The impact of social security on intragenerational income distribution in Japan

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Abstract

We examine how social security affects income distribution within the same generation in Japan. We first assess the impact of current pension programs on annual income distribution among the elderly, and then estimate the potential impact of post-2004 Reform pension programs on lifetime income distribution. We show that social security substantially reduces inequality among the elderly on an annual income basis, but that it is mostly due to an income transfer from the young rather than redistribution within the elderly. We also confirm that the potential distributive impact of post-2004 Reform pension programs on lifetime income is quite limited, compared to that implied by the analysis on an annual income basis. Moreover, we estimate the distributive impact of alternative pension reforms with a bend-point system or claw-back system, both of which have been applied in other advanced countries.

Key words: social security, income redistribution, lifetime income

JEL classification: D31, D63

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1. Introduction

This paper investigates the extent to which social security programs affect income distribution within the same generation in Japan. It is often argued that a PAYG social security system reduces the net lifetime incomes of younger and future generations under population aging, because it entails substantial income transfers to older generations. In fact, there have been many attempts to address empirically the issues of intergenerational redistribution and inequality, based on the framework of generational accounting and overlapping-generations models. The consensus view in Japan seems to be that the current public pension scheme, even after the 2004 Reform, which was the latest public pension reform, maintains a significant inequality between current and future generations (see Suzuki, 2006, and Sato and Uemura, 2007 as recent examples).

It should be noted, however, that social security also affects income distribution within the same generation (see OECD, 2005). To be sure, social security benefits help to reduce income inequality among the elderly in Japan, because they have a flat component, which is called the Basic Pension benefit, and because they raise the average level of disposable income among the elderly. Yet, there are wide gaps among social security benefits. In fact, the beneficiaries of National Pension Insurance (NPI) receive only the Basic Pension benefit, whereas Employees' Pension Insurance (EPI) and Mutual Aid (MA) beneficiaries receive both the Basic Pension benefit and wage-proportional benefits (see **Appendix** for a brief overview of public pension programs in Japan). In addition, among EPI and MA beneficiaries, wage inequality at a young age will be largely carried over to post-retirement inequality via the wage-proportional benefit. Indeed, cross-sectional analyses by Yamada and Casey (2002) and Förster and Mira d'Ercole (2005) highlight uneven income distribution and high poverty rates among the elderly in

Japan.

Under population aging, income inequality among the elderly will determine income inequality in the overall society more directly than in the past. Indeed, there is a well-established view in Japan that the widening income inequality is exaggerated by the impact of population aging (see Ohtake, 2005), as income inequality tends to be wider among the elderly than among the young. It does not, however, mean that we do not need to worry about the recent upward trend in income inequality. The risk is that income inequality among the elderly will further dominate income distribution in society as a whole. In this regard, the distributive impact of social security benefits, which are a key determinant of income distribution among the elderly, needs to be scrutinized.

In addition, income inequality should be examined not only on an *annual* income basis but also on a *lifetime* income basis. The extent of income redistribution caused by social security programs tends to be overemphasized on an annual income basis. It is easy to understand this intuitively. Premiums paid during the working period and benefits received after retirement tend to significantly reduce inequality in annual income, because they reduce the gap in disposable income between the young and the elderly. However, these effects are likely to mostly cancel each other out over a lifetime, because every person experiences both the young and old ages in life. Indeed, Coronado, Fullerton, and Glass (2000) empirically show that the distributive impact of the US social security system is much smaller on a lifetime income basis than on an annual income basis. Also, Nelissen (1998) finds substantial differences between annual incidence and lifetime incidence for social security in the Netherlands.

In this paper, we address two empirical issues to assess the extent to which social security programs affect income distribution within the same generation in Japan. The first issue is how the current social security scheme as a whole affects income distribution

among the elderly on an annual income basis. Based on individual (rather than household) income data, we explicitly separate the impact of income transfer from the young from that of income redistribution among the elderly. This analysis is expected to give some hints about the distributive impacts of the current social security scheme within the same generation. We use micro-data from the "Survey on Income Redistribution" (SIR), which is released by the Ministry of Health, Labour and Welfare (MHLW) in Japan.

The second issue is how the EPI program after the 2004 Pension Reform will potentially affect income distribution on a lifetime income basis. Longitudinal information about wages, tax payments, and social security contributions/benefits are rarely available from official statistics in Japan. Hence, it has been almost impossible to directly discuss income distribution on lifetime income. To address this issue, we focus on pension benefit data from the "Annual Report of the Social Insurance Agency," and roughly assess the distributive impact of the EPI program after the 2004 Pension Reform. To our knowledge, this is the first attempt in Japan to analyze lifetime income distribution based on published data that are directly linked to actual lifetime income. We also estimate the distributive impact of alternative pension reforms with a bend-point system or claw-back system, which has been applied in other advanced countries.

The remainder of this paper is constructed as follows. **Section 2** is allocated to the first empirical analysis, which examines the distributive impact of the current social security scheme as a whole on an annual basis. **Section 3** is allocated to the second empirical analysis, which examines the potential redistribution of the EPI program after the 2004 Reform on a lifetime income basis. **Section 4** estimates the potential impact of alternative pension reforms. **Section 5** summarizes the estimation results, discusses their policy implications, and presents future research topics.

2. Empirical analysis on an annual income basis

2.1 Data

This section examines how current social security programs affect income distribution on an annual income basis. Our empirical analysis is based on micro-data from the SIR, which is conducted by the MHLW every three years. Unlike other household surveys, this survey primarily aims at measuring income distribution and effects of redistribution policies. The SIR is one of the most appropriate household surveys for analyzing income distribution given its wide coverage and the reliability of reported income. We use micro-data from the SIRs in 1992 and 2001 to check whether or not social security caused any change in the pattern of income redistribution during the 1990s.

Our analysis is based on individual (rather than household) income data. Most previous studies use household data, and they often adjust household size by dividing household income by the root of the number of household members. This method is reasonable and well-established, but any household size adjustment is arbitrary. Also, categorizing households by age of household heads fails to grasp the true structures of income distribution by age group and of income transfer across age groups. Of course, discussions based on individual data are not free from another bias; for example, they tend to ignore intra-family income transfer between husband and wife and/or between parents and children who reside together. Hence, it is reasonable to check whether estimated results based on individual data are consistent with those reported in preceding studies based on household data.

Our main focus is on three income variables: (1) pre-SS pre-tax income; (2) post-SS pre-tax income, which reflects social security (premium contributions and benefit receipts) but not tax payments; and, (3) post-SS post-tax income, which reflects both

social security and tax payments. Among these definitions, pre-SS pre-tax income is the sum of gross wages and salaries, self-employed income, farm income, dividends, interest, rents, and private transfer receipts.

In our analysis based on SIR data social security means only public pension programs, and does not include medical and nursing care, employment insurance, and other social policy programs. Tax includes state/local income, property, and automobile tax, but not consumption tax. Our main comparisons are between pre-SS pre-tax income and post-SS pre-tax income, but we also look at post-SS post-tax income to examine the distributive impact of taxation for comparisons.

The original sample sizes in the SIR were 27,622 individuals for 1992 and 21,494 individuals for 2001. We exclude individuals younger than nineteen years old and those with zero or negative post-SS post-tax income. Then, the sample size is reduced to 20,576 for 1992 and 15,971 for 2001. We divide all individuals into two age groups: the young, who are aged between twenty and fifty-nine and the elderly, who are aged sixty or above. The threshold age, sixty, is the initial eligibility age for (partial) EPI benefits and the most common age of mandatory retirement in Japanese firms. In addition, a substantial number of NPI members start to receive pension benefits as early as at age sixty, even if the level of benefits is actuarially reduced.

In the empirical analysis, we additionally conduct the following two adjustments on data. First, we annuitize retirement lump-sum allowances, and include their annuatized values as countable income. We calculate the annuitized value of allowances based on the yield rate of the public pension fund, which can be implicitly calculated from the MHLW's statistics, as the annuity rate. Second, we bottom-code income at one percent of mean income in every survey year for all incomes. Even after excluding individuals with non-positive post-SS post-tax income, we have many individuals of zero pre-SS pre-tax

income. We need this bottom-coding because we cannot calculate some inequality measures that use logarithms if there is an individual with zero income.

2.2 Redistribution by social security

First, we overview the trend of income inequality during the period: 1992~2001. We look at four inequality measures: (1) Gini coefficient; (2) mean logarithmic variation (MLD), which is defined as the mean of the logarithm of the ratio of average income to each individual's income; (3) logarithmic variance (LV), which is defined as the variance of logarithm of income; and, (4) squared coefficient of variation (SCV), which is a squared ratio of the standard deviation to average income.

