Social Security Actuarial Balance in General Equilibrium

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The results in this presentation are very preliminary. The analysis and conclusions expressed are those of the authors and should not be interpreted as those of the Congressional Budget Office (CBO).

Basic Issue: Financing Pension in the U.S.

- Social Security Administration (SSA) manages the public pension system in the United States
- Congressional Budget Office (CBO), since its founding in 1974, " ... produce(s) independent (and nonpartisan) analyses of budgetary and economic issues to support the Congressional budget process."
  - Population is aging; dependency ratio (ratio of age 65+ to 21-64) will rise from 24% in 2013 to 44% in 2088 (SSAs projection alternative II).
  - Various ways to bring actuarial balance to social security.
  - These demographic and policy changes are likely to affect economic decisions on consumption, saving and labor supply.
  - We explore the size and consequences of these demographic and policy changes using a **workhorse macroeconomic model**.

2013 Trustees Report Summary

- OASI: Old Age and Survivors Insurance
- DI: Disability Insurance
- HI: Health Insurance (Medicare)

($ billion)	OASI	DI	OASDI
Assets (end of 2011)	2,524	154	2,678
Income	731	109	840
Expenditure	646	140	786
Assets (end of 2012)	2,610	123	2,733

- 2012 GDP $16,247
- 2012 Debt $11,582 (publicly held)

Comparison of U.S. and Japan on Two Dimensions

- Debt to GDP Ratio at the end of 2013
  - U.S.: 75%
  - Japan: 150%
- Dependency ratio
  - U.S.: 24% in 2012 to 44% in 2088
  - Japan: 40+% in 2012 to nearly 90% in 2088
- Therefore, the size of fiscal adjustment in Japan will have to be much larger than that in the U.S.

According to the 2013 Social Security Trustees Report

- Projected rise in the dependency ratio from 24% to 44% by 2088
- Long run actuarial balance can be achieved by
    - an immediate, additional 2.66% payroll tax, on top of the 12.4% current OASDI tax rate (HI 2.9%)
    - a 16.5% permanent reduction in benefits, starting with the 2014 eligibles (from the current average replacement rate of about 42%)

Alternative Policies in Policy Circles

- Raise the taxable maximum earning level to capture 90% of taxable earnings; this raises benefits; 2013 limit for OASDI was \$113,700.
- Eliminate the taxable maximum earnings; this restricts benefits from rising.
- Use the consumption or the labor income tax rate to solve the problem.
- Increasing references to tax the top 1% even harder
  - In the U.S., top 1% earn about 19% of federal income but pay nearly 40% of federal income taxes (not payroll taxes)
  - Bottom 50% of individuals pay essentially zero federal income tax

What SSA and CBO Do: Use Simple Model/Assumptions

- Essentially back of the envelope calculations uder the severe assumption that there is zero economic response to

    - increase in longevity or conditional survival probability
    - increase in tax rates or benefit cuts in response to the demographic transition
    - changes in interest rates and wages in response to the demographic transition and policy changes designed to deal with the aging

- To the extent that consumers, firms, households respond to changes in their longevity and government fiscal policy, then SSA and CBO ought to re-consider their analysis.

What We Do: Develop a (Very Large) Measurement Device

- A large scale overlapping generations model for U.S. to evaluate simultaneously demographic and policy changes and their welfare effects on individuals
  - individuals differ in age, income, and asset holdings
  - incorporate the U.S. pension rules
  - incorporate the U.S. tax code (progressive personal income taxes)
  - calibrate wage uncertainty from micro data
  - calculate equilibrium transition paths

Preliminary Findings: Long Run

- When current social security arrangements are maintained and a consumption tax is used to raise funds to finance the fiscal burden due to aging, a new federal consumption tax rate of nearly 10% is required.

- Raising the payroll tax by 2.66% is insufficient to bring about actuarial balance. An additional consumption tax rate of 7.76% is required.

- Reducing benefits by 16.5% is insufficient to achieve actuarial balance. An additional consumption tax rate of 6.42% is needed.

- Actuarial balance is achieved either by a 8.25% increase in the payroll tax rate or a 38.8% decrease in benefits.

Preliminary Findings: Long Run

- Raising the maximum taxable income to capture 90% of taxable earnings requires a slightly larger increase in the consumption tax than the baseline case, to 12.08%.
- Removing the cap still requires an 11.53% consumption tax (relative to the 2.5% in the baseline case) and is the most distorting policy.

