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Is Japan's Population Aging Deflationary?

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Abstract

Japan has the most rapidly aging population in the world. This affects growth and fiscal sustainability, but the potential impact on inflation has been studied less. We use the IMF's Global Integrated Fiscal and Monetary Model (GIMF) and find substantial deflationary pressures from aging, mainly from declining growth and falling land prices. Dissaving by the elderly makes matters worse as it leads to real exchange rate appreciation from the repatriation of foreign assets. The deflationary effects from aging are magnified by the large fiscal consolidation need. Many of these factors will beset other advanced countries as well, but we find that deflation risk from aging is not inevitable as ambitious structural reforms and an aggressive monetary policy reaction can provide the offset.

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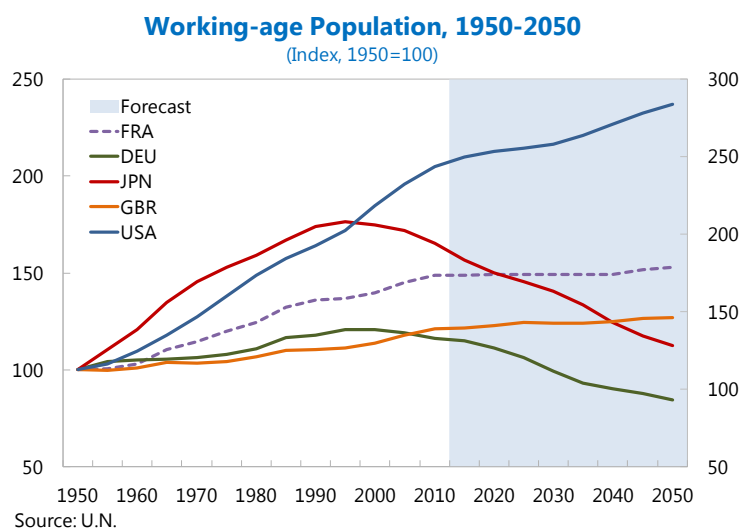
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I. INTRODUCTION

Japan is aging rapidly (Figure 1). Large gains in longevity and virtually no immigration imply Japan is “aging in fast forward.” Life expectancy is the highest in the world, the working-age population started to decline around the early 1990s, and the baby-boom generation (born in 1947–49) started retiring in 2007. As noted in IMF (2012), the old-age population will continue to increase disproportionately in coming years, while the fertility rate declined markedly during the past decades.

Figure 1. Changes in the Working-Age Population



In popular debate a view appears to have emerged that exiting deflation has become more challenging due to aging. However, there is scant theoretical and empirical work on the potential relationship between these factors, with most research on aging focusing on the effects on growth and fiscal sustainability. To some extent this may be due to the monetarist doctrine: whether or not aging exerts downward pressure on prices is irrelevant as a central bank committed to do whatever it takes should remain capable of anchoring inflation expectations at the target.

Nonetheless, the extent to which aging affects the neutral real interest rate² and requires adapting macroeconomic policies to anchor inflation expectations remains a relevant and to a large extent unaddressed question. Among potential channels, aging will likely reduce the overall labor-force participation rate and thereby reduce potential output growth. Whether or not this affects inflation depends crucially on how quickly aggregate demand and supply adjust. At the same time, aging affects other factors of production, such as the rate of return

² The neutral real interest rate is the one consistent with achieving the desired target rate of inflation on a sustained basis.

to capital accumulation and land prices. Furthermore, aging is likely to imply higher government outlays on health care and pensions, adding to the already high fiscal consolidation needs in Japan. A substantial and sustained fiscal consolidation will also have significant implications for the output gap and inflation dynamics. In addition, dissaving by the elderly during retirement could possibly support aggregate demand at the time when aggregate supply is declining with possible implications for underlying inflationary pressures.

Although Japan is ahead of the curve in terms of its pace of population aging, it is not unique. Many advanced countries will experience rapid population aging in coming years (although not necessarily declining populations) amid elevated debt-sustainability concerns in light of rising health care and pension outlays and high starting debt levels. Disinflation risks are also rising in a number of advanced countries (see Moghadam et al, 2014) and are generally above the pre global financial crisis average (see IMF, 2014).

In this paper we use the IMF's Global Integrated Monetary and Fiscal (GIMF) model to analyze these channels and attempt to quantify the overall impact of aging on inflation as well as the effects of corrective macroeconomic and structural policies. Specifically, we address the following questions:

- Under an unchanged monetary policy reaction function, what are the key channels and quantitative effects through which population aging affects inflation and the neutral real interest rate?
- To what extent do life-cycle saving considerations neutralize the impact of aging on growth and inflation?
- How does fiscal consolidation interact with the effects of aging on inflation?
- How should macroeconomic and structural policies respond to counter the effects of aging on the economy?

