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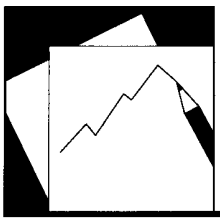

IMF Working Paper

Intergenerational Implications of Fiscal Consolidation in Japan

Kiichi Tokuoka

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Intergenerational Implications of Fiscal Consolidation in Japan

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Authorized for distribution by Ray Brooks

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Abstract

In Japan, intergenerational inequality in lifetime resources is substantial, with a heavier fiscal burden on the young than the old. Moreover, given the need for fiscal consolidation, the inequality is even worse than existing policy would suggest. However, this does not mean that fiscal consolidation would make the young worse off. Lack of fiscal consolidation would eventually increase interest rates, which would reduce output and hit young generations harder. Simulations using an overlapping generations model indicate that, from the perspective of intergenerational fairness, it would be desirable to include both social security spending reforms and revenue measures in a fiscal consolidation package. The simulations also show that delaying fiscal consolidation could be costly and worsen intergenerational resource inequality.

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Keywords: Intergenerational inequality, Fiscal consolidation, Overlapping generations model

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I. INTRODUCTION

1. **Japan's large and rising public debt requires a substantial fiscal consolidation in the coming decade, which would have an important impact on intergenerational resource allocation.** In recent years, the primary deficit has been sizable at about 8 percent of GDP, which pushed general government gross debt to over 220 percent of GDP by end-2011. Although the large deficit partly reflects cyclical components, even the structural (cyclically adjusted) primary deficit is estimated to have exceeded 7 percent of GDP in 2011 (Figure 1, top left). Putting the public debt-to-GDP ratio firmly on a downward path would require consolidation of about 10 percentage points of GDP over the next decade (IMF, 2012). Such a large adjustment has significant implications for intergenerational resource allocation. In principle, fiscal consolidation tends to worsen intergenerational inequality from the level implied by existing policy.

2. **Does intergenerational resource imbalance matter?** The answer could be no, if all the seniors were concerned about their offspring's lower lifetime resources and transferred more resources to younger generations. However, in Japan, the empirical evidence does not support such altruistic behavior among senior generations (Horioka, 2002). Moreover, even if some resource transfer exists, the lifetime resources of many young households will not be compensated through this channel (for example, some may not have rich enough parents or grandparents). Empirical evidence shows that in Japan, rich (high income) households tend to receive larger gifts and inheritances (Hamaaki, Hori, and Murata, 2012).

3. **Intergenerational inequality in resource allocation in Japan is already significant even without accounting for future fiscal consolidation.** The pay-as-you-go social security system that provides pensions, health care, and aged care has widened intergenerational resource inequality substantially because of the rapidly aging population. In 2003, the Cabinet Office estimated that, based on government policy at the time, the present discounted value (PDV) of the lifetime net burden[2] for future generations would be 100 million yen per household (about 20 times household annual disposable income) more than that for those aged 60 years or older (Figure 1, top right). Therefore, a key question is how to implement fiscal consolidation while minimizing further deterioration in intergenerational inequality.

4. **To analyze the intergenerational implications of fiscal consolidation, this paper considers a lifecycle overlapping generations (OLG) model with multiple generations.** This model provides an ideal framework for analyzing this issue. An OLG model with endogenous labor supply can complement a detailed, but partial equilibrium analysis of generational accounting, because it allows us to examine the general equilibrium implications of fiscal consolidation on the supply side.[3] This analysis makes two key contributions. First, in assessing

[2] Net burden is defined as any payment to the government minus any transfers and provision of services from the government.

[3] Many of the OLG studies on Japan assume exogenous labor supply (for example, Oguro, et al., 2011; Kato, 2002; Kato, 1998). Uemura (2004) who assumed endogenous labor supply in a lifecycle OLG model is one of the few exceptions. However, whereas he focused on public pension reform under the assumption of a budget balance (no public debt), this paper allows accumulation of public debt, which has an impact on private savings through interest rates.

the impact of fiscal consolidation on intergenerational resource allocation, the analysis closely ties the consolidation's size, composition, and timing to Japan's current context. Second, the analysis considers fiscal consolidation *packages*, not just individual consolidation measures.

5. **This paper concludes that combining social security spending reforms and revenue measures in a balanced manner would be the fairest way to distribute the burden of fiscal consolidation across the generations.** In Japan, social security reforms are a natural target for fiscal consolidation, given that rising social security benefits, both in pension and nonpension areas, are driving the large deficits (Figure 1, bottom left). The OLG simulation highlights the point that social security spending reforms would have a less adverse effect on intergenerational inequality than alternative measures. However, an excessive reliance on these measures, in particular reducing pension benefits for current pensioners, would have a serious impact on the welfare of seniors—making the case for a more balanced approach involving both social security spending reforms and revenue measures. For example, seniors may have planned their retirement assuming an unchanged policy.

6. **The timing of fiscal consolidation could also have important intergenerational resource implications.** The OLG simulation shows that delaying consolidation would increase the burden for young and future generations while reducing that for current senior generations.

7. **Interpretation of the simulation results requires caution.** Several aspects of the economy are simplified. For example, although pension benefits are explicitly modeled, for tractability nonpension social security benefits and other forms of government spending are treated as exogenous and thus do not affect household utility (for details, see below). Also, in this paper's OLG model, there is no uncertainty about pension benefits, wage income or life length, and no heterogeneity in each generation (only one agent represents each generation). The assumption of no uncertainty about pension benefits is particularly important because it means that future pensions will be paid fully, irrespective of whether fiscal sustainability is ensured (this issue will be revisited later).

8. Section II, which follows, presents the OLG model and reports key findings on intergenerational implications of fiscal consolidation. Section III discusses other key related issues, followed by conclusions.

II. Simulation Analysis and Discussion

9. **The reality of resource imbalance across generations in Japan is even worse than that indicated by the Cabinet Office's 2003 estimates, because they do not take future policy changes into account.** For instance, the government's proposed increase in the value-added tax (VAT) by 5 percentage points to 10 percent by FY2015 would result in a heavier additional tax burden for young generations. The simulation results here indicate that such a tax hike would increase the PDV of the lifetime tax burden of those aged 70 years by 30 percent of current per household wage income before taxes and raise the lifetime tax burden of those aged 20 years by 100 percent (Figure 2, left).[4] Furthermore, recent Cabinet Office projections (January

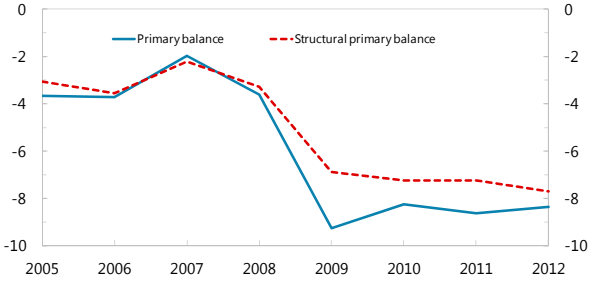
[4] Details concerning the model assumptions are provided later.

2012)[5] suggest that under prudent macroeconomic assumptions, the government would either need to cut expenditure or raise the VAT beyond 10 percent, or both, to achieve its primary surplus goal. Any such action would further increase intergenerational inequality beyond that reported by the Cabinet Office in 2003 (Figure 1, top right) and implied by the proposed 10 percent increase in the VAT. Similarly, by comparing the net tax rates for future generations and newborns, Kotlikoff and Leibfritz (1999) argued that once needed expenditure cuts or future tax increases are considered, Japan is the most intergenerationally unequal economy in the world (Figure 2, right).