Related Work

- Kitao (2013)
  - Raise the payroll tax by 6% or reduce benefits by 33.3% or raise FRA to 73 or means test benefits
  - Raising the payroll tax is bad for the economy; reducing benefits good
  - Current generations prefer an increase in the payroll tax but future cohorts like a reduction in benefits

The Model Economy

- $t = 0, 1, 2, \ldots$ One model period is a year.
- The economy consists of a large number of overlapping-generations individuals, a perfectly competitive representative firm with constant-returns-to-scale technology, and a long-lived government.
- The individuals are heterogeneous and face uninsurable wage risks and partially insurable longevity risks under incomplete markets.

The Model Economy

- Along a balanced growth path, there is a labor-augmenting productivity growth rate μ and a population growth rate ν.
- Along an equilibrium transition path
  - Individual variables other than working hours are growth-adjusted by $(1 + \mu)^{-t}$
  - Aggregate variables are adjusted by $[(1 + \mu)(1 + \nu)]^{-t}$.

Individuals

- Individuals enter the economy and start working at age $i = 1$, which corresponds to real age 21.
- Conditional on survival to age i, they face a conditional survival probability $\phi_{i,t}$ to age $i + 1$ at period t.
- They retire at age I_R, corresponding to real age 65, and live at most up to age I, set equal to 110.

Heterogeneity

- Individuals differ with respect to
  - age $i = 1, \ldots, I$
  - beginning-of-period wealth, $a \in A = [0, a_{\max}]$,
  - average lifetime earnings, $b \in B = [0, b_{\max}]$
  - productivity or efficiency, $e \in E = [0, e_{\max}]$.
  - AIME is used to calculate PIA.
  - An AR(1) is estimated for individual efficiency and approximated by a discrete first oder Markov chain.
  - In every period, t, conditional on survival, households receive an idiosyncratic productivity shock, e, and they choose consumption, c, working hours, h, and wealth at the beginning of next period, a', to maximize their expected (remaining) lifetime utility.

State Vectors

- Individual state vector: $\mathbf{x}$
- Aggregate state vector at t: $\mathbf{X}_t$

$$\mathbf{x} = (i, a, b, e), \qquad \mathbf{X}_t = (\lambda(\mathbf{x}), \mathbf{\Phi}_t),$$

- $\lambda(\mathbf{x})$: population density function of households
- $\mathbf{\Phi}_t = \{(p_{i,s})_{i=0}^{I}, (\phi_{i,s})_{i=0}^{I}\}_{s=t}^{\infty}$ is the population projection at the beginning of year t.
- We consider perfect foresight equilibria in which the individuals know the entire path of demographics, prices, and policy.

Government Policy

$\boldsymbol{\Psi}_t$: government policy schedule at the beginning of period t,

$\left\{ G_s, tr_{LS,s}, \tau_{I,s}(\cdot), \tau_{C,s}, \tau_{HI}, \tau_{P,s}(\cdot), tr_{SS,s}(\cdot), q_s, B_{G,s+1}, F_{s+1} \right\}_{s=t}^{\infty}$,

- G_t: government purchases
- $tr_{LS,t}$: lump sum per capita transfers (w/DI and HI)
- $\tau_{I,t}(\cdot)$: progressive income tax function
- $\tau_{C,t}$: flat consumption tax rate
- $\tau_{P,t}(\cdot)$: Social Security payroll tax function (OASDI)
- $tr_{SS,t}(\cdot)$: Social Security benefit function
- q_t: lump sum transfer per working-age individual from accidental bequests
- $B_{G,t+1}$: government bonds at the beginning of next period
- F_{t+1} Social Security trust fund at $t+1$

Individuals' Problem

$$v(\mathbf{x}, \mathbf{X}_t; \mathbf{\Psi}_t) = \max_{c,h,a'}\left\{ u(c,h) + \tilde{\beta}\phi_i E\left[v(\mathbf{x}', \mathbf{X}_{t+1}; \mathbf{\Psi}_{t+1}) \,|\, \mathbf{x} \right] \right\}$$

subject to $c > 0$, $\quad 0 \le h < 1$, $\quad a' \ge 0$, and the law of
motion of the individual state, $\mathbf{x}' = (i+1, a', b', e')$,

$$
\begin{aligned}
a' = \frac{1}{1+\mu}\Big[&(1+r_t)a + (1-\tau_{HI})w_t eh \\
&- \tau_{I,t}(r_t a, w_t eh) - \tau_{P,t}(w_t eh) \\
&+ tr_{SS,t}(i, b) + tr_{LS,t} + \mathbf{1}_{\{i < I_R\}}q_t - (1+\tau_{C,t})c \Big],
\end{aligned}
$$

$$b' = \mathbf{1}_{\{i < I_R\}}\frac{1}{i}\Big[(i-1)b + \min(w_t eh, \vartheta_{\max}) \Big] + \mathbf{1}_{\{i \ge I_R\}}b,$$

$\mathbf{1}_{\{.\}}$: indicator function that returns 1 if the condition in $\{\ \}$
holds and 0 otherwise

Balanced Growth Preferences

$$u(c, h) = log(c) - \alpha \frac{h^{1+\frac{1}{\gamma}}}{1 + \frac{1}{\gamma}},$$

where α is the disutility from work and γ is the Frisch elasticity of labor supply.

