


The Implications of a Greying Japan for Public Policy.

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¹The views presented here are our own and not those of the Federal Reserve 

Motivation: demographic change

Japan is experiencing sudden and large demographic changes.

- Birthrates are low.
- Babyboomers are aging.
- 1990 share of the over 65 year old population was 12 percent. Lowest in Group of Six.
- 2004 share is 20 percent. Largest in Group of Six.
- Share will rise to above 40 percent by 2050.

Motivation: Fiscal Situation

- Large Public Debt/GDP ratio (gross 200 percent, net 120 percent in 2010)
- Greying of Japan means
 - 1 Dependency ratio will rise.
 - 2 Government expenditures on Social Security will rise.
 - 3 Government expenditures on healthcare will rise.

Questions we consider

What constraints will the greying of Japan place on future fiscal policy?

- how will government indebtedness evolve over time?
- How big are the funding gaps in S.S. and health care?
- Can one reconcile current policy with medium and long-term objectives?
- What are the economic implications of alternative government policies:
 - ① Waiting (kicking the can down the road.)
 - ② Fiscal consolidation
 - ③ Positive Demographic shocks.
 - ④ Inflation

Our setup

- Overlapping generations: Agents of different ages are active every period.
- Quantitative: one model period is one year.
- Time variation in birth rates, mortality rates.
- Taxes on consumption, labor and asset income.
- Government health program: medical expenditures, long term care.
- Social security system reflects demographic adjustments legislated in 2004.

Household Problem, overview

- one adult member (age varies from 21-112)
- Number of children varies with the age of the adult.
- household enjoys consumption and leisure.
- Age specific health expenditures
- Labor income varies with age of the head of household.
- Faces taxes on savings, consumption and labor income.
- Mandatory retirement at age 65.
- Social Security

Household Problem

Utility Function

$$U_s = \sum_{j=1}^J \beta^{j-1} \pi_{j,t} \frac{(c_{j,t}^\theta, \ell_{j,t}^{1-\theta})^{1-\gamma}}{1-\gamma}, \quad (1)$$

Budget constraint

$$(1 - \kappa_{jt})c_{j,t}^m + c_{j,t} + a_{j,t} \leq R_t a_{j-1,t-1} + w_t \varepsilon_j (1 - \ell_{j,t}) + b_{j,t} + \xi_t - \theta_{j,t}$$

Taxes

$$\theta_{j,t} = \tau_t^a (R_t - 1) a_{j-1,t-1} + (\tau_t^\ell + \tau_t^p) w_t \varepsilon_j (1 - \ell_{j,t}) + \tau_t^c c_{j,t}$$

Firm's Problem

Production function

$$Y_t = A_t K_t^\alpha H_t^{1-\alpha},$$

- Perfect competition
- Uses labor and capital to produce single good.

$$r_t = \alpha A_t K_t^{\alpha-1} H_t^{1-\alpha}$$

$$w_t = (1 - \alpha) A_t K_t^\alpha H_t^{-\alpha},$$

Government: Overview

- Taxes households to finance government expenditures.
- Can borrow from private sector.
- Runs a social security program.
- Runs a health program.
- Provides long term care.
- Taxes bequests

Social Security Program

Elements of Japan's Social security program we model.

- Employees program
- Contributions gradually increase to a peak of 18.3% of income in 2017.
- Benefits are linked to contributions using Japan's formulas.
- Benefits at age of retirement are not less than 50% of average wage.
 - 1 partial indexation of inflation (subtract 0.9%)
 - 2 partial indexation of real wage growth (subtract 0.9%)
 - 3 demographic adjustment for number of workers
 - 4 demographic adjustment for longer life expectancy.
- nominal floor (no cuts in nominal benefits).
- Funding gap covered out of general govt. revenue.

Health Care Program

- Medical care
- Long term care
- Copayment varies by age (0.2,0.3,0.1)
- Expenditures vary with age of individual.
- Source is Fukui and Iwamoto (2006).

