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 Inreases 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

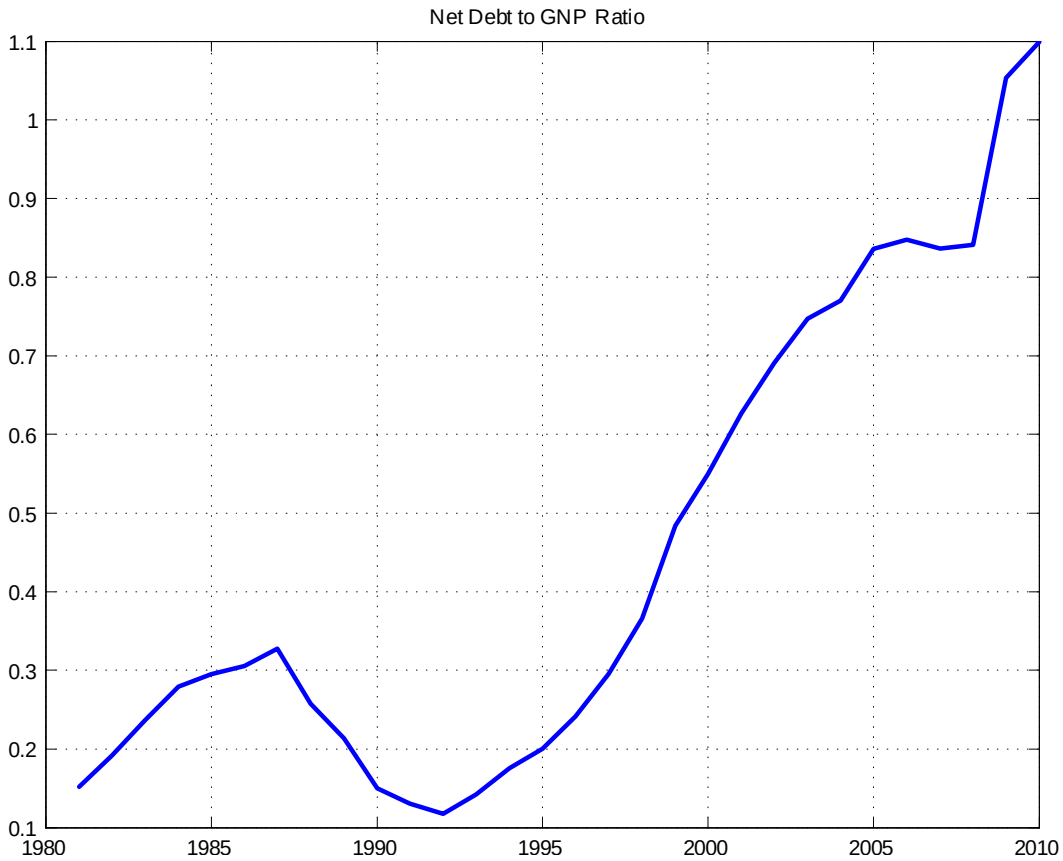


Figure 1. Net Debt to GNP Ratio

Two Significant challenges faced by Japan

2. Aging Population

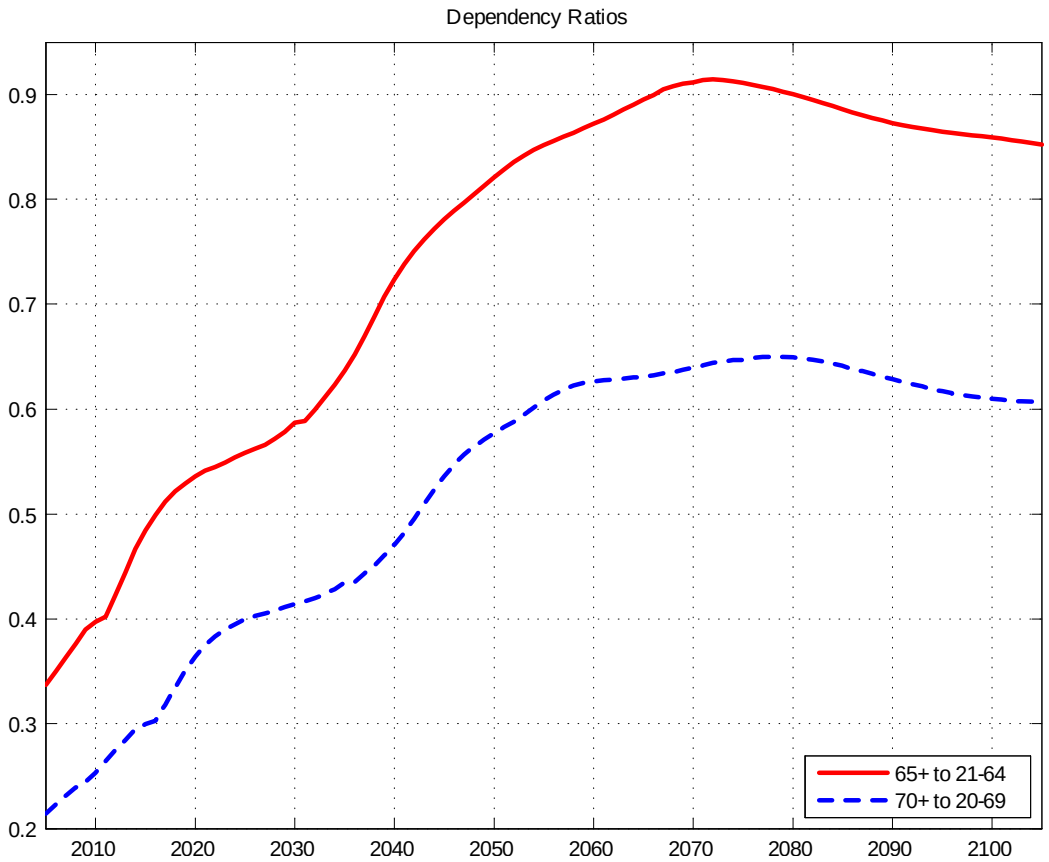


Figure 2. Dependency Ratios

Two Significant challenges faced by Japan

Implications of the Aging Population: Fukawa and Sato (2009)