Figure 1. Overview of Japan's Public Finances

Fiscal deficits remain high…

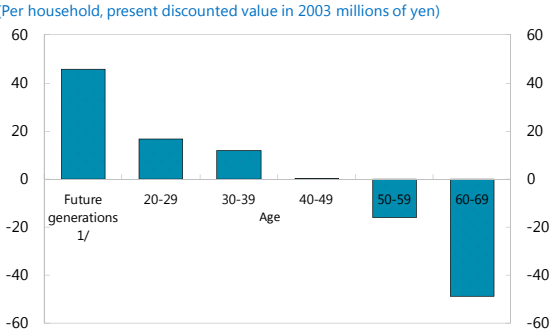
Japan: General Government Primary Balance 1/
(In percent of GDP)



Source: IMF WEO database
1/ Based on a new categorization of interest payment adopted in Dec 2011 by the Japanese government. According to the new categorization, a part of government interest payment is counted as government consumption.

…and net (tax) burden varies substantially across generations.

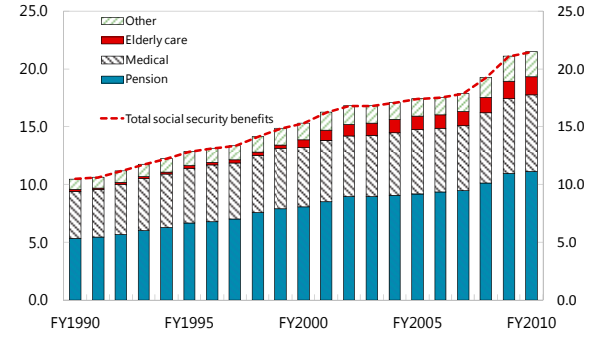
Japan: Lifetime Net Burden by Age Group as of 2003
(Per household, present discounted value in 2003 millions of yen)



Source: Cabinet Office (Japanese Government)
1/ Anyone below age 20 and unborn generations.

Social security benefits have rising rapidly…

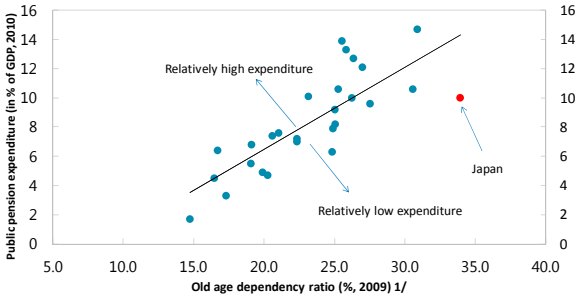
Japan: Social Security Benefits (In percent of GDP)



Sources: Ministry of Health, Labor and Welfare (Japanese Government); staff estimates

…although Japan's public pension expenditure is contained relative to the stage of population aging.

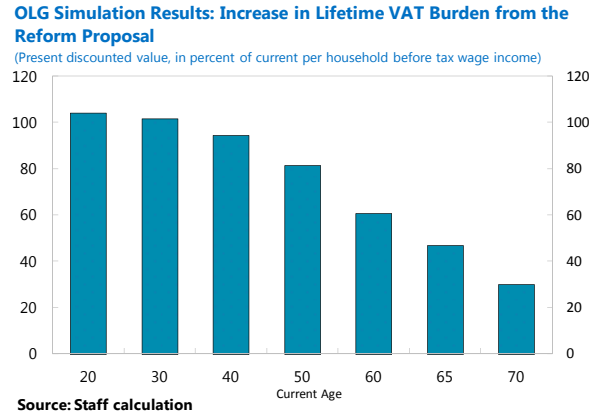
Advanced Economies:
Old Age Dependency Ratio vs Public Pension Expenditure

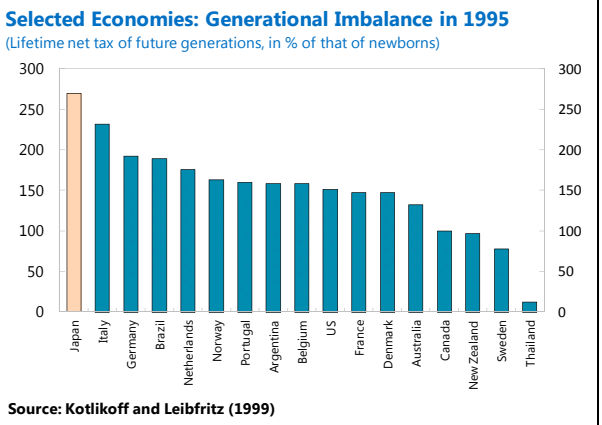


Sources: World Bank; IMF
1/ Ratio of elderly population (aged 65 or higher) to working age population (15-64)

[5] http://www.npu.go.jp/policy/policy01/pdf/20120124/h24chuuchouki.pdf (in Japanese)

Figure 2. Intergenerational Resource Imbalance





10. **These results, however, should not be interpreted as meaning that fiscal consolidation would make younger generations worse off.** As already noted, fiscal consolidation generally worsens intergenerational inequality *compared with the level implied by existing policy*. The reason is simply that the young have a longer remaining lifetime and would therefore feel the impact of fiscal consolidation for a longer period. However, this observation does not imply that fiscal adjustment would make young and future generations worse off. On the contrary, lack of fiscal consolidation would eventually lead to an increase in interest rates, which would lower output and reduce welfare substantially.[6] In such a case, young generations would be hit harder, further aggravating intergenerational imbalance. For example, they face a higher probability of unemployment, as seen in some European economies after the global financial crisis. Therefore, a key question is how to implement much needed fiscal consolidation while minimizing further deterioration in intergenerational inequality.

Model

11. **An OLG model is an ideal analytical tool because it allows us to examine the intergenerational resource implications of fiscal consolidation.** This paper considers a standard lifecycle OLG model (see, for example, Kotlikoff, 1998) with perfect foresight and labor supply, but without uncertainty about income or life length, or heterogeneity within each generation (that is, only one representative agent in each generation). The model consists of the household, corporate, and government sectors.

[6] A declining participation rate to the public pension in Japan might suggest that the young are increasingly concerned about sustainability of the public pension system. If this is the case, fiscal consolidation could also help improve welfare of the young by increasing the (perceived) probability of receiving the full amount of pension benefits.

Household sector. Generation *i* in the household sector who starts life in year t_0 solves the utility maximization problem given by:[7]

$$\max\left[\frac{1}{1-1/\gamma}\sum_{t=t_0}^{t_0+D-1}\beta^{t-t_0}\left(c_{i,t}^{\,1-1/\rho}+\theta(1-l_{i,t})^{1-1/\rho}\right)^{\frac{1-1/\gamma}{1-1/\rho}}\right],$$

where D is the length of life (60 years), c is consumption, l is labor supply, β is the discount factor, and θ is the weight attached to the utility from leisure. The household budget constraint is:

$$a_{i,t}=(1+r_{t-1}-\delta)a_{i,t-1}+(1-\tau w_{t-1})l_{i,t-1}w_t e_{i,t-1}+p_{i,t-1}-(1+\tau vat_{t-1})c_{i,t-1},$$

where a is the asset level at the beginning of the year, r is the gross interest rate (before depreciation), δ is the depreciation rate of aggregate capital, τw is the rate of pension contributions and personal income tax, w is the wage rate, e is labor efficiency (age-dependent), p is pension benefits, and τvat is the VAT rate. The number of generations is 60, with a 60-year life lifespan for each generation starting at age 20 with zero assets and ending at age 79 without leaving bequests. Those aged 65 years and older are eligible for public pension benefits.