Government Budget Constraint

$$T_t = Z_t + \sum_{j=1}^J \tau_t^a (R_t - 1) a_{j-1,t-1} + (\tau_t^\ell + \tau_t^p) w_t \varepsilon_j (1 - \ell_{j,t}) + \tau_t^c c_{j,t}$$

Tax on bequests

$$Z_t = \sum_{j=2}^{J+1} (1 - \psi_{j-1,t-1}) R(X_t) a_{j-1,t-1} (x_{j-1,t-1}; X_{j-1,t-1}) N_{j-1,t-1}.$$

Government debt

$$D_{t+1} = R(X_t) D_t + G_t + B_t + \Xi_0 - T_t \quad (2)$$

Definitions

Definition

Feasible government policy

A feasible period- t government policy is a set of taxes and transfers: $\Psi_t \equiv \{\{b_{j,t}, \kappa_{j,t}\}_{j=1}^J, \tau_t^a, \tau_t^p, \tau_t^l, G_t, D_{t+1}, \lambda_t, \Xi\}$ that satisfies the government budget constraint.

Definition

A sustainable government policy

A sustainable government policy is a sequence of government policies $\{\Psi_t\}_{t=0}^{\infty}$ that are feasible for all t .

Equilibrium

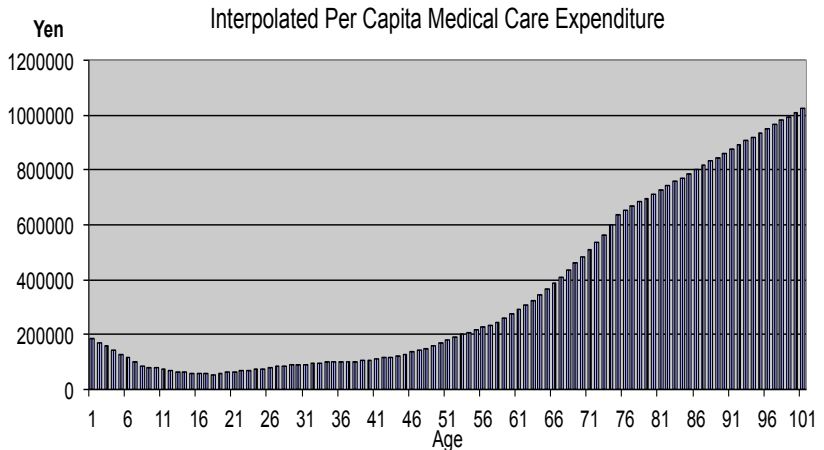
Definition

Competitive Equilibrium

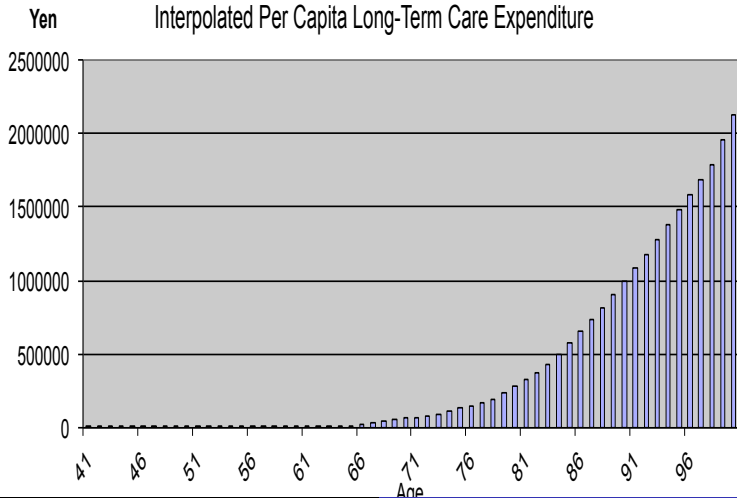
Given an initial age-wealth distribution, a set of government policies, $\{\Psi_t\}_{t=0}^{\infty}$, a sequence of technologies, birth rates and survival probabilities, $\{A_t, n_{1t}, \Gamma_t\}_{t=0}^{\infty}$, a competitive equilibrium is a set of allocations and prices that satisfies the following restrictions:

- 1 Households are on their demand functions for consumption, leisure and assets at the given prices.
- 2 Firms are on their demand functions for labor and capital at the given factor prices.
- 3 The government policies are sustainable.