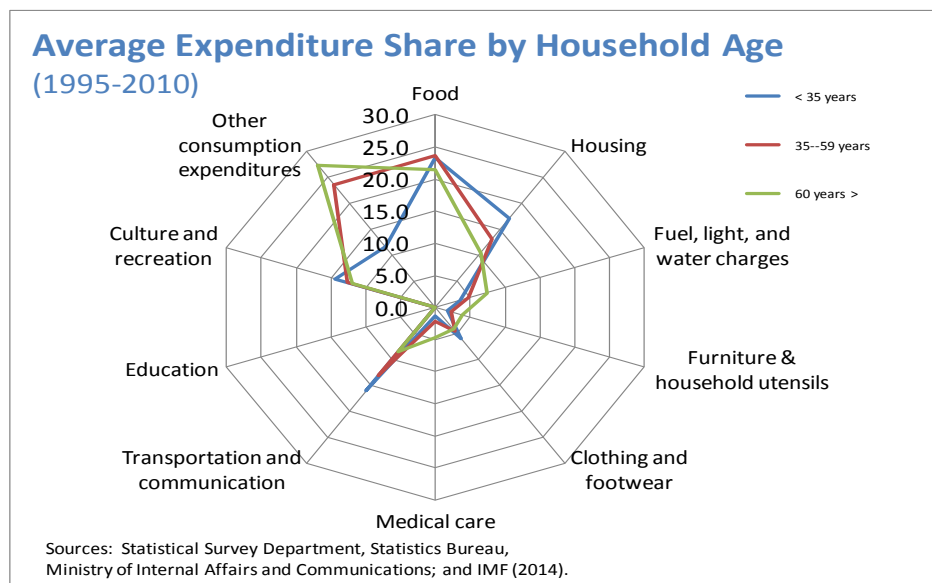
The rest of the paper is structured as follows. Section II contains a discussion of the potential channels through which aging can affect inflation and a summary of the existing theoretical and empirical literature. Section III provides a brief overview of the structure of the GIMF and its calibration. Section IV contains the model simulation analysis. Section V analyzes whether a package of policy reforms could offset the deflationary effects of aging. Section VI presents the conclusions and some discussion of whether our findings are unique to Japan or extend to other advanced economies that will experience similar demographic pressures in the near future.

II. POTENTIAL EFFECTS OF AGING ON INFLATION

Population aging could impact inflation dynamics by affecting relative prices, the output gap, and potential growth among other channels. In particular, deflationary pressures could arise from:

- Changes in relative prices, including from land.** A shrinking or aging population would lower the price of land (for example, because the elderly live in smaller houses). Land is not only a fixed factor of production, but also affects wealth and thereby consumer behavior. In addition, a decline in labor force participation affects real wages. The extent to which relative price changes occur between land, labor, and capital will depend partly on labor market characteristics—in Japan, wage growth has lagged productivity growth despite declining labor force participation and the absence of immigration—and the extent to which aggregate supply responds in a sluggish manner relative to aggregate demand changes. In addition, aging leads to secular shifts in consumption patterns as the elderly's preferences differ from those of the young with less spending on housing, transportation, communication, and education and more spending on medical, utilities, and other consumption expenditures (Figure 2). Whether this shift affects inflation dynamics depends also on the flexibility of supply to adapt to these changes in demand. In turn, this may be affected by the extent to which there will be substitution from market to regulated prices, although this will be difficult to capture empirically.

Figure 2. Aging and Expenditure Shares



- Life-cycle savings considerations** could have wealth implications by affecting asset prices, including the exchange rate following repatriation of foreign assets. As the population ages, aggregate portfolio rebalancing toward safe assets is likely to occur, potentially exerting downward pressure on government bond yields (see IMF 2013).

Most likely this could affect prices of traded and nontraded goods differently, with the effect presumably more pronounced on nontraded goods.

- **Greater excess supply as a result of fiscal consolidation.** In many countries, advanced and emerging economies alike, aging will lead to higher government outlays on pensions and health care and a shrinking tax base. Coupled with the elevated initial deficit and debt levels, the expectation of a rising risk premium and/or fiscal consolidation would lead to a sustained period of output growth below potential and deflationary pressures. In contrast, unsustainable government debt dynamics could increase fears of debt monetization and, therefore, expectations of high inflation in the absence of a credible medium-term fiscal consolidation plan. It should be noted, however, that projections for aging-related fiscal expenditures are relatively modest in Japan—although new work suggests that health care spending could rise faster than previously expected (Kashiwase, Nozaki, and Saito, 2014). As a result, for Japan, the fiscal channel will be driven mainly by the high initial debt and deficit levels. In addition, the composition of government spending could change with fewer outlays on human (education) and physical (public investment) capital accumulation, although the resulting effects on the output gap are not clear a priori.
- **Changes in policy objectives affected by political economy considerations.** Young cohorts do not initially have any assets and wages are their main source of income. Hence, they prefer relatively low real interest rates and high real wage growth. Older generations work less and prefer higher rates of return on their savings and relatively low inflation (Bullard, Garriga, and Waller, 2012). The latter will depend on institutional factors, for example, the extent of pension indexation. As such, aging could affect a central bank's perception of what its objection function should look like and thus the level of its inflation target and speed with which it pursues it. Whether or not this is relevant for Japan is unclear as the Bank of Japan (BoJ) has recently adopted a higher inflation target to be achieved through aggressive quantitative and qualitative monetary easing (QQE), to some extent defying the political economy hypothesis, or at least suggesting that this can be trumped by other economic considerations if a country has been stuck in deflation.

Some of these channels have been studied in the literature. For example, in the case of the United States, it has been observed that the elderly population spends a relatively higher share of income on health care, the prices of which have risen faster than the overall CPI. This has led to the development of an experimental price index to track inflation for the population aged 62 and older (see Cashell, 2010).

