RIETI International Workshop

Long-term Growth and Secular Stagnation

Handout

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Secular Stagnation under the Fear of a Government Debt Crisis

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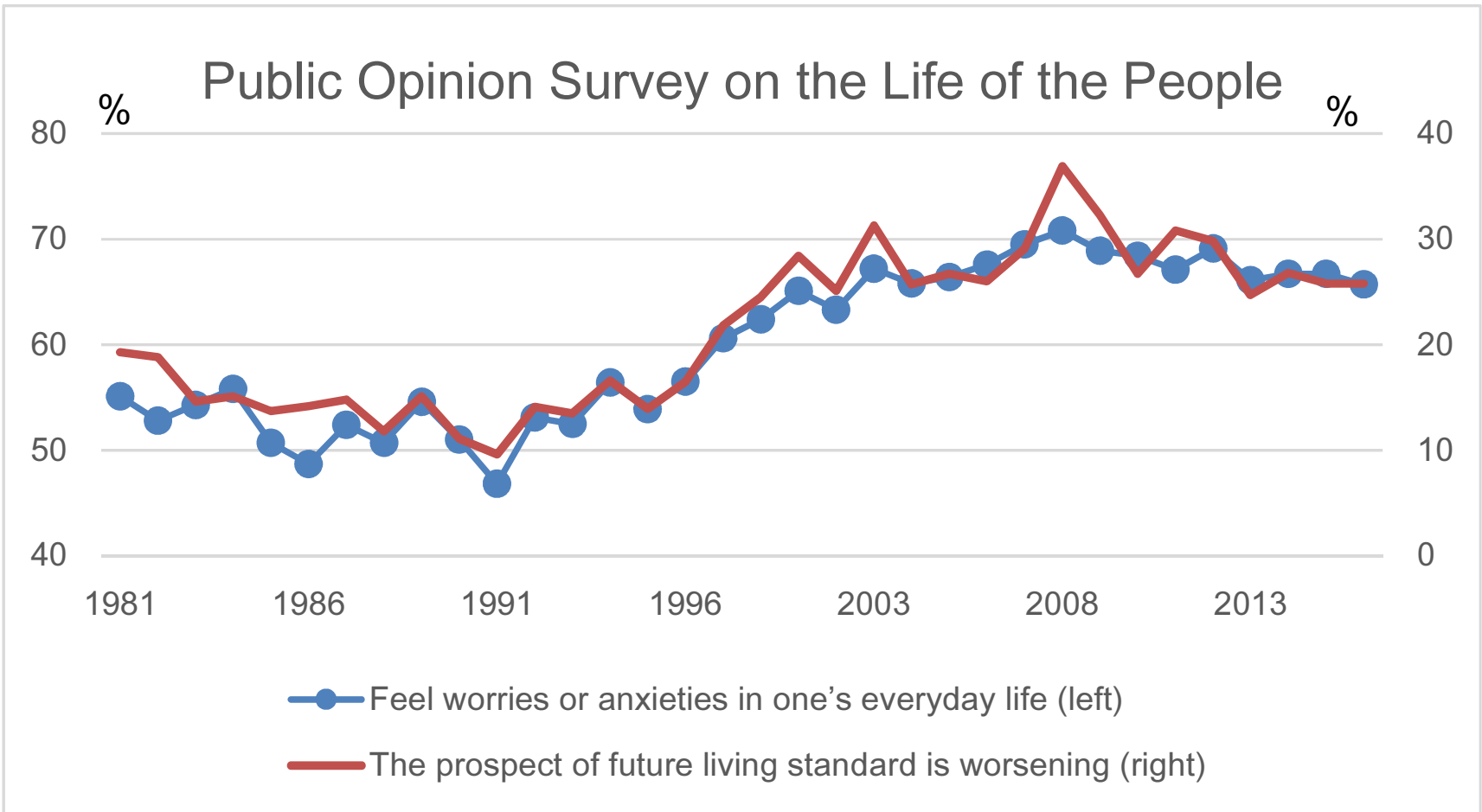