Income Tax Function: Gouveia and Strauss (1994)

$$\tau_{I,t}(r_t a, w_t e h) = \tilde{\tau}_{I,t}(y) = \varphi_t \left[y - \left(y^{-\varphi_1} + \varphi_2 \right)^{-1/\varphi_1} \right],$$

- $y = \max \{ r_t a + w_t e h - d, 0 \}$: individual's taxable income with constant deductions and exemptions d.

The Social Security System

$$\tau_{P,t}(w_t eh) = \bar{\tau}_{P,t} \min(w_t eh, \vartheta_{\max}),$$

$\bar{\tau}_{P,t}$: Payroll tax rate for Old-Age, Survivors and Disability Insurance (OASDI), combines the employee's and the employer's portions; $\vartheta_{\max}$: maximum taxable earnings

$$\begin{aligned}
tr_{SS,t}(i,b) = \mathbf{1}_{\{i \geq I_R\}} \psi_t (1+\mu)^{40-i} \big\{ & 0.90 \min(b, \vartheta_1) \\
& + 0.32 \max \big[\min(b, \vartheta_2) - \vartheta_1, 0 \big] \\
& + 0.15 \max(b - \vartheta_2, 0) \big\},
\end{aligned}$$

ϑ_1 and ϑ_2: thresholds for the 3 replacement rate brackets, 90%, 32%, and 15%

ψ_t: benefit adjustment factor to balance the budget

Individuals' Decision Rules

$c(\mathbf{x}, \mathbf{X}_t; \mathbf{\Psi}_t)$; $h(\mathbf{x}, \mathbf{X}_t; \mathbf{\Psi}_t)$

$$a'(\mathbf{x}, \mathbf{X}_t) = \frac{1}{1+\mu}\big[\,(1+r_t)a + (1-\tau_{HI})w_t eh(\mathbf{x}, \mathbf{X}_t)$$
$$- \tau_{I,t}(r_t a, w_t eh(\mathbf{x}, \mathbf{X}_t))$$
$$- \tau_{P,t}(w_t eh(\mathbf{x}, \mathbf{X}_t))$$
$$+ tr_{SS,t}(i,b) + tr_{LS,t} + \mathbf{1}_{\{i<I_R\}}q_t$$
$$- (1+\tau_{C,t})\,c(\mathbf{x}, \mathbf{X}_t)\,\big],$$
$$b'(\mathbf{x}, \mathbf{X}_t) = \mathbf{1}_{\{i<I_R\}}\frac{1}{i}\big[\,(i-1)b$$
$$+ \min(w_t eh(\mathbf{x}, \mathbf{X}_t), \vartheta_{\max})\,\big] + \mathbf{1}_{\{i\geq I_R\}}b.$$

Distribution of Individuals

- $\lambda_t(\mathbf{x})$: population distribution function of individuals in period t
- $\Lambda_t(\mathbf{x})$ be the corresponding cumulative distribution function
- Households enter the economy with no assets and earning histories, $a = b = 0$, and that the growth-adjusted population of the age $i = 1$ household is normalized to unity.

The law of motion of the growth-adjusted population distribution for $i = 1, \ldots, I - 1$:

$$\lambda_{t+1}(\mathbf{x}') = \frac{\phi_i}{1+\nu}$$
$$\int_{A \times B \times E} \mathbf{1}_{\{a' = a'(\mathbf{x}, \mathbf{X}_t),\, b' = b'(\mathbf{x}, \mathbf{X}_t)\}} \pi_i(e'|e) \, d\Lambda_t(\mathbf{x}),$$

The Firm

Total private wealth, $W_{P,t}$, capital stock, K_t, and labor supply in efficiency units, L_t, are given by

$$W_{P,t} = \sum_{i=1}^{I} \int_{A \times B \times E} a \, d\Lambda_t(\mathbf{x}), \qquad K_t = W_{P,t} - B_{G,t},$$

$$L_t = \sum_{i=1}^{I_R-1} \int_{A \times B \times E} eh(\mathbf{x}, \mathbf{X}_t) \, d\Lambda_t(\mathbf{x}).$$

Firm's Problem

$$\max_{\tilde{K}_t, \tilde{L}_t} F(\tilde{K}_t, \tilde{L}_t) - (r_t + \delta)\tilde{K}_t - w_t \tilde{L}_t,$$