Table 1 reports these four inequality measures for each of pre-SS pre-tax, post-SS pre-tax, and post-SS post-tax income in two years surveyed. Regarding the Gini coefficient, we additionally calculate the effective progression (EP) measure of Musgrave and Thin (1948), also used by Coronado *et al.* (2000) and others: $EP=(1-Gini_1)/(1-Gini_0)$, where $Gini_0$ and $Gini_1$ are pre-SS pre-tax and post-SS pre- (or post–) tax Gini coefficients, respectively. A value of one indicates that $Gini_0$ and $Gini_1$ are the same, and that social security has no impact on income distribution. A value greater than one indicates the progressivity of the system, while a value less than one indicates the regressivity of the system.

Three facts should be noted. First, we confirm that for society as a whole, social security significantly reduces income inequality—for example, 15.0 percent for the Gini coefficient to 39.0 percent for MLD in 2001—even though its magnitude differs by the inequality measure and they cannot be compared with each other. We also recognize that the distributive impact of social security was much larger than that of taxation, judging from the changes in the values of inequality measures caused by additional redistribution

by taxation.

Second, income redistribution was concentrated on the elderly rather than on the young. For all inequality measures, the elderly experienced a substantial reduction in income inequality: 35.6 percent for Gini to 75.9 percent for SCV in terms of post-SS pre-tax income in 2001. For the young in contrast, the distributive impact was quite limited, and even a rise in inequality was observed in the case of SCV in terms of post-SS pre-tax income in both 1992 and 2001, which was probably due to a reduction in the mean of post-SS pre-tax income. These patterns are underlined by the value of EP, which is above two and indicates strong progressivity for the elderly, whereas it is slightly above one and suggests limited progressivity for the young in both years surveyed.

Third, we find that a rise in overall inequality in post-SS income was quite limited compared to pre-SS pre-tax income over the period from 1992 to 2001. More interestingly, post-SS income became more evenly distributed among the elderly between the two survey years, judging from a reduction in the inequality measures and a rise in EP. These facts suggest that social security succeeded in preventing income inequality from increasing over the period.

However, we should be cautious when interpreting these results. On a lifetime income basis, the distributive impact of social security might be limited, especially if it depends much on income transfer from the young to the elderly, and premium contributions and benefit receipts are mostly offset during a lifetime. Unfortunately, we cannot estimate lifetime income because no longitudinal information is available from the SIR. To address this issue, we first attempt to decompose the distributive impact of social security into the effect of income transfer from the young to the elderly and the effect of income redistribution within each group.

2.3 Decomposing redistribution effects

We decompose the distributive impact of social security in this sub-section. We focus on MLD, with which it is easy to decompose redistribution effects. MLD is defined as

$$MLD = \frac{1}{n}\sum_i \ln\left(\frac{\bar{y}}{y_i}\right) = \ln \bar{y} - \frac{1}{n}\sum_i \ln y_i,$$

where y_i, $\bar{y}$, n are each individual's income, average income, and number of individuals, respectively. The conventional way of decomposing the effects of redistribution policies was originally established by Mookherjee and Shorrocks (1982). When individuals are divided into m groups, the well-established way of decomposing the effects of redistribution policies—which is expressed as a change in MLD from pre-SS to post-SS income—is to take

$$\Delta MLD = \sum_{g=1}^{m} \alpha_g \left(MLD_g^* - MLD_g\right) + \sum_{g=1}^{m} \alpha_g \left[\ln\left(\frac{\bar{y}^*}{y_g^*}\right) - \ln\left(\frac{\bar{y}}{y_g}\right)\right],$$

in which we compare MLD and other variables between pre-SS and post-SS in each group (α_g is a share of the g-th group). The first term of the right-hand side refers to the within-age effect (income redistribution within each age group), and the second term refers to the between-age effect (income transfers between age groups).

This decomposition, however, could be misleading because the within-age effect is affected by income transfers between age groups. For the elderly, net income transfer from the young tends to raise their mean income, causing a reduction in within-age inequality, even without any within-age income redistribution among the elderly. For the young, on the contrary, net income transfer reduces their mean income, and increases their within-age inequality. In this sense, the decomposition mentioned tends to overestimate the within-age effect for the elderly, and to underestimate it for the young.

To avoid this bias, we divide the overall within-age effect into two components: the

component that is caused by between-age income transfer, and the *pure* within-age effect that is caused solely by income redistribution within the age group. The first component is calculated for the g-th age group as

$$\frac{1}{n_g}\sum_{i\in g}\ln\left(\frac{\bar{y}_g^{*}}{y_i+\bar{y}_g^{*}-\bar{y}_g}\right)-\frac{1}{n_g}\sum_{i\in g}\ln\left(\frac{\bar{y}_g}{y_i}\right),$$

which grasps the change in within-age inequality, assuming that each household receives the difference between the mean of disposable income ($\bar{y}_g^{*}$) and the mean of initial income ($\bar{y}_g$) for this age group. This component would probably be negative (positive), and indicate that income transfer reduces (raises) income inequality among the elderly (young).

The pure within-age effect is obtained by subtracting this component from the conventional, overall within-age effect, assuming that the government redistributes the sum of initial income and net income transfer receipts within the age group. Also, we define the sum of the within-age effect caused by between-age income transfer and the conventionally defined between-age effect as the total between-age effect.

We apply this methodology of decomposition to our dataset in both 1992 and 2001. The estimation results are summarized in Table 2. In 2001, MLD for society as a whole was reduced from 2.289 for pre-SS pre-tax income to 1.395 for post-SS pre-tax income, meaning that social security dampens MLD by 0.893 (39 percent). This redistribution effect is decomposed into 0.782 as the (conventionally defined) within-age effect and 0.112 as the between-age effect, which suggests that the within-age effect dominated the overall redistribution.

By decomposing this within-age effect into the within-age effect caused by between-age income transfer and the pure within-age effect, however, we find that the former reduced MLD by 1.189, whereas the latter raised MLD by 0.408 in 2001. This

means that income redistribution within each age group, excluding the effect of income transfer between age groups, was regressive rather than progressive. This structure mainly reflects the wage-proportional benefit, as well as the gap between NPI and EPI benefits.

The regressive feature of the pure within-age effect is not revealed by the conventional methodology of decomposing the impact of redistribution policies. Indeed, the total between-age effect reduced overall income inequality by 1.301, more than offsetting the regressive pure within-age effect. Moreover, this structure of offsetting effects became clearer in 2001 than in 1992; both the progressivity and the regressivity of social security increased, reflecting the increasing maturity of public pension programs, that is, increasing pension beneficiaries and benefit receipts.

The bottom part of Table 2 also reports the distributive impact of a combination of social security and tax. We confirm that income redistribution due to tax reduced somewhat the regressive impact of social security on within-age income distribution. However, the progressivity of tax failed to offset the regressivity of social security.

The within-age distributive impact of social security can also be assessed by age group, as shown in Table 3 for each survey year. The following three facts observed in this table are noteworthy. First, we confirm that income redistribution among the elderly, the magnitude of which was much greater than that for the young, was entirely due to income transfer from the young. Pure within-age income distribution increased income inequality somewhat, but its regressive impact was more than offset by the progressive impact of income transfer from the young.

Second, within-age income redistribution among the young was quite limited. Also, income transfer to the elderly increased inequality among them, presumably because it reduced the average level of post-SS income. In contrast, pure within-age redistribution added to inequality somewhat. This fact is not consistent with the regressive structure of

social security contributions due to the flat-rate NPI premium. The main reason seems to be that non-working spouses of employed workers, who earn virtually no wage income, are not required to pay any premium, preventing the overall social security system from being regressive.

Third, tax did not substantially change this age pattern of income redistribution. To be sure, tax reduced the regressive within-age redistribution for the elderly, and added to the progressive within-age redistribution for the young, reflecting its progressive structure. In contrast, tax reduced progressive redistribution due to between-age income transfer for the elderly, and added to regressive redistribution due to it for the young, because tax reduced mean income for both the elderly and the young. These impacts were, however, so limited that social security dominated the overall picture of income redistribution.

Altogether, we confirm that income redistribution on an annual income basis is concentrated on the elderly, and that it is mostly due to income transfer from the young. More importantly, the fact that income redistribution among the elderly is regressive if the impact of income transfer is excluded points to the risk that redistribution within the same generation on a lifetime income basis is not very progressive.

3. Empirical analysis on a lifetime income basis

3.1 Data

Discussions in the previous section strongly suggest that we need to empirically examine the extent to which social security redistributes lifetime income. Unfortunately, the SIR and other household surveys do not provide any longitudinal information about wage income, premium contributions, and tax payments. Indirect ways of assessing lifetime income distribution include examining inequality of consumption, on the assumption that

individuals maximize lifetime utility (see Ohtake and Saito, 1998), and extracting cohort effects from the repeated cross-sectional data (see Oshio, 2006).

