TABLE 1
Income Redistribution of the Social Security System as a Whole

	Average	St. dev.	SCV
(a) Total[a]			
Gross income (¥'000)			
Total	2385	3494	2.147
Young (age 20–59)	2914	3530	1.468
Old (age 60+)	1114	3051	7.500
Gini index (G_{BT})			0.662
Net income with social security (¥'000)			
Total	2579	3352	1.690
Young (age 20–59)	2789	3408	1.494
Old (age 60+)	2075	3157	2.315
Gini Index (G_{AT})			0.593
Reduction in SCV (%)			
Total			21.3
Inter-age group			4.6
Intra-age group			3.3
Incompleteness			13.3
Effective progression [= $(1 - G_{AT})/(1 - G_{BT})$]			1.2057
(b) Private and public employees' pension programmes[b]			
Gross income (¥'000)			
Total	3867	3511	0.825
Young (age 20–59)	5128	2998	0.342
Old (age 60+)	1012	2853	7.953
Gini index (G_{BT})			0.475
Net income with social security (¥'000)			
Total	4239	3068	0.524
Young (age 20–59)	4838	2884	0.355
Old (age 60+)	2882	3042	1.114
Gini index (G_{AT})			0.355
Reduction in SCV (%)			
Total			36.5
Inter-age group			22.6
Intra-age group			1.0
Incompleteness			12.8
Effective progression [= $(1 - G_{AT})/(1 - G_{BT})$]			1.2269

[a] Sample: 18 253 (young 12 888, old: 5365).
[b] Sample: 7030 (young: 4876; old: 2154)
Source: The micro data from the 1996 Survey on the Redistribution of Income.

in the table is the one reported by each individual in the Survey without any adjustment (see Section 3.2).

As can be seen from this table, a significant part of a 21.3% reduction in the SCV is attributable to the "incompleteness" of the programmes, which reduces the SCV by 13.3 percentage points. This is consistent with a gap between averages of net and gross income caused by two factors: (i) employers pay half of required premiums (gross income reported in the Survey excludes employers' contributions), and (ii) the government subsidizes one-third of the flat basic benefit given to the elderly. Aside from the effects of this incompleteness, the social security programmes reduce the inter-age group variance of annual income by 4.6 percentage points through income transfers from the young to the old, and they reduce the intra-age group variance by 3.3 percentage points, mainly through income redistribution among the young.

Next, we focus on employed workers and pensioners, both of whom seem to be Kosei Nenkin or Kyosai Kumiai members. We select those (4876) who are aged 20–59 and pay Kosei/Kyosai premiums and those (2154) who are aged 60+ and receive Kosei/Kyosai benefits. The latter individuals are considered to have been employed workers, part-time or full-time, and to have paid contributions to Kosei/Kyosai programmes before age 60. Table 1(b) summarizes the results, which are different from those for all individuals. The redistributive impact of Kosei/Kyosai programmes, which lowers the SCV by 36.5%, is somewhat stronger than that observed for all individuals. This is largely due to substantial income transfers from the young to the old, in line with a remarkable reduction of the inter-age variance of net income. On the other hand, the SCV for the young remains little changed, because premiums are basically wage-proportional. A reduction of the SCV for the old is due mostly to a rise in net income, which is boosted by the benefit. The level of the incompleteness effect is almost the same as that observed for all individuals.

The numbers in the last rows in the both parts of Table 1 report the effective progression of the social security programmes: 1.206 for the total sample and 1.227 for Kosei/Kyosai members. These values indicate that the current social security system is progressive in terms of annual income, which is in line with the above-mentioned results based on a change of the SCV.

3.2 Modifying annual income and setting up lifetime income

To quantify the redistributive effects of social security more precisely, we modify and reorganize the data from the Survey. First, we modify "gross income" so that it includes employers' contributions to social security, because gross income reported in the Survey excludes them. Consequently, "gross income" hereafter means total compensation paid by an employer, which is equivalent to employment compensation on a national accounts basis. We need to make this modification to get a comprehensive picture of income redistribution. We also assume that this redefined gross income is fixed regardless of policy changes; for example, even if a new system allows employers to pay no social security contributions, they are assumed to make the same contributions as they have to pay under the current system on wages.

