The Effects of a Lower Capital Income Tax Rate on the Japanese Economy (Very Preliminary and Incomplete)

Selo İmrohoroğlu (USC) and Nao Sudo (BoJ)

December 26, 2014 Canon Institute for Global Studies

USC Marshall
School of Business

CIGS The Canon Institute for Global Studies

Capital Income Tax and the Japanese Economy

Less is More?

- In April 2014:
  - the Japanese government announced plans to reduce the corporate income tax rate from 35% to 25%
  - a medium term goal of achieving a primary surplus in 2020
- In this paper, we study the impact of a lower capital income tax rate on the Japanese economy
- We also calculate the size of fiscal adjustment needed to deliver a primary surplus in 2020

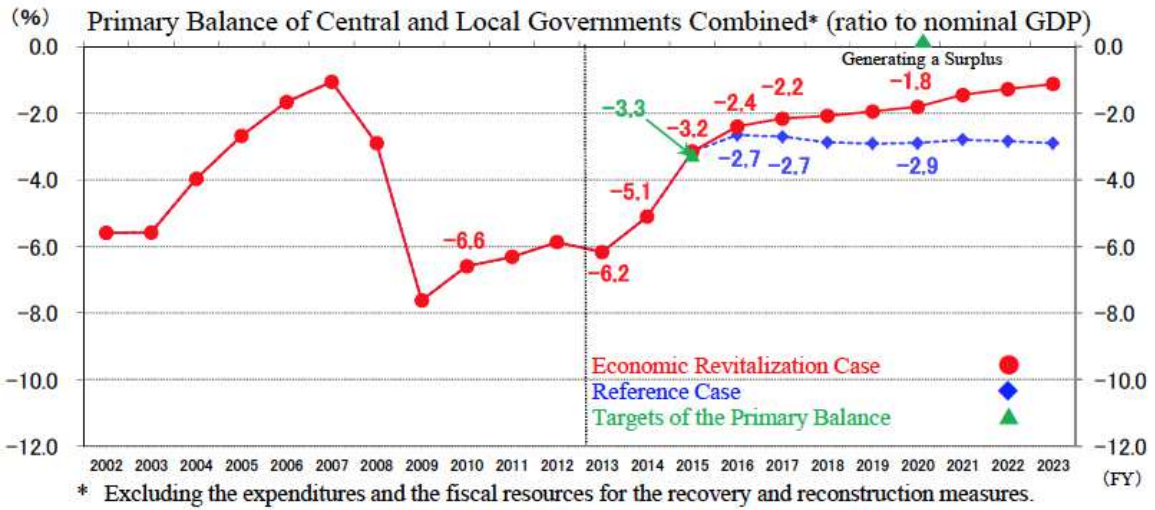
Capital Income Tax and the Japanese Economy

Where Are We Now?

- Net debt to GDP ratio at about 150% in 2013
- Dependency ratio projected to rise from 40% in 2013 to 92% in 2092
- We study the long run impact of the proposed policies but focus on the short run from 2014 to 2020