To our knowledge, the only way of directly estimating lifetime income in Japan is to use information about public pension benefits published in the "Annual Report of the Social Insurance Agency." This Annual Report, which covers all EPI and NPI (but not MA) beneficiaries and contributors in Japan, shows the distribution of initially claimed EPI benefits in each year. It is thus reasonable to use such information about these benefits obtained from the Annual Report for estimating lifetime income backward[1].

Here, it is useful to overview the structure of the EPI benefit (see **Appendix**). It consists of a wage-proportional component and a flat-rate component (Basic Pension benefit). The eligibility age for both these benefits used to be sixty. However, the 2000 Reform called for a rise in the eligible age for the flat-rate component by one year from sixty every three years from 2001 for male beneficiaries. Hence, since 2001, most of the benefits initially claimed by male beneficiaries aged sixty, reported in the Annual Report, can be reasonably considered to have only been the earnings-proportional component. The level of this component is based on lifetime income, which is calculated by multiplying the Carrier Average of Monthly Income (CAMI: *heikin-hyojun-hoshu-getsugaku*) by the number of months of coverage. The CAMI is calculated based on a worker's entire period of coverage, and is indexed to nationwide wage growth, unlike the Average Indexed Monthly Earnings (AIME) in the United States, in which only the thirty-five highest-earnings years are indexed. In addition, monthly earnings are standardized, in that they are categorized into thirty brackets (most of which have a width of 10,000 yen), with lower and upper limits.

[1] In the United States, some studies have used actual social security records to examine issues of redistribution (see Burkhauser and Warlick, 1981 and Liebman, 2002 for example).

Therefore, it is a straightforward task to estimate lifetime income backward, based on the data released on the newly claimed benefits. More specifically, lifetime income is estimated by dividing the initially claimed benefit by the benefit multiplier, which is applied to the cohort aged sixty years old in the survey year. In addition, we know that most male EPI beneficiaries initially claim the benefit at the age sixty as mentioned later. Hence, we can estimate lifetime income distribution within almost the same cohort.

However, this methodology has the following four limitations, which require us to be cautious when interpreting the estimation results. First, we cannot get any information about lifetime income for female EPI beneficiaries from the Annual Report. The 2000 Reform called for a rise in the eligibility age for the wage-proportional component for females starting from 2006, five years later than in the case of males. Hence, until the 2006 data are released, we cannot decompose the initially claimed EPI benefits for female beneficiaries into wage-proportional and flat-rate components[2], meaning that we cannot estimate their lifetime income.

Second, the lifetime income estimated from the Annual Report covers only the standardized monthly income (*hyojun-hoshu-getsugaku*)—on which calculations of EPI contributions and benefits are based—obtained only during the period of EPI coverage. Some beneficiaries receive only a small amount of EPI benefits, reflecting a short period of EPI coverage, which is mostly due to a move from or to self-employment or employment in the public sector[3]. Moreover, the standardized wage income has a cap, which has been raised to 620,000 yen per month (from 590,000 yen) as of December, 2000. Thus, employees who earn more than this cap pay just the premium that

[2] The flat-rate benefit is based on the number of months of contributions, which is not available in the Annual Report.

[3] Of course, some may experience a transition to/from unemployment or an exit from or reentry to the labor market, but the latter case seems to be less common than in the case of females.

corresponds to this cap[4], and their benefits are calculated corresponding to the cap. This means that we are most likely to underestimate lifetime income for higher-income individuals (whose reported benefits are also relatively high), as we depend solely on reported information about EPI benefits.

Third, we cannot get any information from the Annual Report about bonus payments and retirement allowances, both of which account for a large portion of wage income, and vary substantially from individual to individual[5]. Hence, the estimated average of lifetime income inequality based on the Annual Report is likely to be somewhat lower than the actual one, whereas the redistributive impact of social security is also likely to be overestimated. The base for our assessment of the distributive impact of the EPI programs is limited to standardized monthly income, on which calculations of EPI contributions and benefits are based.

Fourth, the Annual Report does not provide any longitudinal information about wage profiles and premium payments by employees and employers. This makes it impossible to assess income redistribution under current and previous social security programs, because the premium rate has been changed often.

These four limitations allow us only to estimate the potential distributive impact of some alternative social security polices on lifetime income among male EPI members.

[4] According to the "Wage Census" of the MHLW, male employees who earned more than 600,000 yen per month (excluding overtime wages and bonus payments) accounted for about 6.4 percent of total male employees who were employed by firms with more than ten employees in 2005.

[5] According to the "Wage Census," the average bonus payment was 1,082,200 yen, which covers 19.5 percent of the annual income, for males who were employed by firms with more than ten employees in 2006, and the range was quite wide: 561,900 yen for firms with 10-99 employees to 1,722,600 yen for firms with 1,000 or more employees. According to the Survey by the National Personnel Authority, the average retirement allowance (both lump-sum and annuity) was 22.1 million yen for employees who had been working for thirty years for firms with fifty or more employees in 2006, with a wide range from 13.0 million yen for firms with 50-99 employees to 28.9 million for firms with 1,000 or more employees.

3.2 Estimating the distribution of lifetime income

In this section, we focus on data from the 2004 Annual Report as the base for assessing the potential impact of the post-2004 Reform EPI program. This report provides a distribution of initially claimed benefits, as well as a distribution of ages of beneficiaries in 2004. It does not present a benefit-age matrix, but the data on initially claimed benefits are mostly for those who were born in 1944. In fact, 81.2 percent of new male EPI beneficiaries (518,925 in total) were sixty years old in 2004 (421,327). The distribution of beneficiaries is reported by annual benefit class with a width of 120,000 yen. The average is 1,282,000 yen for males (and 1,275,000 yen for females). We assume for simplicity that all individuals in each benefit class receive the middle value of the upper and lower bounds of the benefit class to which they belong[6].

The next step is to estimate their lifetime income based on the benefit multiplier for the 1944 cohort[7]. According to the EPI formula, the annual wage-proportional benefit for this cohort is calculated as: CAMI (evaluated at 2004 prices) × number of months of coverage × benefit multiplier (7.720/1000)[8]. Hence, lifetime income evaluated at 2004 prices, which corresponds to the product of the CAMI and the number of months of coverage, is estimated by dividing the reported initial claim of the wage-proportional benefit by 7.720/1000.

Of course, this estimation is just the first approximation, in that the aggregated data are affected by the benefits received by other cohorts than the 1944 cohort. In particular,

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[6] Both the bottom benefit class (below 120,000 yen) and the top benefit class (above 360,000 yen) are neglected because they account for a negligible portion.

[7] Since April 2003, the income base for calculating contributions and wage-proportional benefits has been shifting from regular monthly income (excluding bonus payments) to total income (including them). But, we ignore this change and apply the previous formula when estimating lifetime wage income backward, because we do not know wage income after April 2003, and because we believe that our simplified method, which affects at most the last year before the initial claim, has quite a limited impact on the estimation results.

[8] This benefit multiplier is applied to the 1944 cohort.

the dataset includes older-than-1944 cohorts, who claimed both wage-proportional and flat-rate components, meaning that we tend to overestimate lifetime income if we directly apply our methodology to reported data. To minimize these statistical biases, we focus on beneficiaries who received benefits of less than 192,000 yen per month in 2004. The reason is as follows. Given that the cap of the standardized monthly income is 590,000 yen, which was applied to the 2004 cohort for most of the period of EPI contributions, and that the average number of months of coverage for those who initially claimed EPI benefits in 2004 was 430, it is likely that most of those who receive annual EPI benefits of more than about 1,920,000 yen ($\approx 590{,}000 \times 430 \times 0.00772$) are older-than-1944 cohorts, who claimed both flat-rate Basic Pension and wage-proportional benefits at their initial benefit claims. Indeed, there is a sharp drop in the share of the beneficiaries from the group of 180,000~192,000 yen benefit (2.2 percent) to the group of 192,000~204,000 yen benefit (0.5 percent), and the share remains below one percent for groups with more benefits.

This truncation of the dataset enables us to grasp the 1944 cohort more precisely. In the original dataset (518,925), the 1944 cohort (421,327) accounted for 81.2 percent. If we simply, but reasonably, assume that all of 29,617 beneficiaries who initially claimed more than 192,000 yen per month in 2004 are older-than-1944 cohorts, and subtract them from the dataset, the share of the 1944 cohort rises to 86.1 percent (=421,327/(518,925-29,617)). Still, it should be noted that our estimation results are likely to be distorted by including the older-than-1944 cohorts in the dataset.