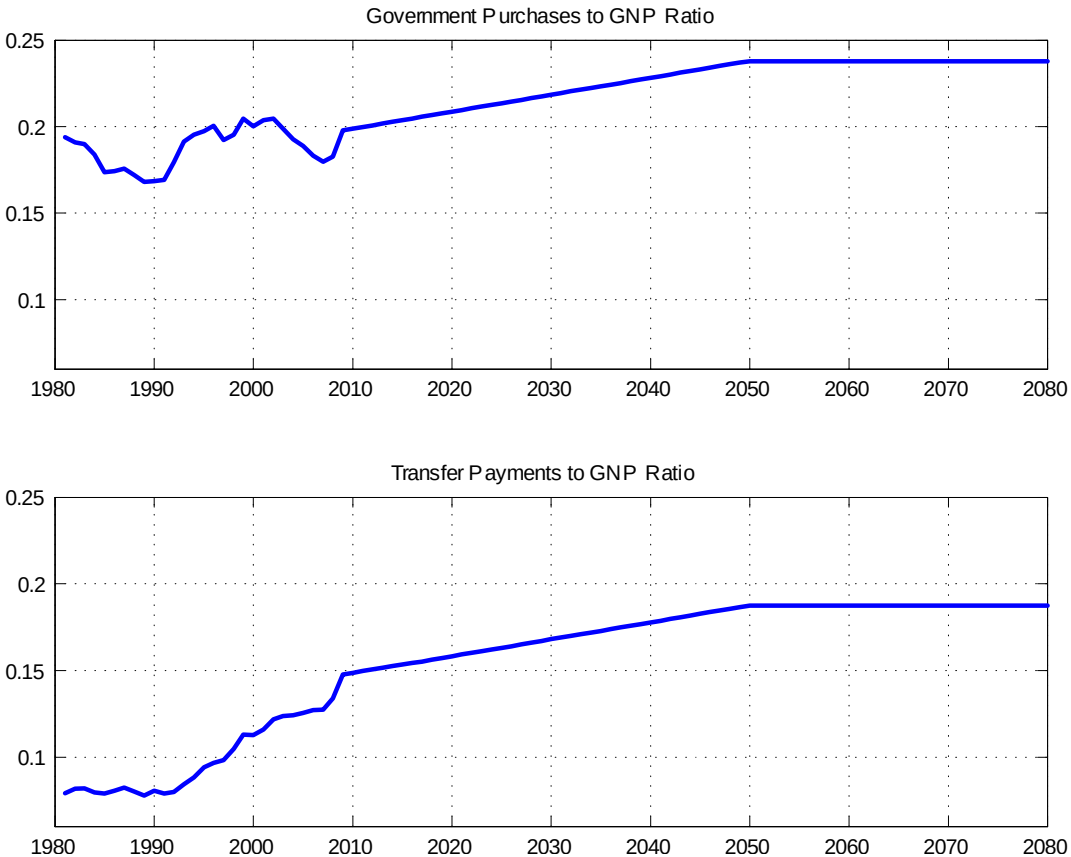


Figure 3. Government Expenditures to GNP Ratio

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

Methodology

- Economic actors know the future, including futures changes in government policy.
- Exogenous: total factor productivity, tax rates, government spending, transfer payments, and population levels.
  - Actual values for 1981-2008, forecasts (Fukawa and Sato (2009)) after.
- 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

Why These Alternative Policies

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

Government

Budget Constraint:

$$\begin{aligned} G_t + TR_t + B_t &= \eta_t q_t B_{t+1} + \tau_{c,t} C_t + \tau_{h,t} W_t h_t \\ &\quad + \tau_{k,t}(r_t - \delta)K_t + \tau_{b,t}(1 - q_{t-1})B_t. \end{aligned} \tag{1}$$

Debt Sustainability Rule:

$$D_t = \kappa \iota_t (B_t - \overline{B}_t),$$

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

Replace TR_t with $TR_t^* = TR_t - D_t$

Calibration

Tax Rates

- Tax rate on Capital Income: Updated version of Hayashi and Prescott (2002)
- 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.

Calibration

Tax Rates

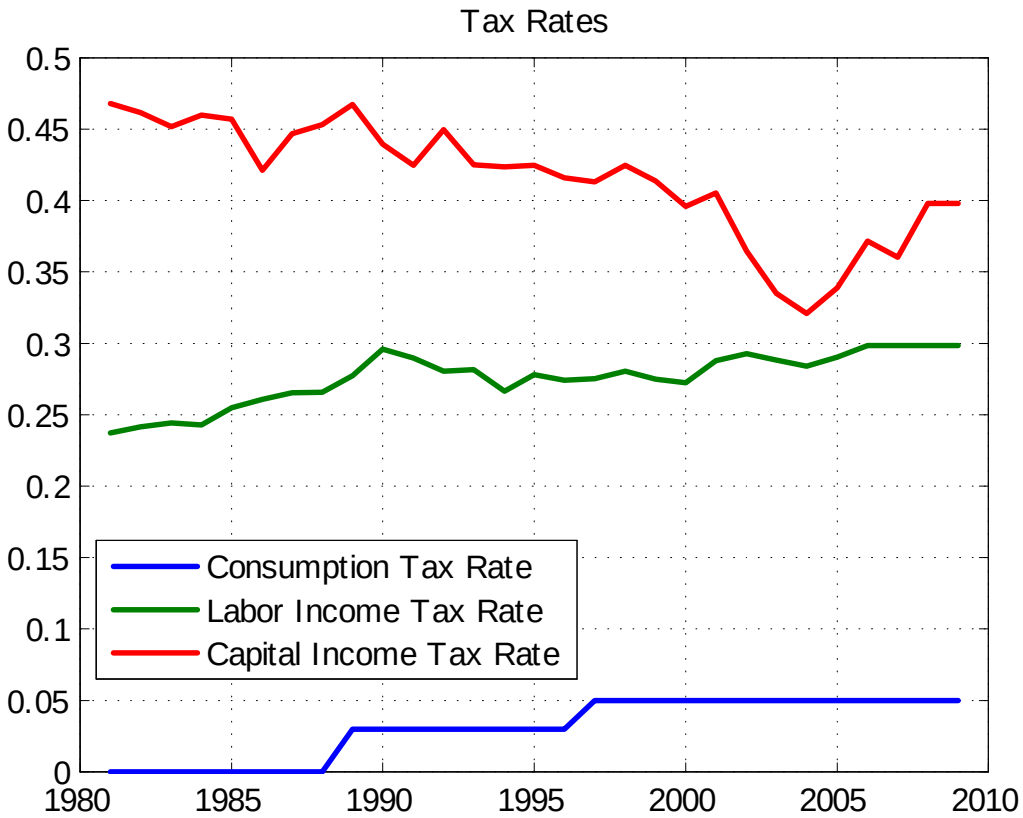


Figure 4. Tax Rates

Calibration

TFP, Population Growth Rates, Expenditure Ratios

Actual Values used for 1981-2009

Table 3. Calibration of TFP and Population Growth Rates

	$1981-2009$	$2010-2050$	$2051-\infty$
γ_t	Actual Values	$1.02^{(1-\theta)}$	$1.02^{(1-\theta)}$
η_t	Actual Values	Government Projections	1.0