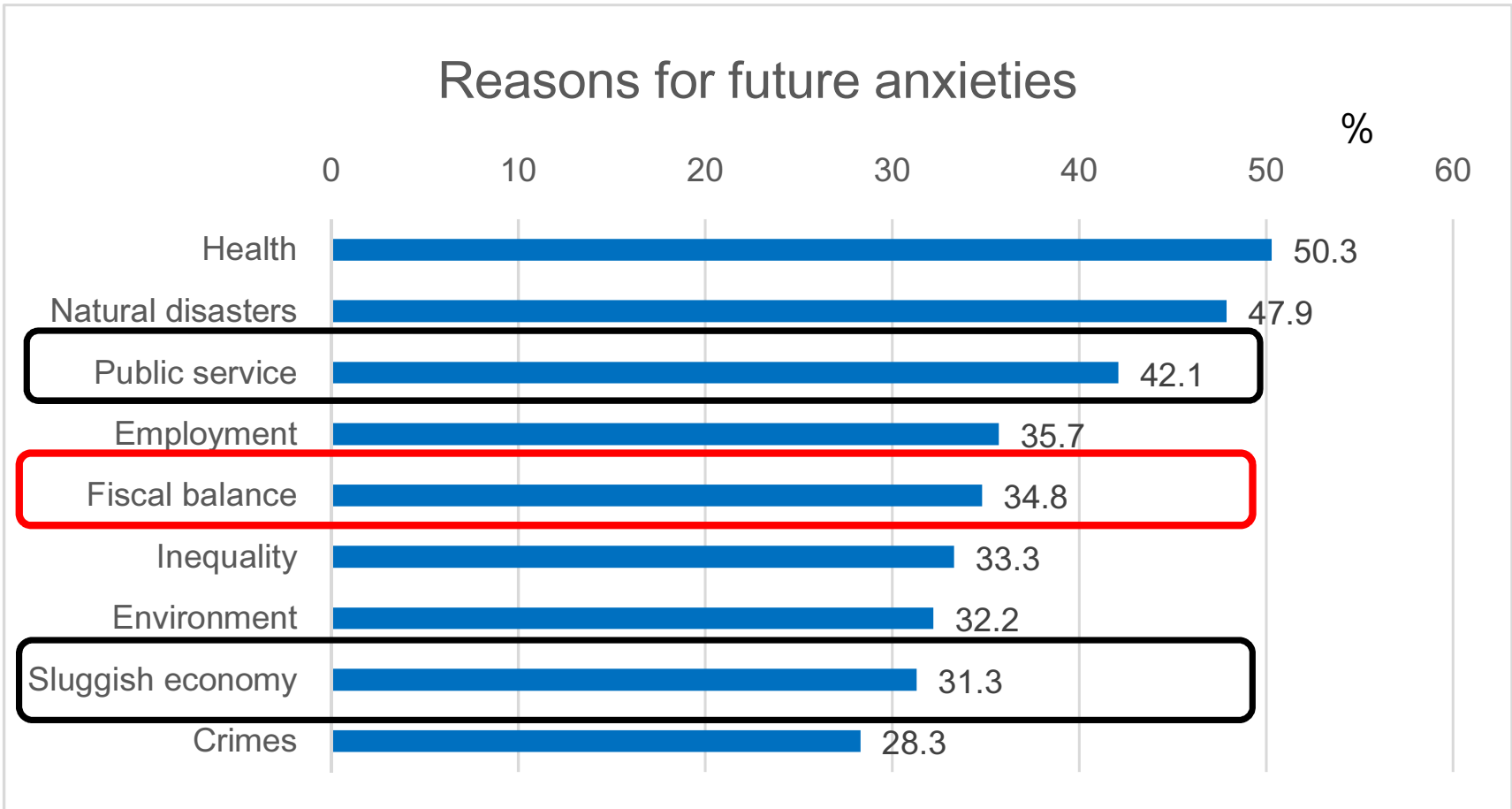
Motivation

- Secular stagnations in advanced economies
  - Japan: lost decades
  - US and the Euro area: aftermath of the Great Recession
- One possible reason: fear of a government debt crisis?
  - Debt over 200% of nominal GDP in Japan
  - Something bad may happen (default, big tax?).

