general medical care, medical care for the elderly, and nursing care for the elderly are estimated as follows.

> Each benefit = per-capita benefit of each care and service in
> 2000 × annual increase rate of per-capita expenditure for each
> care and service.   (13)

The annual increase rate of per-capita expenditure for general medical care is 2.1% and that rate of per-capita medical expenditure for the elderly is 3.2%. And the annual increase rate of nursing care for the elderly is 2% from 2000 to 2025, and that will be 1% after 2026. Those rates are the same ones in the "Review of the future social security benefits and burdens — Revised October 2000 —" presented by Ministry of health, labor, and welfare in Japan.

Thirdly, the future benefits of other social security transfers, public investment, and administrative service are estimated by increasing per-capita benefit of each transfer and service in 2000 by the annual increase rate of price presented in table 1.

(4) Estimation of public burden

This paper focuses on the public burden which a household really bears. Therefore, the estimated public burdens in the analysis are income tax, residence tax (both in prefectures and in municipals), consumption tax, tax on the income from interest, and social security premium. This section explains how to calculate those burdens.

Income tax and residence tax burden

In order to calculate tax burdens, it is necessary to know annual income of each generation household and the number of persons in each household. Such information helps us calculating taxable income and income deductions that depend on persons in a household. This analysis uses

income data and household data given by cohort data, which is based on "National Survey of Family Income and Expenditure" in Japan.

The outline of calculating income tax is as expressed in the equation (14) — (16). First, we calculate adjusted income by reducing estimated cost for earnings of each household (equation (14)). The estimated cost can be calculated as a statutory income deduction for salaried income in Japan like the adjustments in the USA which are subtracted from income to arrive at adjusted gross income. Next, we calculate taxable income by subtracting the following statutory deduction items from the adjusted income (equation (15)). The deduction items are 'basic deduction', 'exemption for spouse', 'special exemption for spouse', 'exemption for dependents', 'deduction for social security premium', and so on. They depend on members of a taxpayer's family. Finally, we calculate income tax and residence tax based on taxable income and tax rates (equation (16)).

$$\text{Adjusted income} = \text{gross income} - \text{estimated cost} \tag{14}$$

$$\text{Taxable income} = \text{adjusted income} - \text{total of deduction items} \tag{15}$$
$$\text{(basic deduction, exemption for spouse etc.)}$$

$$\text{Tax burden} = \text{tax rate} \times \text{taxable income} \tag{16}$$

Consumption tax burden and tax on income form interest

Basically we calculate consumption tax burden by using consumption expenditure of a household and consumption tax rate. In order to calculate this tax burden, it is necessary to have consumption expenditure data. We use the expenditure data in the cohort for the past consumption (1953-2000). But the future consumption is estimated by simulating the model of maximizing a lifetime utility subjected to a lifetime income constraint.

By subtracting estimated annual consumption from annual income, we can obtain how much each generation household saves in a year. That tells us the amount of accumulated savings of each household. So we calculate tax on income from interest of the savings.

Social security premium

We calculate social security premium by using the simplified method of calculation presented by Ministry of Finance in Japan because there are no

available data on social security premium in cohort data. The simplified method of calculating social security premium is as shown in the table 2.

Table 2 Simplified social security contribution based on income

Income	Social security contribution
Less than 9 million yen	10% of income
More than 9 million yen And less than 15 million yen	4% of income + 540 thousand yen
More than 15 million yen	1.14 million yen

Estimation of future public burdens: 2001-2070

The basic calculation method of future public burden is the same as explained above. In order to calculate future income tax and residence tax, we need to have future income data. So we estimate the future income by increasing the average annual income of a head of each generation household in 2000 by the annual increase rate of nominal wage in table 1.

3. Empirical Results

This section presents the results of analyzing the effects of social security reforms on generational public benefits and burdens in Japan. The generations that the analysis focuses on are seven generations, that is, generation born in 1930, 1940, 1950, 1960, 1970, 1980, and in 1990. In order to compare the public benefits and burdens among generations, this paper calculates sum of the annual public benefits and burdens that each generation receives and bears during his life, and estimates them at constant price in 2000.

