# Macroeconomic Impact and Public Finance Perspectives of the Aging Society*

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## 1. Introduction

During the next fifty years, the population of Japan is expected to age at an unprecedented speed. The proportion of those at 65 years old or older is about 20% of the population now and the government expects it to exceed 40% in fifty years. Since most of these people will be retired, their living expenditures will have to be financed

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either by liquidating their private wealth, or by private or public transfers from the working generation. During the last few decades, the increase in the life-expectancy, the increase in the risk of medical care costs and in the long-term care costs have been greatly adding to the financial uncertainty in the old age.

In response to these increased risks, the universal coverage in public pension plan and the health insurance system had been established in the early 1960s in Japan, and finally in 2000 the long-term care insurance was introduced. These social security programs are operated, by and large, as pay-as-you-go systems. This is clear for health care and long-term care insurance programs that hold only minimal financial reserves. While some of our pension programs still own substantial reserve funds, they are small relative to their liability, and, in the long-run, they have to be operated under a modified pay-as-you-go principle.

Under a pay-as-you-go system, as population ages, the social insurance contribution unavoidably increases for the younger generations to maintain constant benefits. If the population ages rapidly, the insurance cost must increase sharply: Japan is having misgivings about such a steep increase for coming generations[1]. The motive can be very selfish. The government has now learned that a social insurance program can lose its

[1] For example, see Ogura (1994).

credibility very fast once the public realizes its cost rises too fast to be honored by the future generations.

The problem is further complicated in Japan where so far, only the estimates of the costs of benefits have been published by the government. There the insurance contribution costs are usually computed according to the present financing framework, leaving substantial portions to general tax revenue, effectively hiding them from public eyes. Looking at the government future projection of individual programs, it is easy to overlook the overall implication of the hidden costs, particularly when close to a third of public expenditure is financed by public debt. This is precisely what we want to accomplish in this paper; namely to present overall picture of social insurance costs and the size of the already “earmarked” general tax revenue to maintain them in this century.

This chapter is organized as follows. In section 2, the relation between social security and demographic change in the future are described. In section 3, we outline the model used in our paper. In section 4, the simulation result is described. Section 5 concludes the paper.

## 2. Demographic Change and Social Security

It is useful to review the basic relationship between the tax rate of pay-as-you-go

social security system and the dependency ratio[2].

If $b$ is the benefit per retiree and $N_b$ is the number of retirees, then total benefits are $b \times N_b$. The taxes paid by current workers are the products of tax rate $t$, the average covered wage per worker $w$, and the number of workers $N_w$. Hence, equality between benefits received and taxes paid requires that

$$b \times N_b = t \times w \times N_w \tag{1}$$

Rearranging this equation gives us

$$t = \frac{N_b}{N_w} \times \frac{b}{w} \tag{2}$$

The first term on the right-hand side of equation (2) is the *dependency ratio*, the ratio of the number of retirees to the number of workers. The second term is the *replacement ratio*, the ratio of average benefits to average wages. The long-term problems with the social security system arise from the fact that the Japan has an aging population, which implies that the dependency ratio is increasing over time.

In Figure 1, we have shown how the elderly dependency ratio has changed since 1960 for Japan, and how it is expected to change in this century. The data for the period from 1960 to 2000 are taken either from *the Population Census* or from *the Annual Report on Current Population Estimate* published by the Ministry of Public Management. The

[2] For example, see Rosen (2002).

data for year 2001 to year 2100 are taken from *the Population Projections for Japan* (January 2002) by the National Institute of Population and Social Security Research (NIPSSR), and three different paths are shown for the three fertility scenarios, low, medium and high. Population trend of medium variant are shown in Figure 2 and three fertility scenarios are shown in Figure 3.

＜Figure 1＞

＜Figure 2＞

＜Figure 3＞

In 1961 when the universal coverage was achieved for both public pensions and public health insurance, the elderly dependency ratio was only 0.11, and, in 1973, which used to be referred as “the first year of the welfare era”, or “*Fukushi Gannen*”, it was still only 0.12. In other words, to support one retiree, in 1973 there were 8.1 workers. The population aging accelerated in the 1970s and 1980s, however, and the elderly dependency ration has reached 0.17 in 1985, when the basic pension was introduced for all adults, and it was 0.28 in year 2000. We have only 3.6 workers to support one retiree in 2000. Further aging will raise the elderly dependency ratio to 0.5 in 2020, when two workers are expected to support one retiree. The timing of the peak year is different in different fertility scenario: in the high fertility scenario, it is in 2051 at the dependency

ratio of 0.67, in the medium fertility scenario, it is in 2054 at 0.73, but in the low fertility scenario it is in 2072 at 0.89. In all three scenarios, however, the dependency ratios are expected to decline after these peak values.

In a pay-as-you-go social security system, an increase in the dependency ratio implies that for a contributing worker, more elderly are receiving the benefits. Given the fixed retirement benefits, in particular, a rapid aging will require a rapid increase in the contributions by the current workers, which may create serious intergenerational conflicts and destabilize the social security system. As the society ages, the aggregate risks of long-life, chronic diseases and long-term care increase, and structural adjustments are needed to stabilize the system once more.

Perhaps, in the long-run, it may be still possible for Japan to lift the elderly dependency ratio downward by effective pro-fertility policies and remove substantial pressure on its social security. It will take, however, at least twenty years before such policies start making a difference in the ratio, and another forty years to realize their full effects. Moreover, the causes of low fertility seem to be rooted deep in the structures of our market economy and our society. It may not be easy, and it may very well be very costly, to put effective pro-fertility policies into place. In any case, for the first half of this century, we can ignore the effects of pro-fertility policies as they will make little

difference in our analysis during this period.

Given the official population projection, and given the present benefit policies of our social insurance programs, therefore, we will first compute the overall burden of these programs. We will then examine if the current fiscal system provides sufficient funds to pay for these benefits.

## 3. The Model

In what follows, we first outline the framework of our simulation model developed by Kawase *et al*. (2007). The entire model consists of three sectors; macroeconomic sector, social insurance sector, and general government sector[3]. For each year, first, the macroeconomic sector is solved to provide the basic economic environments, and secondly, the expenditures and the revenues of the three social insurance programs (public pension, public health insurance and long-term care insurance) are computed. Thirdly, the expenditures and revenues of the public sector are computed. Finally, the capital stock and the public debt are recomputed, and new population structure data are given. Basic settings of our simulation are shown in Table 1.

＜Table 1＞

[3] See Atoda *et al*. (2003), Kawase *et al*., (2005) and Kawase *et al*. (2007) for details.

### 3.1. Economic Assumptions

For our macroeconomic sector, we adopt a simple growth model that has been used in the last official pension projection of public pensions by the Ministry of Health, Labour and Welfare (MHLW). The official 2004 pension projection, however, focuses exclusively on the cost of public pensions in the context of a growing economy. In order to fully grasp the burden of aging population of the public sector, however, it is clear that we have to extend the analysis to include all three major social insurance programs; namely, public pension, health insurance and long-term care insurances. Also we have to take into account the general tax burden as well as the public debt. It is also necessary for us to adopt identical assumptions on such important macroeconomic indicators as the economic growth rate, the interest rate, and the inflation rate, as well as on the population structure, to the ones used by the government.

Following the set of assumptions employed for the public pension projection of 2004, the medium variant in *the Population Projections for Japan* by the NIPSSR in January 2002 is adopted (see Table 2). Also we have set the rate of growth in real wage rate at 1.1%, the rate of inflation at 1.0%, and the real rate of return on pension funds at 2.2%. The economic growth rates and the long-term interest rates during the period from 2000

to 2008 are identical to the ones used for the Cabinet Office's middle-term economic and fiscal projection of 2003. We have shown these variables in Table 3.

＜Table 2＞

＜Table 3＞

The economic growth rates and the long-term interest rates beyond year 2009, on the other hand, are generated by the same macroeconomic model presented at the Pension Subcommittee of Social Security Council on the August 27 in 2003.

We can write the Cobb-Douglas production function as

$$Y = AK^{\alpha}L^{1-\alpha} \tag{3}$$

where $Y$ is GDP, $A$ is total factor productivity (TFP), $K$ is capital, $L$ is labor, and $\alpha$ is the capital share of income. The growth rate of this economy can be expressed as

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L} \tag{4}$$

where $\dot{Y}, \dot{A}, \dot{K}, \dot{L}$ represents the time derivatives of these variables respectively.