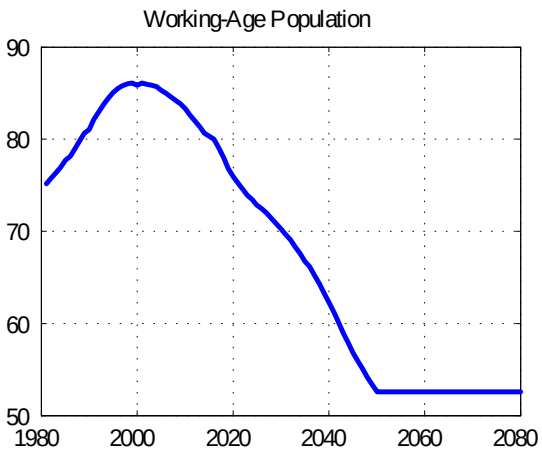
Projections by Fukawa and Sato (2009)

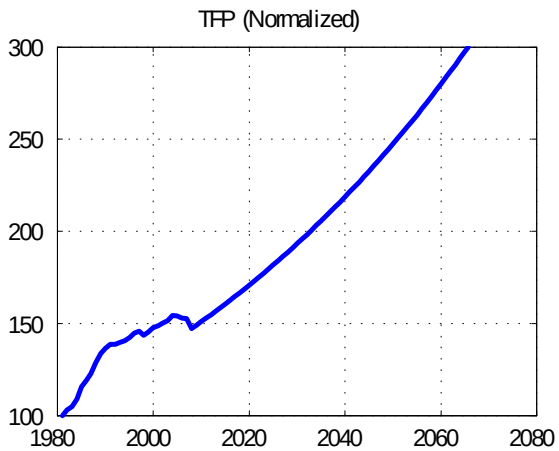
Table 4. Calibration of G/Y and TR/Y

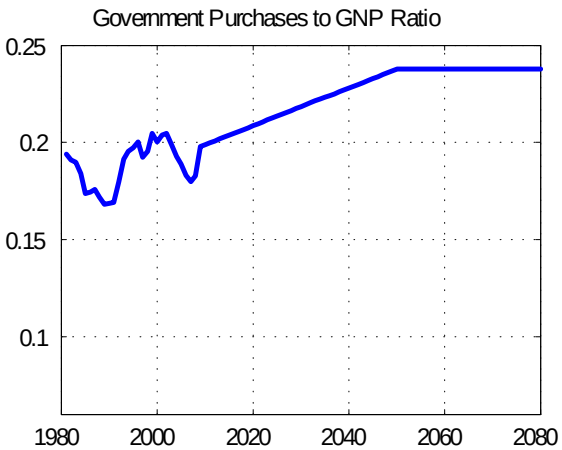
	$1981-2009$	$2010-2050$	$2051-\infty$
G/Y	Actual Values	linear increase from 0.198 to 0.238	0.238
TR/Y	Actual Values	linear increase from 0.148 to 0.188	0.188

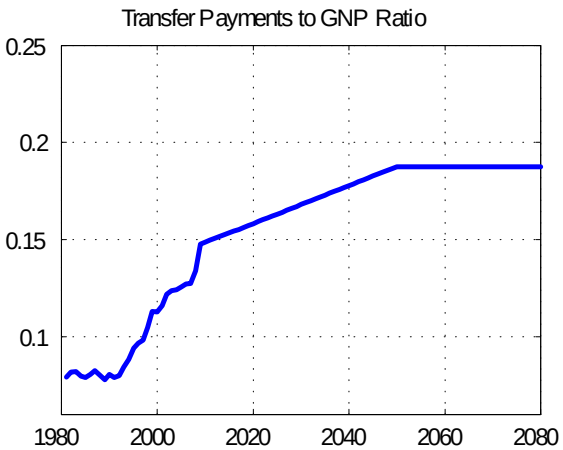
Calibration

TFP, Population Growth Rates, Expenditure Ratios









Calibration

Parameters for Fiscal Balance:

κ, $b_{\max}$, and $\overline{b}$

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

$$D_t = \kappa \iota_t (B_t - \overline{B}_t),$$

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

Calibration

Revenue Requirements:

$b_{\max} = 150\%$

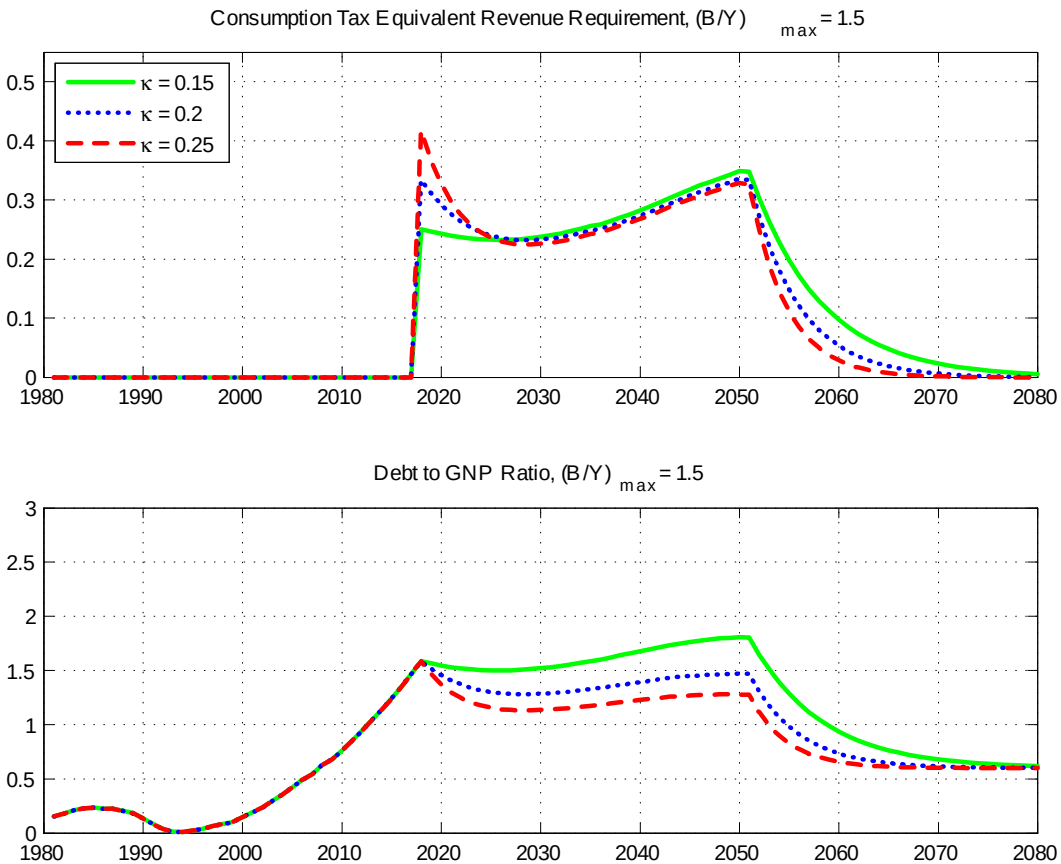


Figure 6. Revenue Requirement

Calibration

Revenue Requirements:

$b_{\max} = 200\%$

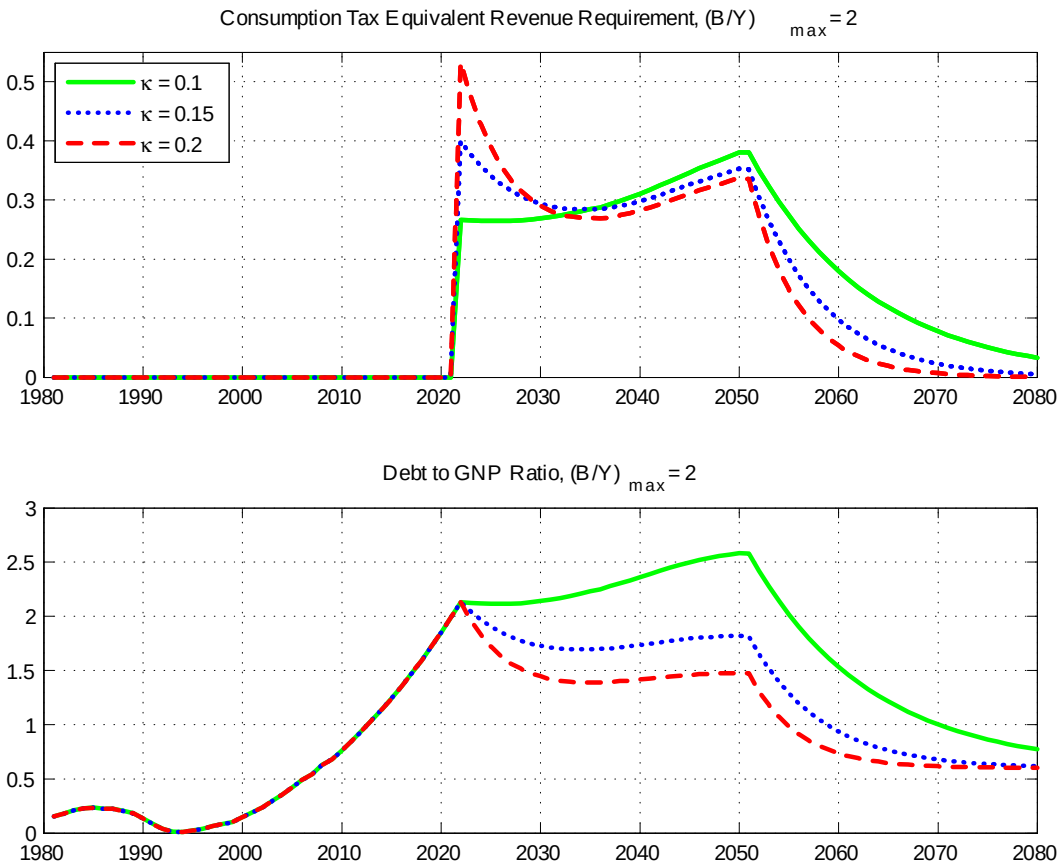


Figure 7. Revenue Requirement

Quantitative Findings

Benchmark Results

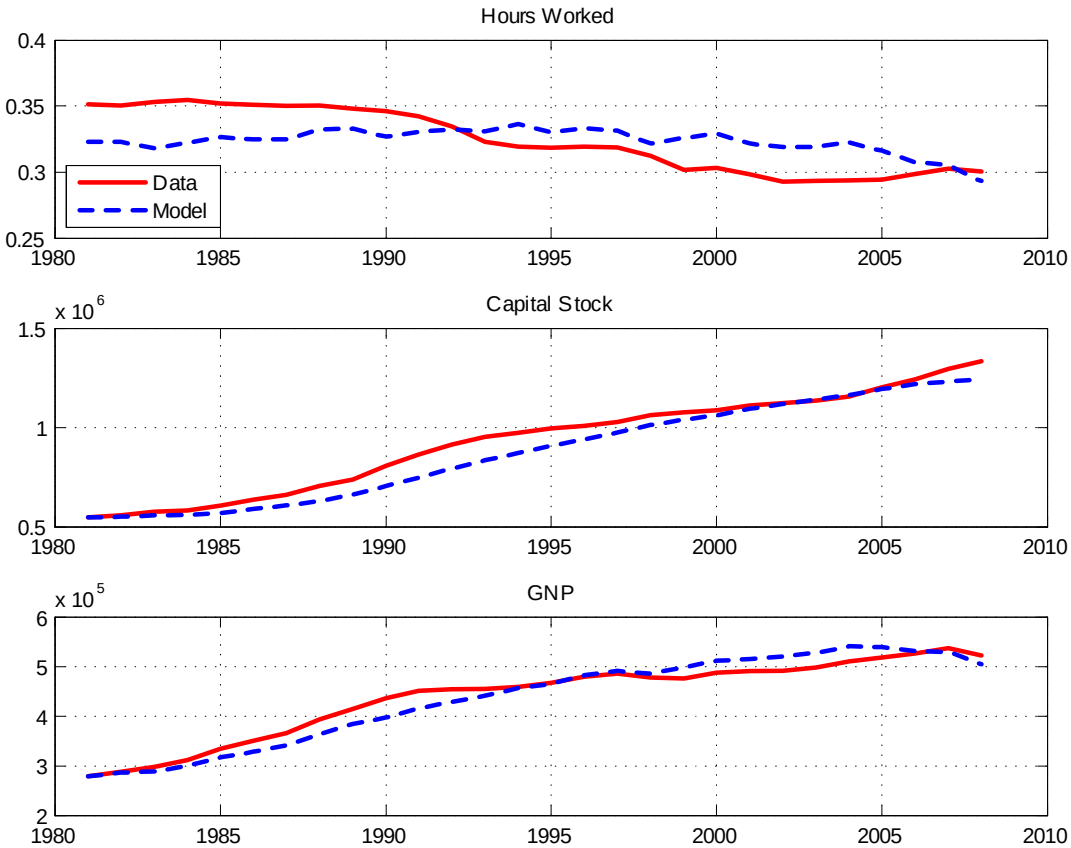


Figure 10. Capital, Labor and Output

Quantitative Findings

Benchmark Results

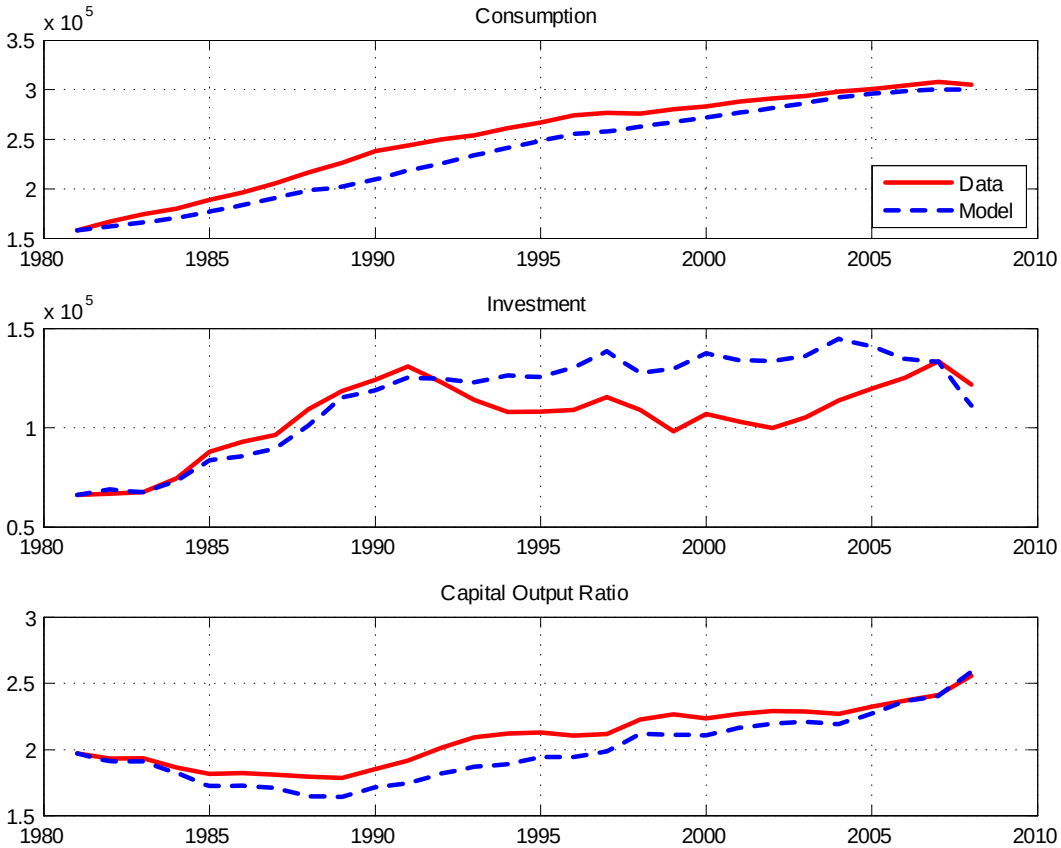


Figure 11. Consumption, Investment, and Capital-Output Ratio

Quantitative Findings

Benchmark Results

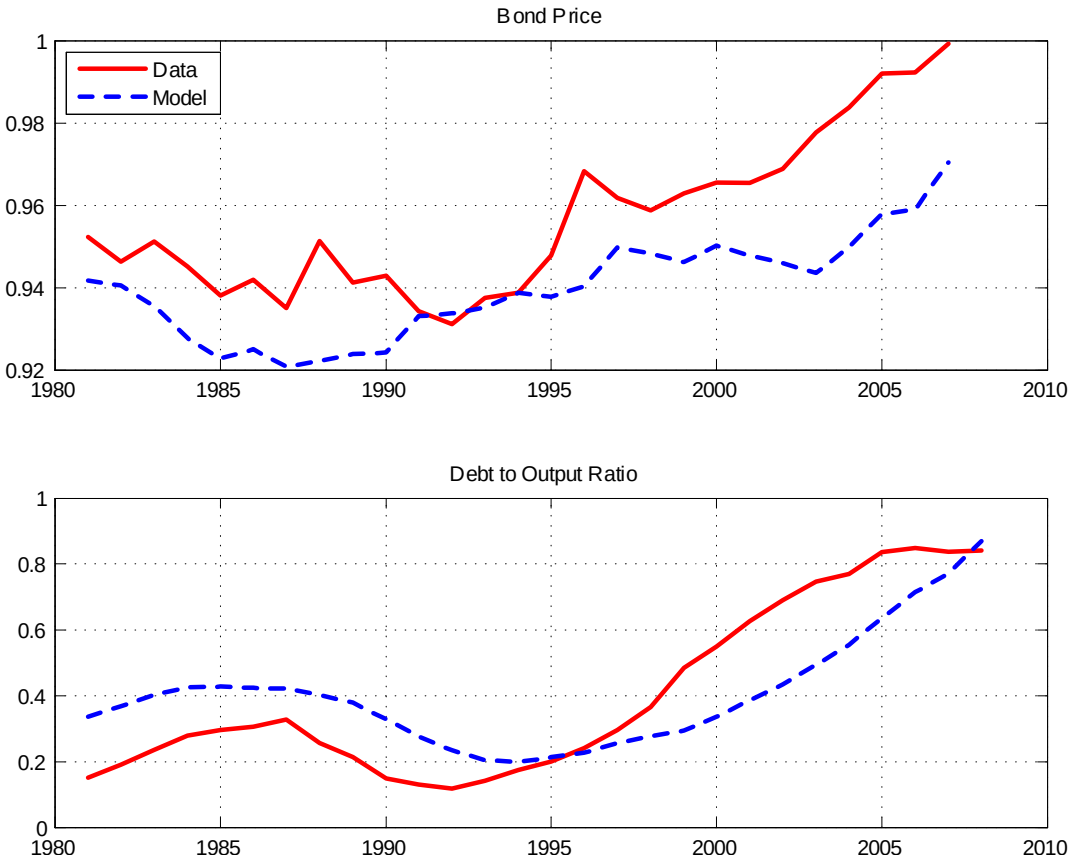


Figure 12. Bond Price and Debt to GNP Ratio

Using a Distorting Tax Instead of Lumpsum Reduction in Transfers

Transition Policy

Fiscal policy is assumed to follow

$$\tau_{x,t} = \begin{cases} \tau_{x,2009} & \text{if } B_s/Y_s \leq b_{\max} \text{ for all } s \leq t \\ \overline{\tau}_x + \pi & \text{if } B_s/Y_s > b_{\max} \text{ for some } s \leq t \text{ and } B_t/Y_t > \overline{b} \\ \overline{\tau}_x & \text{if } B_t/Y_t \leq \overline{b}. \end{cases}$$