Corporate sector. The production function in the corporate sector takes a standard Cobb–Douglas form:

$$K_t^{\alpha}\left((1+\lambda)^t L_t\right)^{1-\alpha},$$

where K is aggregate capital, λ is the growth rate of labor productivity, and L is aggregate labor supply. As usual, the first derivatives of the production function determine the gross interest rate ($r_t=\alpha K_t^{\alpha-1}\left((1+\lambda)^t L_t\right)^{1-\alpha}$) and the wage rate ($w_t=(1-\alpha)K_t^{\alpha}\left((1+\lambda)^t L_t\right)^{-\alpha}$). Aggregate capital K and aggregate labor supply L are calculated by summing assets and labor supply across generations.

Government sector. The government collects revenue through personal income tax, social security contributions, and the VAT, and runs a pay-as-you-go pension system with a fraction of pension benefits funded by tax revenue (as currently in Japan). Nonpension social security spending and other government spending also affect the fiscal balance but not household utility. The primary balance is given by (see the appendix for the path assumed in the simulation):

primary balance$_t$ = aggregate revenue$_t$ – aggregate spending$_t$

= (personal income tax revenue$_t$ + social security contributions$_t$ + VAT revenue$_t$)

– (pension benefits$_t$ + nonpension social security spending$_t$ + other government spending$_t$)

[7] An alternative approach would be to use an OLG model with a common death probability but without an explicit lifecycle (Blanchard, 1985; Karam, et al., 2010). Such an approach would substantially simplify the solution, but make it difficult to analyze resource implications by generation (as this paper will do below) or take into account the age dependent hump-shaped labor efficiency.

Aggregate tax revenue, social security contributions, and pension benefits are calculated by adding them up across generations. If expenditure exceeds revenue, the government issues debt, which is absorbed by the household sector. Throughout the paper (unless otherwise noted), it is assumed that the structural primary balance improves by 10 percentage points of GDP from –6.5 percent in year $T-1$ to 3.5 percent in year $T+8$.[8]

The current period is year T. If 2012 is considered to be year T, year $T+8$ corresponds to 2020. All cyclical factors affecting the fiscal balance are assumed away, which equalizes the structural (cyclically adjusted) primary balance and the primary balance.[9] The growth rate of generation size is set at –0.75 percent for newborns in the transition phase (between $T-10$ and $T+59$) and 0 percent for newborns in year $T+60$ and thereafter. (See the appendix for parameter values and some more details about the model assumptions. For the solution method, see, for example, Kotlikoff (1998).[10])

Assessment of adjustment measures

12. **What does the OLG simulation tell us about the intergenerational resource implications of various fiscal adjustment measures?** Compare the lifetime resource burden from the following five measures, assuming permanent savings that improve the structural primary balance by 0.5 percent of GDP for each measure:

(1) reducing the pension replacement ratio (while maintaining the pension eligibility age);

(2) raising the pension eligibility age;

(3) raising the pension contribution rate;

(4) containing nonpension social security benefits; and

(5) raising the VAT rate.

The 0.5 percentage point adjustment is part of the overall assumed 10 percentage points of GDP adjustment mentioned above.[11] Each of the five measures above is implemented immediately in year $T+3$ except for (2), in which the pension eligibility age starts to rise gradually in $T+3$. When measuring the lifetime resource burden, it is assumed throughout this paper that fiscal consolidation does not change the security of future provision of government services and

[8] The assumption of a 10 percentage point improvement in GDP is from IMF (2011). The structural primary balance of –6.5 percent of GDP is about the same level as 2011 in Japan (on a general government basis). In December 2011, the Japanese government adopted in their National Accounts statistics a new categorization of interest payment. If we follow that, a part of government interest payment is categorized as government consumption and the structural primary balance in 2011 is estimated at about –7 percent of GDP (see the top left chart of Figure 1).

[9] For tractability, reconstruction measures are assumed away too.

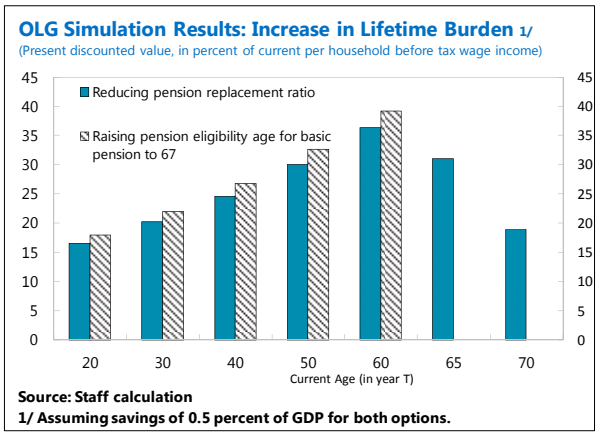
[10] Solving the model consists of three parts: (i) calculating the steady state with zero population environment as the initial state; (ii) starting with the initial state, simulating the model with certain fiscal consolidation and population path; and (iii) running a simulation until the model reaches the steady state after fiscal consolidation (population growth is assumed to converge to zero in the long run).

[11] The remaining 9.5 percentage point adjustment consists of measures in option (1) in Table 2, excluding "containing pension benefits."

transfers (e.g., pension). If that effect is taken into account, the net burden of fiscal consolidation could be smaller than reported in this paper. This is because consolidation would improve confidence in public finances and increase the likelihood that the government would be able to pay pension benefits to future generations. Key findings from the OLG simulation are as follows (for a summary, see Table 1).

- **Although both reducing the pension replacement ratio and raising the pension eligibility age would keep the burden for young generations relatively low, the former could work more toward correcting intergenerational inequality.** The chart compares increases in the lifetime burden (decline in benefits) from each of the two measures that would reduce pension expenditure and improve the structural primary balance by 0.5 percent of GDP permanently:

  ✓ Reduce the pension replacement ratio by about 5 percent in year $T+3$ (i.e., reduce the replacement ratio to average wage income before taxes by about 2 percentage points from 40 percent to 38 percent). Assume that the change in the replacement ratio affects immediately in year $T+3$ all generations receiving pension benefits. By this adjustment, this paper does not mean an across-the-board reduction in the replacement ratio in each generation. Instead, the paper is implicitly assuming a disproportionately larger pension benefit reduction for higher income households as an across-the-board cut would increase the incidence of poverty as discussed later.[12] (See Box 1 for more details about the current pension system.)



  ✓ Raise the eligibility age for the basic pension from 65 to 66 in year $T+3$ and to 67 in $T+5$ (while maintaining the private pension contribution rate).[13] [14]

  The increase in the PDV burden from each option would be relatively low for younger generations compared with generations nearer retirement, because the additional burden is farther in the future and discounted more heavily for younger generations. However, the chart also shows that raising the eligibility age would impose a zero burden on generations

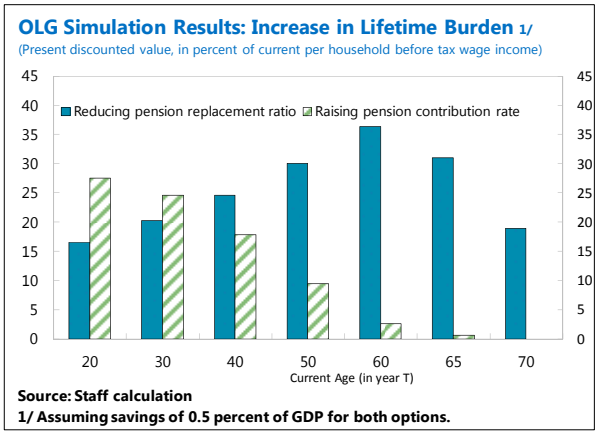
[12] Explicit modeling of heterogeneity within each generation is beyond the scope of this paper because, for tractability, this model assumes only one representative agent in each generation.

