Fiscal Reform and Government Debt in Japan:
A Neoclassical Perspective

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Basic Issue

- Japan faces two significant challenges
  - High debt to output ratio
  - Aging population
    - Projected Increases in Government Expenditures
- View issue through lens of neoclassical growth model.
- How big is the problem and what are the consequences of possible solutions?
Two Significant challenges faced by Japan

1. High Debt

Figure 1. Net Debt to GNP Ratio
Two Significant challenges faced by Japan

2. Aging Population

Figure 2. Dependency Ratios

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Two Significant challenges faced by Japan

Figure 3. Government Expenditures to GNP Ratio

Figure 3. Transfer Payments to GNP Ratio
What We Do

Use Hayashi and Prescott (2002)

1. Measure the size of fiscal adjustment needed
2. Calculate the effects of two alternative fiscal policies designed to achieve fiscal balance
Economic actors know the future, including futures changes in government policy.

Exogenous: total factor productivity, tax rates, government spending, transfer payments, and population levels.


Model determines: Output, hours, investment, consumption, capital stock, interest rates, and government debt.
More on What We Do

- Implement a debt sustainability rule. Once an ad hoc threshold is reached, debt is reduced toward assumed long run level.
- Compute required revenue to reduce debt given projected government expenditures.
- Compute two alternative fiscal policy transitions
  - Consumption tax
  - Labor income tax
The policies considered are not "optimal" policies. We are motivated by two considerations:

1. Politically there is likely an incentive to put off any reform as long as possible. This is why we use a debt to output trigger.

2. We focus on consumption and labor income tax rates because of their simplicity. Further research should explore things like increasing the retirement age, other reforms of entitlement programs, encouraging immigration, encourage female labor supply, etc.
Main Findings

- Very large additional revenues needed to finance the projected increases in government expenditures due to aging
  - About 30% of aggregate consumption each year
- If the government uses the consumption tax to finance the expected burden due to aging, then the consumption tax rate needs to increase from its current level of 5% to about 35%.
- If the labor income tax is used, then the tax rate will nearly double from its current level of 30% to about 60%.
- The welfare cost of using the labor income tax is 3.22% of consumption, which is more than twice that of using the consumption tax to restore fiscal balance.
Model

- **Endogenous:**
  - Hours worked \( (h_t) \), per capita consumption \( (C_t) \), output \( (Y_t) \), the stock of capital \( (K_{t+1}) \), tax revenues, government debt \( (B_{t+1}) \), and the price of government bonds, \( (q_t) \), from 1981 into the infinite future.

- **Population:** \( N_{t+1} = \eta_t N_t \).

- **Exogenous:**
  - Tax rates \( \tau_{h,t}, \tau_{k,t}, \tau_{b,t}, \tau_{c,t} \)
  - Government purchases \( G_t \)
  - Transfer payments \( TR_t \)
  - Working age population \( N_t \)
  - TFP \( A_t \)

- Use actual time series 1981-2008; forecasts and assumptions for 2009 and beyond.

- Eventually, the tax rates, \( G_t / Y_t, TR_t / Y_t \), growth rates of \( N_t \) and \( A_t \) are all constant; economy converges to a balanced growth path.
Revenue Required to Stablilize Debt

Budget Constraint:

\[ G_t + TR_t + B_t = \eta_t q_t B_{t+1} + \tau_{c,t} C_t + \tau_{h,t} W_t h_t + \tau_{k,t} (r_t - \delta) K_t + \tau_{b,t} (1 - q_{t-1}) B_t. \] (1)

Debt Sustainability Rule:

\[ D_t = \kappa \iota_t (B_t - \bar{B}_t), \]

\[ \iota_t = \begin{cases} 1 & \text{if } B_s / Y_s \geq b_{\text{max}} \text{ for some } s \leq t, \\ 0 & \text{otherwise} \end{cases} \]

Replace \( TR_t \) with \( TR^*_t = TR_t - D_t \)
Calibration

Tax Rates

- Tax Rate on Labor Income: Updated version of Mendoza, Razin, and Tesar (1994)
- Tax Rate on Consumption:
  - 0% 1981-1988
  - 3% 1989-1996
  - 5% 1997-2008
- For 2009 and beyond, we assume that tax rates are constant at their 2008 levels.
Figure 4. Tax Rates
Actual Values used for 1981-2009