$F(\cdot)$ is a constant-returns-to-scale production function,

$$F(\tilde{K}_t, \tilde{L}_t) = A\tilde{K}_t^{\theta} \tilde{L}_t^{1-\theta},$$

where A is the total factor productivity and δ is the depreciation rate of capital.

$$F_K(\tilde{K}_t, \tilde{L}_t) = r_t + \delta, \qquad F_L(\tilde{K}_t, \tilde{L}_t) = w_t.$$

Closed Economy

The factor market clearing conditions:

$$K_t = \tilde{K}_t, \qquad L_t = \tilde{L}_t.$$

$$Y_t = F(K_t, L_t) = (r_t + \delta)(K_t) + w_t L_t.$$

Government Accounting

The government's income tax revenue:

$$T_{I,t}(\varphi_t) = \sum_{i=1}^{I} \int_{A \times B \times E} \tau_{I,t}(r_t a + w_t e h(\mathbf{x}, \mathbf{X}_t); \varphi_t) \, d\Lambda_t(\mathbf{x}),$$

$$T_{C,t}(\tau_{C,t}) = \tau_{C,t} \sum_{i=1}^{I} \int_{A \times B \times E} c(\mathbf{x}, \mathbf{X}_t) \, d\Lambda_t(\mathbf{x}),$$

$$TR_{LS,t}(tr_{LS,t}) = \sum_{i=1}^{I} \int_{A \times B \times E} tr_{LS,t} \, d\Lambda_t(\mathbf{x}).$$

SSA Accounting

$$T_{P,t}(\bar{\tau}_{P,t}) = \sum_{i=1}^{I_R-1} \int_{A \times B \times E} \tau_{P,t}(w_t e h(\mathbf{x}, \mathbf{X}_t); \bar{\tau}_{P,t}) \, d\Lambda_t(\mathbf{x}),$$

$$TR_{SS,t}(\psi_t) = \sum_{i=I_R}^{I} \int_{A \times B \times E} tr_{SS,t}(i, b; \psi_t) \, d\Lambda_t(\mathbf{x}).$$

$$F_{t+1} = \frac{1}{(1+\mu)(1+\nu)} \big[(1+r_{F,t})F_t$$
$$+ T_{P,t}(\bar{\tau}_{P,t}) - TR_{SS,t}(\psi_t) \big] \geq 0,$$

Government Budget Constraint

$$
\begin{aligned}
B_{G,t+1} = \frac{1}{(1+\mu)(1+\nu)} \big[\, & (1+r_{B,t})B_{G,t} \\
& + T_{I,t}(\varphi_t) + T_{C,t}(\tau_{C,t}) + T_{HI,t}(\tau_{HI}) - C_{G,t} \\
& - TR_{LS,t}(tr_{LS,t}) + T_{P,t}(\bar{\tau}_{P,t}) - TR_{SS,t}(\psi_t) \, \big],
\end{aligned}
$$

Accidental Bequests

Unintended bequests are confiscated by the government at the end of the period and transferred to working age individuals in a lump sum fashion in the same period.

$$Q_t = \sum_{i=1}^{I} \int_{A \times B \times E} (1 - \phi_i)(1 + \mu)a'(\mathbf{x}, \mathbf{X}_t) \, d\Lambda_t(\mathbf{x}).$$

$$q_t = \left(\sum_{i=1}^{I_R - 1} \int_{A \times B \times E} d\Lambda_t(\mathbf{x}) \right)^{-1} Q_t.$$

Recursive Competitive Equilibrium

DEFINITION Recursive Competitive Equilibrium: Given the individual state vector $\mathbf{x} = (i, a, b, e)$, the aggregate state vector $\mathbf{X}_t = (\lambda(\mathbf{x}), \mathbf{\Phi}_t)$, and the government policy vector $\mathbf{\Psi}_t$ at the beginning of period t,

$$\left\{ C_{G,s}, tr_{LS,s}, \tau_{I,s}(\cdot), \tau_{C,s}, \tau_{HI}, \tau_{P,s}(\cdot), tr_{SS,s}(\cdot), q_s, W_{G,s+1}, F_{s+1} \right\}_{s=}^{\infty}$$

a Recursive Competitive Equilibrium consists of a sequence of prices and government policy variables,

$$\mathbf{\Omega}_t = \left\{ r_s, w_s, C_{G,s}, tr_{LS,s}, \varphi_s, \tau_{C,s}, \bar{\tau}_{P,s}, \psi_s, q_s, W_{G,s+1}, F_{s+1} \right\}_{s=t}^{\infty},$$

value functions of households, $\left\{ v(\mathbf{x}, \mathbf{X}_s; \mathbf{\Psi}_s) \right\}_{s=t}^{\infty}$, the decision rules of households,