Konishi and Ueda (2013) suggest that negative correlations between inflation and demographic aging have been observed across developed nations recently. They analyze this phenomenon from a political economy perspective, by embedding the fiscal theory of the price level into an overlapping-generations model. They assume that short-lived governments

successively make decisions about income tax rates and bond issuance taking into account political influence from existing generations and the expected policy responses of future governments. Their analysis reveals that the effects of aging depend on its causes; aging is deflationary when caused by an unexpected increase in longevity, but is inflationary when caused by a decline in the birth rate.

Ikeda and Saito (2012), study the effects of demographic changes on the real interest rate in Japan. Using a dynamic general equilibrium model, they find that a decline in the labor-force participation rate reduced the real interest rate, which is amplified by falling land prices in the presence of collateral constraints. Nonetheless, they find that total factor productivity growth is a more important source of variations in the real interest rate.

In their paper, aging affects the real interest rate by changing the demand and supply of loanable funds.³ First, household savings rise as the number of wage earners relative to the number of consumers in the household declines. This puts downward pressure on the real interest rate. This is consistent with Lindh and Malmberg (1998 and 2000) who, for a sample of OECD countries, find that increases in the population of net savers dampen inflation, whereas the younger retirees fan inflation as they start consuming out of accumulated pension claims. Second, as firms' demand for capital and land declines, downward pressure on the real interest rate emerges from reduced demand for loanable funds. Third, firms' collateral falls as land prices decline, leading to a further decline in the demand for loanable funds.

A key distinction of our approach is that the GIMF is an open-economy model and therefore effects on the real interest rate occur only to the extent that developments in Japan affect the global supply and demand for savings. As a result, in the GIMF, the majority of the action occurs through changes in relative factor prices and as a result of fiscal consolidation. Furthermore, as in Hoshi and Ito (2012), we postulate that Japan has now entered the state in which we should start to see a decline in the savings rate as the population ages. In addition, consumption by retirees will in part be funded by running down Japan's sizable net foreign asset position. The effect on the neutral real interest rate will then also depend on the response of the real exchange rate following repatriation of savings.

Katagiri (2012) studies the effects of aging on growth, unemployment, and inflation using a multisector new Keynesian model with job creation and destruction. Aging leads to a shift in aggregate demand from durable goods to services which, owing to various labor market frictions, increases the structural unemployment rate. In addition, productivity in the nonmanufacturing sector has been lower than in the manufacturing sector, implying that these demand shifts reduce aggregate productivity growth. Since estimates of aging have

³ Other studies that use computable general equilibrium models to study the effects of aging on the aggregate savings rate include Miles (1999) for the U.K. and Western Europe and Chen et al. (2007) and Braun et al. (2009) for Japan.

increased annually, the repeated upward revisions are treated as unexpected shocks to the economy. All considered, the author finds deflationary effects of aging in the case of Japan.

III. SUMMARY OF THE GLOBAL INTEGRATED MONETARY AND FISCAL MODEL (GIMF)⁴

The GIMF is a multicountry Dynamic Stochastic General Equilibrium (DSGE) model with optimizing behavior by households and firms, and full intertemporal stock-flow accounting. Frictions in the form of sticky prices and wages, real adjustment costs, liquidity-constrained households, along with finite-planning horizons of households, imply an important role for monetary and fiscal policy in economic stabilization.

The assumption of finite horizons separates the GIMF from standard monetary DSGE models and allows it to have well-defined steady states where countries can be long-run debtors or creditors. This allows studying the transition from one steady state to another where fiscal policy and private saving behavior play a critical role in both the dynamics and long-run comparative statics.⁵

The non-Ricardian features of the model provide non-neutrality for both spending-based and revenue-based fiscal measures, which makes the model particularly suitable to analyze fiscal policy questions. In particular, fiscal policy can stimulate the level of economic activity in the short run, but sustained government deficits crowd out private investment and net foreign assets in the long run.⁶ Sustained fiscal deficits in large economies can also lead to a higher world real interest rate, which is endogenous.

Asset markets are incomplete in the model. Government debt is only held domestically, as nominal, non-contingent, one-period bonds denominated in domestic currency. The only assets traded internationally are nominal, non-contingent, one-period bonds denominated in U.S. dollars that can be issued by the U.S. government and by private agents in any region. Firms are owned domestically. Equity is not traded in domestic financial markets; instead, households receive lump-sum dividend payments.

Firms employ capital and labor to produce tradable and nontradable intermediate goods. There is a financial sector à la Bernanke, Gertler and Gilchrist (1999), that incorporates a

⁴ For detailed documentation on the structure of the model see Kumhof and others (2010). For details on the model's properties see Anderson and others (2013).

⁵ See Blanchard (1985) for the basic theoretical building blocks and Kumhof and Laxton (2007, 2009b) to understand their fiscal policy implications.

⁶ Coenen and others (2010) show that fiscal multipliers in the GIMF, for temporary shocks, are similar to standard monetary business cycle models, but more importantly, the GIMF can handle a much broader array of permanent shocks that can be used to study transitions from one steady state to another caused by permanent changes in the level of government debt.

procyclical financial accelerator, with the cost of external finance faced by firms rising with their indebtedness.