Figure 1 illustrates a distribution of the estimated lifetime income obtained by the methodology described above. At 2004 prices, their mean is estimated to be 156.0 million yen with a standard deviation of 47.1 million yen. The distribution is concentrated in the range of 150~200 million yen (with the median of 152.8 million yen). Meanwhile, MLD

and SCV for lifetime income are calculated to be 0.0556 and 0.0935, respectively, which are well below the figures calculated on an annual income basis (1.3~2.3 for MLD and 1.6~2.6 for SCV in 2001) reported in Table 1, even though they cannot simply be compared with each other. This is mainly because a substantial portion of individuals in the SIR—such as dependent non-working spouses and elderly who depend solely on pension benefits—earn no annual wage income, while the lifetime income distribution for male EPI affiliates has a bell curve around the mean.

If we assume that the bonus payments are roughly equivalent to thirty percent of total monthly income (as assumed by the MLHW in recent pension reforms), the average lifetime income is estimated to be about 200 ($\approx 156.0 \times 1.3$) million. In addition, given that retirement allowances are in the 10~30 million yen range (see footnote 5), it is reasonable to estimate the average of total lifetime income to lie between 210 and 230 million yen for the male 1944 cohort, who are covered by the EPI program.

3.3 Distributive impact of post-2004 Reform EPI program

In this section, we estimate the potential distributive impact of the social security scheme after the 2004 Reform. This Reform calls for a gradual increase in the EPI premium rate from 13.58 percent to 18.3 percent by 2017, and plans to keep it at that level later. The Reform also incorporates a gradual increase in the share of transfers from the general account of the central government in payments of the Basic Pension benefit from the current one-third to one-half. This implies a rise in the consumption and/or income tax rate to sustain the fiscal balance of the social security programs. Finally, the Reform plans a gradual rise in the eligibility age for EPI benefits (both flat-rate and wage-proportional components) to sixty-five by 2025.

We first roughly estimate the extent to which the EPI program after the 2004 Reform

potentially redistributes lifetime income under a steady state, where both the premium and tax rates have completed their adjustment, and the eligibility age has been raised to sixty-five. The estimation strategy is summarized as follows.

(1) Regarding pre-SS pre-tax lifetime income, we use the estimated distribution of lifetime income for the 1944 cohort as a benchmark. Here, we should remember that this indicates income after employers' premium payments, which we cannot estimate retrospectively. For simplicity, we assume that each individual receives the same amount of this estimated income from their employers even after the 2004 Reform. In addition, we ignore the impact of the raised eligibility age on wage income, assuming zero income between ages sixty and sixty-four. This assumption, even if unrealistic, does not seem to substantially change the overall pattern of income distribution and the distributive impact of the EPI program. We also assume no wage growth after 2004, so all of the figures are evaluated at 2004 prices.

(2) To estimate post-SS (and post-tax) lifetime income, we need lifetime social security benefits, premiums, and tax. Annual benefits are calculated as the sum of flat-rate and wage-proportional components. We set the flat-rate benefit at 804,200 yen per year (67,017 yen per month) at 2004 prices, as incorporated in the 2004 Reform. We assume that each individual receives the full amount for simplicity, meaning that they have contributed premiums for forty years. The wage-proportional annual benefit is calculated as the product of expected lifetime income and benefit multiplier $(7.125/1000)$[9]. Lifetime benefits are total annual benefits over a lifetime, discounted by average mortality rates (released by the MLHW) and the long-term interest rate, 3.2 percent per annum, which is assumed in the 2004 Reform.

[9] More precisely, we multiply the product by 0.98, which is the ratio of disposable income in 2003 to that in 1988, reflecting the postponed price indexation. If we include bonus payments, the benefit multiplier is 0.05481, but this does not affect the results.

(3) Regarding the premium rate, we assume that EPI members pay 9.15 percent—half of 18.3 percent incorporated in the 2004 Reform as the final target—from their estimated lifetime income. The remaining half is paid by employers, so we also consider the case in which pre-SS lifetime income is defined as the sum of estimated lifetime income and the premium paid by employees. This adjustment does not affect post-SS income and its inequality, but raises net social security tax (or reduce its net benefit) over a lifetime. In addition, we have to consider tax payments required to finance transfers from the general account of the central government. The 2004 Reform requires these transfers to finance half of the Basic Pension benefit[10]. We assume that the government chooses a proportional income tax to finance this transfer, and levies the tax equally on wage income and social security benefits[11]. Considerations about employers' premium contributions and additional tax payments for the Basic Pension benefit do not affect income inequality measures because these premiums and taxes are proportional to income.

The estimation results are summarized in Table 4, which compares pre-SS and post-SS lifetime incomes, and assesses the distributive impact of the EPI program under the steady state after the 2004 Reform. Before addressing income distribution issues, we compare mean incomes before and after social security transfer. Mean pre-SS income is 156.0 million yen as mentioned above, and it becomes 170.3 million yen if we add employers' premium contributions. In comparison, mean post-SS income is 161.9 million yen, which is 3.7 percent higher than 156.0 million yen. Also, if we subtract tax payments to finance the Basic Pension benefit, mean post-SS lifetime income is reduced to 152.4 million yen, 10.5 percent lower than pre-SS income, which includes employers' premium

[10] According to the MLHW's projections, these transfers will be 15.7 trillion yen in 2050, compared to 47.2 trillion yen of premium revenues.

[11] If we assume that individuals leave no bequest, and spend all lifetime income on consumption spending, financing with income tax is effectively equivalent to financing with consumption tax.

contributions. These estimation results suggest that future EPI members will be required to pay more than they receive on net over a lifetime (in contrast to the current elderly who receive more than they paid). This pattern and the size of the net lifetime payment are roughly consistent with the results of the preceding analyses, which confirm intergenerational income inequality under the EPI program (see Suzuki, 2006, and Sato and Uemura, 2006 for example).

Then, to what extent would the post-2004 Reform EPI program potentially redistribute lifetime income? Table 4 confirms that its distributive impact is quite limited. For example, the Gini coefficient declines only 5.2 percent (from 0.298 for pre-SS income to 0.283 for post-SS income) and EP is just 1.022. These are well below the distributive impact on annual income reported in Table 1, although the figures in the two tables cannot be compared directly with each other. The limited redistributive impacts can be confirmed by MLD and SCV, which decline 12 and 10 percent, respectively, and are much lower than on an annual income basis reported in Table 1. In line with expectations and results from preceding studies (Nelissen, 1998 and Coronado *et al*., 2000), these results indicate that the redistributive impact of the current social security programs is quite limited on lifetime income in Japan. It should be noted that the limited impact of social security is not fully attributable to its structure, which makes benefits and contributions largely offset one another over a lifetime. As mentioned above, post-SS income is 10.5 percent lower than pre-SS income (which includes employers' contributions) on average. This reduction in average income is considered to reduce the overall distributive impact of social security.

Meanwhile, Figure 2 depicts how the estimated net lifetime tax rate, which is the ratio of payments of social security premiums and tax minus benefits to lifetime pre-SS pre-tax income (which includes employers' contributions). On average, the net lifetime tax rate is

10.5 percent as mentioned above. This figure depicts a clear pattern of progressivity within the same generation. Individuals with lower lifetime income (lower than about fifty million yen) face a negative tax rate, meaning that they receive net benefits over a lifetime.

4 Alternative pension reforms

4.1 Designing pension reforms

The previous section shows that the potential impact on lifetime income redistribution of the 2004 Reform is much more limited. In this section, we estimate the impacts of some alternative reforms, which have been applied in other advanced countries. We consider three reforms, taking the 2004 Reform as a baseline for comparisons. We focus on the distributive impacts of alternative benefit schemes, assuming that total benefits and total contributions in alternative reforms remain the same as those in the 2004 Reform.

First, Reform I raises the level of the Basic Pension benefit to 80,820 yen per month (from the current 67,017 yen) and correspondingly reduces the share of the wage-proportional component. This newly proposed amount of Basic Pension benefit is the standard amount of the public assistance benefit for a household with a single elderly person in an urban area in 2006. It is often criticized that even the full amount of the Basic Pension benefit falls short of the public assistance benefit for elderly households, meaning that the Basic Pension benefit cannot guarantee the minimum level of income for the elderly (see Abe, 2006). The benefit multiplier is implicitly calculated to keep the total benefits unchanged from the 2004 Reform. It is reasonable to expect that a shift of weight to the flat-rate benefit from the wage-proportional one will increase the distributive impact.