One of the objectives of this analysis is to reveal the effects of social security reform on generational public benefits and burdens. Therefore, this paper considers three cases about social security reforms. The cases are (1) status quo (no reforms), (2) pension reform, and (3) medical care reform in addition to the pension reform (2). The pension reform considered in the analysis is to increase gradually social security contribution rate (13.58% in Employee's Pension Insurance system in 2003) up to 20% of average income and to keep it. If total amount of contributions fails to cover expenditure, per-capita pension benefit will be reduced so that total expenditure

should be the same as total contributions. This is one of the reform plans that the Ministry of Health, Labor, and Welfare in Japan has proposed.

The medical care reform in the case (3) is to control medical expenditure after 2004 so that annual increase rate in medical expenditure will be the same as increase rate in nominal wage. The medical care expenditure has increased more rapidly than the nominal wage. So this reform means to curb medical care expenses. The results of those cases are explained below respectively.

Case 1: status quo (no reforms)

Figure 1 presents the result in case 1, where no social security reforms are done. Table 3 summarizes the numerical results of the case. They show details of the public benefits of each generation in order to make clear the presence of social security benefits.

Figure 1 Lifetime Public Benefits and Burdens in case 1 (Status quo)
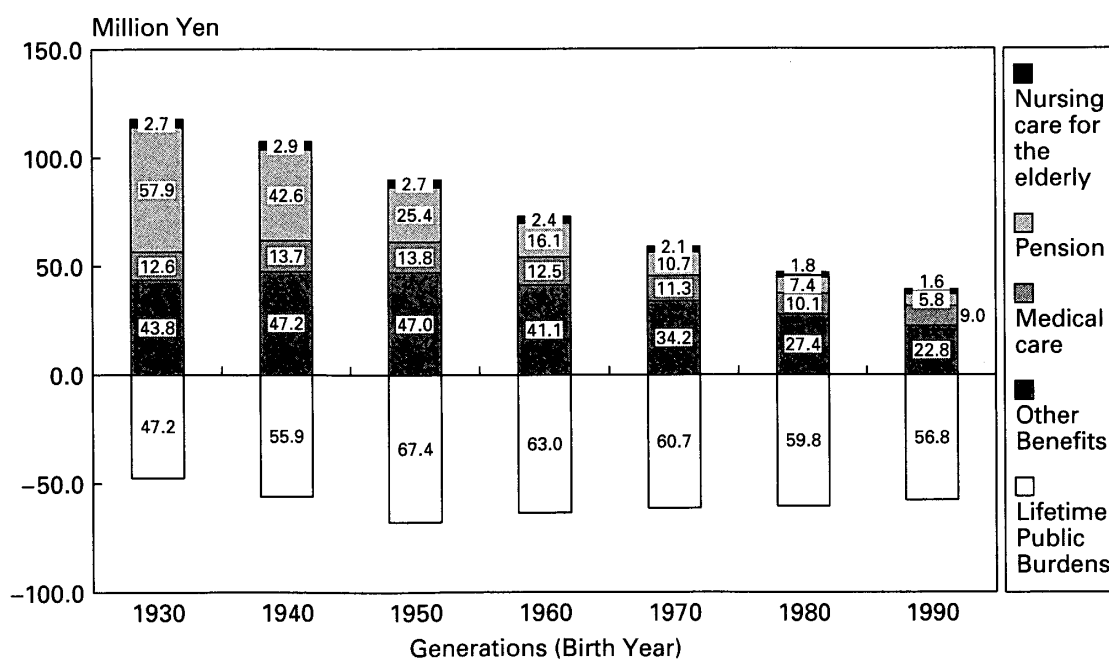
Table 3 Lifetime Public Benefit-Burden Relationship in case 1 (Status quo)

Million Yen

	1930	1940	1950	1960	1970	1980	1990
Lifetime Total Public Benefits	116.9	106.4	88.9	72.2	58.2	46.7	39.1
Medical Care	12.6	13.7	13.8	12.5	11.3	10.1	9.0
Pension	57.9	42.6	25.4	16.1	10.7	7.4	5.8
Nursing care for the elderly	2.7	2.9	2.7	2.4	2.1	1.8	1.6
Others	43.8	47.2	47.0	41.1	34.2	27.4	22.8
Lifetime Total Public Burdens	47.2	55.9	67.4	63.0	60.7	59.8	56.8
Benefits-Burdens	69.7	50.5	21.5	9.2	-2.5	-13.1	-17.7
Benefit/Burden Ratio	2.47	1.90	1.32	1.15	0.96	0.78	0.69