When calculating this redefined gross income, we take into account the relationships among redefined gross income (W_a), reported gross income (W_a^R) and "standardized" income [*hyojun hoshu*] (on which the social security premiums are levied, and which is capped by A as the maximum for calculating premiums) (W_a^S):

$$W_a^R = W_a - \frac{t_0}{2} W_a^S, \qquad W_a^S = \min[A, (1-\lambda) W_a^R],$$

where t_0 is the premium rate and λ denotes the share of bonus payments in reported gross income. Assuming for simplicity that λ is equal for all employees, and neglecting the employers' contributions to other social security programmes, we can estimate gross income from reported income by

$$W_a = \left[1 + \frac{(1-\lambda)t_0}{2}\right] W_a^R \qquad \text{if } W_a^R \leq \frac{A}{1-\lambda},$$

$$W_a = W_a^R + \frac{t_0 A}{2} \qquad \text{otherwise.}$$

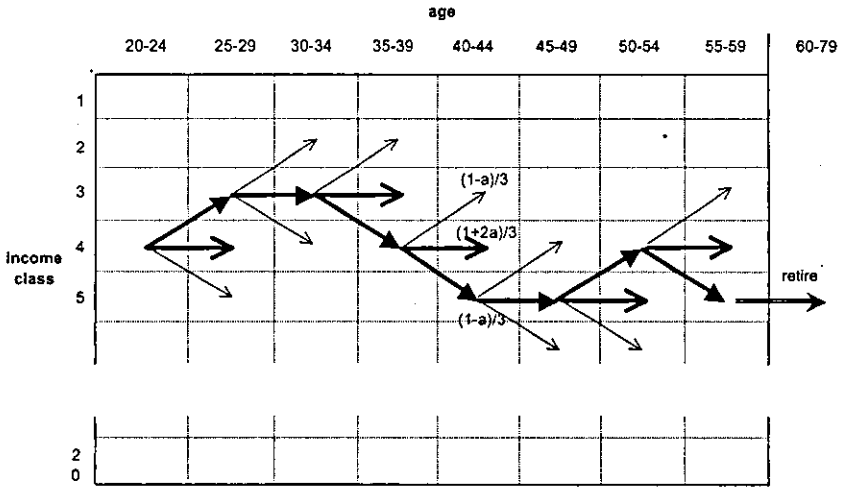

FIGURE 1. Simulated life: an example

Reflecting the current Kosei Nenkin programme, we set $t_0 = 0.165$ and $A = ¥7\,080\,000$ (= ¥590 000/month × 12 months), both of which are statutory parameters in the survey year 1996; also, $\lambda = 1/4$ is close to the average among Japanese employees.

Second, and more importantly, we have to set up lifetime income. Because no panel data are available in Japan, we reorganize the micro data of the Survey to roughly estimate lifetime income, and then we evaluate the potential redistributive effects of the social security system, focusing on the Kosei Nenkin programme.

We reorganize the micro data in the following ways. First, we choose only male employees in the private sector aged 59 or under from the Survey. Second, we classify these individuals into eight age groups at intervals of five years, from 20–24 years old to 55–59. Third, we divide each age group into 20 income classes, to get 160 (= 8 × 20) "cells". Fourth, we calculate average income and Kosei Nenkin premiums for each cell through age 50–59. Then, we assume that each individual remains in one of 20 income classes for each of the life stages and earns income and pays premiums, which are estimated as the average for each cell based on the microdata.[6]

Of course, an individual may move from one income class to another at any life stage. So we tentatively define "the degree of immobility" of income classes as α ($0 \leq \alpha \leq 1$); if the individual belongs to, say, income class j at any life stage, he will remain in class j at the next life stage with a probability of $(1 + 2\alpha)/3 \times 100\%$, and will move to the neighbouring class $j - 1$ or class $j + 1$ with a probability of $(1 - \alpha)/3 \times 100\%$, respectively (as illustrated in Figure 1). For simplicity, the individual is assumed to move to no other classes, and if he belongs to either the 1st (the poorest) class or 20th (the richest) class at any life stage we assume that the probability of his remaining in that class is $(2 + \alpha)/3 \times 100\%$ at the next stage, and that the probability of moving to either the 2nd class or 19th class is $(1 - \alpha)/3 \times 100\%$. Lifetime income is calculated as the expected value of the present discounted income obtained by this simulation.

If $\alpha = 1$, that is if we assume no mobility between income classes, then each individual will continue to belong to the income class to which he belonged when he was in the

[6] In the United States there have been several research projects using arbitrary levels of income for different groups in order to analyse intragenerational redistribution of social security; see e.g. Boskin, *et al.* (1987).