Second, Reform II introduces the bend-point system to the wage-proportional

component, which is incorporated in the US social security program (OASDI), with the Basic Pension benefit unchanged from the 2004 Reform. In the United States, bend points are used to define different levels of the Average Indexed Monthly Earnings (AIME) to which different Primary Insurance Amount (PIA) factors are applied.[12] In 2005, the first PIA factor is ninety percent and the first bend point is $627. This means that if the AIME is up to $627, the PIA is ninety percent of the AIME. If the AIME is between $627 and $3,779, the second PIA factor of thirty-two percent is applied to the *additional* AIME dollars. If the AIME is above $3,779, the third PIA factor of fifteen percent is applied. The benefit formula is thus progressive, in that the PIA factors shrink as an individual's AIME increases. We apply an analogous bend-point system for the wage-proportional component in the EPI program in Japan such that

$$\textit{Bend point}\ (\text{Japan}) = [\textit{Bend point}\ (\text{US}) / \textit{Average AIME}\ (\text{US})] \times \textit{Average CAMI}\ (\text{Japan}),$$

for each bend point, where the average AIME (US) is $2,842 (in 2005) and the average CAMI is 304,796 yen (in 2004).[13] Hence, the EPI wage-proportional component is calculated as:

$$\textit{Wage-proportional component} = \textit{Benefit multiplier} \times (0.9A + 0.32B + 0.15C),$$

where

A: CAMI up to 67,244 yen,

B: CAMI in excess of 67,244 up to 405,287 yen, and

C: CAMI in excess of 405,287 yen.

[12] Under the current system in the United States, determining a retired worker's monthly benefit level begins with calculating career average earnings. Before averaging, earnings from years before the worker turns age sixty are indexed by changes in the national average wage up to the year the worker turns age 60. The thirty-five highest indexed earnings are averaged and divided by twelve, and the resulting amount is called the average indexed monthly earnings (AIME). See SSA (2007) about the feature in the current U.S. social security system.

[13] Here, the average CAMI is adjusted by dividing the original average CAMI (396,235 yen) reported in the 2004 Annual Report by 1.3 to subtract the effects of the bonus payments and retirement allowances, which are not included in estimated lifetime income.

We apply this formula based on the CAMI, which is calculated from lifetime income based on the 2004 Annual Report.[14] The Basic benefit is unchanged at 67,016 yen per month from the 2004 Reform, and we implicitly calculate the benefit multiplier to keep the total benefits unchanged from the 2004 Reform. We can expect that application of this system will increase the distributive impact more than Reform I.

Finally, Reform III reflects the feature of the claw-back system, which is adopted in Canada, Sweden, and other countries. The Basic Pension benefit in this system is adjusted according to lifetime income such that:

$$\textit{Basic Pension benefit} = \max\left[\textit{minimum benefit} - k \times \max\left(CAMI - Z, 0\right), 0\right].$$

In this formula, the adjustment factor, k, indicates the pace of the reduction of the Basic Pension benefit, and Z represents the threshold level of the CAMI, at which a reduction of the Basic Pension benefit starts. Under this framework, an individual with income below Z receives the full amount of the minimum benefit, while an individual of income above $[(\textit{Minimum benefit} - Z)/k]$ receives no Basic Pension benefit. In addition, we assume that the minimum pension benefit is 67,016 yen per month as well as the 2004 Reform, and that the adjustment factor, k, corresponds to 0.15, which is actually used in Canada.[15] Given the level of Z, the benefit multiplier is implicitly calculated to keep the total benefits unchanged from the 2004 Reform, as in the cases of Reforms I and II. In Reform III, the flat-rate component gradually decreases as income rises, while the benefit multiplier is higher than 7.125/1000 of the 2004 Reform.

[14] CAMI is calculated by dividing the estimated lifetime income by 430: the average months of coverage for those who initially claimed EPI benefits in 2004.

[15] Canada's elderly benefits system comprises three federal direct spending programs—Old Age Security (OAS), Guaranteed Income Supplement, and Spouse's Allowance (recently renamed Allowance)—and two tax-delivered benefits, Age Credit and Pension Income Credit. OAS is a universal program serving all the elderly at all income levels, and it demonstrates a gradually progressive distribution of benefits: the higher income is, the smaller is the after-tax benefit. For example, OAS recipients with income over C$60,806 per year ('threshold') with OAS benefits would have to repay fifteen cents of their OAS for every dollar of income above the threshold, over and above their normal federal and provincial income taxes in 2005. However, in Canada as of 2005, the claw-back threshold is so high that it affects only about five percent of the elderly. See Battle (2003) and Battle and Tamagno (2007) and for more details.

The redistribution impact of the Reform III on lifetime income is expected to depend much on the threshold *Z*. Therefore, we first examine how the redistribution impact varies according to the threshold *Z*. For this purpose, we gradually raise the value of Z from zero to find the optimal level that maximizes the distributive impact of the claw-back system on a lifetime basis.

4.2 Simulation Results

First, we search the optimal level of Z that maximizes the distributive impact of Reform III, assuming that the minimum pension benefit is 67,016 yen per month. Figure 3 depicts the relationship between the level of *Z* and the redistribution effect of the system. *Z* is expressed on a monthly income basis and is gradually raised from zero to 600,000 yen, and the distributive impact of the reform is evaluated in terms of percent changes of the inequality measures (the Gini coefficient, SCV, and MLD) from their pre-SS levels.

The figure shows that as the level of Z rises from zero the distributive impact increases because lower-income individuals can receive the full amount of the minimum benefit and the benefit multiplier for the wage-proportional benefit declines. However, a very high level of *Z* reduces the redistributive impact, because it makes the system closer to the system with no adjustment of the level of the Basic Pension benefit.

We find that the optimal level of *Z* that has the largest impact on income redistribution is 235,000 yen per month, judging from inequality measures: reductions in the Gini coefficient and SCV are maximized at 235,000 yen and a reduction in MLD is also maximized at nearly this level, as seen from Figure 3. This level of *Z* corresponds roughly to the bottom fifteen percentile of lifetime income, meaning that those whose income is below it do not face a reduction in the minimum benefit. Our simulations also reveal that the top ten percentile of lifetime income—which corresponds roughly to 227

million yen of lifetime income—receives only 34.4 percent of the full amount of minimum benefit.

Then, we can compare the distributive impacts of alternative reform, assuming that the level of Z is set at 235,000 yen per month for Reform III. The simulation results are summarized in Table 5 and Figure 4. The following results are noteworthy. First, Reform I, which raises the level of the Basic Pension Benefit to 80,820 yen from the current 67,017 yen, raises the distributive impact on lifetime income because it reduces the benefit multiplier of the wage-proportional benefit to 6.042/1000 from the current 7.125/1000. The Gini coefficient, MLD, and SCV fall by 6.3 percent, 14.6, percent and 12.4 percent, respectively, from pre-SS pre-tax income. These magnitudes of redistribution are somewhat larger than in the case of the 2004 Reform.

Reform II, which has the minimum benefit of 67,016 yen with the bend-point system for the wage-proportional component, reduces income inequality more than Reform I, judging from the changes in the inequality measures. This is because the benefit formula for the wage-proportional component is more progressive, with the marginal lifetime benefit falling as lifetime income increases. About forty percent of beneficiaries are subject to the third PIA factor of fifteen percent for the CAMI in excess of 405,287 yen. This result confirms that the bend-point system is effective for alleviating lifetime income inequality within the same age generation.

Finally, the redistributive impact of Reform III, which has the claw-back system for the Basic Pension benefit component, is slightly lower than that of Reform II but is still higher than the 2004 Reform and Reform I. Taken altogether, we can conclude that Reform II with the bend-point system can reduce income inequality more effectively than other reforms judging from changes in inequality measures.

Figure 4 is useful for interpreting the simulation results shown in Table 5. This figure

illustrates the net lifetime tax rate in terms of EPI benefits and contributions (including employers' contributions and tax to finance transfers from the general account of the central government). All curves confirm the progressivity of the EPI program: the tax rate is negative for the lowest income group and rises as lifetime income increases. This pattern is almost unaffected by any additional reform. Individuals with low incomes face a reduction in the tax rate (or increase in the subsidy rate) under all reforms compared to the 2004 Reform, especially in the case of Reform II. We also confirm that a small increase in the net tax rate for higher-income individuals can finance a large increase in pension benefits for lower-income individuals.

5. Concluding remarks

We have examined how social security programs affect income distribution within the same generation in Japan. To address this issue, we have done two empirical analyses. First, we assessed income redistribution under the current social security and tax schemes based on micro-data from the "Survey on Income Redistribution." Second, we examined the potential impact of the 2004 Reform, as well as some alternative reforms, on lifetime income distribution based on data from the "Annual Report of the Social Insurance Agency."

The key results are the following. First, social security substantially reduces inequality among the elderly on an annual income basis, but this is mostly due to an income transfer from the young. Income redistribution among the elderly is regressive even if the impact of income transfer is excluded. This pattern of redistribution has become more apparent in recent years under population aging, which raised the income transfer to the elderly via social security programs.