Macroeconomic Outlook in Japan: ESRI Estimates

Deficits: Reference vs Revitalization



Fundamental Problem 1: Aging Population

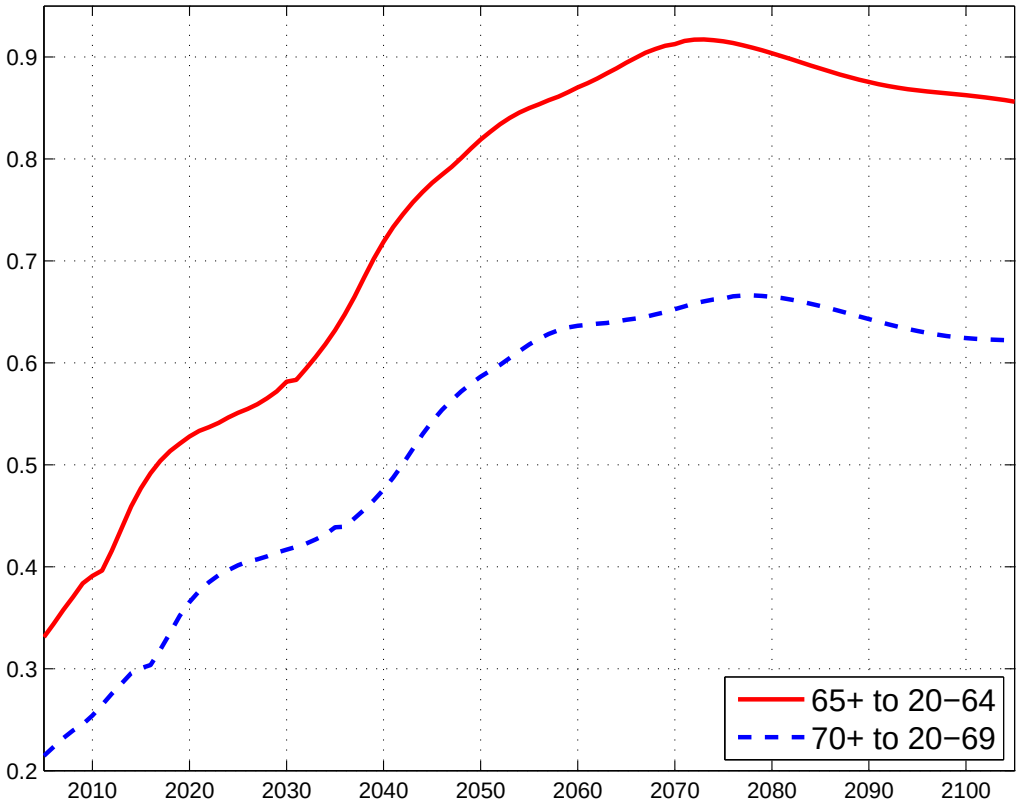


Figure : Dependency Ratios

Fundamental Problem 2: High Debt

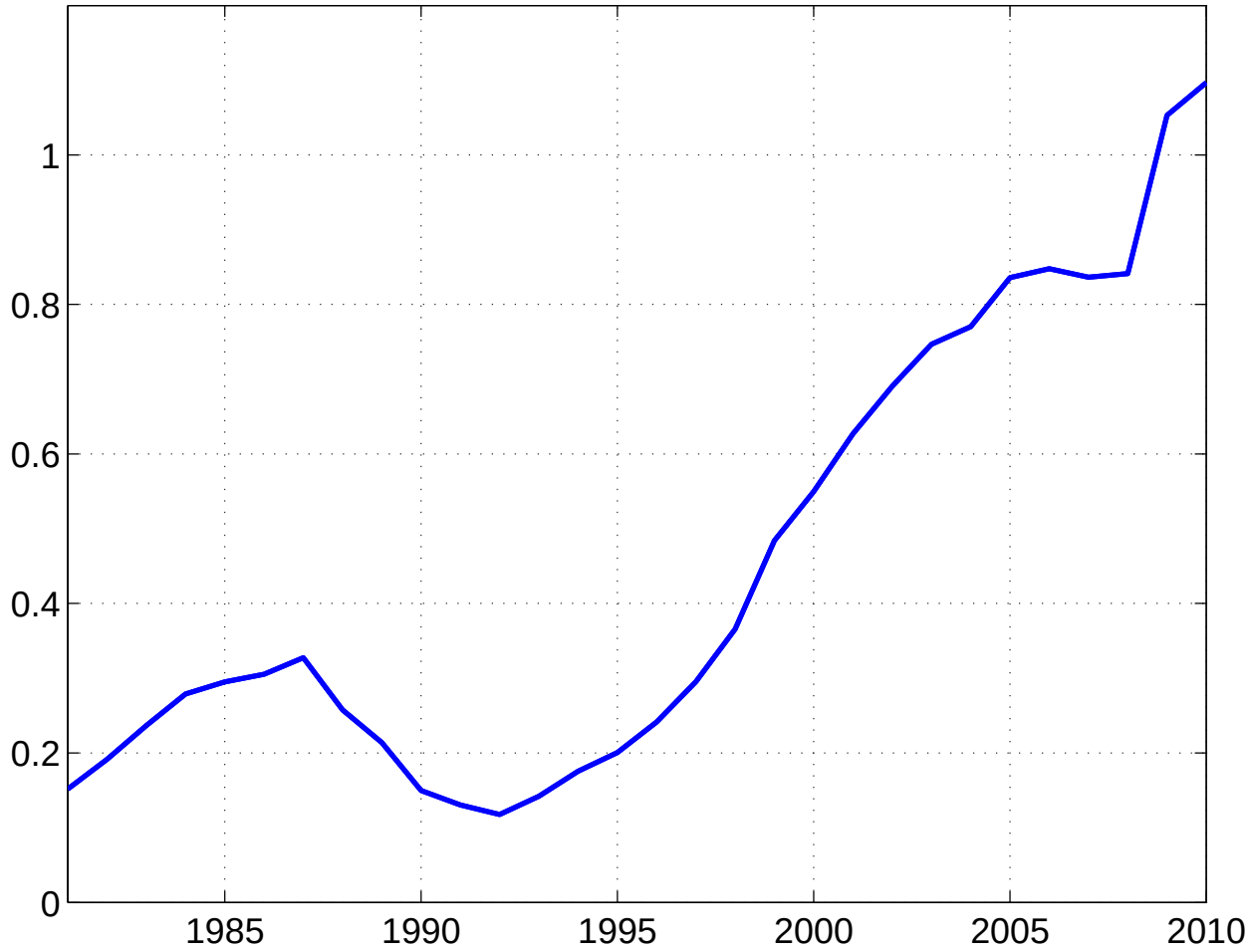


Figure : Net Debt to GNP Ratio

Implications of Aging Population

Fukawa and Sato (2009)

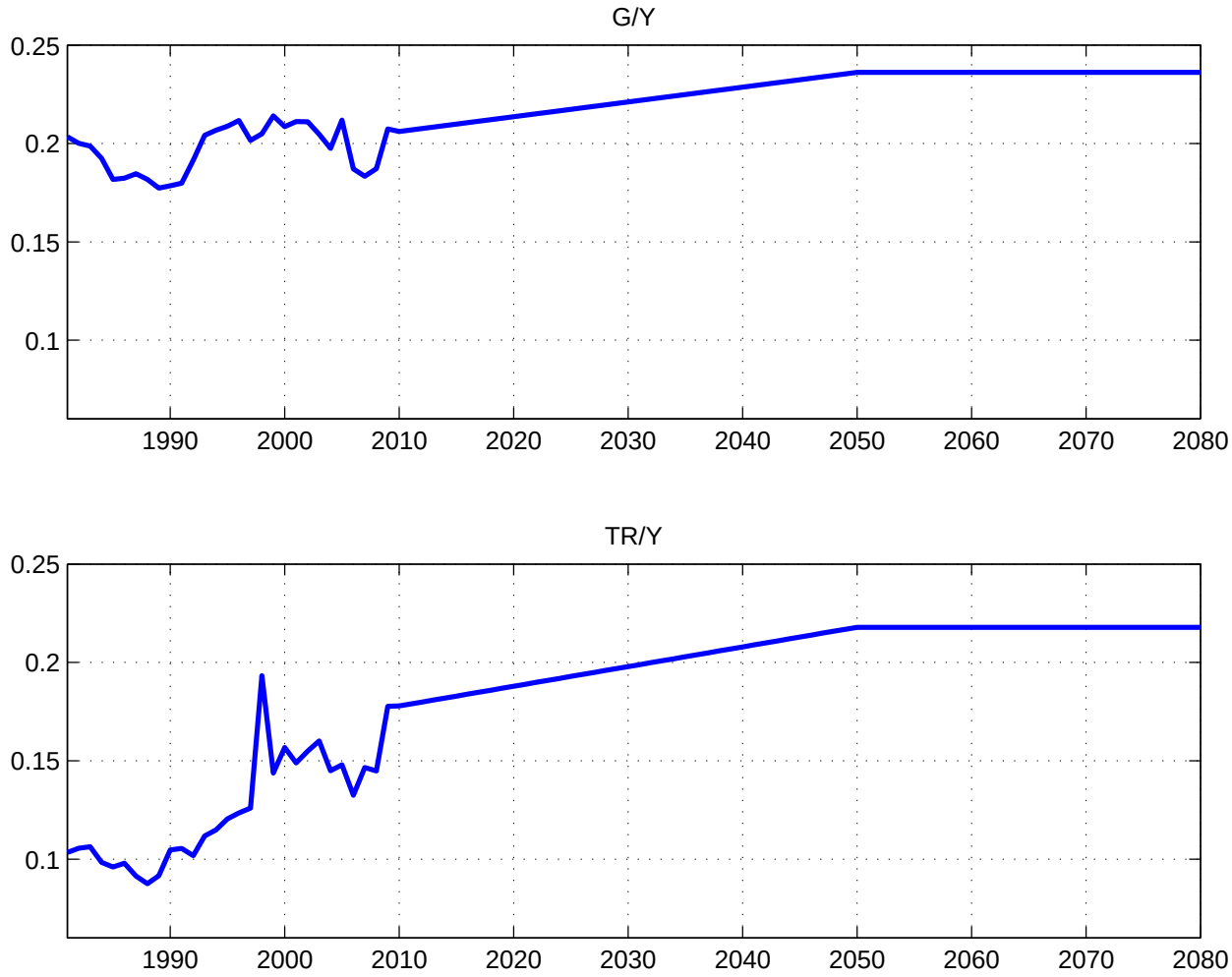


Figure : Government Expenditures to GNP Ratio

What We Do

- Formulate and calibrate a neoclassical growth model of Japan.
- What is the effect on the Japanese economy from a reduction in the capital income tax rate?
- What is the implications of this tax reform on the fiscal imbalance?
- How much revenue must be raised to achieve a primary surplus in 2020?
- How much spending must be cut to achieve a primary surplus in 2020?

What We Do

- Hayashi and Prescott (2002), Chen, İmrohoroğlu and İmrohoroğlu (2006), Hansen and İmrohoroğlu (2013)
- Standard growth model.
- Characterize how model performs from 1981-2013.
  - Take as exogenous TFP, tax rates, government consumption, transfers and population.
  - Use observed values 1981-2013.
- Use model to forecast from 2014 and beyond; perfect foresight and also 'MIT' simulations.
  - Government projections for population to 2050.
  - Forecasts of Fukawa and Sato (2009) of G/Y and TR/Y to 2050. [Consistent with independent projections of İmrohoroğlu, Kitao, and Yamada (2013)]

Features of Model

- Endogenous labor choice $\Rightarrow$ consumption and labor income taxes are distorting.
- Primary balance is endogenous and produces a path for debt.
- Produce deterministic and stochastic simulations.

Related Literature

- İmrohoroğlu and Sudo, "Productivity and Fiscal Policy in Japan: Short Term Forecasts from the Standard Growth Model"
  - Experiment with policies to eliminate budget deficit in near future by increasing consumption tax. 15% not enough.
- İmrohoroğlu and Sudo, "Will a Growth Miracle Reduce Debt in Japan"
  - Assess possibility that high TFP growth could eliminate government debt. China-like growth for a decade not enough.