Recursive Competitive Equilibrium

$$\mathbf{d}(\mathbf{x}, \mathbf{X}_s; \mathbf{\Psi}_s) = \big\{ c(\mathbf{x}, \mathbf{X}_s; \mathbf{\Psi}_s), h(\mathbf{x}, \mathbf{X}_s; \mathbf{\Psi}_s), a'(\mathbf{x}, \mathbf{X}_s; \mathbf{\Psi}_s),$$
$$b'(\mathbf{x}, \mathbf{X}_s; \mathbf{\Psi}_s) \big\}_{s=t}^{\infty},$$

and the distribution of households, $\{\lambda_s(\mathbf{x})\}_{s=t}^{\infty}$, if, for all
$s = t, \ldots, \infty$, each household solves the optimization problem,
taking $\mathbf{X}_s$ and $\mathbf{\Psi}_s$ as given; the firm solves its profit
maximization problem; the government policy schedule
satisfies conditions; and the factor markets are cleared. The
economy is in a steady-state equilibrium, if, in addition,
$\mathbf{X}_{s+1} = \mathbf{X}_s$ and $\mathbf{\Psi}_{s+1} = \mathbf{\Psi}_s$ for all $s = t, \ldots, \infty$.

CV in Wealth

Suppose that the economy is in the initial equilibrium in period $t = 0$ and that the government introduces a new policy at the beginning of period 1. Then, the (remaining) lifetime value of a household of state $\mathbf{x} = (i, a, b, e)$ is denoted by $v(\mathbf{x}, \mathbf{X}_0; \mathbf{\Psi}_0)$ before the policy change and $v(\mathbf{x}, \mathbf{X}_t; \mathbf{\Psi}_t)$ for $t = 1, \ldots, \infty$ after the policy change.

The compensating variation of an individual with state $\mathbf{x} = (i, a, b, e)$ is the one-time negative wealth transfer that restores the baseline welfare level in the alternative economy after the policy change.

Welfare Measure

The compensating variations of newborn (age $i = 1$) households at the beginning of period $t = 1, \ldots, \infty$ are calculated as $cv(\mathbf{x}_1, \mathbf{X}_t; \mathbf{\Psi}_t)$ such that

$$v(1, a - cv(\mathbf{x}_1, \mathbf{X}_t; \mathbf{\Psi}_t), b, e, \mathbf{X}_t; \mathbf{\Psi}_t) = v(1, a, b, e, \mathbf{X}_0; \mathbf{\Psi}_0),$$

and the compensating variations of age $i = 2, \ldots, I$ at the time of policy change ($t = 1$) are calculated as $cv(\mathbf{x}_i, \mathbf{X}_1; \mathbf{\Psi}_1)$ such that

$$v(i, a - cv(\mathbf{x}_i, \mathbf{X}_1; \mathbf{\Psi}_1), b, e, \mathbf{X}_1; \mathbf{\Psi}_1) = v(i, a, b, e, \mathbf{X}_0; \mathbf{\Psi}_0).$$

Welfare Measure

The average (growth adjusted) compensating variations by age cohort are calculated as

$$CV_{1,t} = \int_{A \times B \times E} cv(1, a, b, e, \mathbf{X}_t; \mathbf{\Psi}_t) d\Lambda_t(\mathbf{x}_1) \times \frac{1}{p_{1,t}},$$

$$CV_{i,1} = \int_{A \times B \times E} cv(i, a, b, e, \mathbf{X}_1; \mathbf{\Psi}_1) d\Lambda_1(\mathbf{x}_i) \times \frac{1}{p_{i,t}},$$

for $t = 1, \ldots, \infty$ and $i = 2, \ldots, I$.

Demographics

Maximum age	I	90	Real life age 110
Retirement age	I_R	45	FRA 65
Productivity growth	μ	0.0180	Average in 1971-2011
Population growth	ν	0.0037	Long run projection
Conditional survival	$\phi_{i,t}$		SSA (2013)

Preferences and Technology

Consumption share	α	0.36	Fraction of work hours
Discount factor	β	0.9879	$K/Y = 3.3$
Capital's share	θ	0.41	Average in 2009-2013
Depreciation rate	δ	0.0742	$r = 0.05$
TFP	A		$w = 1.0$ in the baseline

Wage Distribution

The working ability, e_i, of an age i household in the model economy is assumed to satisfy

$$\ln e_i = \ln \bar{e}_i + \ln z_i \quad \text{for} \quad i = 1, \dots, I_R - 1,$$

where $\bar{e}_i$ is the median wage rate at age i, and z_i is a persistent shock that follows an AR(1) process:

$$\ln z_i = \rho \ln z_{i-1} + \epsilon_i, \qquad \epsilon_i \sim N(0, \sigma^2), \qquad \ln z_0 \sim N(0, \sigma_{\ln z_0}^2).$$

Persistence of log wage	ρ	0.9500	
Stdev of log wage shocks	σ	0.2830	$txern/cvern = 83\%$
Median working ability	$\bar{e}_i$		OLS SSA Data

The log persistent shock, $\ln z_i$, is discretized into 13 levels for each age using Tauchen's procedure and create the Markov transition matrix.