The GIMF is a multi-region model, encompassing the entire world economy, and explicitly models all the bilateral trade flows and their relative prices for each region, including exchange rates. The version used in this paper is comprised of 6 regions: the United States, the euro area, Japan, emerging Asia (including China), Latin America, and, as a single entity, the remaining countries. The international linkages in the model allow the analysis of policy spillovers at the regional and global level.

A. Household Sector

There are two types of households, both of which consume goods and supply labor. First, there are overlapping-generation households (OLG) that optimize their borrowing and saving decisions over a 20-year planning horizon. Second, there are liquidity-constrained households (LIQ), who do not save and have no access to credit. Both types of households pay direct taxes on labor income, indirect taxes on consumption spending, and a lump-sum tax.

OLG households save by acquiring domestic government bonds, international U.S. dollar bonds, and through fixed-term deposits. They maximize their utility subject to their budget constraint. Aggregate consumption for these households is a function of financial wealth and the present discounted value of after-tax wage and investment income. The consumption of LIQ households is equal to their current net income, so their marginal propensity to consume out of current income is unity by construction.⁷ A high proportion of LIQ households in the population would imply large fiscal multipliers from temporary changes to taxes and transfer payments.

For OLG households with finite-planning horizons, a tax cut has a short-run positive effect on output. When the cuts are matched with a tax increase in the future, so as to leave government debt unchanged in the long run, the short-run impact remains positive, as the change will tilt the time profile of consumption toward the present. In effect, OLG households discount future tax liabilities at a higher rate than the market rate of interest. Thus, an increase in government debt today represents an increase in their wealth, because a share of the resulting higher taxes in the future is payable beyond their planning horizon. If the increase in government debt is permanent (tax rates are assumed to rise sufficiently in the

⁷ The liquidity-constrained consumers could also be interpreted more generally as rule-of-thumb consumers, which in other models are assumed to consume all of their income.

long run to stabilize the debt-to-GDP ratio by financing the higher interest burden) this will crowd out real private capital by raising real interest rates.⁸

Increases in the interest rate have a negative effect on consumption, mainly through the impact on the value of wealth. The intertemporal substitution effect from interest rate changes is moderate and has been calibrated to be consistent with the empirical evidence. The intertemporal elasticity of substitution determines the magnitude of the long-run crowding-out effects of government debt since it pins down how much real interest rates have to rise to encourage households to provide the required savings.

B. Production Sector

Firms, which produce tradable and nontradable intermediate goods, are managed in accordance with the preferences of their owners, finitely-lived households. Therefore, firms also have finite-planning horizons. The main substantive implication of this assumption is the presence of a substantial equity premium driven by impatience.⁹ Firms are subject to nominal rigidities in price setting as well as real adjustment costs in labor hiring and investment. They pay capital income taxes to governments, wages to all households, and dividends to OLG households.

In this version of GIMF, there is also a fixed stock of land, owned entirely by OLG households. Land is used as a factor of production alongside the capital and labor bundle chosen by firms, and also generates a dividend paid to OLG households. Land acts as a proxy for the fixed stock of housing, and will play a role in inflation dynamics. It is included only for Japan, and excluded elsewhere, which does not affect our results in a significant manner.

Retained earnings are insufficient to fully finance investment, so firms must borrow from financial intermediaries. If earnings fall below the minimum required to make the contracted interest payments, the financial intermediaries take over the firm's capital stock, less any auditing and bankruptcy costs, and redistribute it back to their depositors (households).

Firms operate in monopolistically competitive markets, and thus goods' prices contain a markup over marginal cost. Exports are priced to the local destination market and imports are subject to quantity adjustment costs. There are also price adjustment costs which lead to sticky prices.

Firms use public infrastructure (which is the government capital stock) as an input, in combination with tradable and nontradable intermediate goods. Therefore, government capital adds to the productivity of the economy.

⁸ For a more detailed description of fiscal implications in the GIMF see Kumhof and Laxton (2007, 2009a, 2009b).

⁹ This feature would disappear if equity was assumed to be traded in financial markets. We find the assumption of myopic firm behavior, and the resulting equity premium, to be more plausible.

C. Financial Sector

The GIMF contains a limited menu of financial assets. Government debt consists of one-period bonds denominated in domestic currency. Banks offer households one-period fixed-term deposits, their source of funds for loans to firms. These financial assets, as well as the ownership of firms, are not tradable across borders. OLG households may, however, issue or purchase tradable U.S.-dollar-denominated obligations.

Banks pay a market rate of return on deposits, and charge a risk premium on loans. Because of the costs of bankruptcy (capital can only be liquidated at a discount), the lending rate includes an external financing premium, which varies directly with the debt-to-equity (leverage) ratio—the financial accelerator effect. Non-linearities imply steep increases in the risk premium for large negative shocks to net worth.

Uncovered interest parity does not hold, due to the presence of country risk premiums. The premiums create deviations, both in the short run and the long run, between interest rates in different regions, even after adjusting for expected changes in exchange rates.

D. International Dimensions and Spillovers

All bilateral trade flows are explicitly modeled, as are the relative prices for each region, including exchange rates. These flows include the export and import of intermediate and final goods. They are calibrated in the steady state to match the flows observed in the recent data. International linkages are driven by global saving and investment decisions, a by-product of consumers' finite horizons. This leads to uniquely defined current account balances and net foreign asset positions for each region. Since asset markets are incomplete, net foreign asset positions are represented by nominal non-contingent one-period bonds denominated in U.S. dollars.