Table 3. Calibration of TFP and Population Growth Rates

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<tbody>
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<td>$\gamma_t$</td>
<td>Actual Values</td>
<td>1.02$^{(1-\theta)}$</td>
<td>1.02$^{(1-\theta)}$</td>
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<td>$\eta_t$</td>
<td>Actual Values</td>
<td>Government Projections</td>
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Projections by Fukawa and Sato (2009)

Table 4. Calibration of $G/Y$ and $TR/Y$

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<tr>
<td>$G/Y$</td>
<td>Actual Values</td>
<td>linear increase from 0.198 to 0.238</td>
<td>0.238</td>
</tr>
<tr>
<td>$TR/Y$</td>
<td>Actual Values</td>
<td>linear increase from 0.148 to 0.188</td>
<td>0.188</td>
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Calibration
TFP, Population Growth Rates, Expenditure Ratios

![Graphs showing Working-Age Population, TFP (Normalized), Government Purchases to GNP Ratio, and Transfer Payments to GNP Ratio over the years 1980 to 2080.]
Calibration
Parameters for Fiscal Balance:

\[ \kappa, b_{\text{max}}, \text{ and } \bar{b} \]

\[ \iota_t = \begin{cases} 
1 & \text{if } B_s / Y_s \geq b_{\text{max}} \text{ for some } s \leq t, \\
0 & \text{otherwise} 
\end{cases} \]

\[ D_t = \kappa \iota_t (B_t - \bar{B}_t), \]

- For the debt to output ratio along the balanced growth path, \( \bar{b} \), we use a value of 60%.
- For \( b_{\text{max}} \), the debt to output ratio that triggers tax increases, we used 150% and 200%.
- For \( \kappa \), see next slide.
Calibration

Revenue Requirements:

\[ b_{\text{max}} = 150\% \]

Figure 6. Revenue Requirement
**Calibration**

**Revenue Requirements:**

\[ b_{\text{max}} = 200\% \]

**Figure 7. Revenue Requirement**
Figure 10. Capital, Labor and Output
Figure 11. Consumption, Investment, and Capital-Output Ratio
Quantitative Findings

Benchmark Results

Figure 12. Bond Price and Debt to GNP Ratio
Using a Distorting Tax Instead of Lumpsum Reduction in Transfers

Transition Policy

Fiscal policy is assumed to follow

\[
\tau_{x,t} = \begin{cases} 
\tau_{x,2009} & \text{if } B_s / Y_s \leq b_{\text{max}} \text{ for all } s \leq t \\
\bar{\tau}_x + \pi & \text{if } B_s / Y_s > b_{\text{max}} \text{ for some } s \leq t \text{ and } B_t / Y_t > \bar{b} \\
\bar{\tau}_x & \text{if } B_t / Y_t \leq \bar{b}.
\end{cases}
\]
Using a Distorting Tax Instead of a Lumpsum Tax

Consumption Tax

Figure 13. Consumption Tax Rate
Using a Distorting Tax Instead of a Lumpsum Tax

Labor Income Tax

Figure 14. Labor Income Tax Rate
Figure 15. Labor, Capital, and Output
Figure 16. Consumption and Investment
\[(1 - \tau) = \frac{(1 - \tau_h)}{(1 + \tau_c)} \text{ which implies } \tau = \frac{\tau_c + \tau_h}{1 + \tau_h}\]
Figure 17. Debt to GNP Ratios
Figure 18. Output Effects
Welfare Costs

What percentage *decrease* in consumption each period would give someone in the benchmark (lump sum tax) economy the same lifetime utility as someone living in an economy where increases in the consumption tax or labor tax is used to achieve fiscal stability?

\[
\lambda_c = 1.41\% \\
\lambda_h = 3.22\%
\]
Conclusions
This Paper

- Fiscal day of reckoning is soon—2017-2022.
- A nearly PERMANENT increase in consumption tax rate of about 30 percent.
- A nearly PERMANENT increase in labor income tax rate of about 30 percent.
Other possibilities:

- social security reform
- immigration
- fertility
- encourage female labor force participation
- reduce spending