[13] In reality, the pension eligibility age for the basis pension in year $T+3$ will be 65 for males but 63 for females, and the females' eligibility age will reach 65 only in year $T+6$ (if we see year T as 2012). In simulations, we assume for simplicity that the pension eligibility age for the basic pension in year $T+3$ will be 65 for all (before raising the eligibility age).

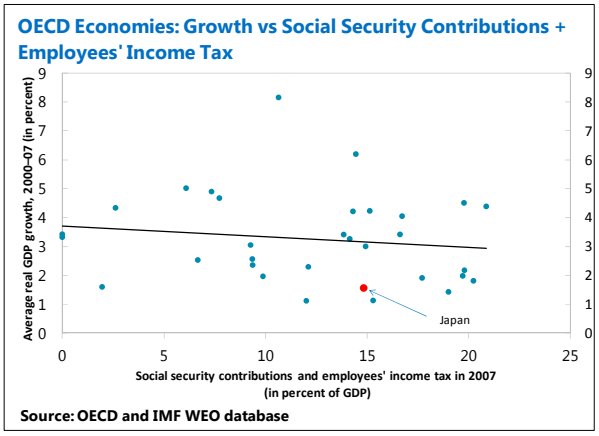
[14] The Japanese authorities estimate that raising the eligibility age for the basis pension by 2 years could reduce government subsides and create savings of 0.2 percent of GDP, assuming that private contributions are reduced proportional to government subsides. This is about half of the savings (0.5 percent of GDP) assumed in this paper. The difference reflects the fact that this paper assumes no reductions in private contributions to the basic pension.

65 years of age or older, because it does not affect those who have already started receiving pension benefits. In contrast, reducing the pension replacement ratio has resource implications for all generations receiving pension benefits and also lowers the burden for younger generations, given a fixed size of aggregate savings (here, 0.5 percentage point of GDP). The bottom line is that reducing the replacement ratio, if applied immediately to all generations receiving pension benefits, would be fairer in terms of intergenerational equality than increasing the pension eligibility age. The aggregate economic impact implied by the OLG simulation is very similar for both measures (results not reported here).

- **Relative to reducing the pension replacement ratio, raising the pension contribution rate or the personal income tax rate would worsen the existing intergenerational imbalance.** The chart shows that for younger generations, an increase in the lifetime burden would be much larger with higher pension contributions (starting in year $T + 3$), because only working generations would pay the higher contributions. The same would be true with a rise in the personal income tax, because like social security contributions, it is proportional to income.[15] Thus, in terms of intergenerational fairness, raising the pension contribution rate or the personal income tax rate does not appear to be a good idea.



Not only would the burden for young generations be higher, but output would be lower, given the greater distortionary impact of an increase in the pension contribution rate on the labor supply and capital accumulation (Figure 3). This finding is consistent with the empirical observation for OECD economies that growth is moderately, but negatively correlated with the burden from social security contributions and employee income tax (see chart).[16] Although the simulation focuses on pension benefits and contributions, the distributional implications would be qualitatively similar to those of social security in general. This is because social security benefits skew toward seniors, while the young make heavier social security contributions.

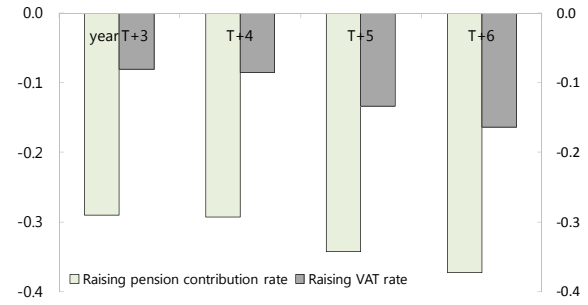


[15] Disney (2004) presented evidence that a saving component of social security contributions has a smaller impact on economic activity than taxes, but the statistical significance of his results is not high.

[16] See, for example, Arnold (2008) for formal evidence concerning the distortionary impact of higher personal income tax on GDP growth. For a comprehensive literature review, see OECD (2010).

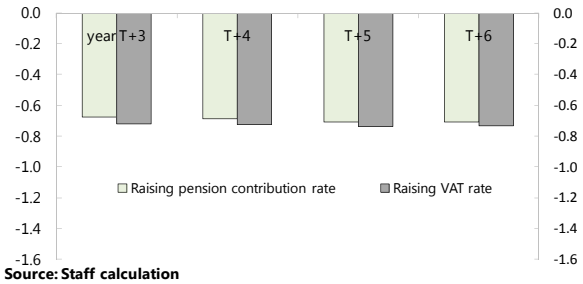
Figure 3. Macroeconomic Implications of Fiscal Consolidation

Raising the pension contribution rate would have a more detrimental impact on output as it distorts labor supply…



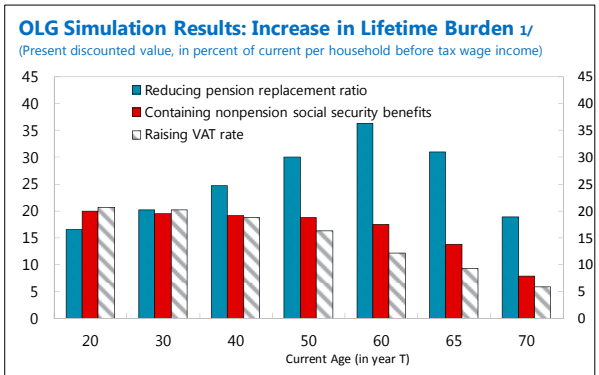
Source: Staff calculation
1/ Policy implementation in year T+3.

…and reduces capital accumulation.



Source: Staff calculation
1/ Policy implementation in year T+3. Saving rate is calculated GDP minus consumption, all the tax payments, and social security contributions divided by GDP.

- **Containing nonpension social security benefits would increase the lifetime burden more equally across generations than reducing pension benefits or raising the pension contribution rate.** This approach can be considered a middle option between containing pension benefits and raising the pension contribution rate.[17]



Source: Staff calculation
1/ For three options, assuming savings of 0.5 percent of GDP and policy implementation in year T+3.

- **The implication for intergenerational resource inequality of raising the VAT would be similar to an adjustment to nonpension social security benefits.** A VAT increase would also dampen aggregate output, but less than an increase in the pension contribution rate, because the latter has a larger negative effect on labor supply (Figure 3, left). In reality, a VAT increase would raise pension benefits in nominal terms, because it would raise CPI prices, to which pension benefits are linked. This would work toward reducing the *net* burden by raising the replacement ratio, assuming that wages do not rise as much as CPI prices. However, for simplicity this paper has assumed that a VAT increase does not change the replacement ratio, meaning that a VAT increase considered in this paper should be interpreted as a combination of a VAT increase and a reduction in the pace of pension benefit increases. Assuming that nominal pension benefits rise in line with CPI prices, however, would not change the key message that a higher VAT rate raises the burden relatively equally across generations compared to lower pension

[17] The simulation assumes that per household nonpension social security benefits for those aged 65 years or older are three times as high as those for the rest of the population. The results are not very sensitive to this parametric choice.

benefits or higher pension contributions. This is because more than half (about 60 percent) of consumption of those aged over 65 years is financed by past savings.