Model: Household's Problem

$$\max \sum_{t=0}^{\infty} \beta^t N_t \left[\log C_t - \alpha \frac{h_t^{1+1/\psi}}{1+1/\psi} \right]$$

subject to

$$\begin{aligned}(1+\tau_{c,t})C_t + \eta_t K_{t+1} &= (1-\tau_{h,t})W_t h_t \\ &\quad + \left[(1+(1-\tau_{k,t})(r_t-\delta)\right] K_t + I_t \\ &\quad + TR_t - \tau_t + \pi p, t\end{aligned}$$

Model: Firm's Problem

$$
\begin{aligned}
N_t Y_t &= A_t (N_t K_t)^{\theta} (N_t h_t)^{1-\theta} \\
N_{t+1} K_{t+1} &= (1-\delta) N_t K_t + N_t X_t \\
A_{t+1} &= \gamma_t A_t
\end{aligned}
$$

Model: Government Budget

$$
\begin{aligned}
G_t + TR_t + I_t &= \tau_{c,t} C_t + \tau_{h,t} W_t h_t + \tau_{k,t}(r_t - \delta) K_t + \tau_t - \pi_{b,t} \\
G_t + TR_t &= \tau_{c,t} C_t + \tau_{h,t} W_t h_t + \tau_{k,t}(r_t - \delta) K_t + \tau_t - \pi_{p,t} \\
I_t &= (1 - \tau_{b,t}) r_{b,t} B_t \\
B_t &= B_{1980} + \sum_{s=1981}^{t} \pi_{b,s}
\end{aligned}
$$

Stationary Equilibrium Conditions

Given a per capita variable Z_t we obtain its detrended counterpart

$$z_t = \frac{Z_t}{A_t^{1/(1-\theta)}}.$$

- First order conditions and market clearing conditions combine to give equations to solve for $\{c_t, x_t, h_t, y_t, k_{t+1}, w_t, r_t\}$ for each period t.
- Computation Objective: Find value for k_1 such that sequence converges to steady state.

Population and Labor Input

- N_t = working age population between the ages of 20 and 69
- Use actual values for 1981-2013
- Use official projections for 2014-2050
- Population constant after 2050
- h_t is employment per working age population multiplied by average weekly hours worked divided by 98 (discretionary hours available per week).

National Accounts: Hayashi and Prescott (2002)

Table : Adjustments to National Account Measurements

$C =$	Private Consumption Expenditures
$I =$	Private Gross Investment
	$+$ Change in Inventories
	$+$ Net Exports
	$+$ Net Factor Payments from Abroad
$G =$	Government Final Consumption Expenditures
	$+$ General Government Gross Capital Formation
	$+$ Government Net Land Purchases
	$-$ Book Value Depreciation of Government Capital
$Y =$	$C + I + G$

Government Accounts

- Public health expenditures in Japan are included in G_t.
- TR_t, includes social benefits (other than those in kind, which are in G_t,) that are mostly public pensions, plus other current net transfers minus net indirect taxes.
- 5% of output is added to TR_t since modeling of flat tax rates ignores deductions and exemptions.

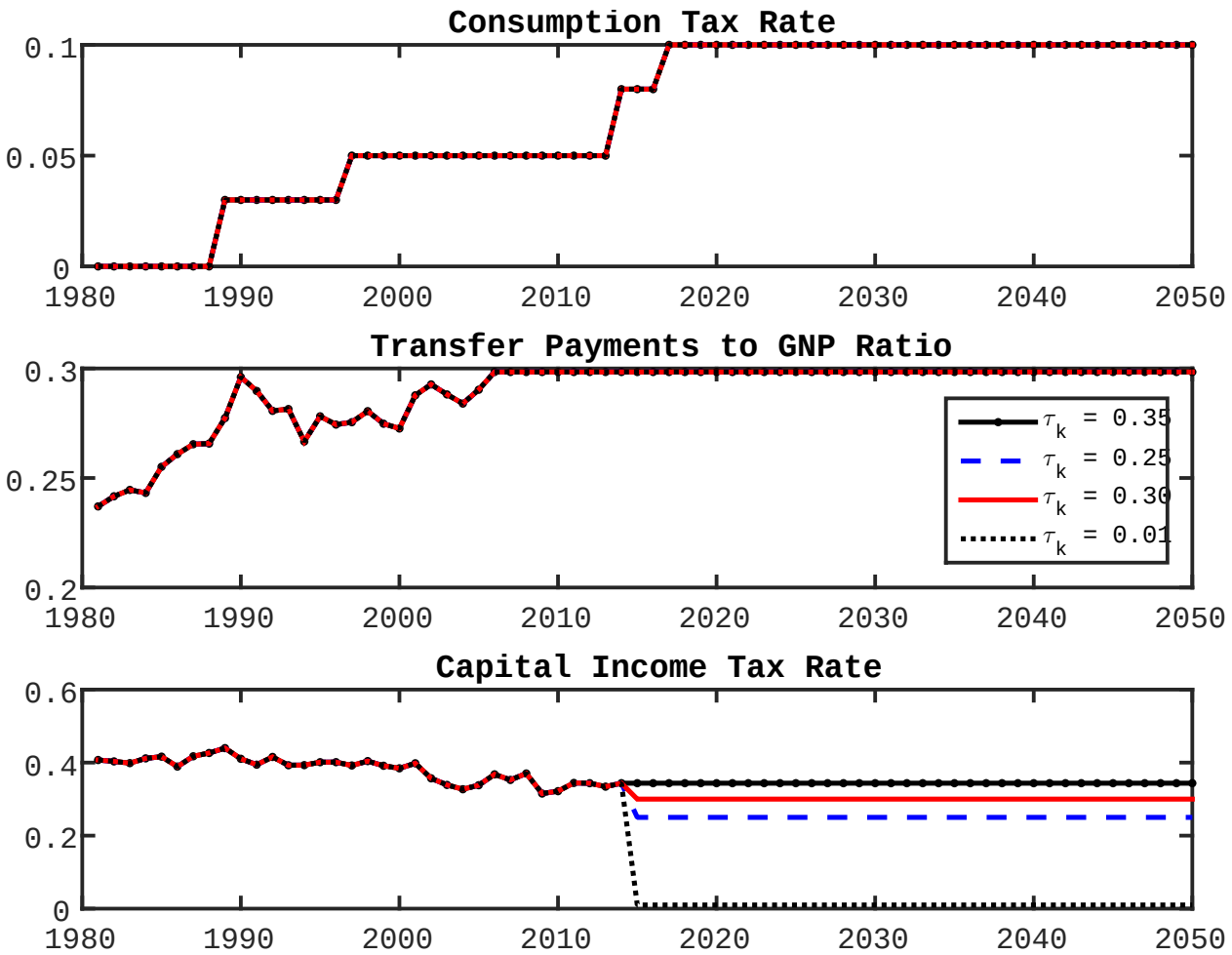
Tax Rates

- $\tau_{h,t}$, are average marginal labor income tax rates estimated by Gunji and Miyazaki (2011).
  - Last value is 0.324 for 2007 and we assume that this remains constant thereafter.
- $\tau_{k,t}$, is constructed following methodology in Hayashi and Prescott (2002).
  - Last value is 0.3557 for 2010 and we assume that this remains constant thereafter.

Tax Rates, continued

- Tax Rate on Consumption, $\tau_{c,t}$
  - 0% 1981-1988
  - 3% 1989-1996
  - 5% 1997-2013
  - 8% 2014
  - 10% 2015 and beyond.