Constant Price in 2000

The figure 1 and table 3 clearly show that there is a great difference of lifetime public benefits among generations. The lifetime total benefits become smaller as the generations become younger. Especially the benefits of pension for younger generations are extremely reduced. The lifetime total benefit of the generation born in 1930 is estimated as 116.9 million yen and his benefit of pension is estimated as 57.8 million yen while the lifetime total benefit of the generation born in 1990 is estimated as 38.6 million yen and his benefit of pension is estimated as 5.3 million yen. It is about one tenth of the pension benefit of the generation in 1930.

On the other hand, lifetime total public burden on the generation born in 1950 is the largest one, and it becomes a little smaller as the generations become younger. In Japan, from 1974 to 1986 when the economy recovered and had been overheating, income taxation had been the same as before. So the nominal income tax burden had been growing up as income has been rising. Such increase in income tax burden may affect the lifetime public burden of the generation born in 1950.

In order to compare the balance of lifetime public benefit and burden among generations, we calculate benefit-burden ratios (= lifetime total public benefits/lifetime total burdens). The results are presented as "Benefit/ Burden Ratio" at bottom row in Table 3. If this ratio of a generation is larger than 1, it means that the generation is net benefit recipient. On the contrary, if the ratio of a generation is smaller than 1, it indicates that the generation is net contributor.

Table 3 shows that "Benefit/Burden Ratio" of the generations born in 1930, 1940, 1950, 1960 are more than 1, and the others' "Benefit/Burden

Ratio" (generation born in 1970, 1980, 1990) are less than 1. Moreover, "Benefit/Burden Ratio" becomes smaller as generations are younger. For example, the "Benefit/Burden Ratio" of generation born in 1930 is 2.47, while that of generation born in 1960 is 1.13 and that of generation born in 1990 falls to 0.65. That makes it clear there is extremely great difference of pubic benefit-burden relationship among generations in Japan. The older generations receive too much benefit comparing to their public burdens, and the younger generations receive it too little. The balance of components of public benefit tells us that the difference of pension benefit should be one of the reasons that such a great difference among generations occurs.

Case 2: Pension Reform

The pension reform in the estimation is to keep contribution rate less than equal 20% of average income and to control total expenditure for pension benefits less than the total amount of contributions. That reform will reduce not only contribution but also pension benefits.

Table 4 Lifetime Public Benefit-Burden Relationship in case 2 (Pension Reform)

Million Yen

	1930	1940	1950	1960	1970	1980	1990
Lifetime Total Public Benefits	116.9	106.4	88.3	71.0	57.6	45.7	38.7
Medical Care	12.6	13.7	13.8	12.5	11.3	10.1	9.0
Pension	57.9	42.6	24.8	14.9	10.0	6.8	5.3
Nursing care for the elderly	2.7	2.9	2.7	2.4	2.1	1.8	1.6
Others	43.8	47.2	47.0	41.1	34.2	27.4	22.8
Lifetime Total Public Burdens	47.2	55.9	67.5	63.0	60.5	59.3	56.1
Benefits-Burdens	69.7	50.5	20.8	8.0	-2.9	-13.7	-17.4
Benefit/Burden Ratio	2.47	1.90	1.31	1.13	0.95	0.77	0.69

Constant Price in 2000

Table 4 shows the results of the pension reform. The pension benefits become less except those the generations born in 1930 and 1940 receive. This is because the pension reform in this analysis will become effective after 2024 and the generations born in 1930 and in 1940 are assumed in the model to die in 2010 and in 2020. So those old generations will not be affected by the pension reform.

Although the reform in case 2 reduces lifetime total benefits and bur-

dens of generations born in 1950, 1960, 1970, 1980, and 1990, it scarcely changes the difference in "Benefit/Burden Ratio" among generations. For example, "Benefit/Burden Ratio" of generation born in 1960 is 1.13 in case 2. That is smaller than in the case 1 by only 0.02 point. The results also show that "Benefit/Burden Ratio" of generation born in 1970, 1980, and in 1990 become a little smaller and those generations remain to net contributors.