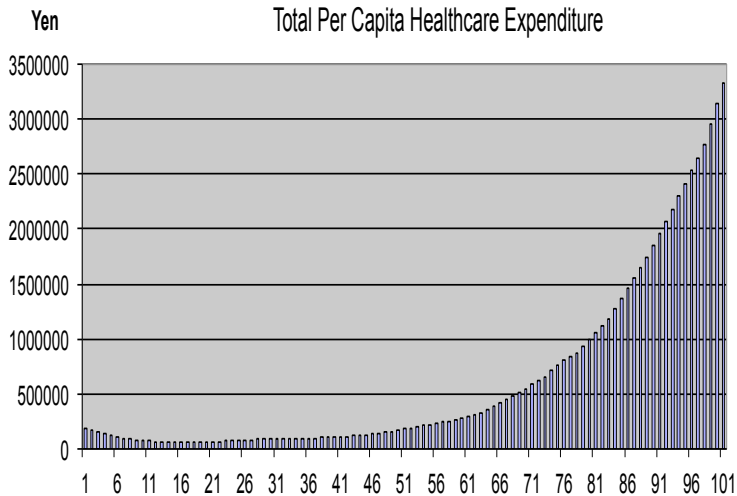
Per Capita Medical Expenditures by age in 2004



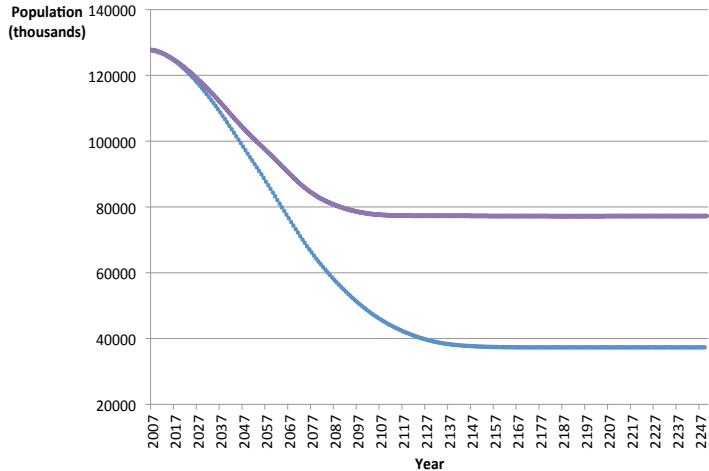
Per Capita Long Term Health Expenditures by age in 2004



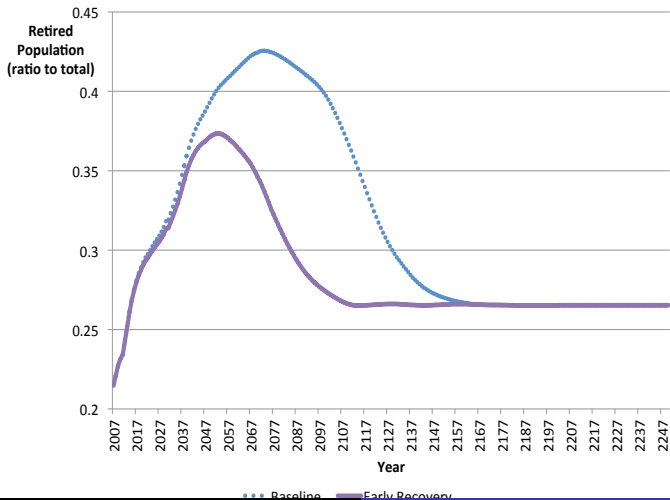
Per Capita Total Health Expenditures by age in 2004