If we define per capita GDP as $y = Y/L$, the growth rate of per capita income can be expressed as

$$\frac{\dot{y}}{y} = \frac{\dot{A}}{A} + \alpha\left(\frac{\dot{K}}{K} - \frac{\dot{L}}{L}\right) \tag{5}$$

Denoting the rate of depreciation by $\delta$, the rate of growth in capital stock is expressed as

$$\frac{\dot{K}}{K} = \frac{I}{K} - \delta \tag{6}$$

where $I$ is the gross investment of the economy, a policy variable in this simulation. The rate of growth in labor, $\dot{L}/L$, on the other hand, is an exogenous variable in our model. We define the net profit rate $r$ as the marginal product of capital net of depreciation, or

$$r = \alpha \frac{Y}{K} - \delta \tag{7}$$

Our long-term interest rate is derived from this profit rate as the real long-term interest rate is, by and large, proportional to the net profit rate. More specifically, the real long-term interest rate will be given by multiplying the average real long-term interest rate of the last 15 years (2.8%) and the ratio of the net profit rate to the average net profit rate of the last 15 years (9.9%).

The constant parameters of this model are the capital income share $\alpha$, the rate of depreciation $\delta$, and the rate of technological change. The growth rate of labor is not necessarily constant over time, but it will be given from outside of the system. Under normal circumstances, the policy variable of the model is the gross investment: given the path for $I$, the model will determine the complete paths for the wage rate, the net profit rate, the growth rate of the economy, and the growth rates of per capita income.

Specifically, in this model, the capital share $\alpha$ is set at 37.3%, and the rate of

depreciation $\delta$ is set at 8.2% per year, and rate of technological progress is set at 0.7% per year. The labor supply data are taken from the labor force projection of the MHLW until year 2025 (Table 4), and they were computed by the authors from the population projection of the NIPSSR for years beyond 2025. For the gross investment, we have used the figures used by the MHLW for their official pension projection: they have assumed that the gross investment ratio will slowly decline from 24.7% in 2001 to 21.4% in 2032. Furthermore, for years beyond 2032, it is held constant at 21.4%.

Solving this model, we have obtained 1.1% as the average growth rate of per capita GDP. This is exactly the figure obtained for the average real wage growth rate by the MHLW, which they decided to use until year 2100 in their pension simulation. This completes our attempt to reproduce the MHLW economic growth model.

The MHLW have added 0.5% point to the estimated real long-term interest rate (1.8%-2.1%) as the additional return from the diversification of portfolios on public pension funds. Rather than using variable rate, they have used the mid-range value of the sum (2.2%) as the real rate of return in their official pension projection. We have followed their assumption to reproduce their results faithfully.

In Figure 4, we have shown the results of our simulated growth rates of real GDP and real long-term rate of interest. Throughout this 90 year period, the real long-term rate of

interest remains fairly stable around its mean of 1.8%. The growth rate of real GDP for this period is far from stable: first it falls for the next 30 years, stays around zero for another 30 years, and gradually recovers up to 0.5%. The average growth rate of real GDP (not per capita) during this period is only 0.2%.

＜Figure 4＞

### 3.2. Public Pension Programs

#### (1) Revenue from Contributions

Revenue from contributions in each program is obtained as the product of the numbers of insured workers and their average contribution.

We classify our population into three major groups according to their basic pension status, Category 1 for self-employed, Category 2 for employees, and Category 3 for dependent spouses of Category 2 individuals. First, the number of insured workers (Category 2) for each year is obtained from the population projection and the labor force participation rate projection, and then the number of dependent spouse (Category 3) is obtained by multiplying the dependency ratio. The number of Category 1 individuals is obtained as a fixed proportion of the difference between the population and the sum of Category 2 and Category 3. This process is repeated for each age and for each sex.

For the average contribution values, for Category 1 insured, we have used the projected contribution values in the MHLW projection, and, for Category 2 insured, we have used the product of the projected payroll tax rates in the MHLW projection and their estimated average payroll.

**(2) Cost of Benefits**

Cost of benefits of each pension is computed by multiplying the per capita benefit and the number of beneficiaries. The number of beneficiaries is estimated from the population projection.

To obtain the cost of the basic pension benefits, first, we add the number of those at age 65 or older and the number of those who opt for early retirement benefit to obtain the number of the basic pension beneficiaries, which we multiply by the estimated per capita benefit. Incidentally, the subsidy of the national government is computed as a fixed proportion of the cost of the basic pension benefit.

As to the cost of public pensions for employees, we have generated the total number of entitled retirees by taking into account their mortality and the inflow of new retirees, from which the numbers those receiving full benefits and partial benefits are computed. The latter are those individuals who continue to work after they become eligible. For each benefit, the average cost is computed as a weighted average of the existing claims

and the average new claims. The scheduled changes in benefit parameters are duly taken into account to compute the value of the average new claims, including the increasing pensionable age. This process is repeated for each age and each sex.

**(3) Simulation of Revenue and Payment Balances**

Given these estimates of revenues, benefit payments, national government subsidies, the only missing link for the financial projections of the basic pension program and employees' pension programs are the returns on their accumulated funds. They are obtained simply by multiplying the end of year figures of the funds by the assumed rate of return. In the simulation, we have used all the basic system parameters published by the MHLW. In order to reproduce the official financial balance projection faithfully, we have further adjusted the estimated data to the official figure when necessary.

### 3.3. Health Insurance

We have first estimated the future national health care expenditures using the population projection and our per capita health care projection. The latter has been obtained by simply assuming that the per capita health care costs (Table 5) to grow at 2.1% per year for individuals below age 70, and at 3.2% per year for individuals at age 70 or older, which is exactly the assumption in *the Projections of the Cost and Benefits*

*of Social Security* (May 2004) by the MHLW (Table 6)[4]. Using the latest data, we distributed a fixed proportion of the national health care expenditure as the cost of public health insurance benefits. Given the cost of the insurance benefits, the health insurance charges and government subsidies have been obtained.

＜Table 5＞

＜Table 6＞

### 3.4. Long-Term Care Insurance Program

For each care-need grade, we have computed the cost of the benefit as the product of the number of beneficiaries and the average cost of benefits in the grade. The number of beneficiaries is obtained by applying the present long-term care incidence rate of the elderly to the projected elderly population. The average cost of benefits (Table 7) are assumed to grow at 2% per year until 2025, and at 1% per year thereafter, which is the assumption employed in *the Projection of the Cost and Benefits of Social Security* (May 2004) by the MHLW. After the cost of benefits is computed, it is distributed to insurance charges and government subsidies, following the present legal framework.

＜Table 7＞

[4] http://www.mhlw.go.jp/houdou/2004/05/h0514-3.html

### 3.5. General Government Sector

General government sector consists of the combined national and local government financial transactions. The expenditure items consist of the cost of subsidies to social insurance programs, interest payments for public debts, and the other government expenditures. The revenue items consist of the total tax revenue, the (non-insurance) charges, and the net deficit.

The cost of the subsidies to social insurance programs is the sum of the government subsidies computed in the social insurances sector. The interest payment for public debt is computed by using the long-term interest rate generated by the macroeconomic sector on the stock of last year’s public debt. The cost of the other government expenditures is assumed to grow at the same rate as GDP. The total tax revenues and the revenue from charges are assumed to grow 1.1 times faster than the GDP growth rate. The net deficit is the difference between the sum of the government expenditures and the sum of the total tax revenue and revenue from charges.

## 4. Simulation Results

### 4.1. Cost of Social Insurance Programs

In Figure 5, we have shown the burdens of pension, health insurance and long-term care insurance contributions as percentages of GDP.

The size of the combined contributions increases rapidly for the first twenty years but grows more slowly until it exceeds 14% of GDP in 2050. After reaching its peak at 14.54% in 2060, it remains around 14%. The most important component is the public pension contribution, whose level the pension reform of 2004 has fixed for years beyond 2018 (see also Figure 6 and 7). The contribution of health care insurance increases more steadily, and approaches public pension in importance. The long-term care insurance grows gradually until it reaches 1.6%.