Second, the distributive impact of the EPI program on a lifetime income basis is quite limited compared to that implied by the analysis based on annual income. This is largely because income transfer from the young to the elderly is largely offset over a lifetime.

Third, there remains much room to raise the distributive impact of the EPI program. Raising the level of the flat-rate Basic Pension benefit, introducing a bend-point system for the wage-proportional benefit, or a claw-back system for the Basic Pension benefit can redistribute lifetime income within the same generation. The effects of these alternative reforms on EPI beneficiaries differ by income class, but can effectively reduce lifetime income inequality.

To be sure, the desirable degree of income distribution always depends on value judgments about the equity-efficiency trade-off. Our estimation results suggest, however, that we should look more cautiously at income distribution and the impacts of redistribution policies on a lifetime income basis. Population aging increases the magnitude of income transfers from the young to the elderly, raising the risk that the impact of existing redistribution policies is overstated.

Poverty in Japan has risen among the elderly since the mid-1990s. Indeed, a cross-country study by OECD (2004) reveals that the relative poverty rate in Japan is 15.3 percent, ranking the country fifth among OECD member countries. In 2005, the number of households receiving public assistance benefits surpassed one million, which was about twice the level in 1995. From the viewpoint of preventing poverty, which has not been seriously discussed so far, it is necessary to review the traditional social security scheme in response to the changes in family and demographic structures.

Finally, we admit that there are several limitations in our analysis and outstanding issues. First, for example, we have to extend the analysis to grasp income redistribution across employees in the private sector (EPI members), employees in the public sector

(MA members), and self-employed workers (NPI members), and also between males and females. Second, we have to examine more explicitly the distributive impacts of income and other taxes, because tax should be a more direct measure to redistribute income than social security. Third, we have to take into account the impact of social security on people's incentives to work and wage income, which have been empirically examined by preceding research (see Oshio and Oishi, 2004). These issues can and should be addressed in future research if more comprehensive datasets that include rich longitudinal information are available.

Appendix: A brief overview of public pension programs in Japan

(1) Programs

National Pension Insurance (NPI) for self-employed workers

Employees' pension Insurance (EPI) for employed workers in the private sector

Mutual Aid (MA) for employed workers in the public sector and private schools

(2) Shares of beneficiaries (in 2005)

NPI=27.2 percent, EPI=45.7 percent, and MA=7.0 percent.

(3) Benefits

NPI: Basic Pension benefit

EPI: Basic Pension benefit + Wage-proportional benefit

MA: Basic Pension benefit + Wage-proportional benefit

* Basic Pension benefit is common to all programs and its full amount is 67,017 yen per month in 2007.

(4) Eligibility age (as of April, 2007)

NPI: 65

EPI and MA: 60 (for the wage-proportional benefit) and 63 (for the Basic Pension benefit)

* The eligibility age for the wage-proportional benefit will be raised to from 60 to 65 by one year every three years during the period from 2001 and 2013, and the eligibility age for the Basic Pension benefit will also be raised from 60 to 65 by one year every three years during the period from 2013 and 2025.

(5) Premiums (as of April, 2007)

NPI: 14,140 yen per month

EPI: 14.642 percent of standardized monthly income (incl. bonus payments)

MA: 14.767 percent (national government), 14.092 percent (local governments), and 11.168 percent (private schools) of standardized monthly income (incl. bonus payments)

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Table 1: Income inequality trends: 1992-2001

(1) 1992

	Total			Young (aged 20-59)			Elderly (aged 60+)		
	Pre-SS pre-tax	Post-SS pre-tax	Post-SS post-tax	Pre-SS pre-tax	Post-SS pre-tax	Post-SS post-tax	Pre-SS pre-tax	Post-SS pre-tax	Post-SS post-tax
Gini	0.634	0.579	0.561	0.558	0.556	0.540	0.826	0.618	0.592
		(-8.7)	(-11.6)		(-0.3)	(-3.3)		(-25.1)	(-28.3)
EP		1.150	1.202		1.004	1.041		2.191	2.342
MLD	1.832	1.326	1.273	1.428	1.387	1.337	2.651	1.128	1.064
		(-27.6)	(-30.5)		(-2.9)	(-6.4)		(-57.4)	(-59.8)
LV	2.641	2.310	2.274	2.479	2.435	2.396	2.444	1.943	1.920
		(-12.6)	(-13.9)		(-1.8)	(-3.4)		(-20.5)	(-21.4)
SCV	2.407	2.037	1.605	1.560	1.597	1.434	10.371	3.947	2.177
		(-15.4)	(-33.3)		(2.4)	(-8.1)		(-61.9)	(-79.0)

(2) 2001

	Total			Young (aged 20-59)			Elderly (aged 60+)		
	Pre-SS pre-tax	Post-SS pre-tax	Post-SS post-tax	Pre-SS pre-tax	Post-SS pre-tax	Post-SS post-tax	Pre-SS pre-tax	Post-SS pre-tax	Post-SS post-tax
Gini	0.684	0.581	0.567	0.587	0.583	0.572	0.844	0.544	0.524
		(-15.0)	(-17.1)		(-0.7)	(-2.6)		(-35.6)	(-37.9)
EP		1.324	1.369		1.010	1.037		2.924	3.051
MLD	2.289	1.395	1.352	1.729	1.668	1.625	2.945	0.886	0.845
		(-39.0)	(-40.9)		(-3.5)	(-6.0)		(-69.9)	(-71.3)
LV	2.922	2.459	2.428	2.784	2.731	2.695	2.552	1.839	1.818
		(-15.9)	(-16.9)		(-1.9)	(-3.2)		(-27.9)	(-28.8)
SCV	2.563	1.794	1.604	1.621	1.650	1.563	8.494	2.050	1.562
		(-30.0)	(-37.4)		(1.8)	(-3.6)		(-75.9)	(-81.6)

(Note) Individual basis. The figures in the parentheses indicate % changes from pre-SS pre-tax levels.
(Source) The author's calculation based on the micro-data from the Surveys on Income Redistribution 1993 and 2002.

Table 2: Decomposition of the redistributive impact of social security and tax in terms of MLD

(1) Social security

Year	Pre-SS pre-tax income (a)	Post-SS pre-tax income (b)	Changes (b)-(a)	Income redistribution				
				Within-age effect			Between-age effect (d)	Total between-age effect (c)+(d)
				Total	Pure	Due to between-age transfer (c)		
1992	1.832	1.326	-0.506	-0.451	0.151	-0.602	-0.055	-0.657
2001	2.289	1.395	-0.893	-0.782	0.408	-1.189	-0.112	-1.301
Δ: 1983-2001	0.457	0.069	-0.387	-0.331	0.257	-0.587	-0.057	-0.644

(2) Social security and tax

Year	Pre-SS pre-tax income (a)	Post-SS post-tax income (b)	Changes (b)-(a)	Income redistribution				
				Within-age effect			Between-age effect (d)	Total between-age effect (c)+(d)
				Total	Pure	Due to between-age transfer (c)		
1992	1.832	1.273	-0.559	-0.504	0.033	-0.537	-0.055	-0.592
2001	2.289	1.352	-0.936	-0.824	0.221	-1.045	-0.112	-1.158
Δ: 1983-2001	0.457	0.079	-0.377	-0.320	0.188	-0.508	-0.057	-0.565

(Note) Individual basis.

(Source) The author's calculation based on the micro-data from the Surveys on Income Redistribution 1993 and 2002.