20–24 age bracket until he reaches the 55–59 age bracket. Therefore, the income distribution observed by the cross-section analysis of the age groups from the 20–24 to 55–59 age brackets will be presented in exactly the same form as it is. However, it is easy to prove that whatever value α may have—that is, whatever the lifetime income distribution may look like—the annual income distribution shown in the Survey will be reproduced as it is. Put another way, we are creating synthetic streams of individuals' lifetime income that will always reproduce the annual income distribution shown in the Survey. We have ignored here a variety of factors affecting income redistribution, such as cohort effects and technological progress. However, we believe that this is one of the most easily tractable methodologies for grasping a rough picture of lifetime income distribution, which is consistent with the cross-section actual data, especially with limited longitudinal information.

For calculations of social security benefits, we assume that Kosei Nenkin members pay premiums for 40 years, from 20 to 59 years of age, that they retire completely at age 60, and that they then depend entirely on benefits (without any other income) until they die at age 80. The benefit multiplier (b) for the wage-proportional component of the benefit is 0.3 (for those who have paid premiums for 40 years), and the amount of the flat basic benefit (B) is ¥1 560 000 (=¥65 000/month × 12 months × 2 persons) a year, which is paid to them and their wives.[7] For simplicity, we assume no price and wage inflation, which means that the wage-proportional component of the benefit is proportional to, i.e. is 30% of, the average nominal annual wage earnings. The data for pension benefits and retirement lump-sum payments for the elderly can be obtained from the Survey, but are disregarded because it is impossible to trace their relationship to income when the pensioners were active workers. Income other than employment income, such as interest and dividend income, is ignored for the same reason.

3.3 Redistributive effect of the Kosei Nenkin programme

This section provides a simple and rough assessment of the redistributive effect of the current Kosei Nenkin programme in Japanese society, based on a sample composed of 240 individuals (12 age groups (ranging from 20–24 to 75–79 years) and 20 income classes). Table 2 presents a summary. We assume that the population shrinks by 0.5% annually, which is close to the trend in recent decades, meaning that the older age groups make up a larger proportion of the population.

First we measure progressivity on an annual basis, using the 16.5% premium rate, and we leave the "incompleteness" of the system as it is.[8] As reported in part (a) of Table 2, the SCV of gross annual income of these groups is 0.986, which is somewhat higher than the actual value of 0.825 shown in Table 1(a). This difference is due mainly to the assumption in Table 2 that individuals have no earnings except social security benefits after retirement, leading to higher differentials of annual income between young and old. The Kosei Nenkin programme reduces the SCV by 65.4%, but 11% points of this (not shown in the table) must be covered by resources other than Kosei Nenkin premiums; this is in line with the result that average net annual income is 14.8% higher than gross

[7] My samples consist of all males and we assume that they all have non-working dependent wives, who get the flat-rate basic benefits without making any contributions.

[8] However, it should be noted that employers' contributions are reflected in the calculations, unlike in Table 1.

TABLE 2
Income Redistribution of the Current Kosei Nenkin Programme[a]

	Interest rate (%, annual)	Degree of immobility	Premium rate (%)	SCV: Gross income	SCV: Net income	SCV: Reduction (%)	Gini indices: Gross income	Gini indices: Net income	Gini indices: Effective progression	Change in average income (%)
(a) Incomplete system	Annual income			0.986	0.341	65.4	0.526	0.294	1.4898	14.8
	Lifetime income									
	1	0		0.141	0.119	16.1	0.214	0.196	1.0229	
		0.5		0.150	0.126	16.0	0.218	0.200	1.0235	5.8
		1		0.166	0.140	15.7	0.224	0.205	1.0242	
	2	0		0.138	0.122	12.0	0.211	0.198	1.0168	
		0.5	(16.5 (given))	0.147	0.129	11.8	0.216	0.202	1.0171	1.5
		1		0.161	0.143	11.5	0.221	0.207	1.0175	
	3	0		0.136	0.124	8.6	0.209	0.199	1.0119	
		0.5		0.144	0.132	8.4	0.213	0.204	1.0121	−1.9
		1		0.157	0.145	8.0	0.218	0.208	1.0123	
(b) Complete system	Annual income			0.986	0.314	68.1	0.526	0.275	1.5302	0
	Lifetime income									
	1	0		0.141	0.123	13.1	0.214	0.198	1.0198	
		0.5		0.150	0.131	12.5	0.218	0.203	1.0201	−9.1
		1		0.166	0.147	11.0	0.224	0.208	1.0204	
	2	0		0.138	0.127	8.4	0.211	0.201	1.0130	
		0.5	(37.5)	0.147	0.135	7.7	0.216	0.205	1.0131	−13.5
		1		0.161	0.152	6.1	0.221	0.211	1.0131	
	3	0		0.136	0.129	4.6	0.209	0.203	1.0077	
		0.5		0.144	0.138	3.9	0.213	0.207	1.0076	−17.0
		1		0.157	0.154	2.1	0.218	0.212	1.0074	