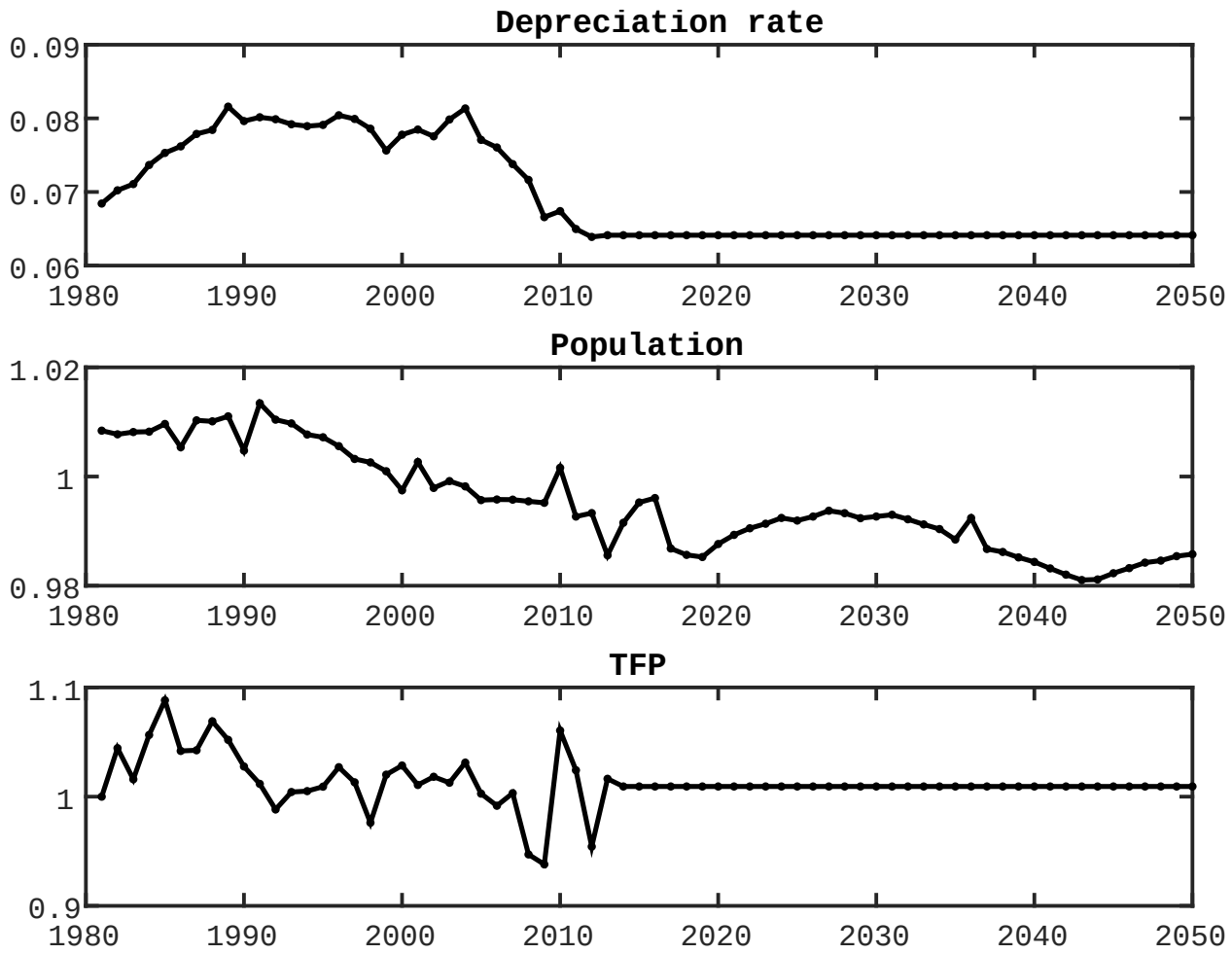
Tax Rates, continued



Technology Parameters

- $A_t = Y_t/(K_t^{\theta} h_t^{1-\theta})$.
- $\theta = 0.378$, which is the average value from 1981-2013.
- $\gamma_t = A_{t+1}/A_t$, comes from the actual data between 1981 and 2013.
- $\gamma_t = 1.015^{1-\theta}$ for 2014 and beyond.
- $\delta = 0.0842$, which is the average value from 1981-2013.

Technology and Population Parameters



Preference Parameters

- Three preference parameters, β, α, ψ.
- $\psi = 0.5$, the Frisch elasticity of labor supply estimated by Chetty et al (2012).

Preference Parameters, continued

For β and α, use equilibrium conditions to obtain a value for each year, and then average over the sample:

$$\beta_t = \frac{(1+\tau_{c,t+1})\gamma_t^{1/(1-\theta)} c_{t+1}}{(1+\tau_{c,t})c_t \left[1+(1-\tau_{k,t+1})\left(\theta \frac{y_{t+1}}{k_{t+1}} - \delta\right)\right]}$$

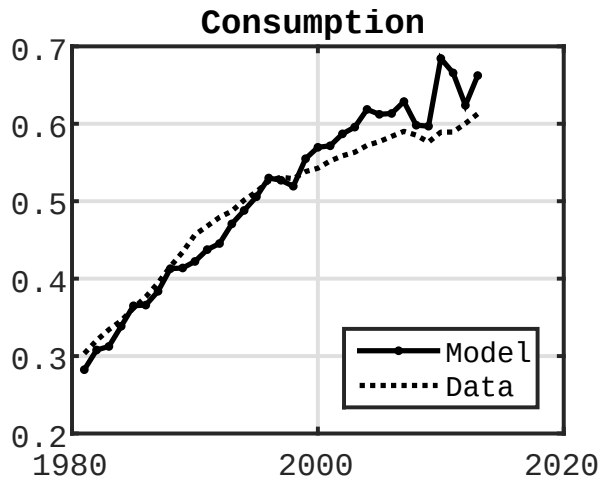
$$\alpha_t = \frac{h_t^{-1/\psi}(1-\tau_{h,t})(1-\theta)y_t}{(1+\tau_{c,t})c_t h_t}$$

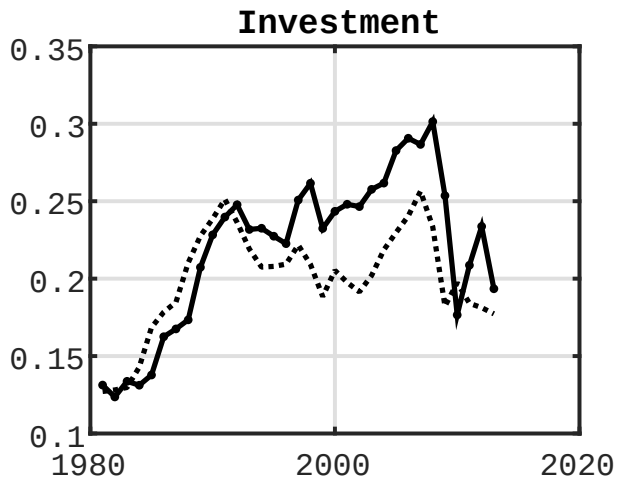
Calibration of Structural Parameters

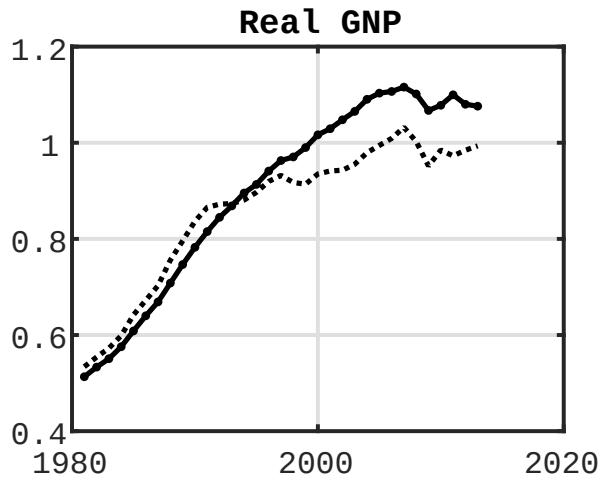
Parameter	Value	
θ	0.3783	Data Average
δ	0.0842	Data Average
β	0.9677	FOC, 1981-2013
α	22.6331	FOC, 1981-2013
ψ	0.5	Chetty et al (2012)