＜Figure 5＞

＜Figure 6＞

＜Figure 7＞

In Figure 8, we have shown the burdens of public pensions, health insurance, and long-term care insurance, including government subsidies, as the ratios to GDP. The government subsidies have to be financed either by tax revenues or by public debt, but the choice does not concern us here. Incidentally, the jump in 2009 reflects the

scheduled increase (from 1/3 to 1/2) in the government subsidy to the basic pension in the 2004 pension reform legislation (see Figure 9). The overall burden of social security programs relative to GDP will exceed 20% in 2033, and, in 2060, it will reach almost 23%. It will remain around 22% thereafter.

＜Figure 8＞

＜Figure 9＞

As we can see from the Figure 8, the introduction of a mechanism for automatic adjustment of benefit level called “macroeconomic slide” and a fixed contribution program will start to stabilize the public pension cost relative to GDP around 2015, which is a substantial accomplishment. For health insurance and long-term care insurance, on the other hand, we still have the progressive cost structure with respect to aging. To be sustainable, the costs of these programs still seem to be too large to be sustainable, particularly in the second half of this century, when more than 20% of GDP are used to finance the programs.

### 4.2. Potential National Burden and Financing Methods

We have seen how the cost of social security programs changes as our population ages, particularly relative to the size of our future GDP. So far, we did not address the

question of financing methods. When we allow the possibility of financing part of these costs through public debt, or deficit financing, we need a new comprehensive index, called potential national burden, to capture the burdens under different financing policies. The potential national burden ratio is the ratio of the sum of the tax revenue, social security contribution and fiscal deficit to the GDP, or

Potential National Burden Ratio

= Total Taxes as a percentage of GDP

+ Social security contribution as a percentage of GDP (8)

+ Fiscal deficit as a percentage of GDP

＜Figure 10＞

In Figure 10, we have shown how the overall national burden changes over time. From the Figure 10, we can see that the general tax burden is stable around 17%, and the social security burden is also stable around 14%, but the fiscal deficit as a proportion of GDP keeps on growing throughout this period. Not only our present fiscal structure leaves an enormous burden on our future generation, and it is not sustainable under the expected population aging. As the public debt to GDP ratio keeps on growing

without limit, sooner or later, the capital market will refuse to finance any more deficits. For the sustainability, the primary fiscal balance has to be restored, sooner or later. To put it differently, ceteris paribus, current design of taxes and contributions are not sufficient to finance the costs of aging for Japan as projected by the government.

One way for the government to reduce the fiscal deficit is through the reduction in public expenditures by cutting the “fats”. Given the size of the current fiscal deficit or the implied future fiscal deficits, however, it is not realistic to restore the primary balance by cutting the expenditures alone. Sooner or later, the government has to resort to increases in taxes or contributions at the same time cutting the benefits. Practically speaking, striking a proper balance between the two will be very important, but for the rest of this section, as a first approximation, we will ignore the latter (or the cuts in benefits) and concentrate on the former (or the increase in tax).

For Japan, the obvious candidate of such an increase is the consumption tax. The tax rate of Japanese consumption tax is only 5%, and it yielded revenue of 12.5 trillion yen in FY 2004. Thus an additional 1% of consumption tax adds 2.5 trillion yen. Compared with such European nations as Sweden (25%), Italy (20%), France (19.6%), United Kingdom (17.5%) or Germany (19%), it is a very low rate. An important aspect of a fundamental reform in a social security program is whether or not we should maintain

the framework of social insurance. For public pensions or public health insurance, for instance, some argue very strongly that we should abandon the social insurance principle and adopt a complete tax financing scheme. It may be difficult to completely do away with the social insurance framework that has almost one hundred years of history. For this reason, we will adopt a middle ground for our financing reform: we maintain the basic social insurance framework but finance the required increase in government funding through “earmarked” consumption tax.

Let us consider introducing the new earmarked consumption tax to finance the public subsidy to the social security programs in year 2010. The required rate of such an earmarked consumption tax is given in Figure 11.

＜Figure 11＞

It is, however, difficult to adjust the consumption tax rate every year, and for this reason, we considered an alternative scenario in which the consumption tax rate is raised by further 15% in 2010 once and for all, which means it is raised to 20%. Needless to say, we may need to increase the consumption tax rate by less than 15%, if the primary fiscal balance is improved sufficiently through the cuts in government expenditures. We have shown the changes in the potential national burden under this scenario in Figure 12.

＜Figure 12＞

By increasing the consumption tax rate in 2010, the potential national burden jumps to 23.6% in the year, but, under the policy, the potential national burden is reduced almost by half of Figure 10 in subsequent years. Clearly a bold and early increase in consumption tax will improve the primary fiscal balance, and reduce the public debt to GDP ratio, and it can effectively cut the future national burden into half.

What if the tax increase is delayed due to political procrastination? What if politicians procrastinate for 20 years, and they finally decide on the 15% increase in consumption tax rate in 2030? This case is shown in Figure 13.

＜Figure 13＞

The potential national burden is reduced to about 70% of the no-tax-increase case of Figure 10, but it is substantially higher than the case in Figure 12. As the consumption tax increase is delayed, not only the public debt keeps on growing, but the reduction of the public debt to GDP ratio becomes so much harder to require a larger increase to achieve the same goal (Figure 14).

＜Figure 14＞

Recently, many argue that fiscal balance can be restored through economic growth and the resulting increase in tax revenues. Such a policy, called a “Deficit Gamble”, can

leave an enormous burden for future generation if the policy fails (Ball *et al.* 1998): current Japanese policy of postponing the tax increase necessary to restore the primary fiscal balance is a good example of a gamble. If we consider the increasing future burden of social security programs, however, the probability of winning such a gamble is extremely small, which makes it a very irresponsible policy.

## 5. Concluding Remarks

According to our analysis, if a current social security benefit level is maintained, the cost reaches the considerable scale. The slim down of social security benefits is necessary. However, the fiscal reconstruction is difficult only in cuts in expenditures, and the tax increase is needed. In that case, the characterization and the raising rate of the consumption tax are important. We have to discuss whether the consumption tax will be characterized as a social security purpose or not, and it is necessary to explore the ideal way of the consumption tax in the future.

After the 1970s, the social security system of Japan has allocated huge resources to unconditional benefits to the elderly. However, continuing such an intergenerational transfer system became impossible by a rapid falling birthrate and aging. The purpose of the social security is to make the scheme in which all generations can live without

anxiety. The success or failure of the social security reform in the future depends on whether we will be able to design the system that the fairness among the generations is considered.

Economic growth is known to be indispensable for the fiscal reconstruction and the tax increase tends to be put off politically. However, there are a lot of problems of the idea that the fiscal reconstruction can be done in case of economic growth even if the tax increase is put off. It is considered as a gamble to expect the fiscal reconstruction by economic growth and it is like relying on the lottery to repay the debt of the child name. The large encumbrance will be left for the children further if coming off though it doesn't remain if it wins a prize in the lottery.

The uncertainty is inherent in the prospects of the economic growth rate, the interest rate, and dynamics of population, etc. The raising rate of the consumption tax grows by putting off time. It is necessary to accomplish a bold and accountable reform considering the uncertainty in the future.

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Table 1: Basic settings of simulation

| | Settings |
|---|---|
| (1) Economic Assumptions | FY 2003-2008:<br>Cabinet Office, *Reform and Outlook: Fiscal 2003 Revision*.<br>From FY 2009 onward:<br>The rates are set based on the report of the Pension Fund Management Committee of the Social Security Council. |
| (2) Population Projection | National Institute of Population and Social Security Research,<br>*Population Projections for Japan* (Medium Variant in January 2002) |
| (3) Public Pension | Ministry of Health, Labour and Welfare,<br>*2004 Actuarial Valuation on Employees Pension Insurance and National Pension in Japan* |
| (4) Health Insurance | Growth rate of per capita health care costs of benefit:<br>2.1% per year for individuals below age 70.<br>3.2% per year for individuals at age 70 or older. |
| (5) Long-Term Care Insurance | Growth rate of per capita long-term care costs of benefit:<br>-FY 2002: 10%<br>FY 2003- 2025: 2%<br>From FY 2026 onward: 1% |
| (6) General Government | Net budget of central and local government.<br>Tax revenue: Nominal GDP growth rate×1.1<br>Amortization rate: 3.0% (Results in FY 2000)<br>Other government expenditures are assumed to grow at the same rate as GDP. |