Table 1. Summary of Measures

	Intergenerational fairness	Aggregate economic impact
1) Reducing pension replacement ratio (while maintaining the pension eligibility age)	+	
2) Raising pension eligibility age		
3) Raising pension contribution rate/ personal income tax rate	−	−
4) Containing nonpension social security benefits		
5) Raising VAT rate		− (but less negative than measure 3))

13. **These results suggest that it would be desirable for Japan to include a balanced combination of both social security spending reform and revenue measures in a fiscal consolidation package.** From the perspective of intergenerational equity, including social security spending reforms would be fairer. However, relying excessively on social security spending reforms—particularly a reduction in the replacement ratio for all generations receiving pension benefits—could have serious welfare implications for seniors who may have planned their retirement based on the assumption that policy would not change. Moreover, the impact of social security spending reforms would be greater for low-income retirees, who could be pushed below the (relative) poverty line. This makes the case for taking a more balanced approach by combining both social security spending reforms and revenue measures. In terms of revenue measures, the OLG simulation has demonstrated that both higher pension contributions and a higher VAT would affect output and intergenerational equity, but that the impact of a VAT increase would be less.

Assessment of Consolidation Packages

14. **The OLG simulation confirms that with a given size of fiscal adjustment, including social security spending reforms in the consolidation package could reduce the burden for young generations.** To illustrate this finding, consider two of the options presented in IMF (2011)[18] for improving the structural primary balance by 10 percentage points of GDP (see Table 2):

Option (1). 1.5 percentage points of savings from social security benefits (0.5 in pension benefits and 1.0 in nonpension social security benefits) and 8.5 percentage points of revenue and nonsocial security adjustment. As sub-options of option (1) consider the following:

- Option (1a). Reducing the pension replacement ratio would generate savings from pension reform of 0.5 percentage points of GDP.

[18] "Japan: Staff Report for the 2011 Article IV Consultation."

- Option (1b). Raising the pension eligibility age would generate savings from pension reform of 0.5 percentage points of GDP.

Option (2). 10 percentage points of revenue and nonsocial security adjustment (no social security reforms)

Table 2. Two Options for Structural Fiscal Adjustment
(In percentage points of GDP)

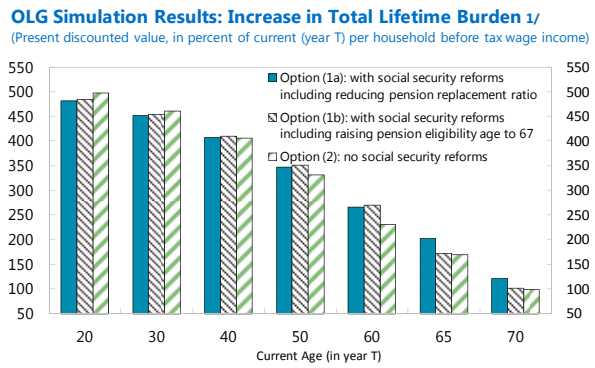
		Option (1)	Option (2)
	Size of savings (in ppt of GDP)		
Containing pension benefits	0.5	✔	
Containing nonpension social security benefits	1.0	✔	
Revenue from higher VAT		✔ (5)	✔ (6.5)
Other	3.5	✔	✔
Total savings		10.0	10.0

Source: IMF (2011)

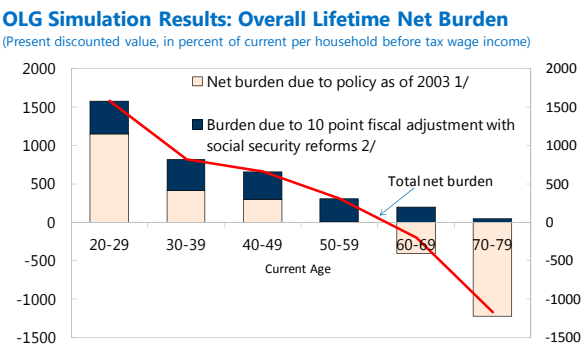
In both options (1) and (2), the increase in the lifetime burden associated with fiscal consolidation would be overwhelmingly larger for young generations (Figure 4, left).[19] For example, the PDV impact for those aged 20 years would amount to about 500 percent of current (year *T*) per household wage income before taxes—in other words, as large as 5 years of the current per household wage income. Option (1), which involves social security reforms, would reduce the PDV net burden of those aged 20 years by about 15 percentage points of current per household wage income before taxes, relative to option (2) with no social security reforms. The left-hand chart of Figure 4 also shows that including a reduction in the pension replacement ratio (1a) would increase the burden for current pensioners more and thus work more toward correcting intergenerational resource imbalance than including an increase in the pension eligibility age (1b). Given the substantial total burden for young generations, including social security spending reforms in a fiscal consolidation package—which work toward correcting intergenerational imbalance—would be appropriate, even if the benefit of such reforms for the young may be modest at most.

[19] Per household burden from adjustment in other government spending and revenue ("other" in Table 2) is assumed to be the same across generations. The burden from other government spending and revenue is also included in the estimates reported below. As a result of population aging in the model, underlying pension benefits (in percent of GDP, excluding the pension cut as a fiscal adjustment) rise slightly between year $T-1$ and $T+8$ and continue to increase after $T+8$ until population aging ends. In this situation, the sum of revenue increases and spending cuts needs to be larger than 10 percentage points of GDP, to achieve a 10 percentage points of GDP adjustment in the primary balance between year $T-1$ and $T+8$ and maintain a primary surplus of 3.5 percent of GDP after year $T+8$. This paper assumes that additional adjustment beyond 10 percentage points is made in other government spending, and includes the burden from such adjustment in the calculations.

Figure 4. Resource Implications of Fiscal Adjustment



Source: Staff calculation
1/ Size of total (structural) adjustment assumed to be 10 percentage points of GDP between year T-1 and year T+8.



Sources: Cabinet Office; staff calculation
1/ Recalculated in 2012 PDV terms, using Cabinet Office's estimates as of 2003.
2/ Including a reduction in the pension replacement ratio.

15. **An adjustment of 10 percentage points would raise the overall lifetime net burden substantially for young generations but minimally for generations aged 70 or higher.** The right-hand side of Figure 4 shows *overall* lifetime net burden, which combines the burden implied by policy as of 2003 and that from the 10 percentage point adjustment of GDP with social security spending reforms (year *T* (current year) is set at 2012). For those aged 20–29, the total net PDV burden would amount to 1600 percent of current per household wage income before taxes, which is nearly 40 percent higher than the net burden implied by the 2003 policy estimates without the 10 percentage point adjustment. At the same time, as highlighted in the chart, for those aged 70 or higher, the increase in the burden due to the adjustment would be minimal relative to the net benefits implied by the 2003 policy estimates. For those aged 60–69, the net burden from fiscal consolidation would be larger, but the total net burden would remain negative.

Timing of Fiscal Consolidation

16. **Delaying fiscal adjustment could be costly and worsen intergenerational resource inequality.** The OLG simulation assumed a 10 percentage point improvement in the structural primary balance between year $T-1$ and $T+8$, with consolidation starting gradually in year T.[20] To assess the costs of delaying consolidation, suppose that the start of the adjustment is delayed by 3 years to year $T+3$ (and fiscal consolidation continues through $T+11$). Two scenarios are examined below.

