

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.

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.

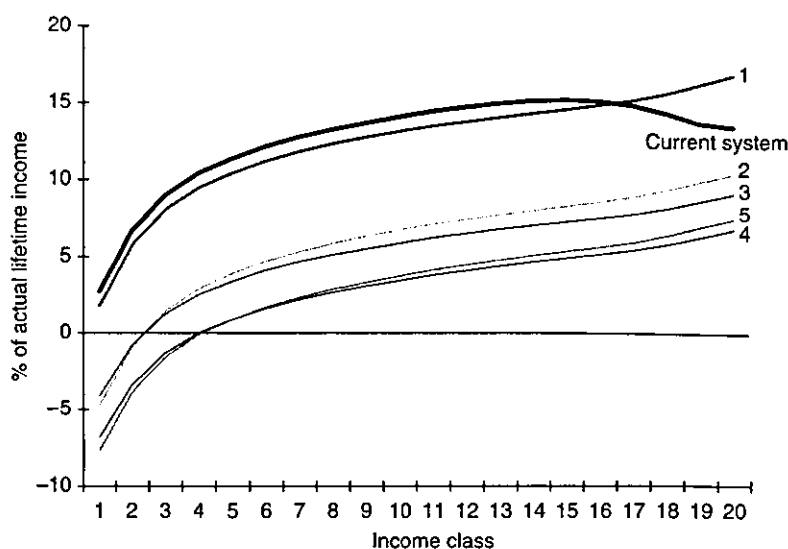


FIGURE 2. Net social security tax rates under the current system and proposed reforms

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. $30\% \times (1 - 1/4)$) 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 | | Premium/taxation | | Cap | Taxed income |
|--|--------------------------|--|--|------------------------------|----------------------|
| Reform | Benefits | Premium/taxation | | Cap | Taxed income |
| Current | Wage-proportional & flat | Wage-proportional premium and no tax on benefits | 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 | Wage-proportional premium and no tax on benefits | no | incl. bonus |
| 2 | Flat | Wage-proportional premium and no tax on benefits | Wage-proportional premium and no tax on benefits | no | incl. bonus |
| 3 | Flat | Proportional tax on wage and benefits | Proportional tax on wage and benefits | no | incl. bonus |
| 4 | Flat | Consumption tax without price indexation | Consumption tax without price indexation | no | incl. bonus |
| 5 | Flat | Consumption tax with price indexation | 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 (%) |
| Current | 37.5 | 7.7 | 1.0131 | -13.5 | 68.1 |
| 1 | 27.2 | 15.6 | 1.0223 | -13.6 | 73.5 |
| 2 | 14.3 | 14.8 | 1.0212 | -7.2 | 47.9 |
| 3 | 12.5 | 12.9 | 1.0184 | -6.3 | 43.0 |
| 4 | 11.4 | 12.9 | 1.0184 | -3.8 | 31.1 |
| 5 | 12.8 | 14.4 | 1.0206 | -4.2 | 34.6 |
| Effective progression | | | | | |
| Current | | | 1.5298 | | 1.5298 |
| 1 | | | 1.5525 | | 1.5525 |
| 2 | | | 1.3364 | | 1.3364 |
| 3 | | | 1.2953 | | 1.2953 |
| 4 | | | 1.2076 | | 1.2076 |
| 5 | | | 1.2339 | | 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.

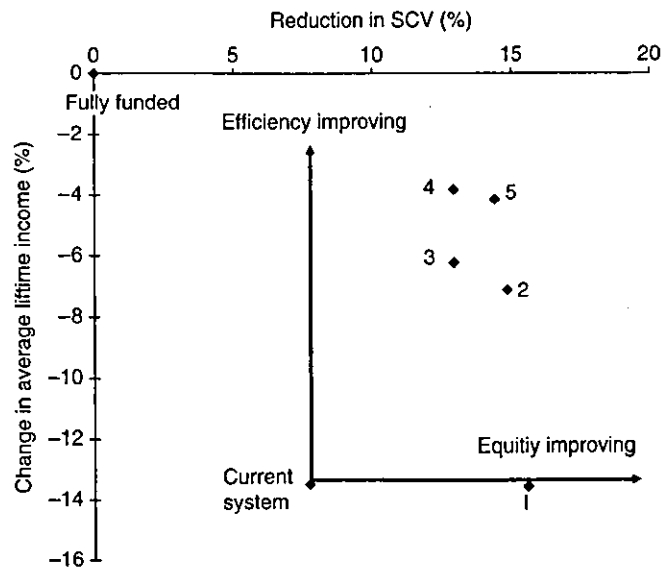


FIGURE 3. Changes in average lifetime income and reductions in SCV

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 heavily 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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