Table 2: Life expectancy at birth for the medium variant

| Life expectancy at birth | 2000 (actual) | In 2050 as previously estimated (in 1997) (medium variant) | In 2050 as now estimated (in 2002) (medium variant) |
|---|---|---|---|
| Male | 77.64 years | 79.43 years | 80.95 years |
| Female | 84.62 years | 86.47 years | 89.22 years |

Source: Ministry of Health, Labour and Welfare, *Outline of 2004 Actuarial Valuation on Employees' Pension Insurance and National Pension in Japan* (March 2005)

Table 3: Economic assumptions for 2004 actuarial valuation

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | From 2009 |
|---|---|---|---|---|---|---|---|
| Price inflation | -0.3 | -0.2 | 0.5 | 1.2 | 1.5 | 1.9 | 1.0 |
| Wage growth rate<br>[real] | 0.0<br>[0.3] | 0.6<br>[0.8] | 1.3<br>[0.8] | 2.0<br>[0.8] | 2.3<br>[0.8] | 2.7<br>[0.8] | 2.1<br>[1.1] |
| Rate of investment return<br>[difference from wage growth rate] | 0.8<br>[0.8] | 0.9<br>[0.3] | 1.6<br>[0.3] | 2.3<br>[0.3] | 2.6<br>[0.3] | 3.0<br>[0.3] | 3.2<br>[1.1] |

Note: The rate of investment return in the table is the assumed rate of return on the independently managed component. The total rate of investment return until FY2007 is the rate calculated taking into account the rate of return on deposits to the Fiscal Loan Fund (calculated based on performance as of the end of FY2002).

Source: Ministry of Health, Labour and Welfare, *Outline of 2004 Actuarial Valuation on Employees' Pension Insurance and National Pension in Japan* (March 2005)

Table 4: The projection of labor force participation rate by age group

| | Male | | | Female | | |
|---|---|---|---|---|---|---|
| | 2000 | 2010 | 2025 | 2000 | 2010 | 2025 |
| 15-19 | 18.4 | 19.0 | 20.1 | 16.6 | 17.8 | 17.8 |
| 20-24 | 72.7 | 75.1 | 77.6 | 72.7 | 73.4 | 73.7 |
| 25-29 | 95.8 | 95.9 | 95.9 | 69.9 | 74.9 | 75.3 |
| 30-34 | 97.7 | 97.6 | 97.6 | 57.1 | 63.6 | 65.0 |
| 35-39 | 97.8 | 97.8 | 97.8 | 61.4 | 64.8 | 67.4 |
| 40-44 | 97.7 | 97.8 | 97.8 | 69.3 | 72.5 | 75.2 |
| 45-49 | 97.3 | 97.5 | 97.5 | 71.8 | 74.9 | 77.0 |
| 50-54 | 96.7 | 96.9 | 96.9 | 68.2 | 70.9 | 73.5 |
| 55-59 | 94.2 | 94.4 | 94.4 | 58.7 | 61.8 | 67.5 |
| 60-64 | 72.6 | 80.0 | 85.0 | 39.5 | 45.0 | 60.5 |
| 65- | 34.1 | 31.6 | 29.5 | 14.4 | 13.5 | 13.0 |

Note: The unit is percent.

Source: Ministry of Health, Labour and Welfare, *Labor Force Participation Rate Projections* (July 2002).

Table 5: Health care cost per capita by age group (FY 2003)

| Age group | Health care cost (thousand yen) |
|---|---|
| 0-4 | 171.6 |
| 5-9 | 99.5 |
| 10-14 | 72.0 |
| 15-19 | 62.8 |
| 20-24 | 76.9 |
| 25-29 | 92.5 |
| 30-34 | 105.3 |
| 35-39 | 111.3 |
| 40-44 | 128.6 |
| 45-49 | 161.9 |
| 50-54 | 215.2 |
| 55-59 | 264.6 |
| 60-64 | 349.0 |
| 65-69 | 468.1 |
| 70-74 | 610.0 |
| 75- | 809.4 |

Source: Ministry of Health, Labour and Welfare, *National Medical Expenditure* (2003).

Table 6: The projection of the costs and benefits of social security

| | Fiscal Year | | | |
|---|---|---|---|---|
| | 2004 | 2010 | 2015 | 2025 |
| Social security benefits | 23.5% | 25.4% | 27.0% | 29.0% |
| Public pension | 12.6% | 12.8% | 12.9% | 12.2% |
| Health care | 7.1% | 8.2% | 9.2% | 11.2% |
| Welfare etc. | 3.8% | 4.3% | 4.7% | 5.7% |
| Long-term care | 1.4% | 2.2% | 2.7% | 3.6% |
| Social security burdens | 21.3% | 24.2% | 26.6% | 29.5% |
| Social insurance premium | 14.2% | 15.5% | 16.7% | 18.3% |
| Public pension | 8.2% | 8.7% | 9.4% | 9.7% |
| Health care | 4.4% | 4.8% | 5.1% | 5.9% |
| Welfare etc. | 1.6% | 1.9% | 2.2% | 2.7% |
| Long-term care | 0.5% | 1.0% | 1.1% | 1.5% |
| Government subsidies | 7.1% | 8.7% | 9.6% | 11.2% |
| Public pension | 2.2% | 2.9% | 2.9% | 2.7% |
| Health care | 2.7% | 3.4% | 4.0% | 5.3% |
| Welfare etc. | 2.2% | 2.4% | 2.7% | 3.2% |
| Long-term care | 0.8% | 1.2% | 1.6% | 2.1% |

Note: Each figure is a percentage of national income (NI).

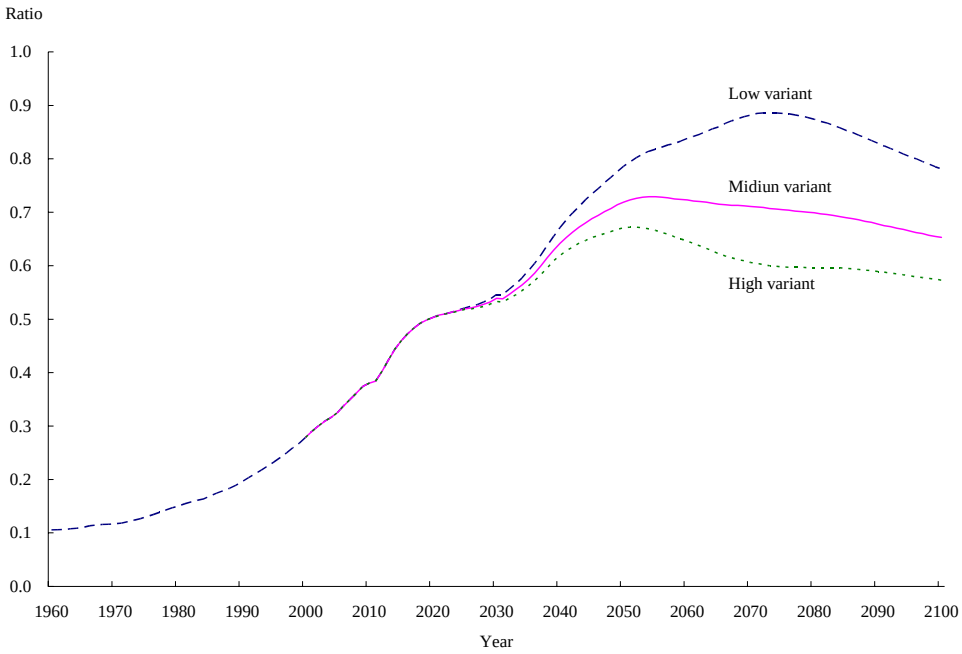
Source: Ministry of Health, Labour and Welfare, *the Projections of the Cost and Benefits of Social Security* (May 2004).