- Maintain the same size of fiscal adjustment (10 percentage points of GDP). In this case, the lifetime burden would be smaller for all generations and the level of GDP would be higher initially relative to the no-delay scenario, thanks to the lower (net tax) burden. But higher

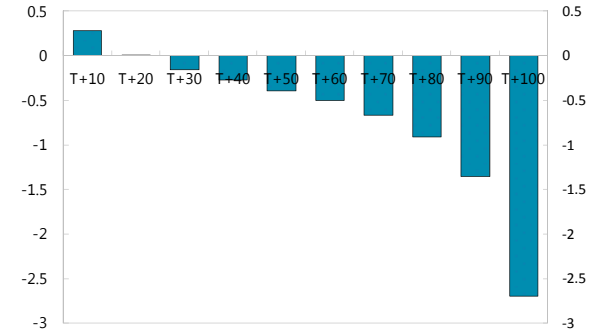
[20] Throughout this paper, the simulation ignores cyclical components of fiscal policy and reconstruction measures. Thus, starting gradual consolidation in year *T* does not mean cutting back reconstruction spending. Instead, it means containing spending (or raising revenue) unrelated to reconstruction measures or withdrawing stimulus implemented in response to the global financial crisis.

deficits would raise public debt and eventually crowd out output through higher interest rates (Figure 5, left). The costs of crowding-out would be higher as the delay of consolidation becomes longer. These results may underestimate the costs of crowding-out, because they exclude the possibility of nonlinear interest rate responses to debt once debt exceeds a certain threshold, even though net public debt reaches nearly 300 percent of GDP in year $T + 60$ (end-life of those aged 20 years in year T).[21]

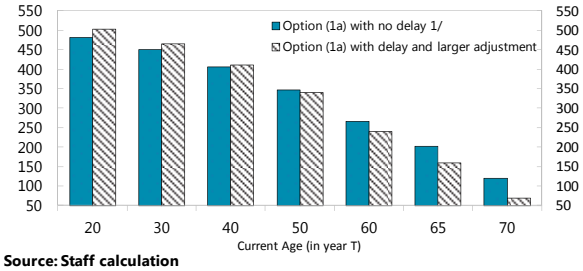
- To avoid crowding-out, assume an eventual reduction in the ratio of debt to GDP to the same level by year $T + 60$ as implied by the no-delay scenario. In this scenario, the overall adjustment would need to be larger by about 1 percentage point of GDP. As a result, the increase in the PDV lifetime burden for those 20 years of age in year T would be larger by 20 percentage points of the current per household wage before taxes, assuming that additional savings arise from nonsocial security spending (Figure 5, right).[22] On the other hand, the increase would be substantially smaller for senior generations relative to the no-delay scenario (because they would experience smaller fiscal savings during their lifetime), exacerbating the intergenerational resource imbalance.

These results imply that the timing of fiscal consolidation is quantitatively as important as its composition.

Figure 5. Costs of Delaying Fiscal Adjustment



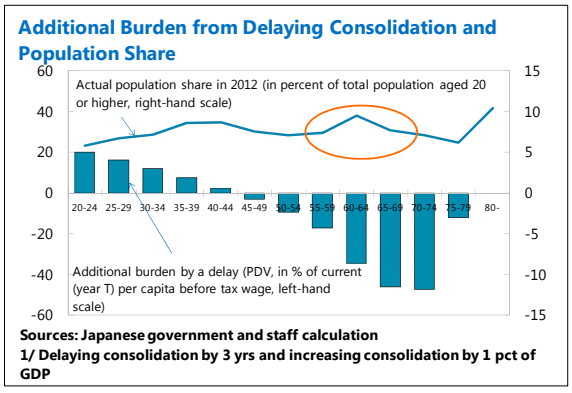
Source: Staff calculation



Source: Staff calculation

1/ Size of total (structural) adjustment assumed to be 10 percentage points of GDP between year T-1 and year T+8.

17. **The suggestion that delaying fiscal consolidation could lower the burden for older generations highlights the political difficulty of implementing fiscal consolidation early.** In Japan, the share of middle-aged and senior voters in the voting population is relatively high, owing to the continuing decline in the birth rate and the baby boomer bulge. Even with an eventually larger overall adjustment, these older generations could



Sources: Japanese government and staff calculation

1/ Delaying consolidation by 3 yrs and increasing consolidation by 1 pct of GDP

[21] Some empirical evidence suggests that the impact of a rise in debt on yields is nonlinear and becomes significant once the debt exceeds a certain threshold (see, for example, Faini, 2006; Ardagna, Caselli, and Lane, 2004).

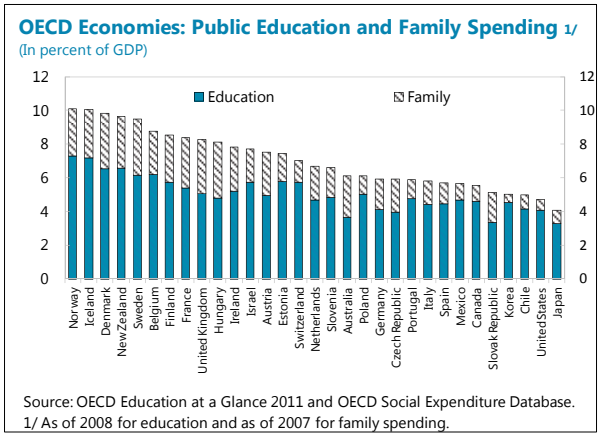
[22] The simulation assumes that the benefits of (nonsocial security) other government spending are distributed equally across the population.

benefit from a delay in fiscal consolidation (see the bar chart), making early implementation politically difficult. An independent body aimed at ensuring fair intergenerational resource distribution has been proposed by some, but establishing such an institution remains politically challenging.

Policy Options to Correct Intergenerational Resource Imbalance

18. **While this paper has focused on how Japan could minimize the detrimental effect of fiscal consolidation on intergenerational resource balance, policy options exist to correct intergenerational resource imbalance proactively,** including:

- *Allowing greater immigration* could correct the intergenerational resource imbalance, though forming a political consensus is a precondition in Japan. This paper has assumed the size of a generation that joins the population declines by 0.75 percent every year between year $T-10$ and $T+60$. An OLG simulation indicates that if, for example, immigration keeps the size of a newly-joining generation constant next year (year $T+1$) and after,[23] the per household lifetime burden of those currently aged at 20 (in year T) for financing senior generations' pension benefits would decline by 20 percentage points of current per household wage income (before taxes) relative to a no-immigration case because a larger working population supports the public pension system. This estimate is based on fiscal consolidation of 10 percentage points of GDP between year $T-1$ and $T+8$ (as in earlier simulations in the paper). Since greater immigration could reduce the debt-to-GDP ratio faster by boosting labor supply and the level of GDP, it could reduce young (and other) generations' burden further by lowering the size of the needed fiscal adjustment given a debt-to-GDP ratio target.
- *Raising productivity growth through structural reforms* could similarly reduce young generations' burden by trimming the needed size of fiscal adjustment (given a debt-to-GDP ratio target). This could in turn help correct the intergenerational resource imbalance as the young would enjoy the benefits of smaller fiscal consolidation for a longer period.
- *Expanding transfers to young generations*, such as public education spending and child allowances, would help mitigate intergenerational imbalances, but the fiscal space for such policies may be limited. Currently, Japan's public education and family spending is the lowest among OECD economies (see chart). Increasing such social expenditures could lessen the intergenerational imbalance not only directly but also indirectly through raising fertility rates and labor input over time. However, given the large size of fiscal consolidation needed, higher spending in these areas requires



[23] The magnitude of increased immigration with this parameter is substantial, with the share of immigrants rising by 6 percentage points by year $T+30$ and by 25 percentage points by year $T+60$. The share of immigrants (foreign nationals) in total population in Japan was about 2 percent in 2009.

savings in other areas. Moreover, if Japan aimed to correct intergenerational resource inequality, it would need to reduce expenditure for senior generations or collect more revenue from them. While implementing such expenditure cuts on top of social security spending reforms (such as considered in this paper) may be both politically and economically difficult, raising the inheritance tax rate could be an option to secure revenue for financing larger education and family spending.