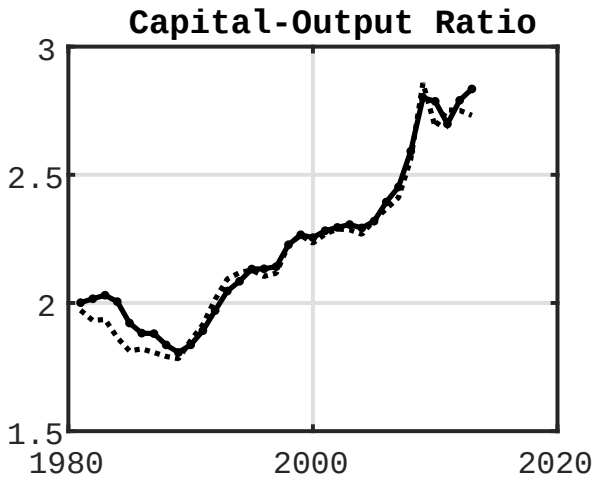
Model versus Data

Consumption, Investment, Output, and Capital Output Ratio



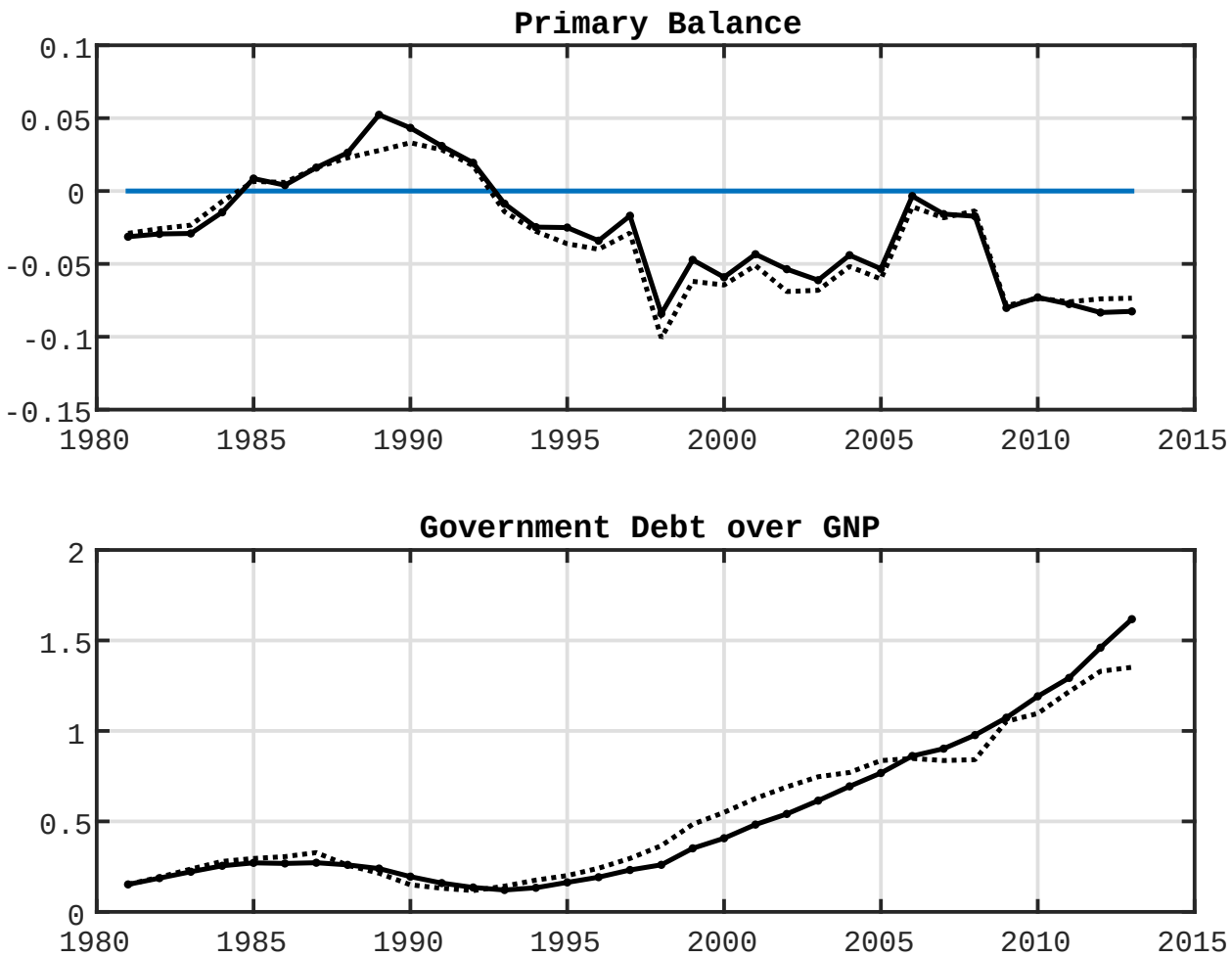






Model versus Data

Primary Balance to GNP and Debt to GNP Ratios



Long Run Comparison

Reducing the Capital Income Tax Rate

- Lower τ_k from 35%
  - to 25% starting in 2015, 2 percentage points each year
  - to 0 starting in 2015