Table 7: Long-term care cost per capita by age group (May 2003)

| | Long-term care cost (thousand yen) | | | | | | |
|---|---|---|---|---|---|---|---|
| Age group | Total | Support required | Care level 1 | Care level 2 | Care level 3 | Care level 4 | Care level 5 |
| 40-64 | 136.7 | 36.6 | 71.0 | 103.5 | 155.8 | 208.7 | 262.4 |
| 65-69 | 133.5 | 36.4 | 74.0 | 113.4 | 167.8 | 222.2 | 261.5 |
| 70-74 | 135.1 | 36.2 | 76.0 | 123.5 | 181.7 | 237.3 | 277.9 |
| 75-79 | 139.3 | 36.7 | 80.0 | 134.8 | 198.7 | 257.5 | 295.1 |
| 80-84 | 150.7 | 38.2 | 86.4 | 148.1 | 213.0 | 273.2 | 306.6 |
| 85-89 | 169.8 | 39.8 | 93.8 | 154.5 | 219.0 | 275.8 | 307.9 |
| 90-94 | 193.7 | 41.2 | 102.1 | 159.8 | 221.5 | 277.3 | 303.5 |
| 95- | 225.4 | 42.7 | 113.8 | 168.5 | 225.5 | 280.9 | 301.5 |

Source: Ministry of Health, Labour and Welfare, *Monthly Report of Long-term Care Expenditure* (May 2003).

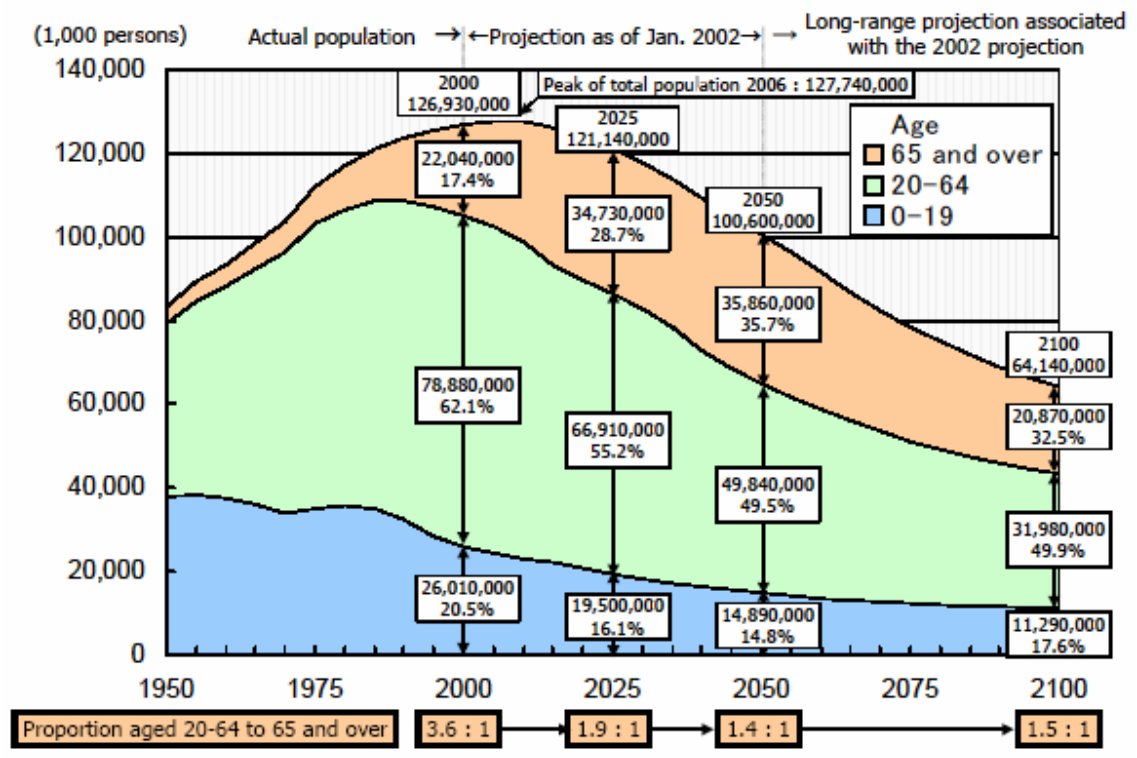
Figure 1: Actual and Projected Elderly Dependency Ratio in Japan




Sources: Statistics Bureau, *the Population Census* and *the Annual Report on Current Population Estimates*, and National Institute of Population and Social Security Research, *Population Projections for Japan* (January 2002).

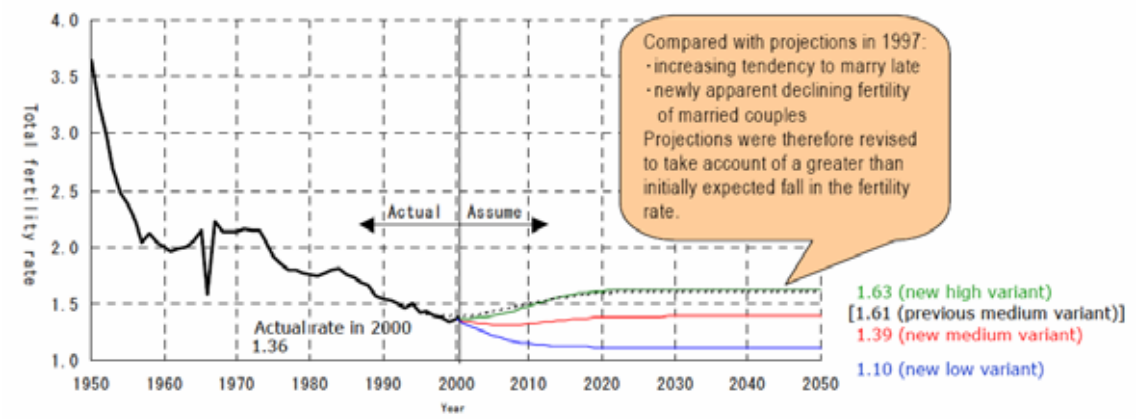
Note: Elderly dependency ratio is the population aged 65 and over divided by the population aged 20-64.

Figure 2: Population Trends by Age Group (Medium Variant in January 2002)




Source: Ministry of Health, Labour and Welfare, *Outline of 2004 Actuarial Valuation on Employees' Pension Insurance and National Pension in Japan* (March 2005)

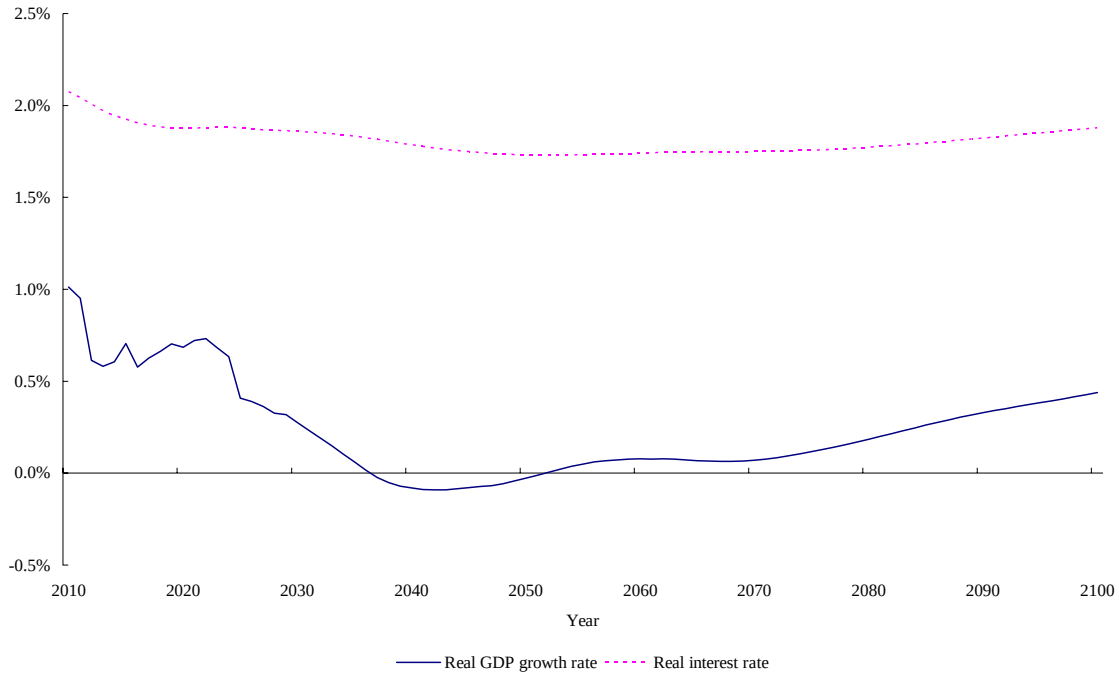
Figure 3: Projected fertility rate (projection as of January 2002)




Note: In the long-range projection for 2050 onward (2050-2100), the fertility rate is hypothesized to return to the population replacement level (i.e. a total fertility rate of around 2.07) toward 2150.