Along with uncovered interest parity, and long-term movements in the world real interest rate, the magnitude of the international trade linkages is the main determinant of spillover effects from shocks in one region to other regions in the world.

E. Fiscal and Monetary Policy

Fiscal policy is conducted using a variety of expenditure and tax instruments. Government spending may take the form of either consumption or investment expenditure, or lump-sum transfers to either all households or targeted towards LIQ households. Revenue accrues from the taxes on labor and corporate income, consumption taxes, and lump-sum taxes. The model also allows for tariffs on imported goods to be a potential source of public revenue. In this version, there are no taxes on land. Government investment spending augments public infrastructure, which depreciates at a constant rate over time.

There is a fiscal policy rule which ensures long-run sustainability, while allowing for short-run counter-cyclical policies. Changes in both labor and capital income taxes provide the instrument to put the rule into effect, but this can be replaced with other tax, transfer or spending instruments if that is considered more realistic for a specific region. First, the fiscal rule ensures that in the long run, the government debt-to-GDP ratio—and hence the deficit-to-GDP ratio—eventually converges to its target level. This excludes the possibility of sovereign default, as well as the risk that out-of-control financing requirements of the government will override monetary policy. Second, the rule allows for countercyclical fiscal policy as it embodies automatic stabilizers.

When conducting monetary policy, the central bank uses an inflation-forecast-based interest rate rule. The central bank varies the gap between the actual policy rate and the long-run equilibrium rate to achieve a stable target rate of inflation over time.

IV. UNDERLYING PRESSURES OF AGING ON INFLATION

We use the GIMF to quantify some of the aforementioned channels through which aging might affect inflation dynamics and to study policy options. Given the model's structure, we are not able to capture all of the channels above. Specifically, changes in consumption patterns and political economy considerations are not included in the simulations. As noted above, we have extended the standard version of the GIMF to include land, as a factor of production and a source of wealth. Since the GIMF does not allow for an explicit incorporation of retirement decisions we impose the decline in labor force participation based on the UN's demographic projections. Likewise, the extent to which retirees dissave also needs to be imposed in the analysis and the decline in the ratio of private savings to GDP is assumed to be about 3.5 percentage points between 2012–40, similar to Hoshi and Ito (2012) where aggregate savings to GDP decline from about 2.8 percent in 2012 to about -1.3 percent in 2040.

The GIMF's structure imposes additional constraints on the analysis. In the model, consistent with the central bank's inflation targeting objective, monetary policy reacts endogenously to the impact on inflation from the shocks that are used to capture the aging process.¹⁰ Consequently, it is not a simple matter to precisely quantify the effect of aging on inflation because policy responds to try to offset it. One alternative would be to hold policy constant, but that is not feasible in the GIMF for an extended period. Because of the model's forward-looking rational-expectations structure, the model becomes unstable if monetary policy does not eventually respond and return inflation to its target rate. As such, any deflationary effects

¹⁰ Although there remains the open issue of the efficacy of monetary policy under the zero-lower bound, here we assume for the purpose of the analysis that policy can respond.

from aging will be observed in the simulations through its effects on both the “shadow” policy rate and the inflation rate.¹¹

The effects of aging on the neutral real interest rate operate through changes in inflation pressures and rising risk premiums. First, as a large proportion of the population moves into retirement, the labor force will decline with implications for both supply and demand in Japan. Second, without labor income, retirees will draw down their savings to finance consumption expenditures. Finally, as private domestic saving declines, it has been argued that Japan will need to increasingly tap foreign investors to meet its high public financing requirement, which would likely require higher interest rates, modeled here as a rising sovereign risk premium over time. We have layered these various channels to illustrate their relative contribution to the overall deflationary effects from population aging.

In the first layer (blue line in Figure 3), the labor force in Japan declines by roughly $\frac{1}{4}$ percent a year for 30 years. This magnitude is calibrated to match the decline in the United Nations median forecast for Japan’s working age population. As the labor force declines, consumption and investment both fall. Both demand and supply side factors serve to decrease the overall demand for factors of production. A falling labor supply results in a higher real wage which induces firms to move back along their supply curves, reducing demand for both capital and land. At the same time, falling demand implies the return to all factors of production is declining, also reducing demand for capital, labor, and land. Lower demand for land causes its price to fall as well. The decline in the labor supply is similar in nature to a negative economy wide productivity shock and thus with less output to sell to the rest of the world, the Japanese currency appreciates. The appreciated real effective exchange rate results in increased demand for imports, as foreign goods become relatively cheaper compared to domestic goods. Declining demand for domestic output, falling land prices, and cheaper imports all exert continuous downward pressure on inflation. The calibrated aggressiveness of the monetary policy rule results in a reduction in the “shadow” policy rate of about 20 basis points, but this still results in inflation falling by about 10 basis points. The public debt-to-GDP ratio rises gradually over the simulation horizon owing to the trend decline in nominal GDP.