Feel worries or anxieties?

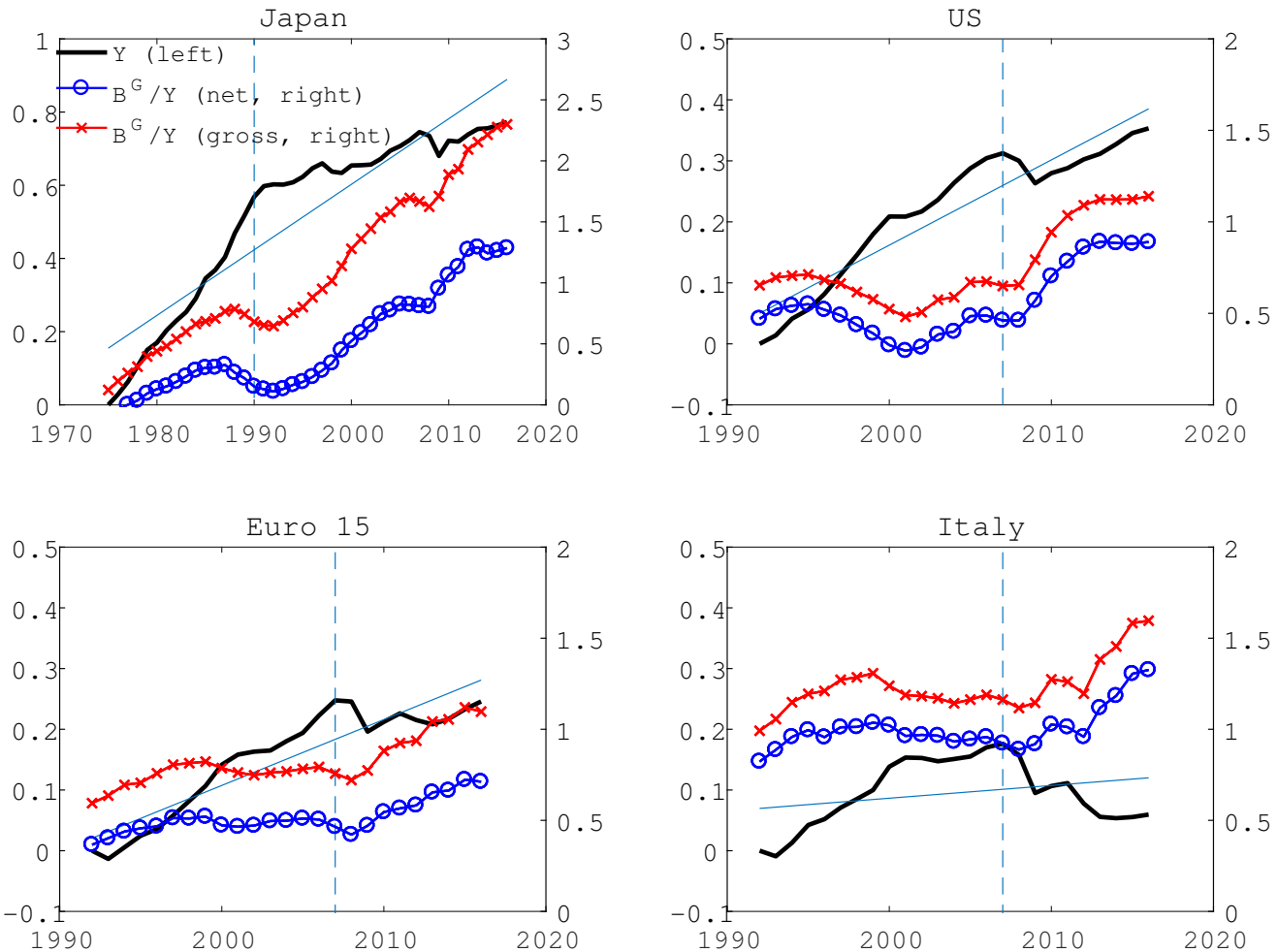


Source: Cabinet Office "Public Opinion Survey on the Life of the People"