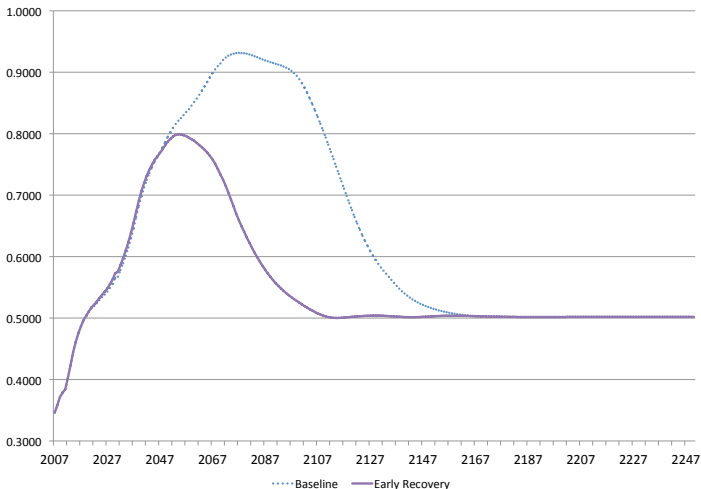
Japan's demographic transition: Population



Japan's demographic transition: retirees



Japan's demographic transition: dependency ratio



Parameterization

Initial condition set to reproduce facts from Japan in 2007

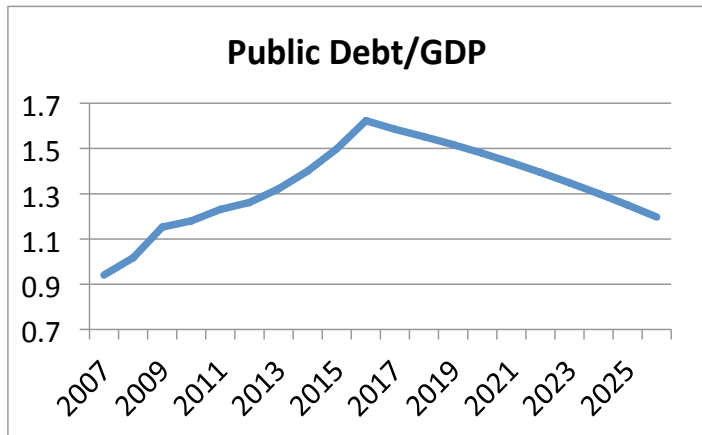
- Government purchases 14% of GDP
- Initial contribution rate to Social Security scaled to reproduce revenues of 7% of GDP.
- Consumption tax 5%.
- Labor tax 17.8%
- Initial govt. debt 0.83
- Copayments: children 0.2, working adults 0.3, retirees 0.1
- Initial scale of public health care spending 8.1% of GDP.

Baseline

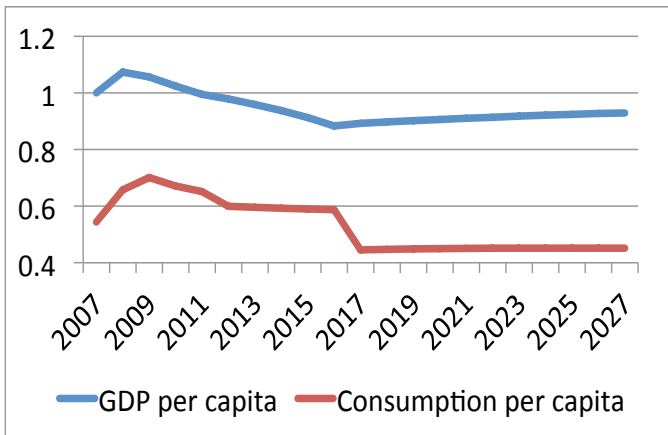
An empirically relevant and sustainable policy.

- Increase the consumption tax to 10% in 2012.
- Increase consumption tax again in 2017.
 - 1 Consumption tax is constant until 2068
 - 2 Consumption tax never arises about this level after 2068.
- Consumption tax must increase to 33% in 2017.
- government expenditures on Social Security, interest payments and health adjust.
- Other government expenditures are a constant 14% of GDP.