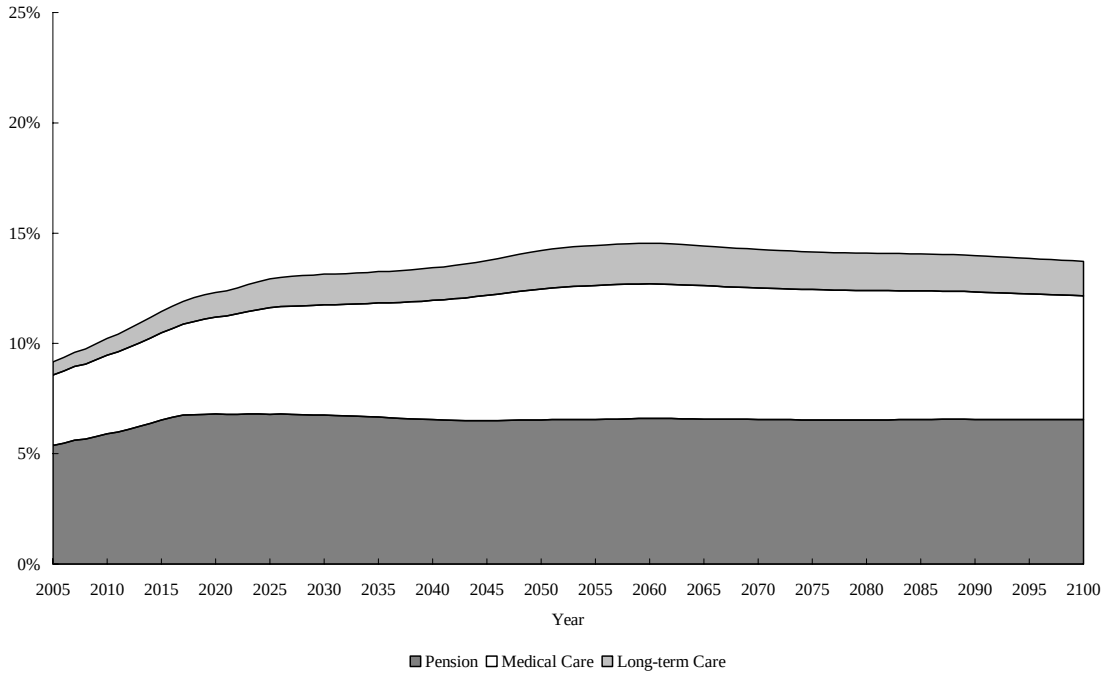
Source: Ministry of Health, Labour and Welfare, *Outline of 2004 Actuarial Valuation on Employees' Pension Insurance and National Pension in Japan* (March 2005)

Figure 4: Economic growth rate and interest rate



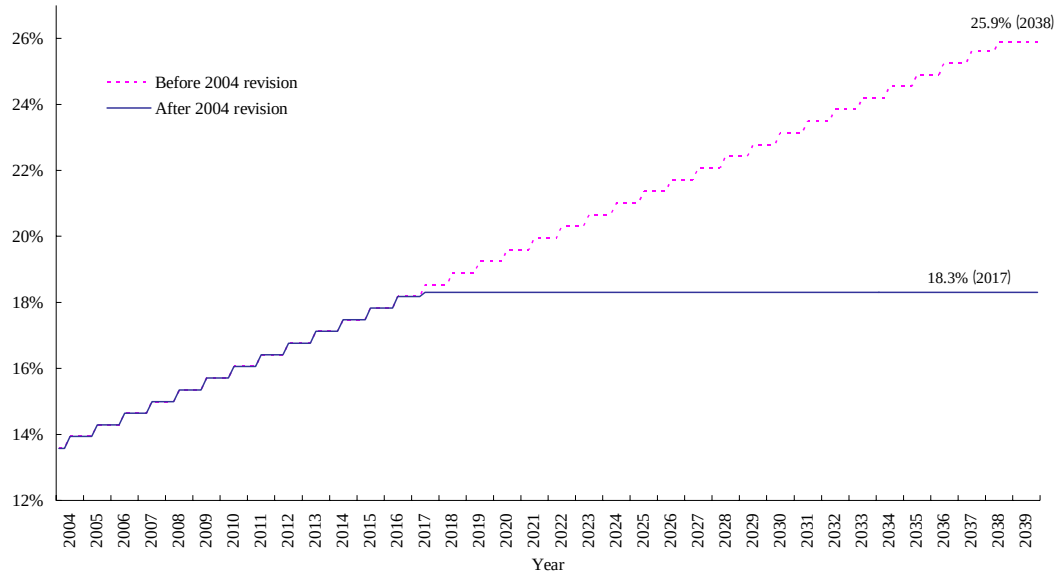

Source: Simulation by the authors.

Figure 5: Social security contribution as a percentage of GDP



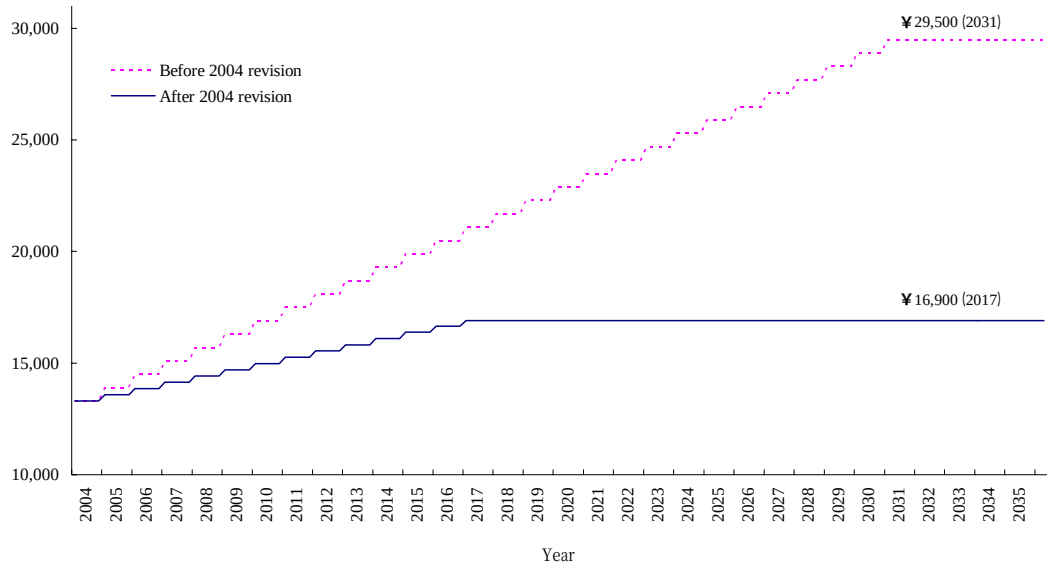

Source: Simulation by the authors.

Figure 6: Employees' Pension contribution rate



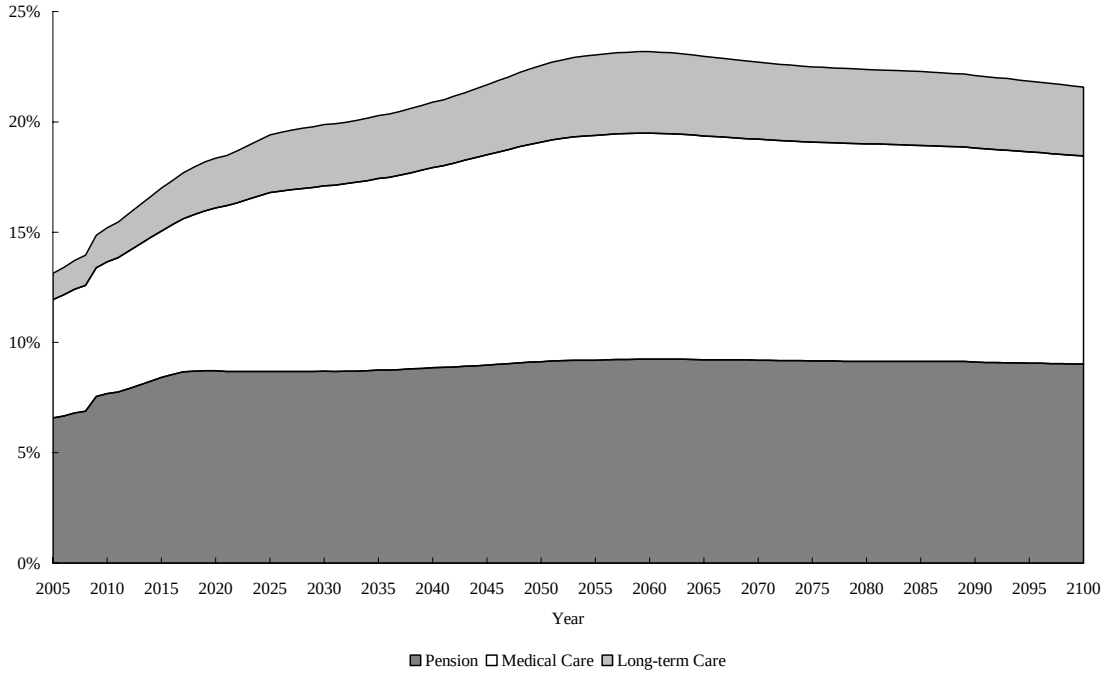

Source: Kawase *et al*. (2005)