Source: Cabinet Office (Oct 2014) "Public Opinion Survey on the Prospects of Japan's Popluation, Economy, and Society"

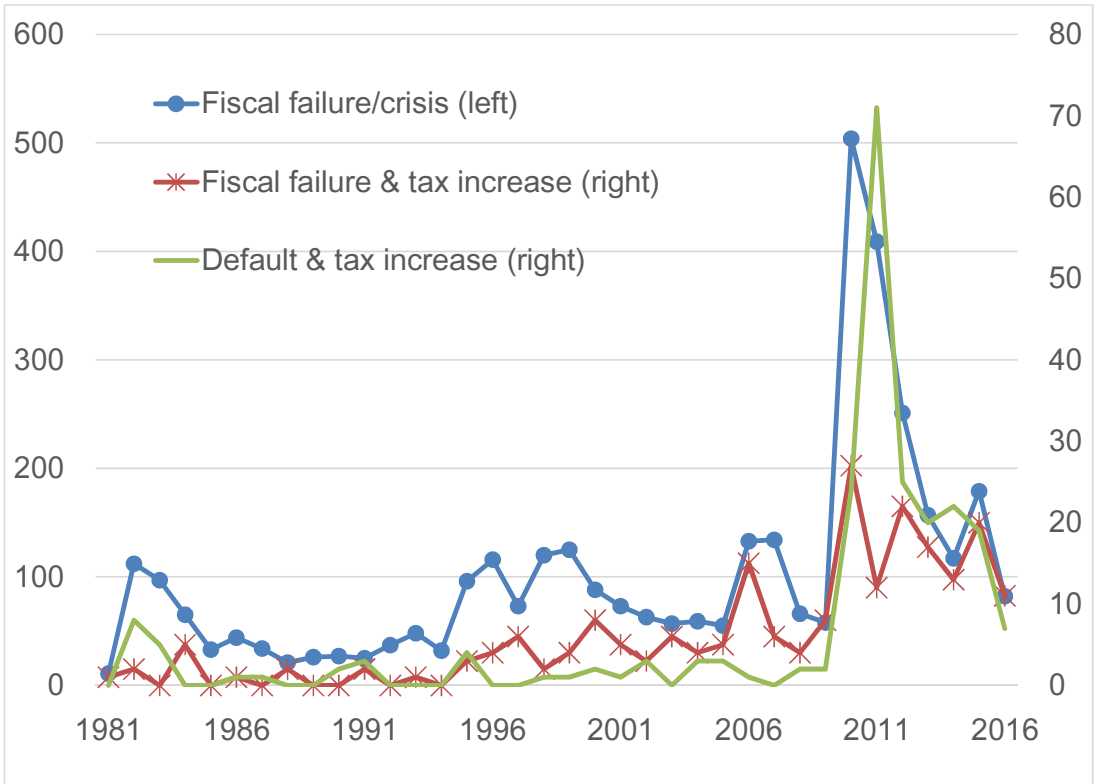
Output decrease with a debt increase



Source: OECD "Economic Outlook"