Policy Parameters

OASDI payroll tax rate	$\bar{\tau}_{P,t}$	12.4%	OASI tax rate
Maximum taxable earnings	$\vartheta_{\max}$	\$113,700	in 2013

Steady States in 2015 and 2200

	Initial Steady State 2015 Demographics	Final Steady State 2200 Demographics
Trust Fund	17% GDP	0 in 2034
Capital Stock	297.0	357.4
Labor Supply	53.1	58.5
Output	90.0	102.8
Wage	1.0	1.0370
Interest Rate	0.05	0.0437
OASDI payroll tax	12.4%	12.4%
Consumption tax	0.025	0.1203

Baseline and Reform Experiments

Reforms	Policy Instruments			
	τ_p	ψ	τ_c	txern/cvern
Baseline	12.40%	Current	12.03%	83%
R_{T_1}	20.65%	No Δ	6.59%	83%
R_{B_1}	12.40%	$\downarrow$ 38.8%	4.73%	83%
R_{T_2}	15.06%	No Δ	10.26%	83%
R_{B_2}	12.40%	$\downarrow$ 16.5%	8.92%	83%
R_{T_3}	12.40%	No Δ	12.08%	90%
R_{T_4}	12.40%	No Δ	11.53%	100%

Reforms Relative to the Baseline

	Baseline	R_{T_1}	R_{B_1}	R_{T_2}	R_{B_2}
K	357.4	-2.81%	8.5%	-0.9%	3.3%
L	58.5	0.3%	0.7%	0.1%	0.3%
Y	102.8	-1.0%	3.8%	-0.3%	1.5%
w	1.0370	1.0235	1.0695	1.0327	1.0496
r	0.0437	0.0459	0.0386	0.0444	0.0416
τ_p	12.4%	20.65%	12.4%	15.06%	12.4%
ψ	—	—	-38.8%	—	-16.5%
τ_c	12.03%	6.59%	4.73%	10.26%	8.92%
$txern/cvern$	83%	83%	83%	83%	83%

Reforms Relative to the Baseline

	Baseline	R_{T_3}	R_{T_4}
K	357.4	-1.4%	-3.3%
L	58.5	-0.1%	1.2%
Y	102.8	0.6%	-2.0%
w	1.0370	1.0315	1.0277
r	0.0437	0.0446	0.0452
τ_p	12.4%	12.4%	12.4%
ψ	—	—	—
τ_c	12.03%	12.08%	11.53%
$txern/cvern$	83%	90%	100%

Baseline, Tax Reform 1 and Benefit Reform 1
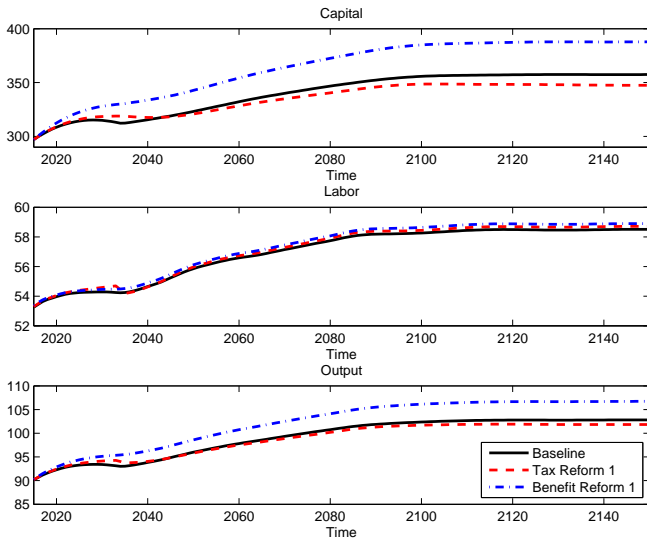
Baseline, Tax Reform 3 and Tax Reform 4
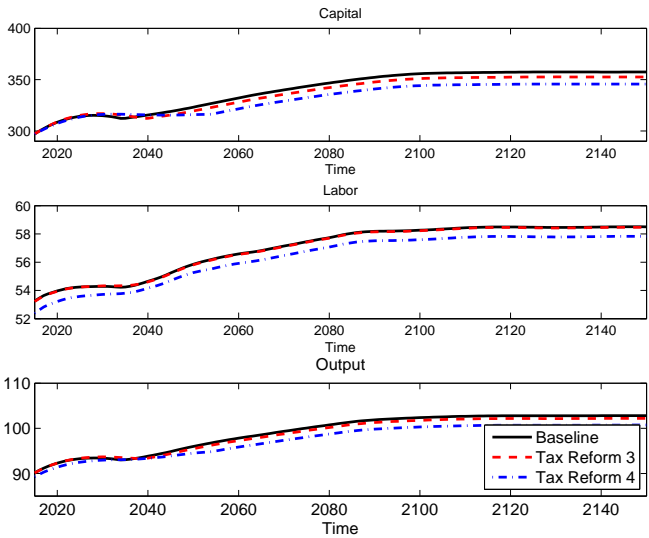
Compensating Variation in Wealth, Relative to 2015