Figure 7: National Pension contribution



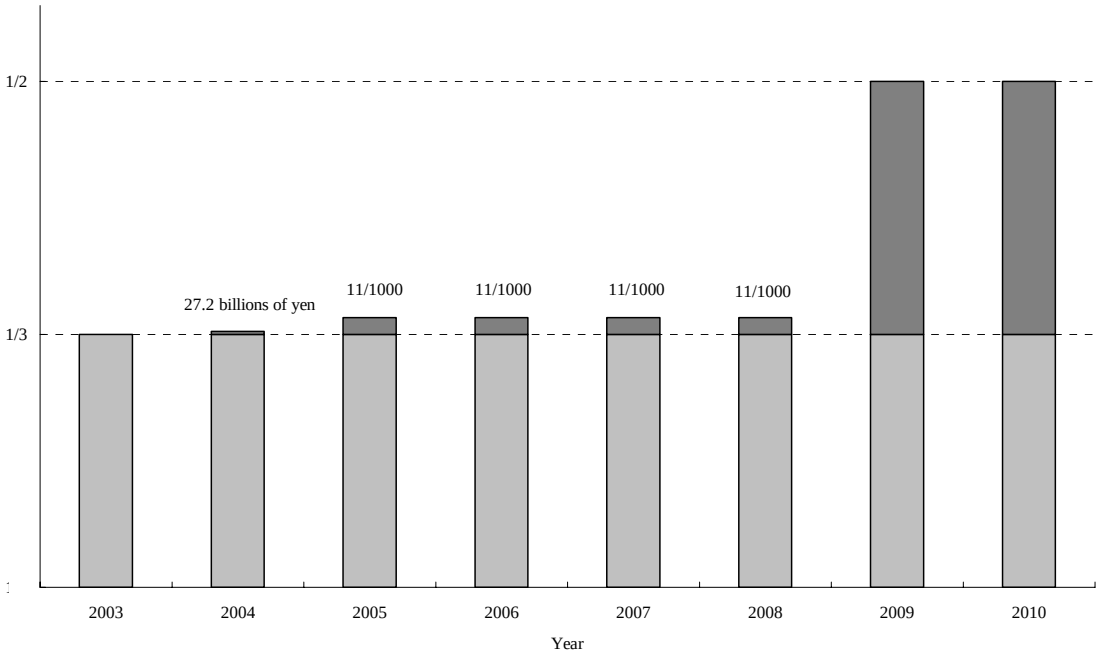

Source: Kawase *et al*. (2005)

Figure 8: Social security contribution including government subsidies as a percentage of GDP



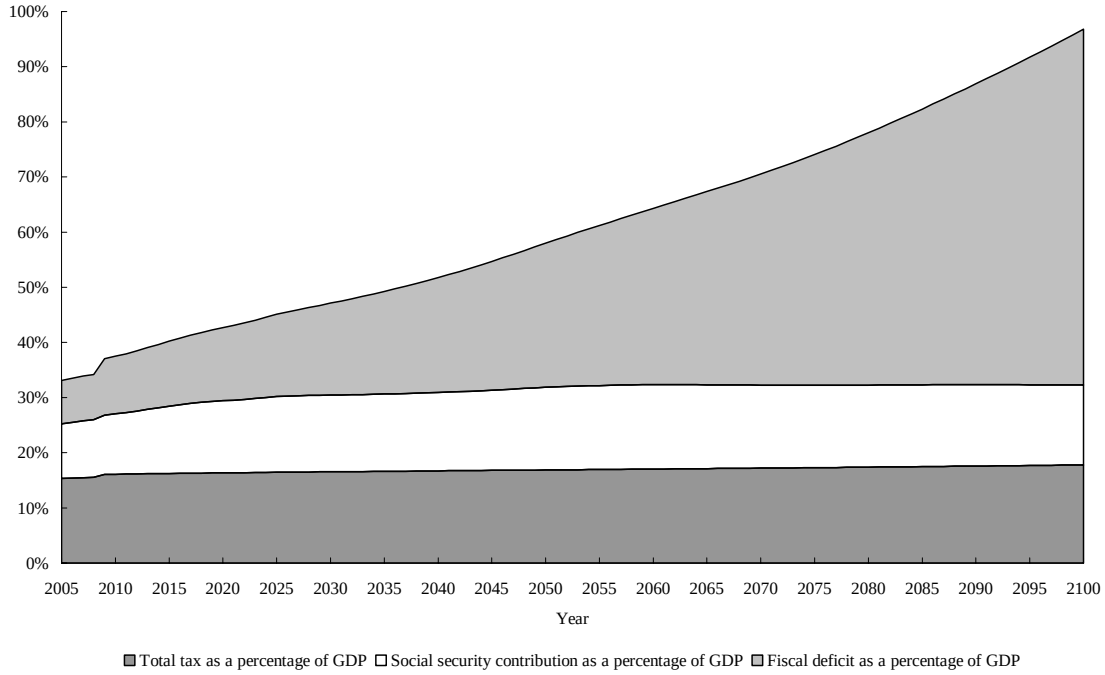

Source: Simulation by the authors.

Figure 9: Government subsidy ratio to the basic pension



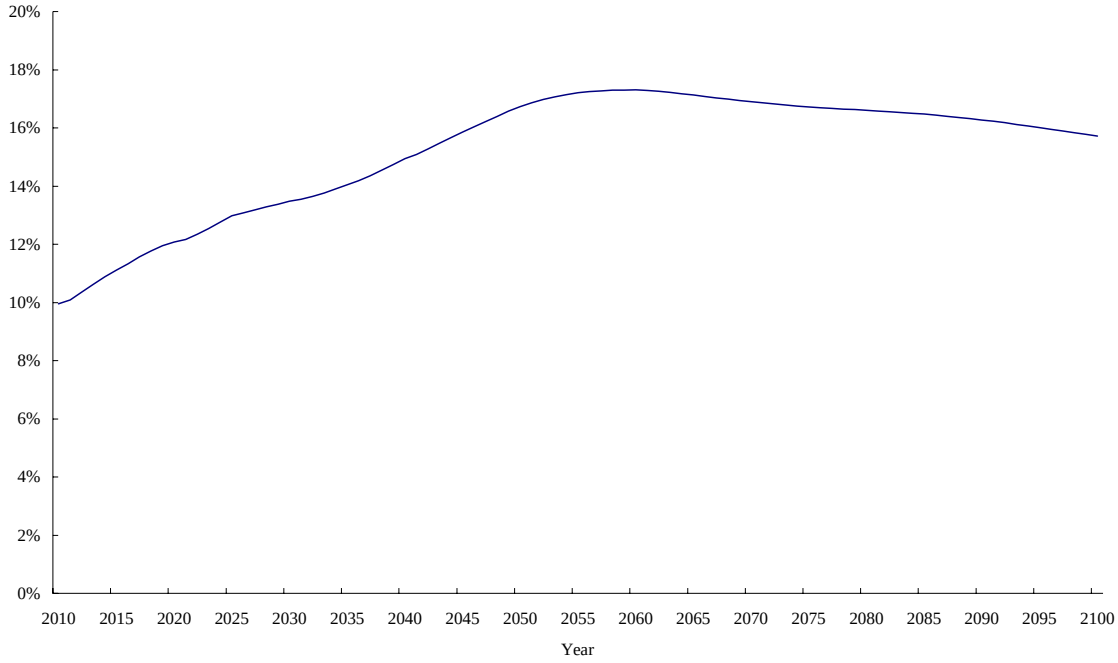

Source: Kawase *et al*. (2005)