Evolution of Public Debt

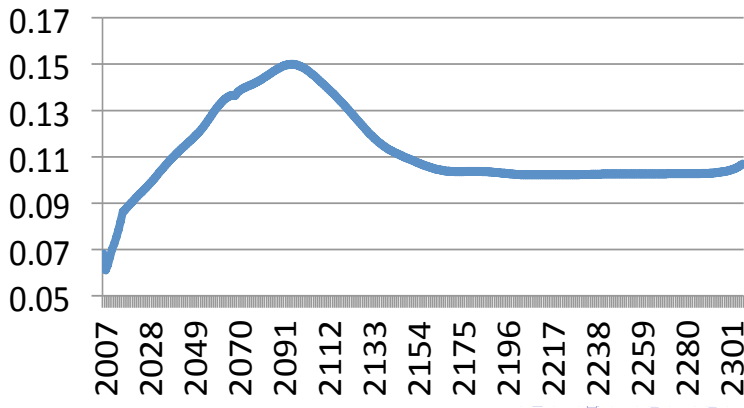


Evolution of GDP and consumption, deviations from 2% trend.



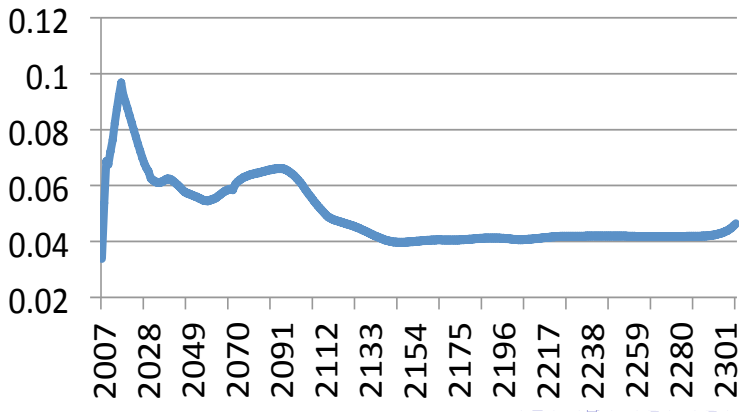
Health expenditures

health expenditures/GDP

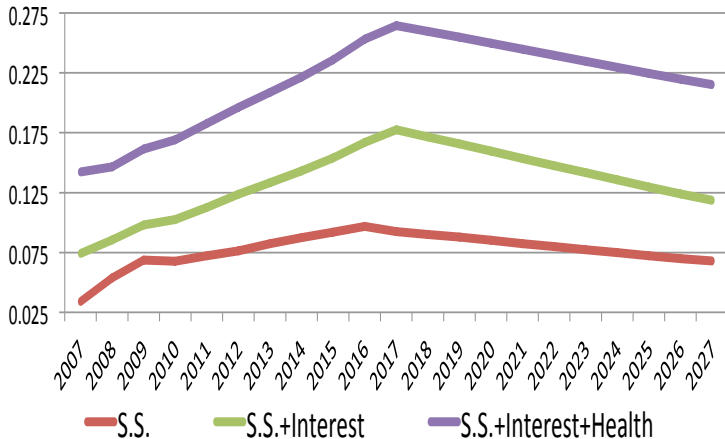


Additional funding for Social Security (benefits-revenues)

Net Social Security Outlays



Sum of Government outlays, for SS, health, interest



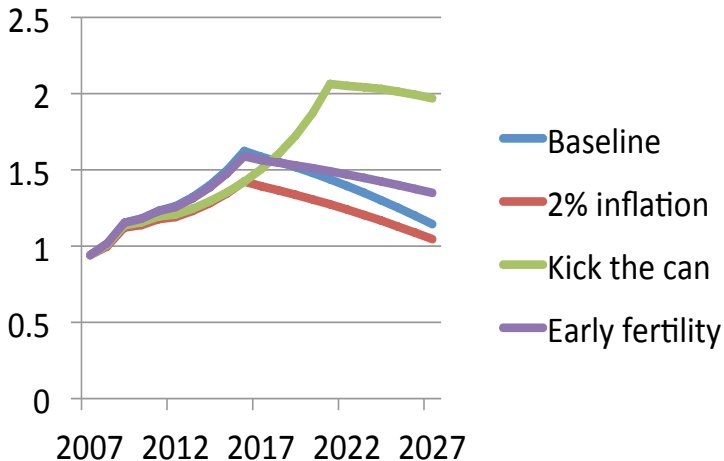
Alternative scenarios

- Kick the can down the road: Longer period of 10% consumption tax.
- 2% inflation rate (baseline assumes 1%)
- Early recovery in fertility.