Welfare

Age at the Time of Reform

Tax 1
Benefit 1
Tax 3
Tax 4
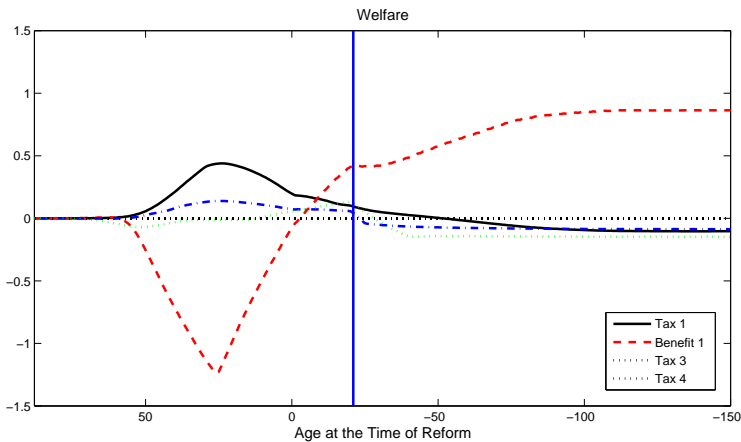
Concluding Remarks

- SSA Trustees report argues that actuarial balance will be acheived by
  - a 2.66% increase in the OASDI payroll tax, or,
  - a 16.5% decrease in benefits.
- SSA Trustees report underestimates the size of the adjustment needed.
- Among the various policy options considered in this paper, the best seems to be to raise the consumption tax.
- The worst policy seems to be eliminating the taxable maximum limit on earnings; this introduces the largest distortion.
- More work is needed.

Abe Reforms for 2014

Children & child-raising

○ Establish a new system to support children and child-raising
- Resolution of the problem of the waiting-list children
- Integration of kindergarten and day nursery
- Support for community-based childcare

Pension

○ Ensure sustainability of the pension system (permanently fix funding by the national treasury at 50%)
○ Add pension benefits to low-income earners Review pension benefits to high-income earners
○ Unify employee pension systems
○ Eliminate special exceptions in indexed pension

Medical/long-term care

○ Improve home medical/long-term care
-- integrated community care system
→ Allowing patients to continue life in their home community

○ Expand advanced medical care
→ Early recovery and early return to home care

○ Intensify reduction of social insurance contribution by low-income earners

○ Reduce burden on patients receiving long-term, expensive medical care

○ Promote use of generic drugs and prioritize benefits

○ Expand coverage of employee insurance
→ Extend full-time workers' social security to part-time workers

İmrohoroğlu, Kitao, and Yamada (2013): Achieving Fiscal Balance in Japan

- Under current policies, large pension and non-pension deficits will persist, with growing interest payments on government debt eventually becoming a serious burden.
  - Pension and non-pension deficits contribute about the same, about 4% of GDP each, to new borrowing over the next few years, with net interest on debt playing a much smaller role, due to current low real interest rate on JGBs.
  - With the consumption tax rate scheduled to rise from 5% to 10% in 2014-2015, there is a significant improvement in the non-pension deficit and then a gradual rise of the deficit over time as the ratios of non-pension transfers and government expenditures to GDP start to rise.