[a]A rate of population growth (n) is assumed to be equal to −0.5% (annual).

income. Moreover, the estimated effective progression is 1.4898, confirming the system's substantial redistribution on an annual basis.

Now we focus on the redistributive effects on a lifetime basis. We compare the results with three different interest rates (i = 1%, 2% and 3% at an annual rate) and with three degrees of immobility of income classes (= 0, 0.5 and 1). As can be clearly seen in Table 2, the redistributive effects on a lifetime basis are much more limited than on an annual basis, and depend on the interest rate as well as the degree of immobility of income classes. The reduction of the SCV is in the 8%–16.1% range and the effective progression is in the 1.01–1.02 range, both of which are much smaller than observed on an annual basis.[9] A higher interest rate reduces the progressivity of the Kosei Nenkin programme, because it lowers net lifetime income resulting from a PAYGO structure and increases its relative inequality. Indeed, if the interest rate is as high as 3%, net lifetime income will fall short of gross income, despite the government subsidy for the benefit. On the other hand, a lower mobility of income classes, i.e. a higher value of α, reduces the progressivity of the system, but not substantially, because it raises the inequality of both gross and net income.

How will these results change if we adjust the premium rate to make the system "complete", that is to make total premium revenues and total benefit payments balance every year? By making the system complete, we provide a steady-state picture of intragenerational redistribution in Table 2(b). The premium rate is endogenously solved as 37.5%, which is much higher than the current 16.5%, and strongly raises concerns about the sustainability of the current system, which relies heavily on future generations' burdens and/or on financial sources other than social security premiums.[10] This high premium rate adds to redistributive effects and progressivity on an annual basis, but it reduces them substantially on a lifetime income basis, mainly because of a sharp drop in average net income with an ageing society. If the interest rate is as high as 3% and there is limited mobility of income classes, it is quite difficult to justify the current system, as it reduces lifetime income by 17% but makes little improvement in the equality of income distribution.

3.4 Policy simulations

In this section we make some policy simulations and compare the impacts of five pension and tax reforms on lifetime income and its distribution, taking as a benchmark the current system, which is made "complete" by the endogenously solved premium rate (37.5%), and assuming that the interest rate is 2% and the degree of immobility is 0.5. We conducted several simulations, assuming different values for the degree of immobility, and obtained only minor differences in results.

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[9] Using Dutch micro data, Nelissen (1998) reported results similar to those of this paper, including the fact that the lifetime income-based redistribution effect of social security tends to be less than annual income-based effects, and that if the discount rate rises redistribution effects decrease. Nelissen (2000) also compared the redistributive impacts of several Dutch social security programmes on a lifetime basis.

[10] This endogenously determined premium rate in our model is not affected by assumptions on the interest rate or the degree of income class immobility, because (i) it is determined so as to balance premiums and benefits on an annual basis, and (ii) the actual distribution of annual income is reproduced regardless of the immobility of income class. On the other hand, 37.5% seems to be prohibitively high; but the Ministry of Health, Labour and Welfare (MHLW) stated in its report that the premium rate has to be raised eventually to 29%–35% to maintain the current level of pension benefits (Ministry of Health, Labour and Welfare, 2002). In addition, these figures in MHLW's estimates do not include taxes to finance the government subsidy for the Basic Pension benefits.