Using a Distorting Tax Instead of a Lumpsum Tax

Consumption Tax

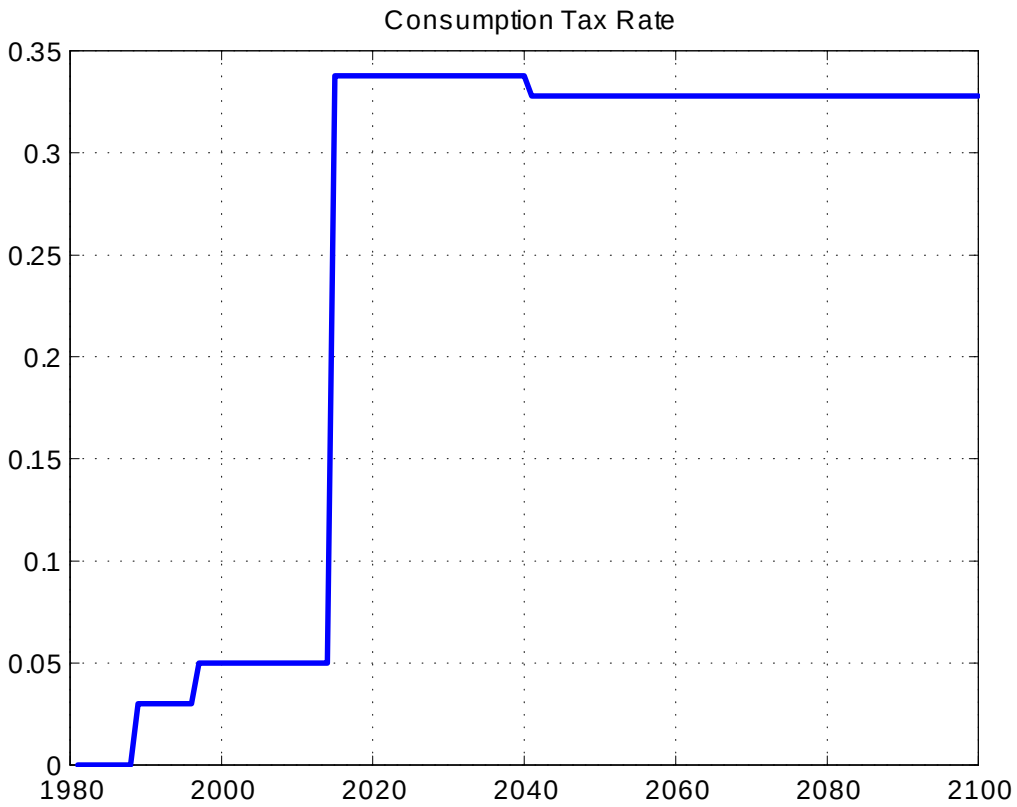


Figure 13. Consumption Tax Rate

Using a Distorting Tax Instead of a Lumpsum Tax

Labor Income Tax

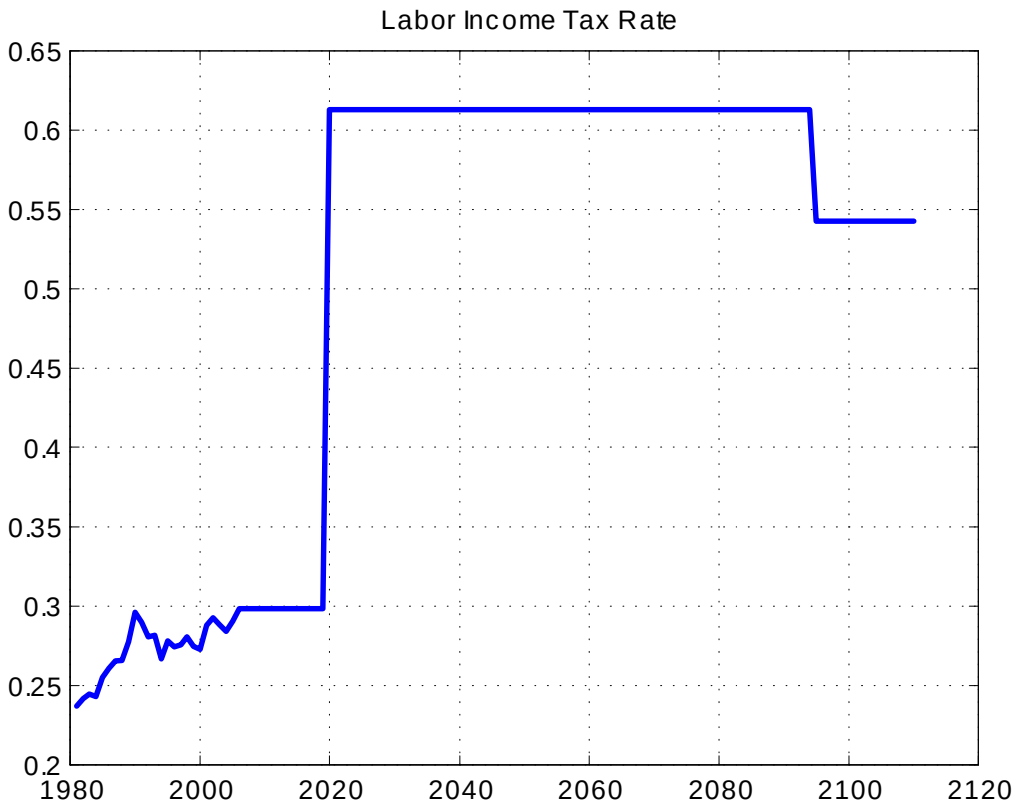