Figure 10: Potential National Burden Ratio



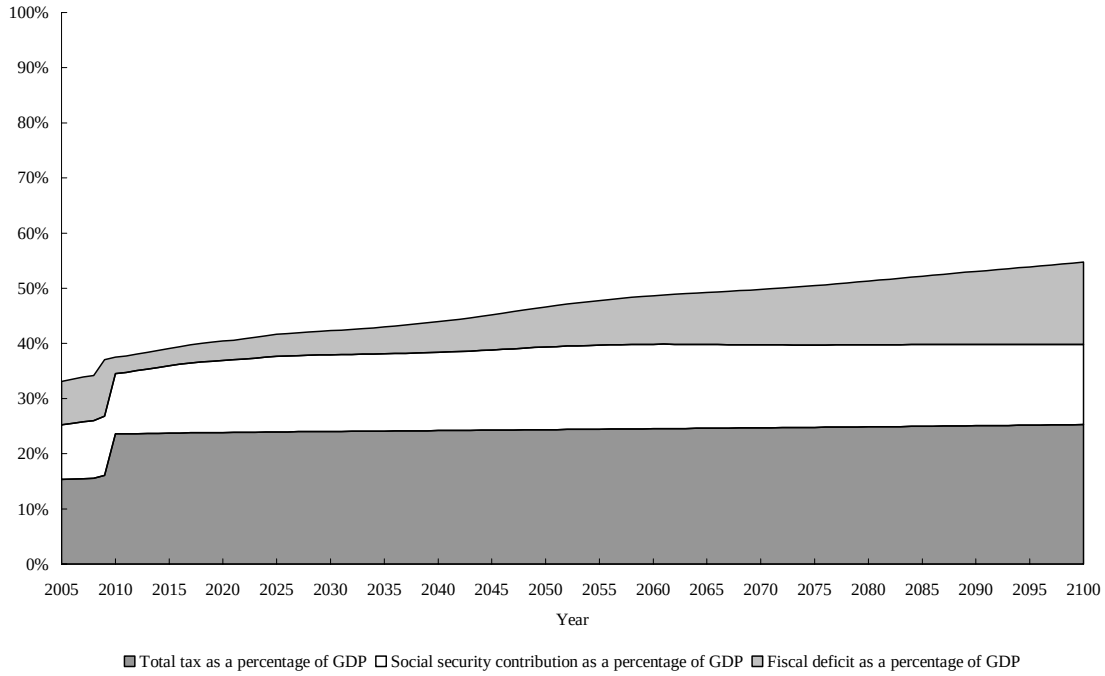

Source: Simulation by the authors.

Figure 11: The required rate of an earmarked consumption tax



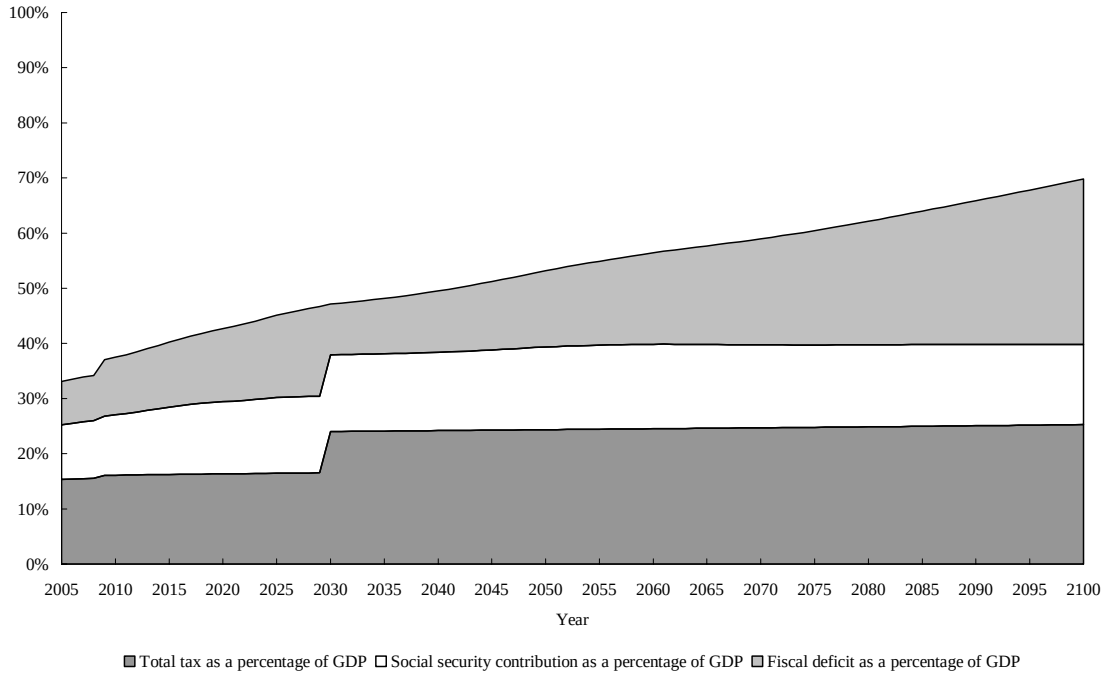

Source: Simulation by the authors.

Figure 12: Potential National Burden Ratio (the consumption tax rate is raised by 15% in 2010)



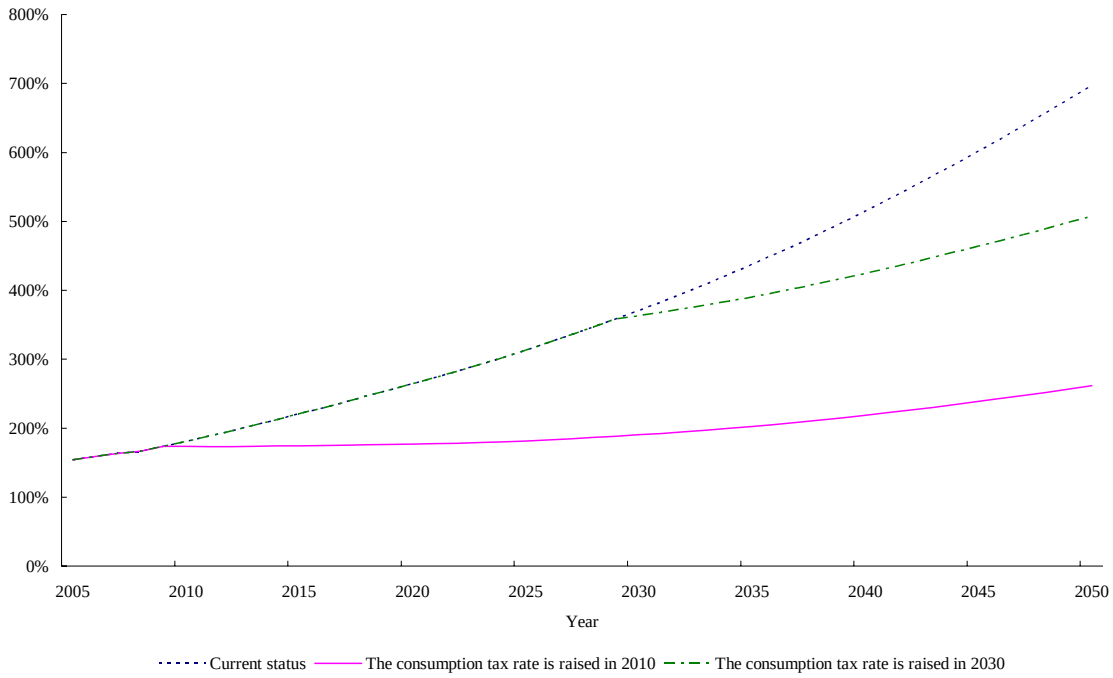

Source: Simulation by the authors.

Figure 13: Potential National Burden Ratio (the consumption tax rate is raised by 15% in 2030)




Source: Simulation by the authors.

Figure 14: Government debt as a percentage of GDP




Source: Simulation by the authors.