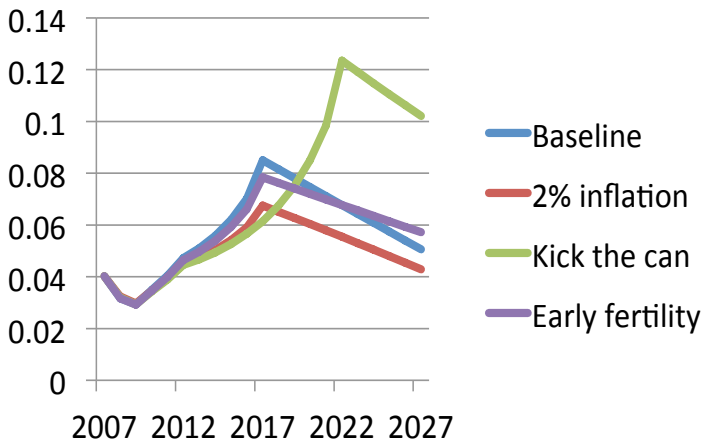
Fiscal Consolidation: Size of Consumption tax

- Baseline: 33%
- Kick the can down the road: 37.5%
- Higher inflation rate: 2.55%
- Early recovery in fertility: 2.85%

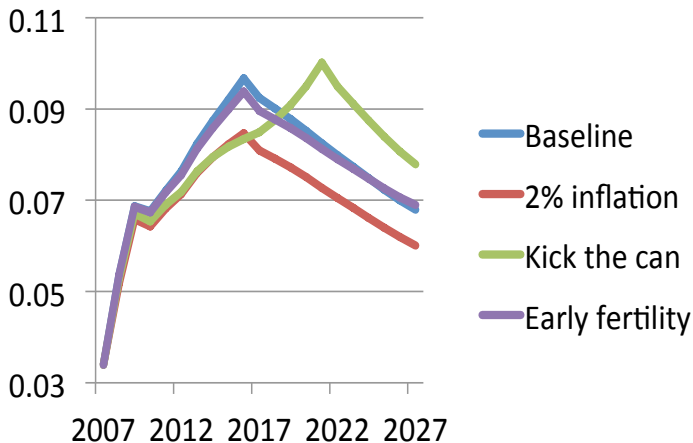
Implications for public debt/GDP ratio



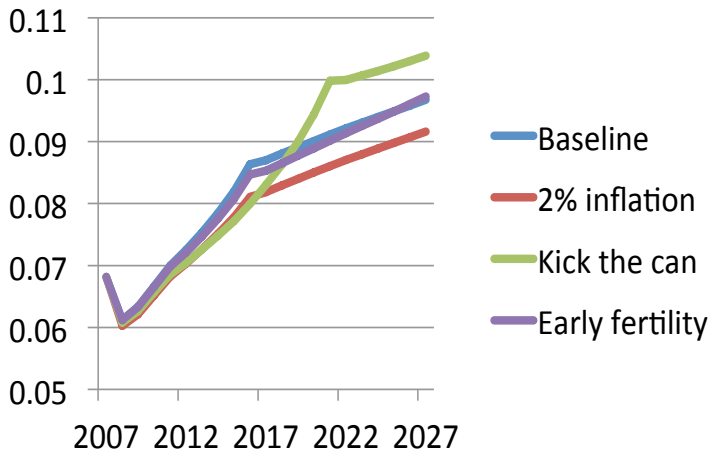
Implications for interest payments on debt relative to GDP



Implications for Social security outlays relative to GDP



Implications for health expenditures relative to GDP



Concluding Remarks

This is Work in Progress. Other things we plan to do.

- Increase the copayment for retirees. ($ctax=0.21$).
- Labor tax adjustments
- Capital tax adjustments
- Welfare Analysis by cohort.