Figure 14. Labor Income Tax Rate

Transition

Comparison

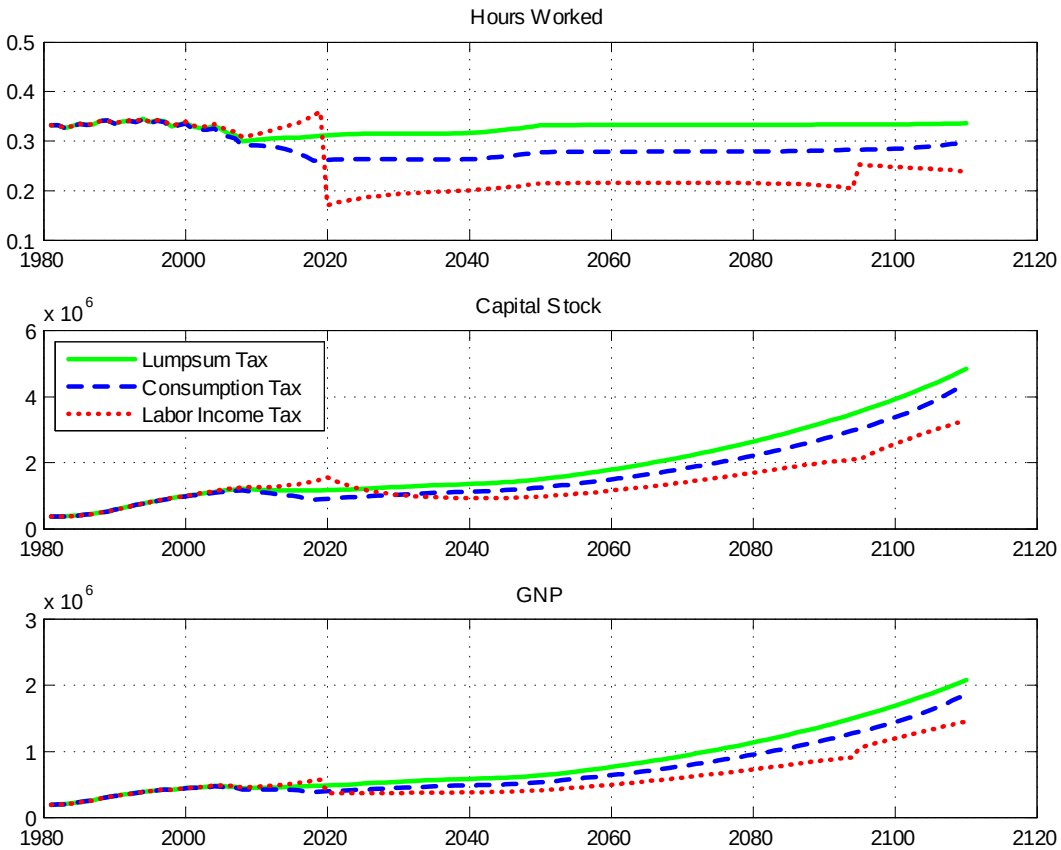


Figure 15. Labor, Capital, and Output

Transition

Comparison

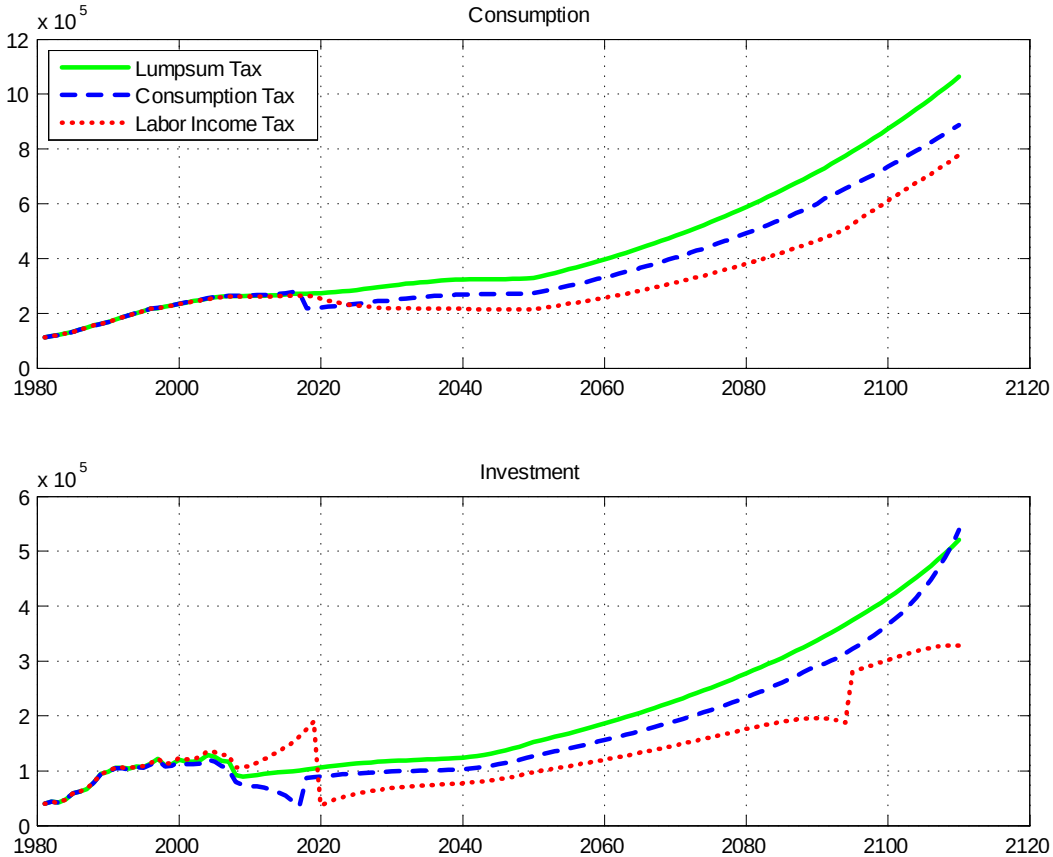
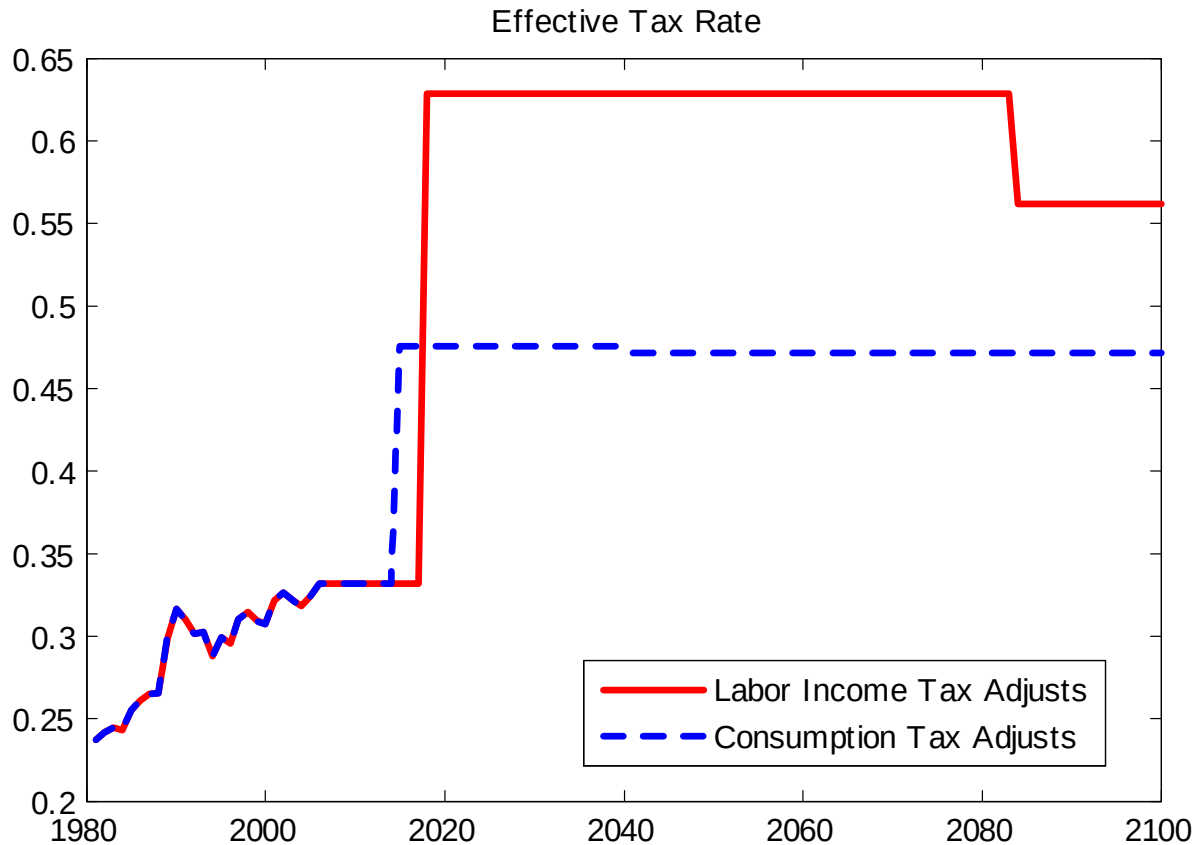