In the second layer (red line in Figure 3), it is assumed that the Japanese saving rate declines by just over 0.1 percent of GDP per year for 30 years. Specifically, the Japanese household savings rate has been gradually dropping since the early 1990s. The net savings rate decreased from around 15 percent of disposable income to around zero in 2011. This decline in the savings rate partially occurred because of demographic changes (aging). The importance of demographic changes was outlined by Hoshi and Ito (2012). One can use the Annual Family Income and Expenditure Survey to determine the autonomous effect of aging

¹¹ The “shadow” policy rate is defined as the rate that would be observed in the absence of the zero-lower bound.

on this decline in the savings rate. Older households have a lower (or negative) savings rate and their share has considerably increased throughout the last 20 years.

Table 1. Savings Rate for Different Age Groups

	20-29	30-44	45-49	50-54	55-59	60+	60+ Non-employed	60+ Employed
1991-1997	0.278	28.8	23.6	26.1	32.3	1.7	-11.0	21.7
1998-2010	0.265	31.8	26.2	25.4	27.8	-9.4	-23.9	14.4

Source: Iwaisako and Okada (2010).

For the decomposition exercise we used the savings rates reported by Iwaisako et al. (2010) (Table 1). It is worth noting that there was a significant change in the savings rate after the financial crisis of 1997-98. The role of demographic factors assumes the same savings rate throughout the whole sample. Demographic factors accounted for about 4 percentage points (one-third) of the decline in the aggregate savings rate (Table 2). The role of aging has gained importance since 1998 and about 3 percentage points out of the 5 percentage point decline was due to this factor (the change in propensity to consume added another 2 percentage points). As such, aging subtracts about 0.1 to 0.2 percentage point from the savings rate each year, and for the simulations we use the lower bound of this estimate.

Table 2. The Role of Demographic Factors in the Decline in Household Savings

	1991-2011	1991-1997	1998-2011
Change in net saving rate (%)	-13.5	-8.2	-5.3
Demographics	-3.8	-1.0	-2.8
C/Y	-2.3	...	...
Other	-7.4	-7.2	-2.5

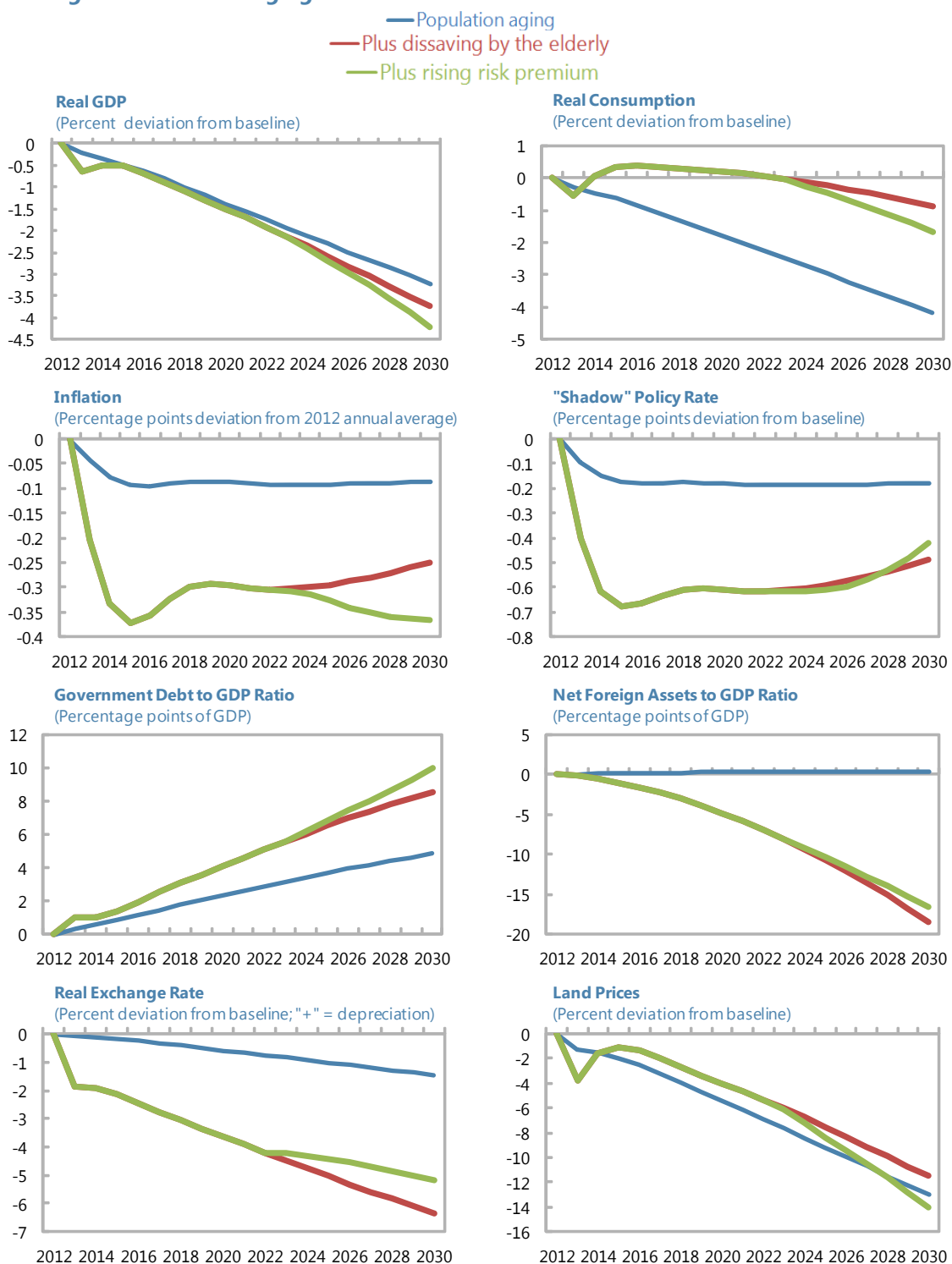
Note: IMF calculations.