Case 3: Pension and medical care expenditure reform

The results in case 2 indicate that the pension reform that Ministry of Health, Labor and welfare in Japan plans to carry out would be hardly effective in improving the difference in balance of public benefit and burden among generations. So, this paper considers further social security reforms such as reduction in medical care expenditure. As explained before, the medical care reform in case 3 is to keep the increase in medical expenditure to be the same as the increase in nominal wage. The annual increase rate of per-capita expenditure for medical care is assumed to be 2.1% and the rate of per-capita medical expenditure for the elderly is assumed to be 3.2%. Therefore the reform will reduce medical expenditure for the elderly while it will increase a little medical expenditure for the younger generation. The estimation result indicates that medical expenditure for the elderly will be largely reduced, so total expenditure for medical care will be reduced. Moreover, in case 3, the reduction in medical expenditure is used for tax reduction, which carry out lump-sum tax cut for each person.

Table 5 Lifetime Public Benefit-Burden Relationship in case 3
(Pension and Medical Care Reform)

Million Yen

	1930	1940	1950	1960	1970	1980	1990
Lifetime Total Public Benefits	116.6	105.5	87.0	69.4	55.8	43.9	36.6
Medical Care	12.3	12.7	12.5	10.9	9.5	8.2	6.9
Pension	57.9	42.6	24.8	14.9	10.0	6.8	5.3
Nursing care for the elderly	2.7	2.9	2.7	2.4	2.1	1.8	1.6
Others	43.8	47.2	47.0	41.1	34.2	27.4	22.8
Lifetime Total Public Burdens	47.2	55.7	66.9	62.0	58.8	55.3	51.4
Benefits-Burdens	69.4	49.8	20.1	7.5	-3.0	-11.5	-14.8
Benefit/Burden Ratio	2.47	1.89	1.30	1.12	0.95	0.79	0.71

Constant Price in 2000

Table 5 shows the results in case 3. It tells us that lifetime public benefits of older generations such as born in 1930 and in 1940 become smaller than the other cases as well as those of the younger generations. Therefore, "Benefit/Burden Ratio" of older generations becomes smaller, and that of younger generations becomes larger. For example, "Benefit/Burden Ratio" of the generation born in 1940 is 1.89 while in the other two cases that is 1.90, reduced by 0.01 point. On the other hand, "Benefit/Burden Ratio" of the generation born in 1990 is 0.71 in case 3 while that is 0.69 in the other two cases, increased by 0.02 point. However, It is also clear that the difference of lifetime public benefits-burden relationship among generations will not be dramatically improved even in case 3.

4. Concluding Remarks

This paper estimates generational public benefits and burdens based on cohort data and reveals how much social security reforms proposed by Ministry of Health, Labor, and Welfare in Japan will improve the differences of public benefits and burdens among generations. One of the characteristics of the analysis is to estimate not based on generational accounts but based on life-cycle theory on household behavior.

There are three findings that the analysis makes clear. First, there is a great difference in lifetime public benefit-burden relationship expressed as "Benefit/Burden Ratio" among generations. "Benefit/Burden Ratio" of generation born in 1930 is 2.47, which indicates this generation receives public benefits much more than his public burdens, while "Benefit/Burden Ratio" of generation born in 1990 is only 0.65, which means this generation receives public benefits less than his own public burden.

Second, the estimation results such as Figure 1 show that difference in benefits of pension among generations plays an important role in generational gap of "Benefit/Burden Ratio". It is because social security in Japan has been provided mainly to the elderly.

One of the ways to improve such generational gap is to reform social security system. Today in Japan, the government like Ministry of Health, Labor, and Welfare (MHLW), and Council on Economic and Fiscal Policy (CEFP), eagerly discusses what should be done as social security reforms. This paper focuses on the pension reform plan that MHLW considers and estimates how much the generational gap could be improved by the plan.

In addition to that plan, this paper considers the effect of reduction in medical expenditure.

Finally, it is clear that two social security reform plans considered in the estimation have little effect on improvement of generational gap in public benefits and burdens. If households decide lifetime consumption subjected to lifetime income after tax like life-cycle theory says, heavy public burden in the future may have negative effects on future generation's consumption. That would affect the economic growth in the long run. So it is important to improve the generational gap more. It should be required not only much more fundamental reform on social security but also other public finance reform, such as reduction in other expenditure, tax reform and so on.

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