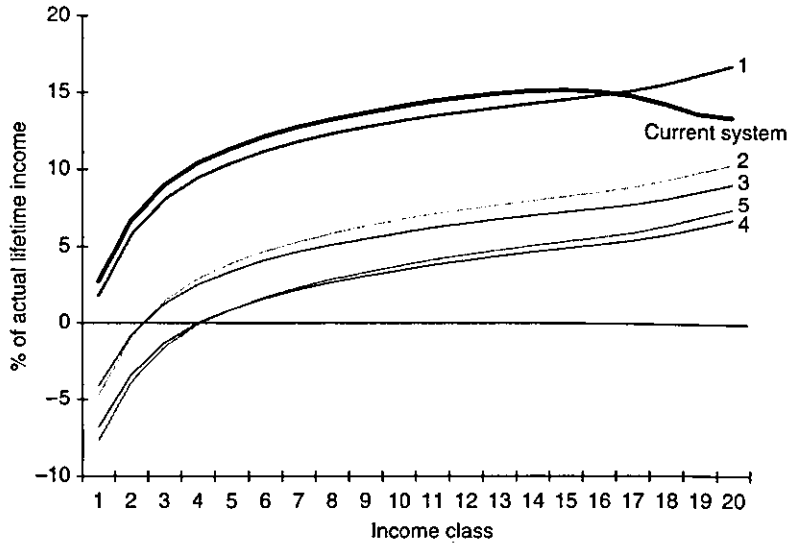

FIGURE 2. Net social security tax rates under the current system and proposed reforms

First, we remove the cap on earnings and take into account each individual's full monthly income (excluding bonus payments) (*reform 1*). This reform will reduce average net income for society as a whole. Its redistributive effect, however, is indeterminate because the intragroup variance of net lifetime becomes smaller for the higher-income group and larger for the low-income one because of the higher premium rate.[11] Table 3 shows that the premium rate falls to 27.2%, reflecting a broader tax base, and that the redistributive effect becomes much stronger with a limited change of average net income.

Figure 2, which compares each reform's impact on lifetime income by income class, helps explain this result. In this figure we compare the magnitude of the net social security tax relative to gross lifetime income. Under the current system, upper-middle-income classes face a higher net tax rate than any other class, largely because the cap system reduces the decrease in income for higher-income classes. Removal of the cap called for by reform 1 makes the tax curve slope monotonically upward, enhancing the overall progressivity of the system. In addition, tax reductions in lower-income classes and tax increases in higher-income classes largely offset each other, leading to a limited increase in the average net lifetime income. Once the cap is removed, shifting the tax base from monthly to annual income (which includes bonus payments)[12] does not matter in our model, provided we assume that the share of bonus payments is the same (1/4) for all individuals, and that the government reduces the benefit multiplier (to 22.5%, i.e. 30% × (1 − 1/4)) to keep the level of benefits unchanged.

For reform 2, we remove the wage-proportional component from the benefit on top of reform 1. Individuals now pay a wage-proportional premium when young (with no cap)

[11] The numerical analysis by Shimono and Tachibanaki (1985) pointed out that removing the cap has a limited impact on income redistribution in Japan. Meanwhile, Coronado *et al.* (2000) showed that in the United States this type of reform makes the system less progressive.

[12] This reform was actually implemented in April 2003. However, its impact will not be recognized yet, as it will take several years for the base for calculating wage-proportional benefits to completely shift to annual income from the current monthly (standardized) income. Thus, we should interpret the simulation results reported here as a long-run, potential impact of the reform. In our simulations the benefit multiplier is endogenously solved to be 24.81% in reform 1.

TABLE 3
Simulation Results: Alternative Systems

(a) Assumptions

Reform	Benefits	Premium/taxation	Cap	Taxed income
Current	Wage-proportional & flat	Wage-proportional premium and no tax on benefits	¥7 080 000/year	excl. bonus
1	Wage-proportional & flat	Wage-proportional premium and no tax on benefits	no	incl. bonus
2	Flat	Wage-proportional premium and no tax on benefits	no	incl. bonus
3	Flat	Proportional tax on wage and benefits	no	incl. bonus
4	Flat	Consumption tax without price indexation	no	incl. bonus
5	Flat	Consumption tax with price indexation	no	incl. bonus

(b) Premium/tax rate and income redistribution

		Lifetime income			Annual income	
Reform	Premium/tax rate (%)	Reduction in SCV (%)	Effective progression	Change in average income (%)	Reduction in SCV (%)	Effective progression
Current	37.5	7.7	1.0131	−13.5	68.1	1.5298
1	27.2	15.6	1.0223	−13.6	73.5	1.5525
2	14.3	14.8	1.0212	−7.2	47.9	1.3364
3	12.5	12.9	1.0184	−6.3	43.0	1.2953
4	11.4	12.9	1.0184	−3.8	31.1	1.2076
5	12.8	14.4	1.0206	−4.2	34.6	1.2339