Dissaving by the elderly exerts further deflationary pressures, mainly through real exchange rate appreciation. Interestingly, a-priori one might expect that dissaving by retirees would be inflationary: while aggregate supply declines owing to a falling labor supply, aggregate demand remains supported by retirees spending from savings. Indeed, this can be observed in panel 2 of Figure 3. However, for Japan, dissaving by the elderly results in a repatriation of foreign savings, which in turn leads to real exchange rate appreciation. The deflationary impact from currency appreciation more than offsets the inflationary effects from higher demand for consumption goods.

As domestic savings decline while the government financing requirement remains large, Japan will need to increasingly rely on foreign investors. This is likely to exert upward pressure on long-term interest rates. This scenario is simulated through a rising risk premium, which adds further deflationary pressures (green line in Figure 3). The simulation assumes

that the risk premium rises by 5 basis points per year. Output contracts more and government debt as a share of GDP rises further. The combined impact of all three developments is to raise public debt by 10 percent of GDP by 2030, relative to the baseline, and to lower inflation by about 0.3 percentage points on average during 2013–30 despite a decline in the “shadow” policy rate of about 60 basis points on average during the same period.

Figure 3. Effects of Aging and Macroeconomic Policies on Selected Macroeconomic Variables



Source: GIMF simulations

V. POLICY IMPLICATIONS

Given the implications of aging for growth and exacerbating deflationary pressures, what are the policy options available to counter these effects? First, we consider the need for significant fiscal consolidation in Japan. For Japan, this need arises not only because an aging population exerts fiscal pressures, but especially because the starting fiscal position is characterized by high deficits and debt. To put debt on a downward trajectory, an adjustment of 1 percent of GDP is assumed to occur each year during 2016–25 over and above the approved increases in the consumption tax rate in 2014 and 2015 (see IMF, 2013). This adjustment is assumed to be divided between revenue (consumption tax increases account for 66 percent of the needed adjustment) and expenditure (lower public consumption accounts for 34 percent of the needed consolidation) measures (purple line in Figure 4). Even though this would avoid the rise in the risk premium, consumption and land prices decline markedly, exerting further downward pressure on the “shadow” policy rate and inflation. Fiscal consolidation more than offsets the decline in private savings resulting from aging, leading to a further accumulation of net foreign assets.

As illustrated in Figure 4, the effects of fiscal consolidation to maintain debt sustainability on the neutral real interest rate far exceed the effects of population aging, including through the real exchange rate. This may provide a cautionary tale for other aging economies that will likely experience increasing debt sustainability pressures owing to rising health care and pension spending, albeit from a better starting position than Japan.

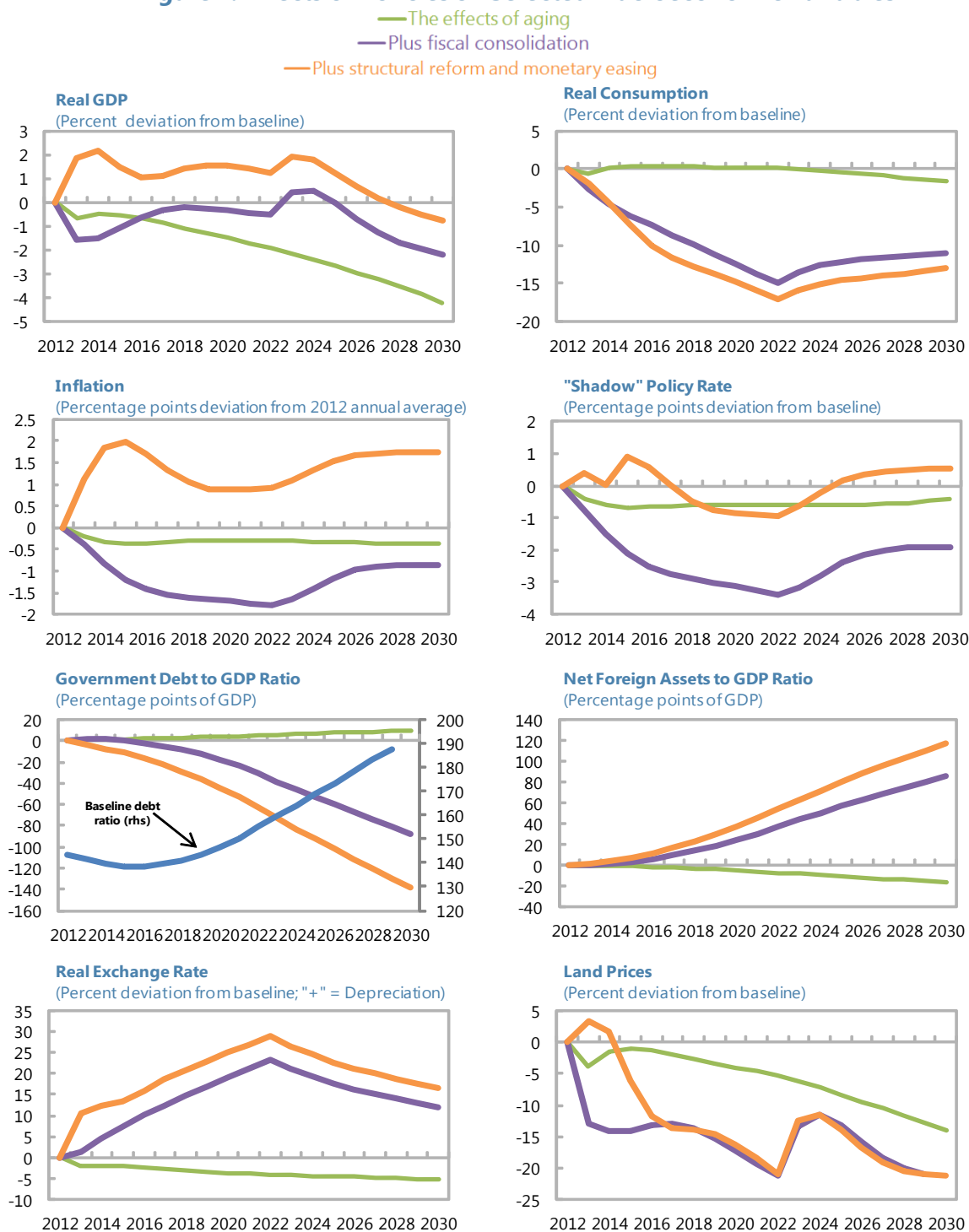
As additional medium-term fiscal consolidation is unavoidable, it needs to be complemented by bold structural reforms and a more aggressive monetary policy reaction function to overcome deflationary pressures and maintain growth prospects. This is precisely at the heart of “Abenomics,” which attempts to be a radical departure from past, more incremental and uncoordinated attempts to exit from deflation and revive growth.¹² Our results indicate that combining fiscal consolidation with structural reforms and aggressive monetary easing to achieve the new inflation target can offset the effects of aging (red line in Figure 4). In the simulation it is assumed that structural reforms raise potential growth by $\frac{1}{4}$ percentage point by 2015 and by $\frac{1}{2}$ percentage point by 2018.