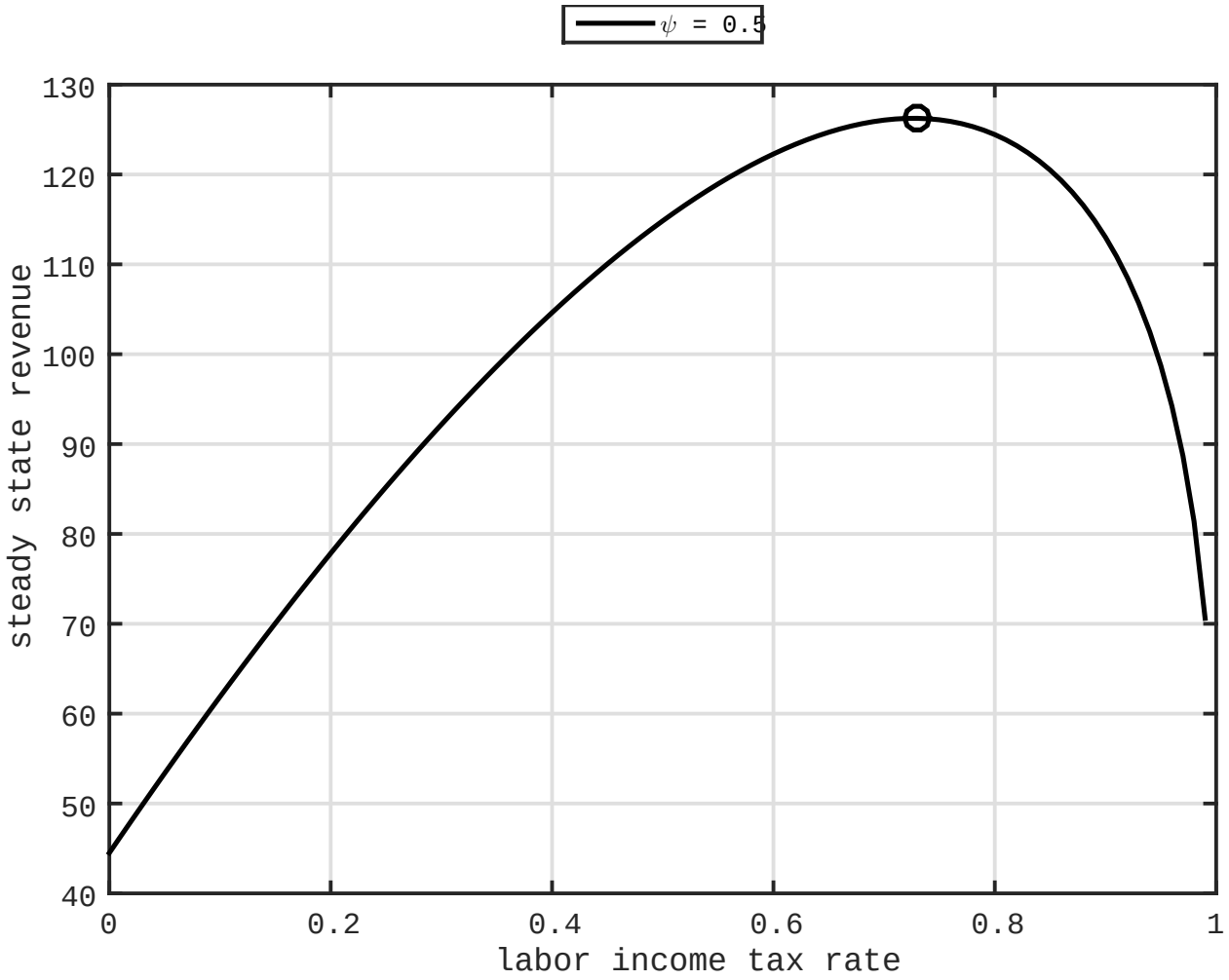
Long Run Comparison

Reducing the Capital Income Tax Rate

	$\tau_k = 0.35$	$\tau_k = 0.30$	$\tau_k = 0.25$	$\tau_k = 0$
Capital Stock K	100	106.2	112.1	137.6
Labor Supply H	100	100.5	100.9	103.0
Output Y	100	102.6	105.0	114.9
Consumption C	100	101.1	102.1	105.3
Wage Rate W	100	102.1	104.0	111.6