Note: A rate of population growth (n), the interest rate (r) and the degree of immobility of income class (α) are assumed to be −0.5%, 2%, and 0.5, respectively.

and receive a flat benefit when old. As implied in the discussions in Section 2.1, this reform is expected to raise net lifetime income but widen its relative inequality, making the government face a trade-off between efficiency and intragenerational equity. According to our simulation, the required premium rate falls remarkably to 14.3%, which suppresses the reduction of average lifetime income to 7.2%. On the other hand, the reduction of the progressivity from reform 1 becomes quite limited, probably because a remarkable rise in average income appears largely to offset the effect of an increase in its variance of income. This situation is also consistent with a substantial downward shift of the tax curve in Figure 2, which shows an increase in net lifetime income across income classes, and contributes to a reduction of its relative inequality.

Accordingly, we can state that downsizing the social security system to a simple one whose benefit has only a flat component succeeds in raising *net lifetime income* on average, without substantially raising its relative inequality compared with the current system. On an *annual income* basis, by contrast, it leads to a substantial reduction of progressivity, because the young pay less and the old receive less.

Reform 3 uses income tax, which is commonly applied to wages earned by the young and benefits received by the old, instead of premiums, to finance the flat-rate benefits. The tax base includes bonus payments. The tax rate is now endogenously solved as 12.5%, which is somewhat lower than the premium rate 14.3% in reform 2, because not only the working young but also the retired old finance benefits. In line with expectations based on the discussions in Section 2.5, a shift to income taxation both suppresses a reduction in average lifetime income and reduces the progressivity of the system, compared with reform 2. Progressivity on an annual income basis also falls, because the old have to pay taxes.

Reform 4 applies consumption tax with no price indexation instead of income tax to finance the benefits. In our simple model net lifetime income (before consumption tax) is proportional to the sum of gross lifetime income and (not price-indexed) benefits. Hence a reduction of the SCV and effective progression are the same in reforms 3 and 4. This result contrasts with that on an annual basis, which shows that consumption tax is less progressive, because the old have to pay more taxes than under income taxation. Meanwhile, a reduction in average lifetime income is more limited in reform 4 than in reform 3, suggesting that consumption tax with no price indexation is preferable to income tax.

It seems, however, to be more realistic to presume price indexation for the social security benefits when introducing consumption tax. Reform 5 attempts to do this. Consumption tax with price indexation makes average net lifetime income somewhat lower than in the case of no price indexation, but still higher than in the case of income tax. However, it makes net lifetime income more equally distributed than those two reforms, but still less than in the case of no taxation. Looking again at Figure 2, we recognize the possibility that lower-income individuals can be better off net even under a PAYGO system, once the social security benefit is limited to its flat component. The introduction of consumption tax raises this possibility, because it can reduce the decrease in average net income.[13]

Figure 3 plots a combination of changes in average lifetime income and a reduction of the SCV reported in Table 2, to enable a comparison of each reform in terms of efficiency

[13] This appears to contradict the conventional view, which emphasizes the regressivity of a consumption tax, considering that lower-income individuals have a higher propensity to consume. In the present model all individuals spend their entire lifetime incomes throughout their lives; thus, the propensity to consume throughout life is equal to 1 for all individuals.