Provided that inflation expectations converge quickly towards the 2 percent inflation target—through aggressive monetary easing and effective forward guidance—such a policy package has substantial benefits by overcoming the deflationary effects of aging, while supporting growth and fiscal sustainability. The positive effects on growth and fiscal sustainability are mainly coming from the rise in inflation expectations, which reduces the real interest rate and stimulates investment. Together with modestly higher potential growth following structural

¹² See Ito and Mishkin (2004) for an overview of Japanese monetary policy during the two “lost decades”.

reforms, this substantially reduces the net debt-to-GDP ratio—albeit relative to a sharply rising debt-to-GDP ratio in the baseline.

Figure 4. Effects of Policies on Selected Macroeconomic Variables



VI. CONCLUSIONS

Our findings suggest that aging tends to exert deflationary pressures through changes in relative prices. These include changes in nominal wages as labor force participation declines, triggering adjustment in the price of capital and land as well. This applies not just to Japan, but also to other countries with aging or declining populations.

This deflationary risk is amplified by dissaving by the elderly in Japan as it leads to real exchange rate appreciation through repatriation of foreign savings. Finally, as the government's financing requirement remains large under baseline policies while aggregate savings decline owing to life-cycle dynamics, the risk premium starts to rise gradually. In combination and under an unchanged monetary policy reaction function, this reduces inflation and the “shadow” policy rate persistently.

In addition, fiscal consolidation needs are large in Japan, mainly because of the high initial deficit and debt levels and to a more limited extent as a result of further increases in aging-related government expenditure (such as health care). We found that medium-term fiscal consolidation that puts the debt-to-GDP ratio on a downward trajectory through a combination of revenue and expenditure measures, while needed, exerts substantial further downward pressure on the neutral rate. This channel is also relevant for other countries that experience fiscal pressures from population aging.

We also showed that these pressures can be overcome with a full package of reforms that includes, besides medium-term fiscal consolidation, bold structural reforms, and a more aggressive monetary policy reaction function, which at the zero lower bound should include unconventional monetary easing and strong forward guidance. Such a package of reforms generates powerful economic synergies, particularly as rising inflation expectations push down the real interest rate, stimulating capital formation whereas bold structural reforms raise permanent-income expectations, stimulating aggregate demand, and helping to close the output gap. Although some of the findings in this paper are Japan specific (such as the starting point of two decades of entrenched deflationary expectations and high net foreign assets) broader lessons for aging economies with low inflation and rising fiscal outlays for health care and public pensions are that ambitious structural reforms and an aggressive monetary policy reaction function are needed to reduce the risk of falling into a deflationary trap. As such a comprehensive approach was lacking during the lost decades in Japan, it is likely that the declining working-age population during the 2000s played some role to the, on average, mild deflation observed during this period.

Structural headwinds from aging justify the aggressive approach that the BoJ has taken to strengthen the credibility of its policy rule. On the structural front, measures that directly address the effects of population aging are likely to be most effective. These include

stimulating female and older workers' labor force participation as well as greater opportunities for immigration, particularly in areas with labor shortages.

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