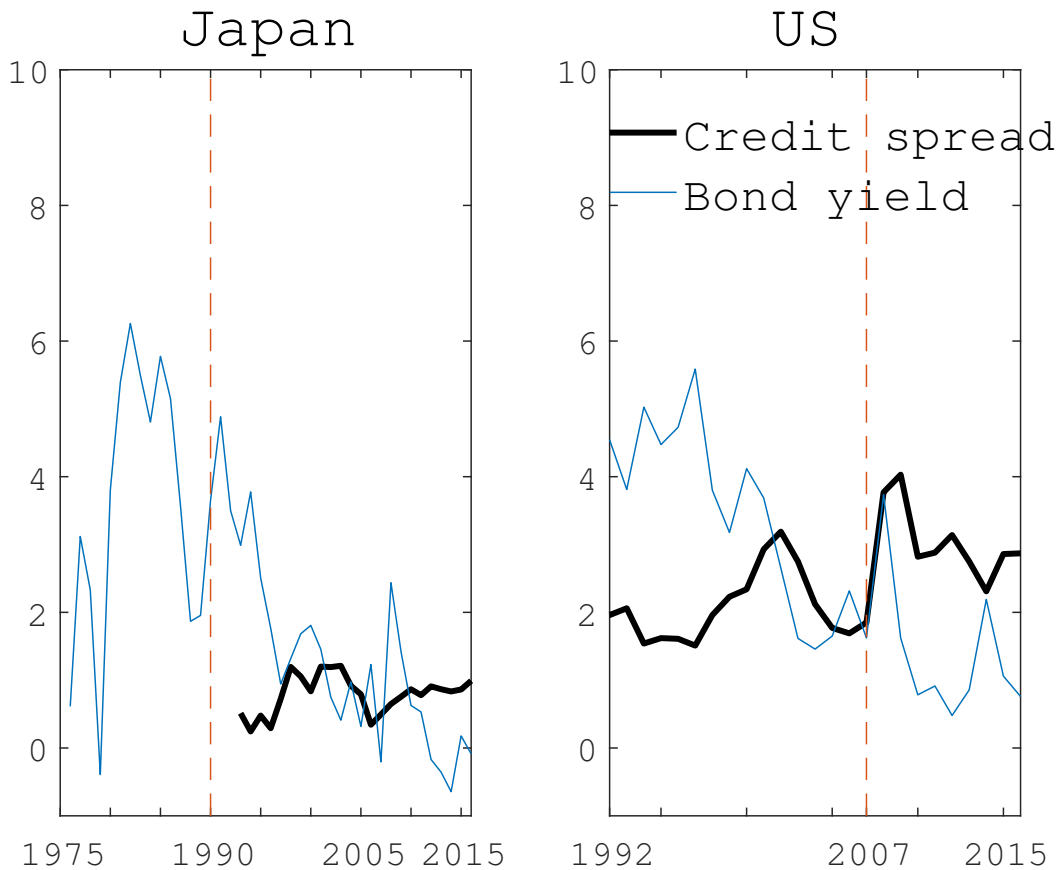
Notes: The vertical dashed line shows the year of the bubble burst (1990 for Japan and 2007 for the US and Euro area). The thin line represents the trend of real GDP from 15 years before the year of the bubble burst to year 2016.

Specific words in newspaper
Tax increase with a debt crisis?



Note: The figure shows the number of occurrences of specific words in the morning and evening editions of the Nihon Keizai Shinbun, Japan's financial newspaper, for each year.

But puzzling fact: low government bond yield (Hoshi and Ito (2014))



Sources: Bank of Japan, FRED, Ministry of Finance, Statistical Bureau
Notes: Credit spread: the bank loan rate with one-year maturity or longer minus the government bond yield with five-year maturity (Japan), the corporate bond spread (BAA) with ten-year maturity (US). Bond yield: the government bond yield with five-year maturity minus the annual CPI inflation rate in the next year, the government bond yield with ten-year maturity minus the annual PCE inflation rate in the next year. The vertical dashed line shows the year of the bubble burst (1990 for Japan and 2007 for the US).

Motivation

- Government debt crisis behind secular stagnations?
  - However, no clear sign of concerns in market prices, esp bond prices
- We construct a simple model of
  - a closed economy
  - physical capital and government bonds
  - debt crisis risk, where a crisis brings about once-and-for-all tax increase and (partial) default
    - notably capital levy (wealth tax)
    - exogenous crisis probability
- Our interests are not in when a crisis occurs or what happens in a crisis, but in what happens before the crisis.