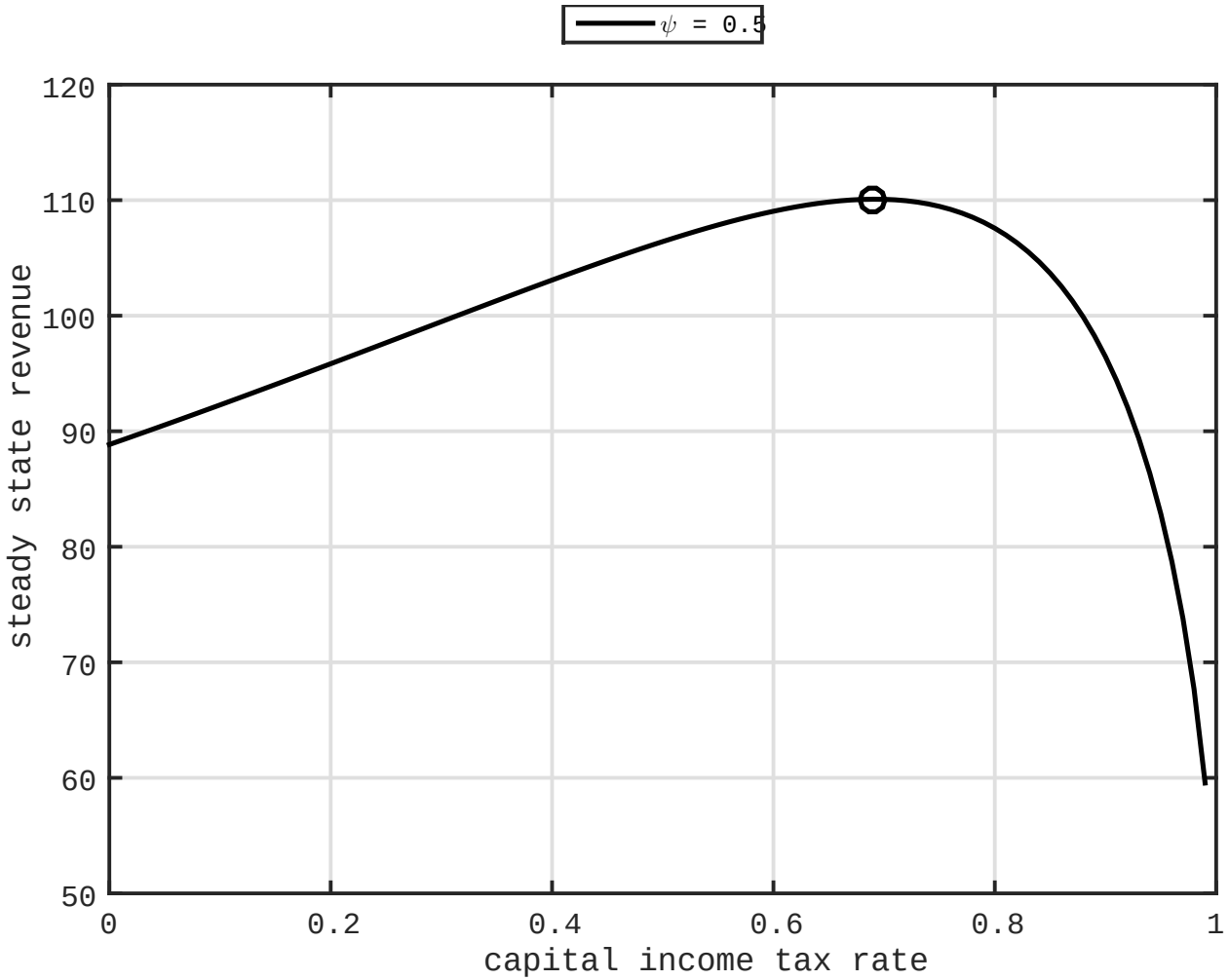
Long Run Comparison

Laffer Curve: Labor Income Tax



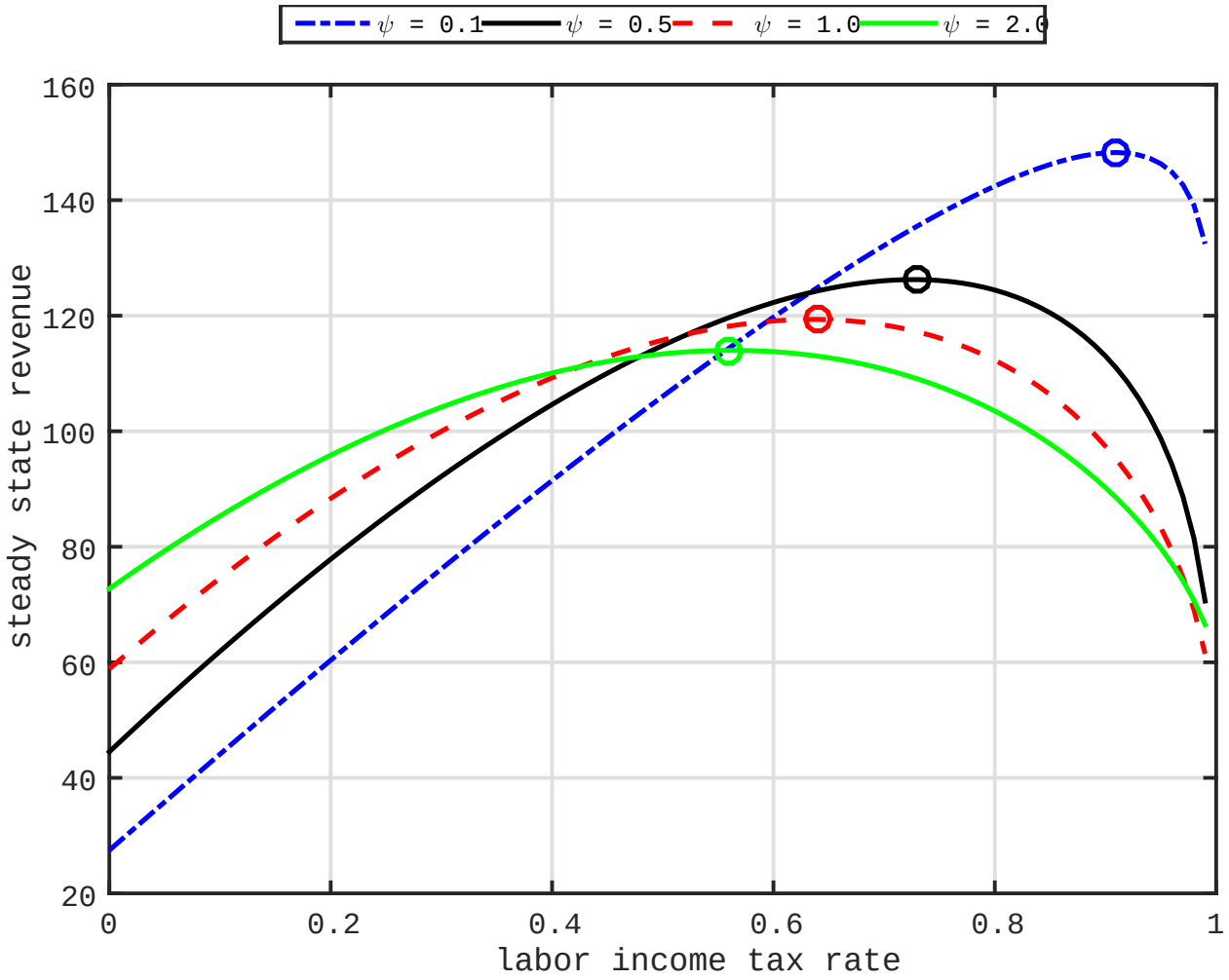
Long Run Comparison

Laffer Curve: Capital Income Tax



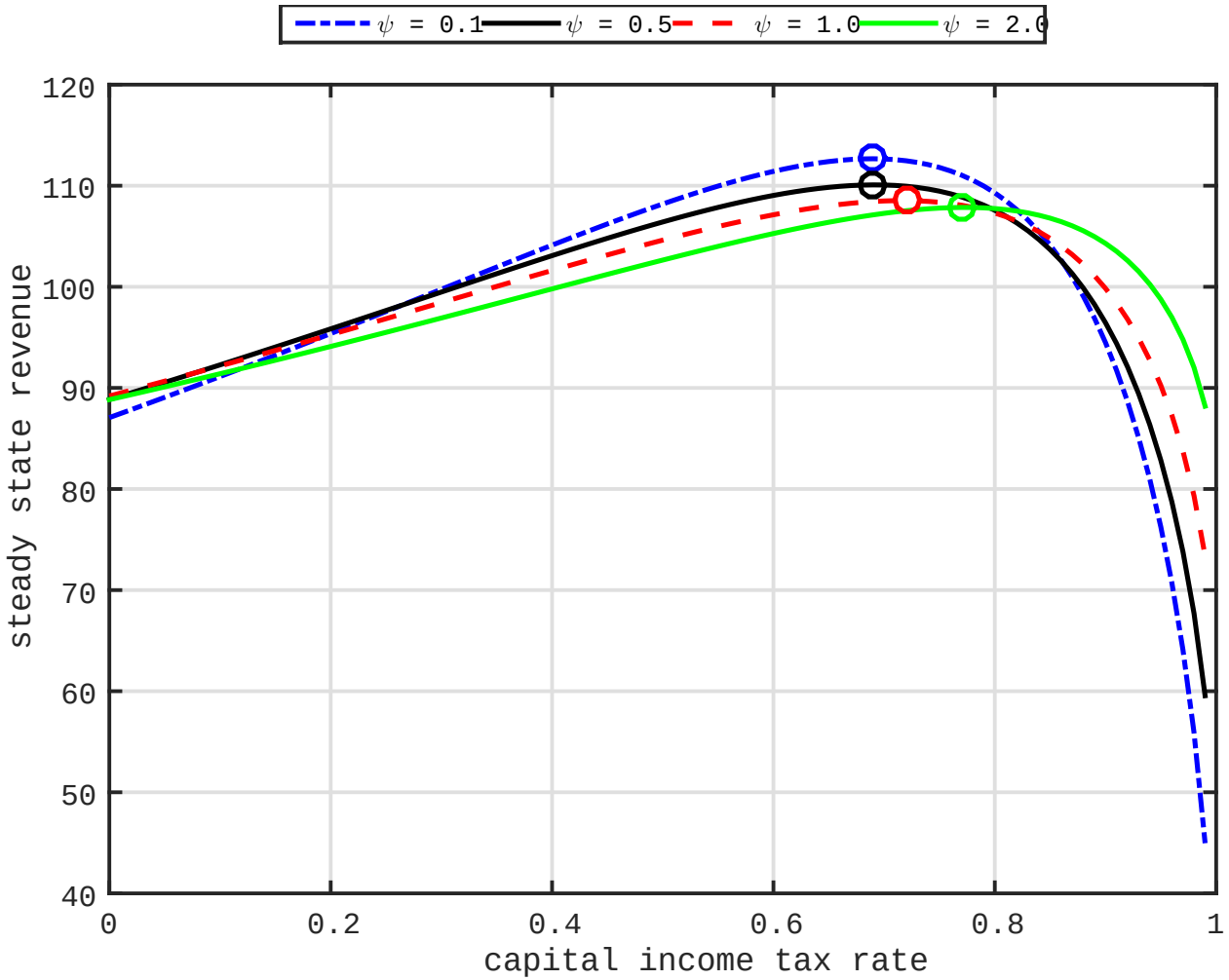
Sensitivity to Frisch Elasticity of Labor Supply