Table 3: Decomposition of within-age income redistribution in terms of MLD

(1) 1992

Age group	Pre-SS pre-tax income (a)	Post-SS pre-tax income (b)	Changes (b)-(a)	Due to between-age transfer	Pure within-age redistribution
Elderly	2.651	1.128	-1.522	-2.214	0.692
Young	1.428	1.387	-0.042	0.013	-0.055

Age group	Pre-SS pre-tax income (a)	Post-SS post-tax income (c)	Changes (c)-(a)	Due to between-age transfer	Pure within-age redistribution
Elderly	2.945	1.064	-1.586	-2.094	0.508
Young	1.729	1.337	-0.091	0.057	-0.148

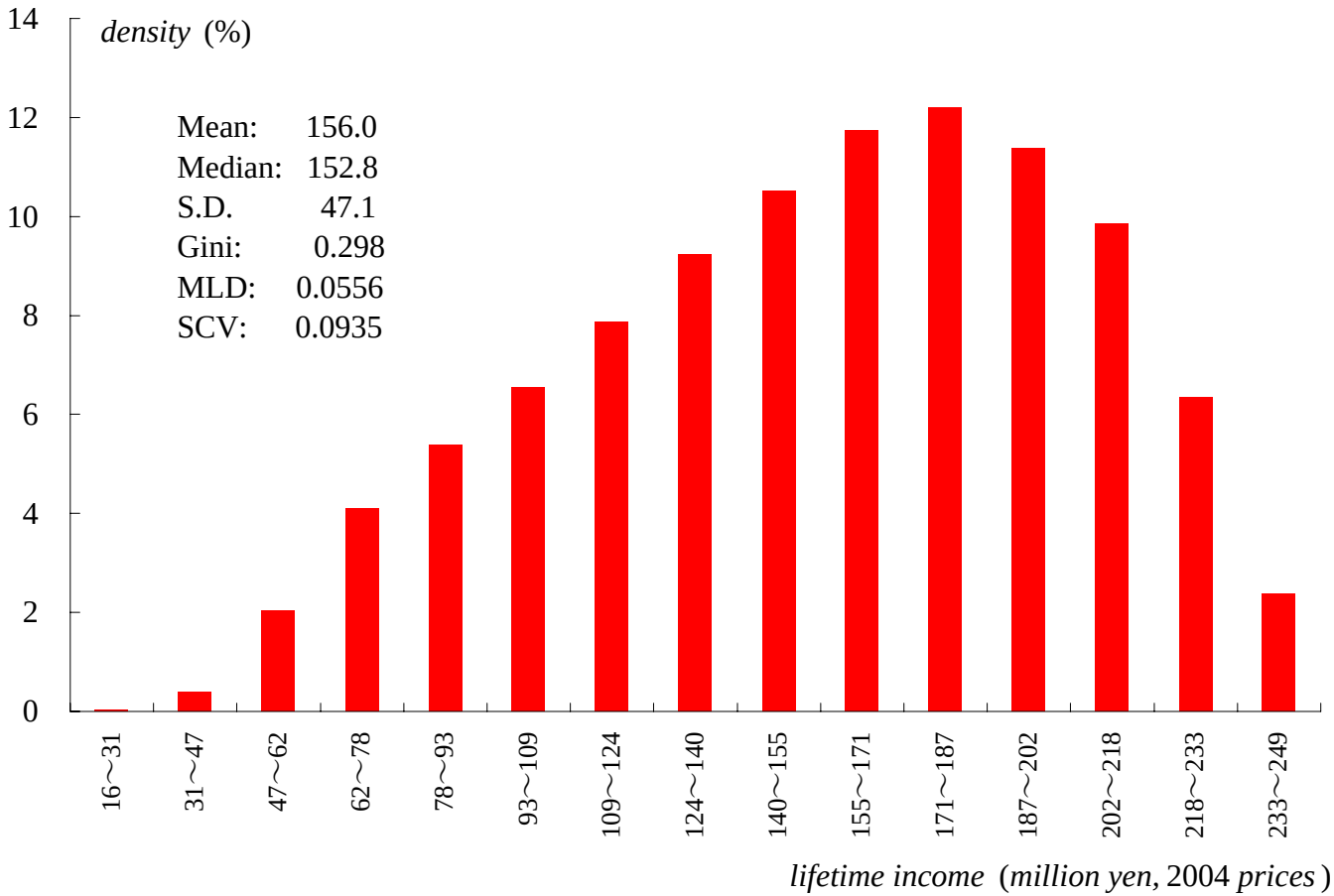
(2) 2001

Age group	Pre-SS pre-tax income (a)	Post-SS pre-tax income (b)	Changes (b)-(a)	Due to between-age transfer	Pure within-age redistribution
Elderly	2.945	0.886	-2.059	-3.425	1.366
Young	1.729	1.668	-0.061	0.071	-0.132

Age group	Pre-SS pre-tax income (a)	Post-SS post-tax income (c)	Changes (c)-(a)	Due to between-age transfer	Pure within-age redistribution
Elderly	2.945	0.845	-2.100	-3.291	1.191
Young	1.729	1.625	-0.104	0.221	-0.326

(Note) Individual basis.
(Source) The author's calculation based on the micro-data from the Surveys on Income Redistribution 1993 and 2002.

Figure 1: Estimated distribution of lifetime wage income for the male 1944 cohort



(Note) Bonus payments, retirement allowances and employers' premium payments are not included.
(Source) The author's calculation based on the Annual Report of the Social Insurance Agency 2004.

Table 4: The estimated impact of post-2004 Reform EPI program on lifetime income

Pre-SS	Mean (mil. yen)	Gini	MLD	SCV
Employers' contributions not included (a)	156.0	0.298	0.0556	0.0911
Employers' contributions included (b)	170.3			

Post-SS	Mean (mil. yen)	Gini	MLD	SCV
Pre-tax (c)	161.9	0.283	0.0488	0.0817
Post-tax (d)	152.4			

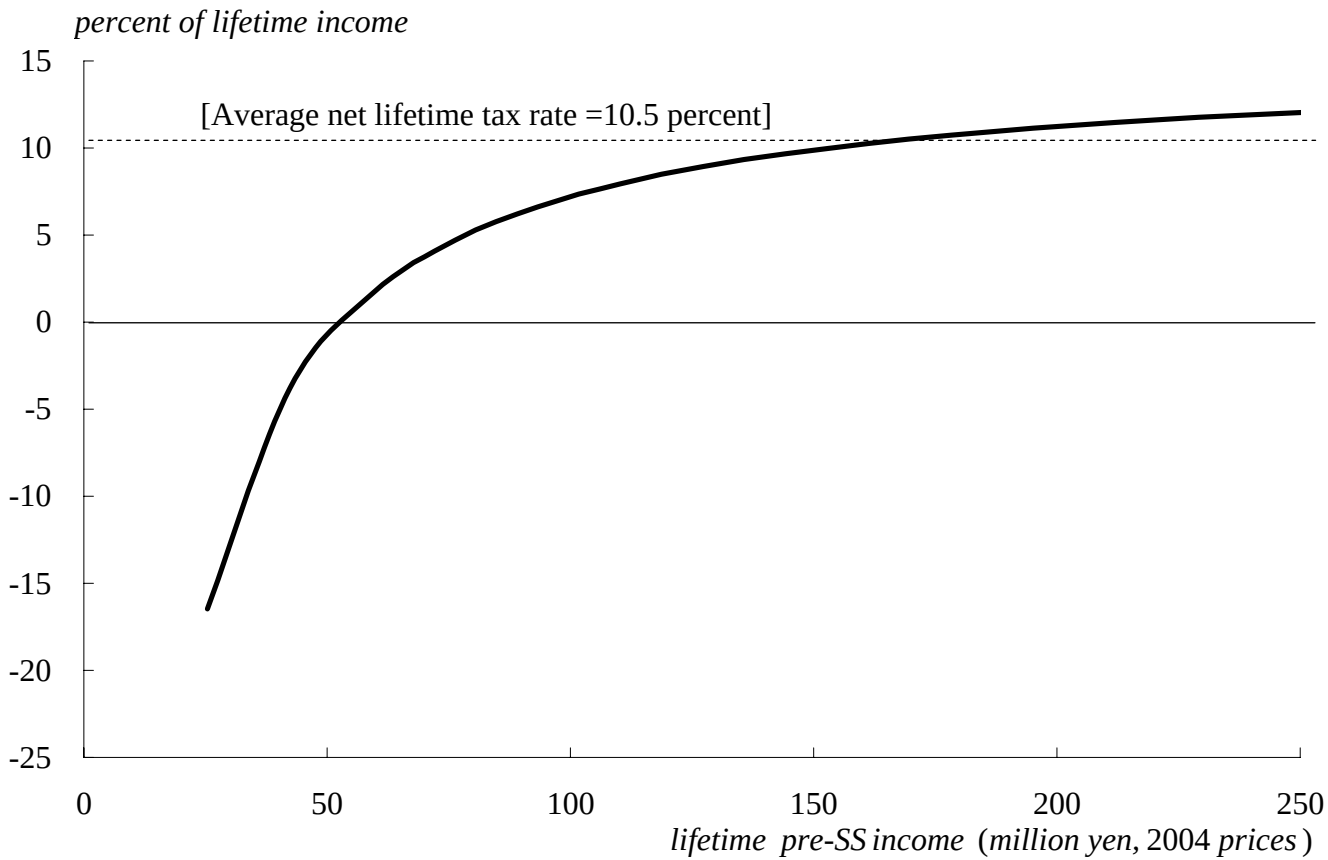
Impact	Mean (mil. yen)			Gini	MLD		SCV	
Changes from Pre-SS to post-SS income	-8.4	(c-b)	(-5.0%)	-0.015 (-5.2%)	-0.0068	(-12.2%)	-0.0094	(-10.3%)
	-17.9	(d-b)	(-10.5%)	EP=1.022				

(Note) 1. Based on the estimated income distribution for the male 1944 cohort.