İmrohoroğlu, Kitao, and Yamada (2013): Achieving Fiscal Balance in Japan

- Among the outcomes and policies considered, three seem to have a large impact, although none of them by itself is able to restore fiscal balance.
  - Raising the retirement age to 70 and cutting benefits by 10% significantly reduces the pension deficit.
  - Raising the consumption tax to 20% produces a surplus in the non-pension balance.
  - Raising the female labor force participation rates to those of males and having the distribution of employment types converge to that of males impact the budget more significantly; both pension and non-pension deficits are reduced.
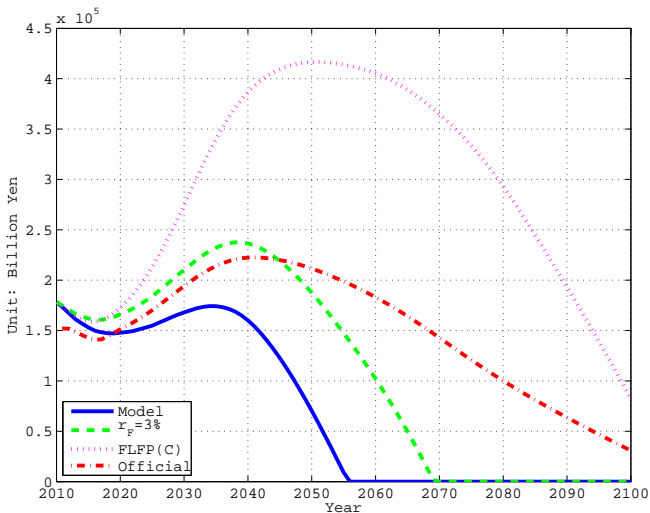
Raising the Consumption Tax to 20%
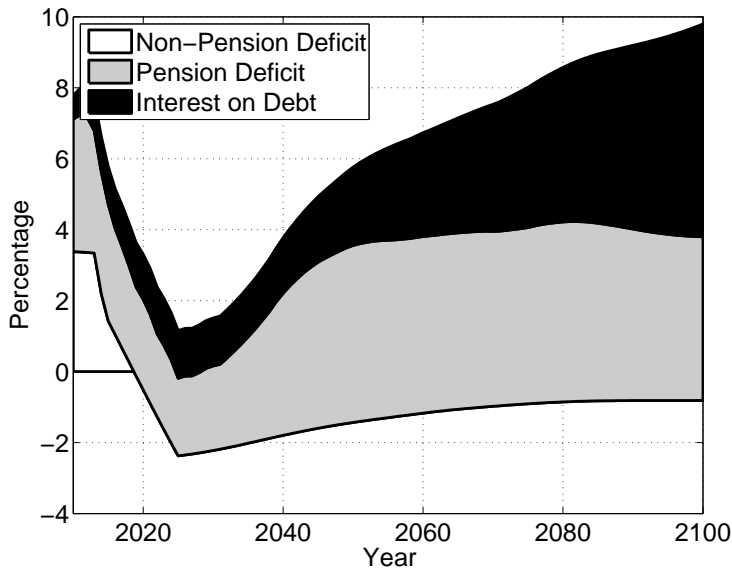
Raising the Female Labor Force Participation Rate to that of Males
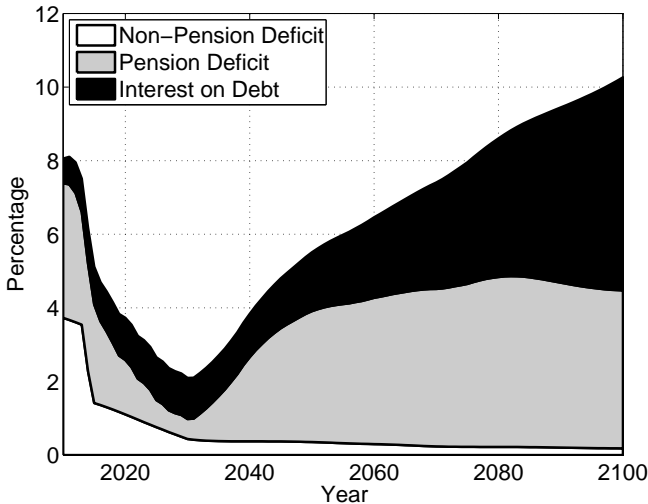
The Future of the Pension Fund in Japan

Hansen and İmrohoroğlu (2013): Fiscal Reform and Government Debt in Japan: A Neoclassical Perspective

- Previous paper assumed zero economic response.
- What does an economic model suggest for Japan?
  - Rising debt to GNP ratio implies huge tax rise will come around 2020.
    - Consumption tax: permanent increase to 48% with additional 12% during transition.
    - Both consumption and labor tax: permanent increase to 40%, smaller additional increase during transition.
- Hoshi and Ito (2013) more optimistic
- Braun and Joines (2013) pessimistic like us; they emphasize the importance of public health expenditures as contributing to the fiscal burden

Major Takeaways

- The scale of the aging and the size of current fiscal situation are much smaller in the U.S.
- As a consequence, much smaller fiscal adjustments are needed in the U.S.
- Still, there are more efficient ways to deal with the needed fiscal adjustment (benefit cuts and/or consumption tax increases).
- Simple accounting models can be misleading.
- Japan is facing difficult choices.
  - Further pension reform (retirement age to 70)
  - Further health care reform
  - Further consumption tax increase
  - Policies to increase female labor force participation
  - Guest worker program