III. Other Issues

19. **In implementing social security spending reforms, policymakers should be mindful of the risk of increasing poverty.** As shown by the OLG simulation, fiscal consolidation would substantially raise the burden for young generations. If combined with social security spending reforms, it could also hit older generations who have begun their retirement without enough savings, even though the increase in the burden would be limited for them on average (see Figure 4, right). Consequently, fiscal consolidation risks increasing the incidence of poverty among both young and old generations, particularly if accompanied by an across-the-board pension replacement cut. To address this risk, policymakers could (1) consider strengthening targeted income transfers; and (2) excluding those households whose income and wealth levels are low from reductions in social security benefits. Both measures would require means testing, and the introduction of a tax identification system is desirable.

20. **Despite some concern that increased old-age labor participation, driven by lower pension benefits, might crowd out employment of youth, international evidence does not support this view.** One of the key findings from the OLG simulation is that given a fixed size of fiscal consolidation, including social security spending reforms, especially curbing pension benefits, would be relatively beneficial for young generations. At the same time, lower pension benefits may encourage old-age labor participation, which, in principle, would have a positive impact on aggregate growth. It has been argued, however, that an increase in the old-age labor participation might crowd out youth employment and further distort the intergenerational resource imbalance. So far, international evidence has not supported this concern. For example, using cross-country panel data, Gruber, Milligan, and Wise (2009) reported that youth employment is positively correlated with old-age employment, controlling for macro shocks.

IV. Conclusions

21. **A balanced fiscal consolidation that includes both social security spending reforms and revenue measures would be the fairest approach to addressing intergeneration inequality.** The OLG simulations in this paper show that social security reforms, in particular reducing pension benefits (e.g., by raising the pension eligibility age), would have a less deleterious effect on intergenerational inequality than alternative measures. Given that seniors may have planned their retirement assuming an unchanged policy, combining social security spending reforms with revenue measures could produce a balanced fiscal consolidation. Finally, delaying fiscal consolidation could further worsen the imbalance in intergenerational resource.

22. **These findings may be relevant for other economies.** Intergenerational resource imbalance is not an issue unique to Japan. For example, Kotlikoff and Burns (2004) argued that a form of "fiscal child abuse" is taking place in the United States, referring to the heavier tax burden for future generations. The intergenerational resource balance often worsens as the

population ages, particularly if revenue increases fall behind rising social security spending. In the coming decade, intergenerational imbalance issues could also become more important in other Asian economies that have been experiencing rapid population aging. Japan's experience could provide an important lesson for such cases.

Box 1. Public Pension System in Japan

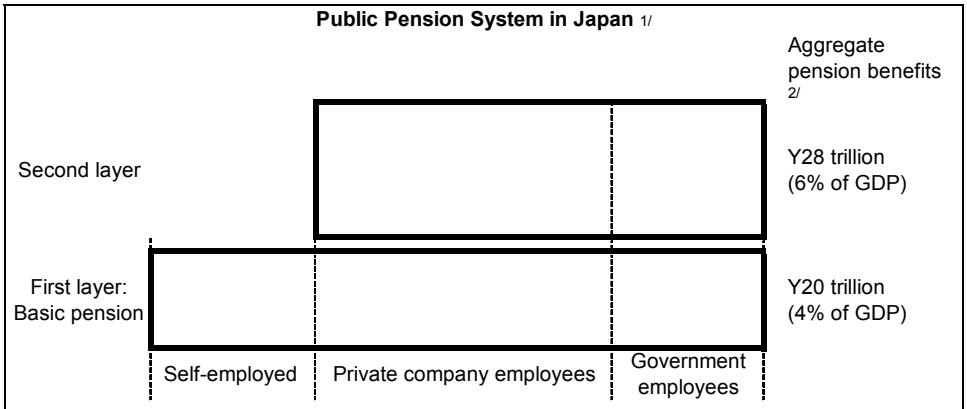
Japan's public pension is a two-layer system.

- The first layer is the basic pension, providing flat-rate pension benefits (currently ¥66,000 per month). As of 2012, those aged 65 or higher who have paid contributions for 25 years or longer are eligible for the basic pension. Contribution to the first layer is mandatory for all residents in Japan aged between 20 and 59. Those who are not eligible for the basic pension may receive separate public assistance if their income and wealth are below certain levels.
- The second layer is a defined-benefit pension system. Pension contribution and benefits are proportional to income levels during the contribution period. Private company and government employees participate in the second layer (the second tier for self-employed people, participation in which is voluntary, also exists). The male eligibility age for the second tier pension will be gradually raised to 65 by 2025 from the current age of 60.

According to the OECD (2011), the replacement ratio of the Japanese public pension is relatively low. For those currently at age 20 with average earnings, the net replacement ratio[1] will be about 0.4, which is lower than the OECD average of 0.5. However, the OECD's estimates do not reflect the replacement ratio for current pensioners, which in Japan, is higher than the future replacement ratio for those currently at age 20.

In FY2009 (April 2009 - March 2010), aggregate public pension benefits amounted to nearly ¥50 trillion (10 percent of GDP). The government contributed ¥10 trillion to the public pension, which financed 50 percent of ¥20 trillion of basic pension benefits (first layer).

Public Pension System in Japan 1/



Source: Ministry of Health, Labor and Welfare.
1/ Some details are omitted here.
2/ As of FY2009 (April 2009-March 2010).

[1] Defined as net pension benefits divided by the lifetime average of pre-retirement net earnings (excluding personal income tax and social security contributions).

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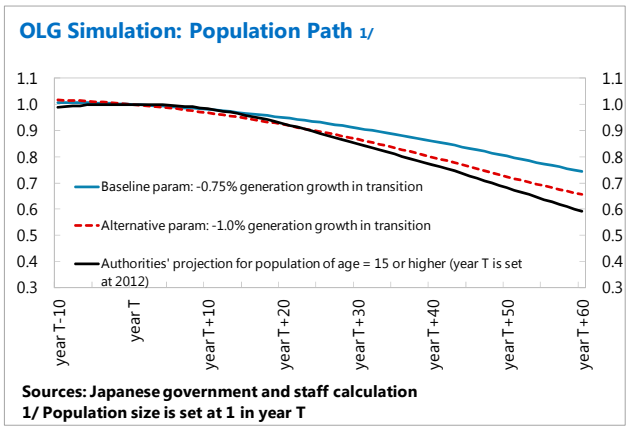
Appendix I. Parameter Values and Key Simulation Assumptions

Model parameter values are summarized in Table A. ρ and γ are from Miles (1999). β is 0.9995 and higher than standard values. A high β is necessary to replicate low interest rates under high public debt levels (as currently in Japan). Changing these parameters together with other parameters changes the size of the overall household burden due to fiscal consolidation but does not change the key messages in the main text. For example, using Uemura (2004)'s parameter values (ρ, γ, θ) = (0.6, 0.5, 0.1), option (1a), which includes social security reforms (in Table 2), would still reduce the PDV burden of those at age 20 by about 15 percentage points of current per household before tax wage income, relative to option (2) with no social security reforms (detailed results not reported here).