Figure 16. Consumption and Investment

Transition

Effective Tax Rates

$(1-\tau) = (1-\tau_h)/(1+\tau_c)$ which implies $\tau = (\tau_c + \tau_h)/(1+\tau_h)$



Transition

Debt to GNP

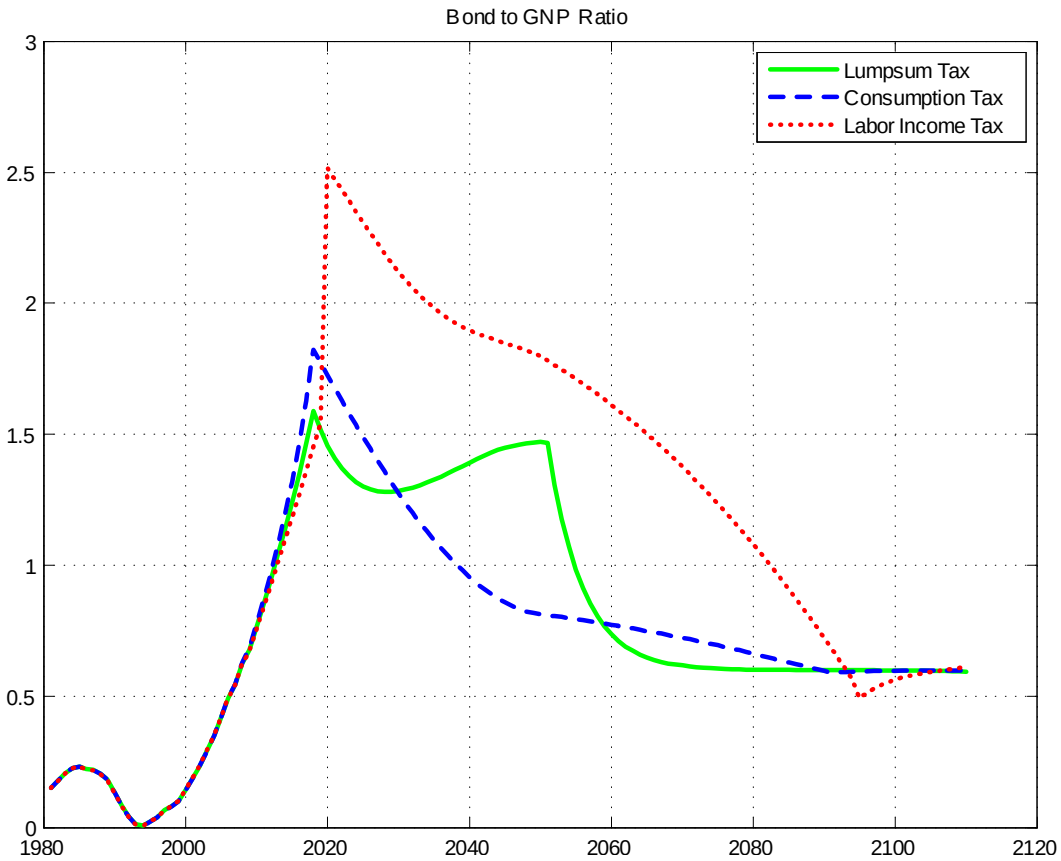


Figure 17. Debt to GNP Ratios

Transition

Output Effects

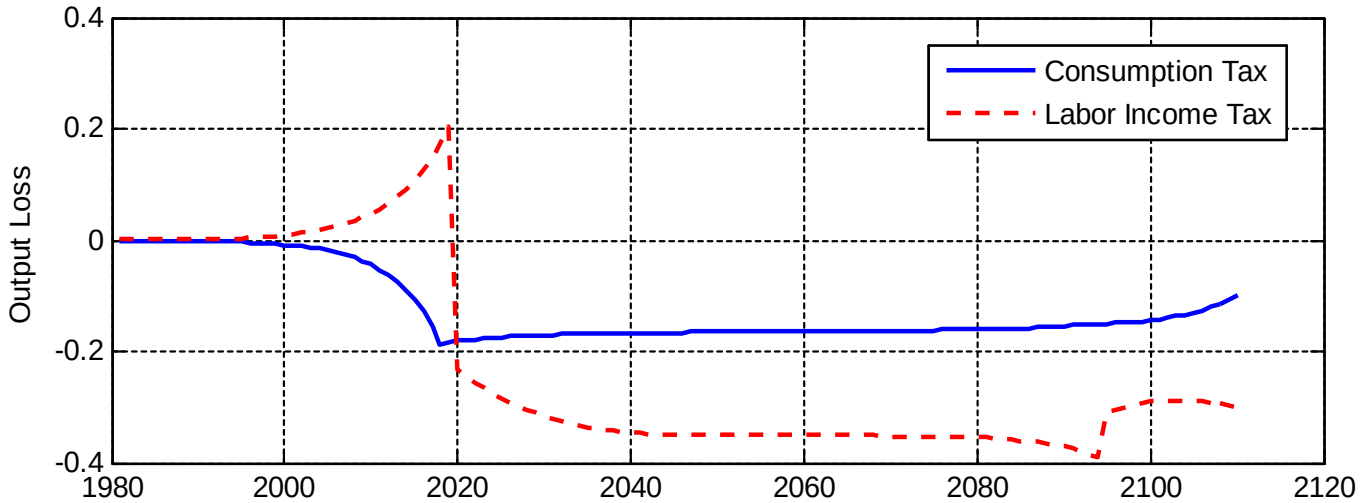


Figure 18. Output Effects

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?

$$\begin{aligned} \lambda_c &= 1.41\% \\ \lambda_h &= 3.22\% \end{aligned}$$

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.

Conclusions

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