2. "Tax" means tax to finance transfers from the general account of the central government.

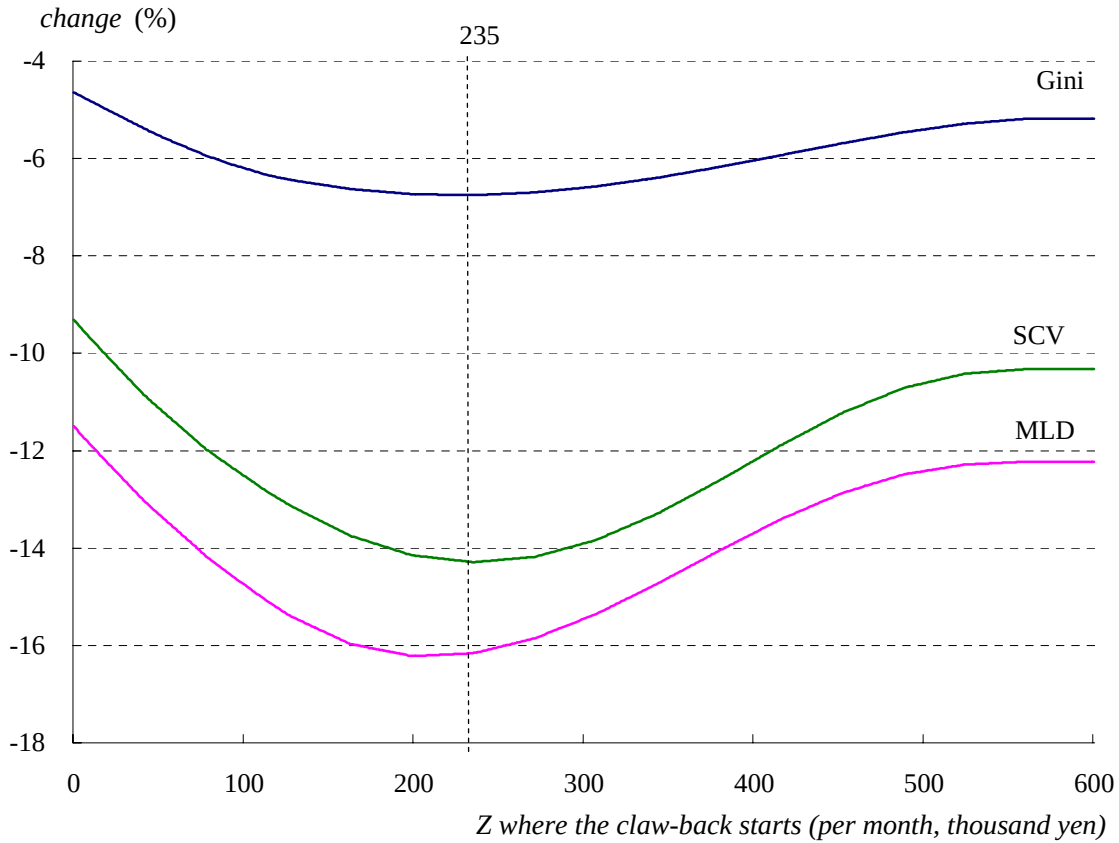
(Source) The author's calculation based on the Annual Report of the Social Insurance Agency 2004.

Figure 2: Estimated net lifetime tax rate in the post-2004 Reform EPI system



(Note) 1. Based on the estimated lifetime income distribution of the male 1944 cohort.
2. Employers' contributions are included in lifetime income.
(Source) The author's calculation based on the Annual Report of the Social Insurance Agency 2004.

Figure 3: The claw-back system and its impact on lifetime income distribution



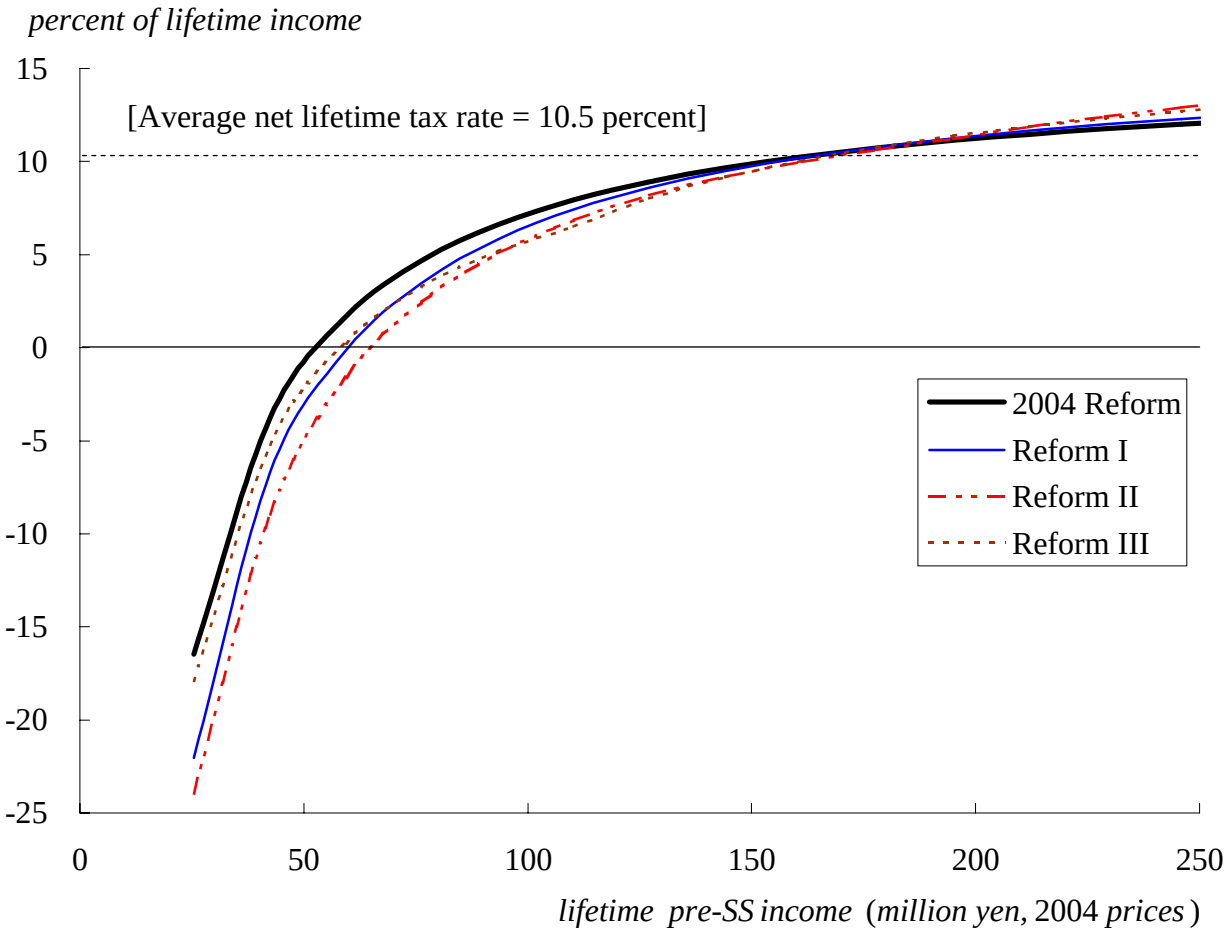
(Note) Changes in Gini, MLD and SCV are from their levels for pre-SS lifetime income.
(Source) The author's calculation based on the Annual Report of the Social Insurance Agency

Table 5: Alternative pension reforms and their impacts on lifetime income distribution

	Basic Pension benefit	Wage-proportional benefit	Post-SS lifetime income					
	Flat-rate benefit	Benefit multiplier	Gini		MLD		SCV	
	(yen, per month)	(/1000)	level	change (%)	level	change (%)	level	change (%)
2004 Reform	67,016	7.125	0.283	(-5.2)	0.049	(- 12.2)	0.082	(- 10.3)
Reform I	80,820	6.042	0.280	(-6.3)	0.047	(-14.6)	0.080	(-12.4)
Reform II	67,016	(Bend Point System)	0.276	(-7.5)	0.046	(-17.1)	0.077	(-15.0)
Reform III	67,016 (Minimum)	8.721	0.278	(-6.8)	0.047	(-16.2)	0.078	(-14.3)

(Note) 1. For Reform III, Z=235,000 yen is assumed.
2. Changes in Gini, MLD and SCV are from their levels for pre-SS lifetime income.
(Source) The author's calculation based on the Annual Report of the Social Insurance Agency 2004.

Figure 4: Estimated net lifetime tax rate



(Note) See note on Figure 2.In the cases of Reforms III, Z=235,000 yen is assumed.