A key parameter value is the growth rate of generation size. Although the pace of population shrinkage affects the magnitude of lifetime burden, it does not change the assertion that including social security spending reforms in a fiscal consolidation package would be beneficial for young generations. As reported earlier, the growth rate of generation size is set at –0.75 percent for newborns in the transition phase (between T – 10 and T + 59) and 0 percent for newborns in year T + 60 and after. This closely approximates overall population growth in the near to medium term but may be somewhat optimistic, particularly in the long term (the pace of decline may be too slow) (see Figure A1, left). Lowering the growth rate of generation size to –1 percent from the baseline value of –0.75 percent would raise the lifetime burden for those 20 years of age in year T by 15 percentage points of current per household wage income before taxes. A more rapid shrinkage of the population raises pension benefits (in percent of GDP) and thus requires a larger spending adjustment in other areas to achieve the same primary balance path under slower population shrinkage. The more rapid rate of shrinkage results in a larger burden for young generations. However, including social security reform in a fiscal consolidation package would still reduce the burden for young generations (see Figure A1, right).

Figure A1. Sensitivity to Population Growth



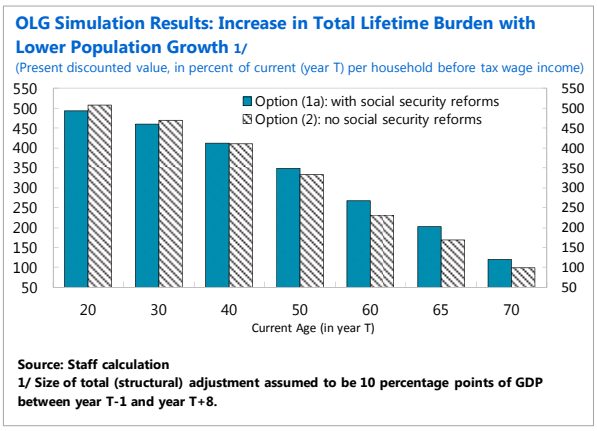


Table A. Baseline Parameter Values

Parameter	Value
Elasticity of substitution between consumption and leisure (ρ)	0.8
Intertemporal elasticity of substitution (γ)	0.75
Weight to utility from leisure (θ)	0.5
Time discount factor (β)	0.9995
Age profile of labor efficiency	Estimated from semi aggregate data 1/
Growth rate of population size in the transition phase	-0.0075
Capital share (α)	0.3
Annual growth rate of labor productivity (λ)	0.014 2/
Annual depreciation rate (δ)	0.05
C-efficiency ratio: VAT revenue/(total consumption*VAT rate)	0.7
Initial VAT rate	0.1 3/
Initial pension contribution rate + personal income tax rate	0.2
Pension replacement ratio (to before tax average wage income)	0.4 4/
Share of basic pension benefits in total pension benefits	0.4
Share of public debt crowding out private capital 5/	0.2

1/ Log(labor efficiency) = 0.97101 + 0.048505*(age-20) -0.000915*(age-20)^2 (parameters estimated using Basic Survey on Wage Structure (2005)). After calculating this equation, the average of labor efficiency (in level, not in log) is normalized at 1.

2/ This corresponds to total factor productivity growth of 0.01 (1 percent).

3/ While in Japan, the narrowly defined VAT rate is 0.05 (5 percent), in the simulation, the initial VAT rate is set at 0.1 to capture other consumption taxation.

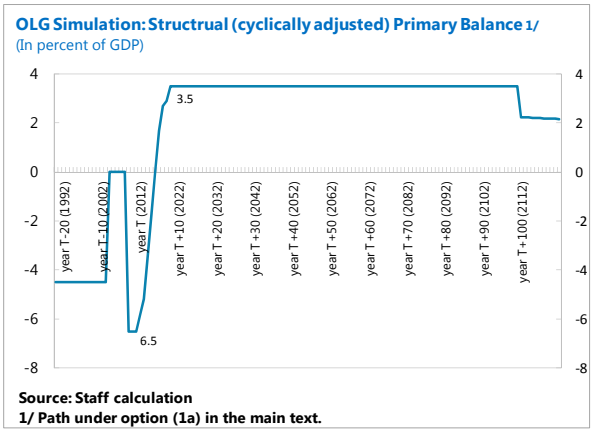
4/ 0.4 times before tax wage income is about 0.5 times after tax wage income.

5/ 1 – share of public debt financing productive capital (e.g., infrastructure) – share of public debt held by the central bank.

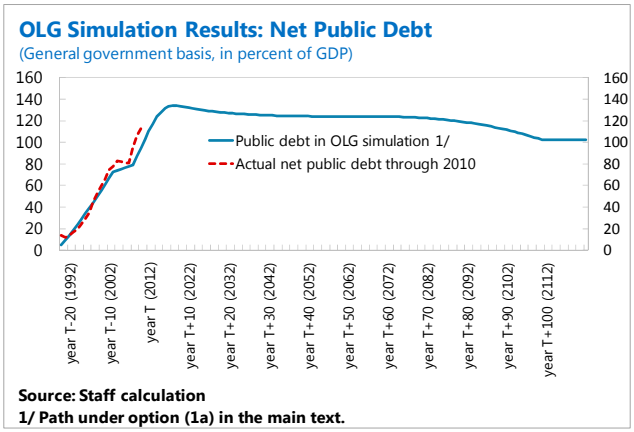
Key assumptions in the simulations are:

- Determine the structural (cyclically adjusted) primary balance so that the *net* public debt to GDP ratio broadly replicates the historical data through $T-2$ (2010) (Figure A2). As noted in the main text, in the case of the baseline 10 percentage point adjustment (option (1a)), the structural primary balance improves from –6.5 percent of GDP in year $T-1$ (2011) to 3.5 percent of GDP in year $T+8$ (2020). The structural primary balance will stay at 3.5 percent of GDP through year $T+99$ (2111), and will adjust in year $T+100$ (2112) and after, so that the net debt to GDP ratio will stay constant.

Figure A2. Path of Structural Primary Balance and Public Debt to GDP Ratio



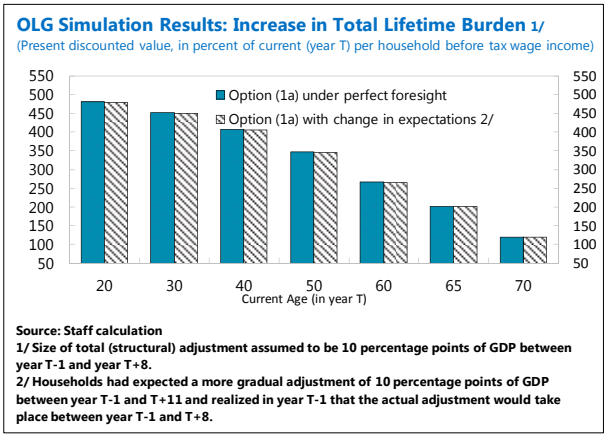
Source: Staff calculation
1/ Path under option (1a) in the main text.



Source: Staff calculation
1/ Path under option (1a) in the main text.

- Nonpension social security spending and other government spending are determined as residuals given the path of the structural primary balance, revenue, and pension spending.

- Throughout the paper, the simulation assumes perfect foresight. In other words, households expect the exact path of future fiscal consolidation rationally. This assumption may be rather restrictive. It may be more realistic, for example, to assume that through year $T-1$, households expected a more gradual than assumed pace of future consolidation in year T and after and then realized in year T that the actual path would be the one assumed in this paper. However, the results change little with this alternative assumption (for an example, see chart).



Source: Staff calculation
1/ Size of total (structural) adjustment assumed to be 10 percentage points of GDP between year T-1 and year T+8.
2/ Households had expected a more gradual adjustment of 10 percentage points of GDP between year T-1 and T+11 and realized in year T-1 that the actual adjustment would take place between year T-1 and T+8.