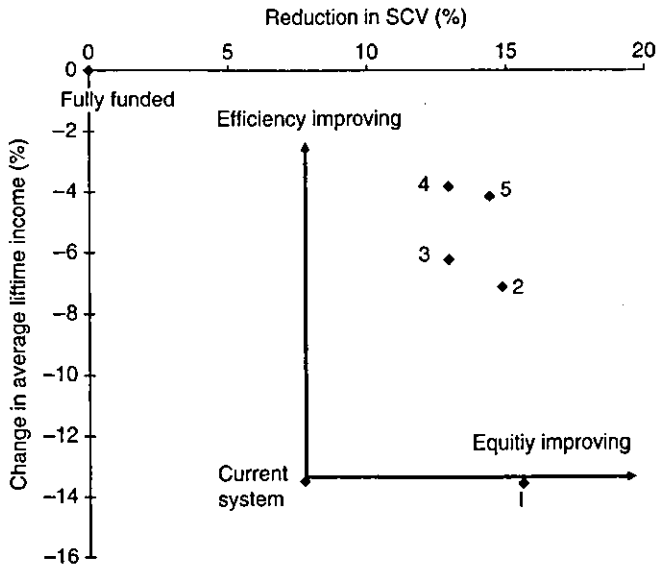

FIGURE 3. Changes in average lifetime income and reductions in SCV

and intragenerational equity.[14] Starting with the current system as a benchmark, upward and rightward shifts indicate improvements of efficiency and equity, respectively. Reform 1 reduces inequality of income, but little improvement in average income makes it less attractive, especially compared with reforms 2–5. Accordingly, removing the cap does not appear to be enough. Reforms 2–5, which call for a scaling down of the social security benefit to only a flat component on top of removing the cap, are all preferable to the current one in terms of both efficiency and equity.[15]

Which is the best choice? Reform 3 is clearly inferior to reforms 4 and 5, as can be clearly seen in the figure, but it is difficult to compare the remaining three. Reforms 4 and 5 are superior in terms of efficiency, whereas reforms 2 and 5 are relatively desirable in terms of equity. Taking into account a small difference in the reduction of the SCV between reforms 2 and 5, as well as a small difference in the reduction of average income between reforms 4 and 5, and also the fact that having no price indexation incorporated into reform 4 is difficult to implement, reform 5 would seem to be the most desirable and plausible choice; that is, it would appear advisable for the government to finance the flat social security benefit with consumption tax and price indexation, provided it wanted to maintain a PAYGO system.

Of course, this is just a rough comparison without any rigorous judgemental criteria, and the relative performance of each reform depends on assumptions of economic and demographic variables. Moreover, it should be noted that our analysis focuses on a very narrow area of policy options, confining the social security system to a PAYGO one. Among a wider range of policy options, especially those combined with tax and other policy measures, one could find a better policy than that shown above the frontier in Figure 3.

[14] We can draw almost the same figure if we use effective progression instead of a reduction in the SCV.

[15] This conclusion may be derived from the fact that our analysis ignores an aspect that rationalizes a wage-proportional benefit. For example, suppose that a paternalistic government forces myopic individuals to save for retirement; since the desired level of consumption after retirement depends on the consumer's permanent income, a wage-proportional benefit is preferable.

For example, the economy might be better off with a suitable combination of a fully funded system, corresponding to the origin in Figure 3, and a redistributive tax system.[16]

4. Concluding remarks

This paper investigates how the social security system in Japan redistributes lifetime income within the same generation. As is widely recognized, a PAYGO social security system reduces net lifetime income with an ageing population, because it entails income transfers from the young to the old. Even on a lifetime basis, however, it may redistribute income from high-income to low-income individuals because of its progressive structure. Hence it is important to assess the intragenerational redistribution of a PAYGO social security system.

The key results of the present analysis, based on a simple life-cycle model and policy simulations using data from the 1996 Survey on the Redistribution of Income, are summarized as follows. First, the redistributive effects and the progressivity of the current social security system are much more limited on a lifetime basis than are observed on an annual basis. Also, the "incompleteness" of the system makes it difficult to capture the whole structure of its progressivity. Second, shifting to a simple system that consists of a flat benefit and a wage-proportional premium and has no contribution cap can be one of the most desirable PAYGO reforms with an ageing population, because it can suppress a reduction of net lifetime income on average, as well as reduce its relative inequality within the same generation. Third, once the system is simplified, financing a price-indexed flat benefit with consumption tax appears to be a good choice in terms of both efficiency and intragenerational equity. It should be noted, however, that a recommendation of price indexation relies heavy on the ignorance of transition. The current Japanese social security system expects a significant burden to be placed on future generations. Price indexation, which does not reduce benefits to the older generation, is likely to have a harmful effect on the intergenerational income redistribution, especially in transition to a new system with a higher consumption tax.

The present analysis has several limitations, and many issues remain to be addressed. Owing to a lack of longitudinal information, our estimation of the redistributive effects relies heavily on data that are synthetically reorganized from cross-section data from the Survey. Heterogeneity regarding family structure, mortality and other factors, which is totally neglected in this paper, would likely provide different pictures of income distribution, as has already been demonstrated by earlier research in the United States. In particular, more labour force participation by women would affect the overall progressivity of the social security system. Finally, our comparative statics, which focuses on the policy impact on steady states and ignores the issue of how to compensate for existing pension liabilities, cannot provide a comprehensive assessment of policy reforms.

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[16] As mentioned in note 3, we ignore the need to compensate the existing pension liabilities.

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