Laffer Curve: Labor Income Tax



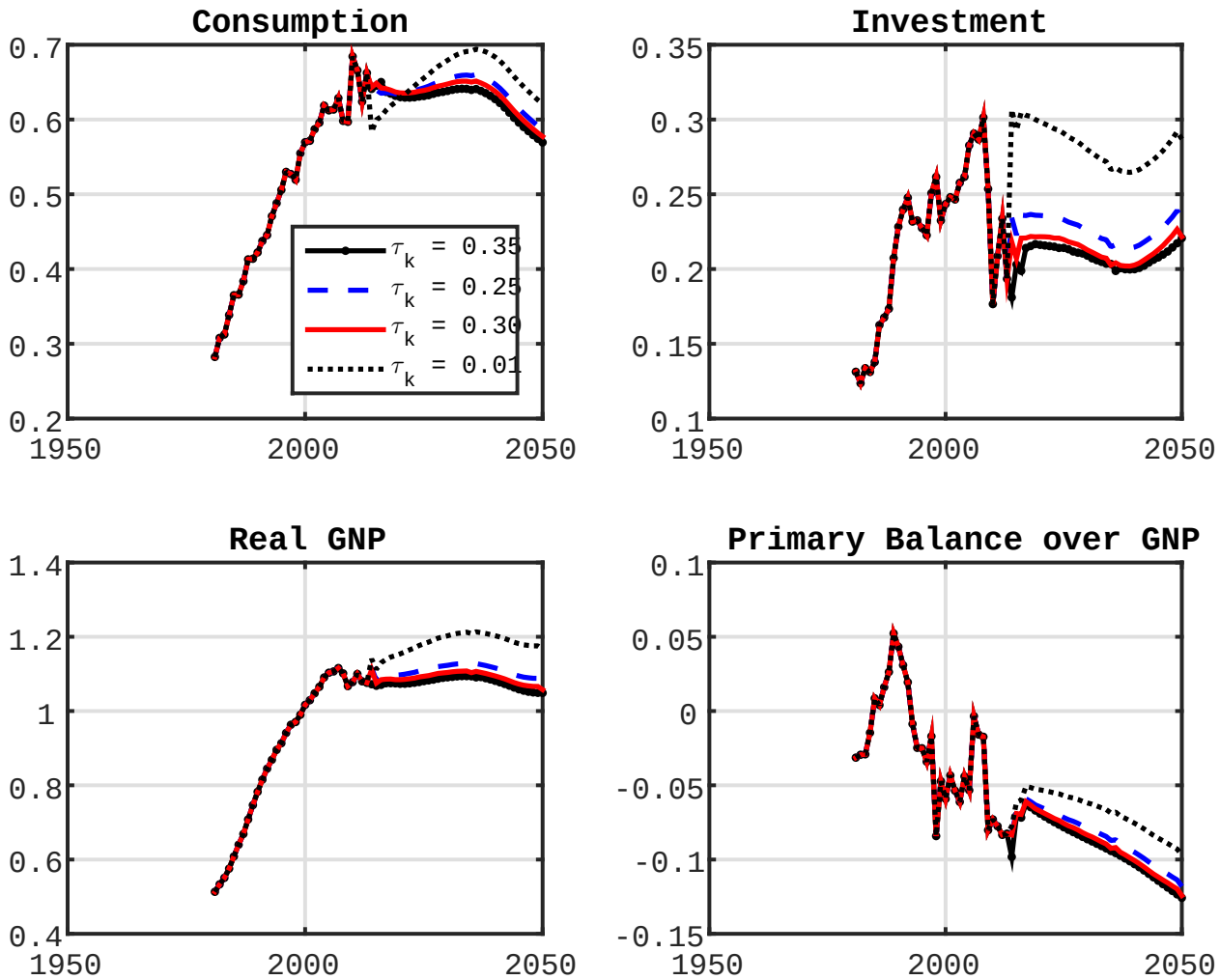
Sensitivity to Frisch Elasticity of Labor Supply

Laffer Curve: Capital Income Tax



Projections of Key Indicators

Consumption, Investment, Output, and Primary Balance to Output Ratio



Short Run Analysis: Effect on K

Reducing the Capital Income Tax Rate: The Next Ten Years

	$\tau_k = 0.30$	$\tau_k = 0.25$	$\tau_k = 0.01$
2013	100.0	100.0	100.0
2014	102.3	102.9	105.3
2015	103.6	104.7	109.3
2016	104.3	105.8	112.4
2017	104.6	106.4	114.8
2018	104.4	106.6	116.5
2019	104.3	106.9	118.1
2020	104.3	107.1	119.6
2021	104.3	107.4	121.0
2022	104.2	107.5	122.2
2023	104.4	107.9	123.4

Short Run Analysis: Effect on H

Reducing the Capital Income Tax Rate: The Next Ten Years

	$\tau_k = 0.30$	$\tau_k = 0.25$	$\tau_k = 0.01$
2013	100.0	100.0	100.0
2014	105.9	106.8	110.4
2015	99.7	100.4	103.5
2016	99.9	100.5	103.4
2017	99.1	99.6	102.2
2018	99.0	99.5	101.9
2019	98.9	99.4	101.5
2020	99.1	99.5	101.5
2021	99.2	99.6	101.5
2022	99.3	99.7	101.4
2023	99.7	99.3	101.3

Short Run Analysis: Effect on Y

Reducing the Capital Income Tax Rate: The Next Ten Years

	$\tau_k = 0.30$	$\tau_k = 0.25$	$\tau_k = 0.01$
2013	100.0	100.0	100.0
2014	103.7	104.1	106.3
2015	100.7	101.3	104.2
2016	101.3	102.1	105.6
2017	101.0	101.9	105.9
2018	101.0	102.1	106.5
2019	100.9	102.0	106.9
2020	102.2	101.0	107.5
2021	101.1	102.4	108.0
2022	101.2	102.5	108.4
2023	101.2	102.6	108.7

Short Run Analysis: Effect on π_p / Y

Reducing the Capital Income Tax Rate: The Next Ten Years

	$\tau_k = 0.35$	$\tau_k = 0.30$	$\tau_k = 0.25$	$\tau_k = 0.01$
2013	−0.0826	−0.0826	−0.0826	−0.0826
2014	−0.0982	−0.0834	−0.0824	−0.0776
2015	−0.0704	−0.0691	−0.0677	−0.0615
2016	−0.0718	−0.0696	−0.0678	−0.0600
2017	−0.0626	−0.0610	−0.0591	−0.0508
2018	−0.0648	−0.0632	−0.0610	−0.0515
2019	−0.0670	−0.0658	−0.0632	−0.0526
2020	−0.0691	−0.0674	−0.0645	−0.0531
2021	−0.0711	−0.0690	−0.0659	−0.0537
2022	−0.0729	−0.0706	−0.0673	−0.0543
2023	−0.0748	−0.0723	−0.0688	−0.0552

Short Run Analysis: Primary Surplus in 2020

What Will It Take? $\tau_c = 0.24$

τ_c	Base	Slow $\tau_k = 0.25$	Fast $\tau_k = 0.25$	$\tau_k = 0.35$
20%	-0.0691	$+0.0340$	$+0.0380$	$+0.0320$
24%	-0.0691	$+0.0044$	$+0.0092$	$+0.0013$
25%	-0.0691	$+0.0090$	$+0.0140$	$+0.0060$
30%	-0.0691	$+0.0340$	$+0.0380$	$+0.0320$

Sensitivity to various assumptions TBD

Conclusions

What We Did

- High debt to output ratio combined with looming public expenditures due to rapid societal aging
- Use the standard growth model to
  - measure the impact of a lower capital income tax on the Japanese economy
  - calculate the needed consumption tax rate to produce a primary balance in 2020

Conclusions

Long Run Results

- Sizable gains in aggregate capital, output and consumption
  - K rises 12.1% with $\tau_k = 0.25$ and 37.6% with $\tau_k = 0$
  - Y rises 5.0% with $\tau_k = 0.25$ and 14.9% with $\tau_k = 0$
  - H does not change much except for $\tau_k = 0$ when it increases 3%
  - C increases 3-5%

Conclusions

Short Run Results

- Relative to the baseline transition of no change in the capital income tax rate, there are immediate and significant gains in aggregate capital
- With τ_k scheduled (surprise announcement) to decline to 25%, capital increases 2.9% in the first year
- By the end of the 5th year of reform when τ_k reaches 25%, the increase in k is 7%
- Y rises 1-2%
- There is a significant improvement in primary balance in the first year (1.6 percentage points) but the gain erodes fast