Main Findings

- A concern of a debt crisis decreases output.
  - This adverse effect increases, as government bond outstandings increases.
  - Not only the level, but also the growth rate
- Mechanism
  - Probability of a crisis increases (exogenously).
  - Tax rates at a crisis increase.
  - Esp, a capital levy raises the credit spread, while the bond yield is stable.
- About one third of the output decrease can be explained.

Literature

- Public debt overhang
  - Reinhart, Reinhart, and Rogoff (2012), Reinhart and Rogoff (2010), Checherita-Westphal and Rother (2012), Baum, Checherita-Westphal and Rother (2013)
  - Arellano (2008) and Arellano, Bai, and Mihalache (2017)
- Model with a disaster
  - Rietz (1988), Barro (2006, 2009), Gabaix (2012), Gourio (2012, 2013), Kozlowski, Veldkamp, and Venkateswaran (2015)
- Secular stagnation (lost decades)
  - Many
  - Our focus is on a fiscal channel.
- Non-Keynesian effect
  - Giavazzi and Pagano (1990), Alesina and Perotti (1996), Alesina and Ardagna (1998), and Perotti (1999).

Setup

- Standard and simple except for a crisis
- A representative household, a firm, and government
- Saving in capital and government bonds (and corporate bonds and equity)
- In normal times, no tax. Government bond outstandings accumulate.
- At a crisis, government imposes several types of once-and-for-all taxes on the household.
- Exogenous probability of a crisis, increasing in government bond outstandings

Firm

A firm faces perfect competition.
Production function

$$Y_t = K_t^{\alpha}(z_t N_t)^{1-\alpha}, \tag{1}$$

where productivity is given by

$$\log z_{t+1} = \log z_t + \mu + \sigma_e e_{t+1}, \qquad \text{where} \quad e_{t+1} \sim N(0,1). \tag{2}$$

Crisis Risk

Define a crisis indicator x_t by $x_t = 0$ in normal times and $x_t = 1$ at the point of the government debt crisis.
The probability that a crisis occurs in period $t+1$ is denoted by

$$\begin{aligned} p(B_t^G / z_t) &= \Pr(x_{t+1} = 1 | B_t^G / z_t) \\ &= d_0 exp(d_1 B_t^G / z_t) \end{aligned} \tag{3}$$

This probability depends on the government bond outstandings only.

Household

Nonseparable utility

$$U_t^{1-\psi} = (1-\beta)(C_t^{\nu}(1-N_t)^{1-\nu})^{1-\psi} + \beta E_t(U_{t+1}^{1-\psi}). \quad (4)$$

The budget constraint

$$\begin{aligned} & (1+x_t\tau_t^C)C_t + K_{t+1} + q_t^G B_{t+1}^G + x_t T_t \\ \leq \quad & W_t N_t + (1-x_t\tau_t^K)R_t^K K_t + (1-x_t\tau_t^G)B_t^G + G. \end{aligned} \quad (5)$$

Note: tax on wealth, not on return.

Government

Budget constraint

$$q_t^G B_{t+1}^G + x_t \tau_t^C C_t + x_t \tau_t^K R_t^K K_t + x_t \tau_t^G B_t^G + x_t T_t = B_t^G + G. \quad (6)$$

In normal times ($x_t = 0$), no tax.
Tax rates at crisis ($x_t = 1$): exogenous ω^i

$$\begin{aligned} \tau_t^C C_t &= \omega^C (B_t^G + G), & (7)\\ \tau_t^K R_t^K K_t &= \omega^K (B_t^G + G), & (8)\\ \tau_t^G B_t^G &= \omega^G (B_t^G + G), & (9)\\ T_t &= \omega^T (B_t^G + G), & (10)\\ 0 &< \omega^C + \omega^K + \omega^G + \omega^T \leq 1. & (11) \end{aligned}$$

Note: ω^K is a capital levy (wealth tax). ω^G is essentially a default.

Market Clearing

$$Y_t = C_t + I_t, \tag{12}$$

I_t equals $K_{t+1} - (1-\delta)K_t$.

Equlibrium

- Expressed using $\{k_t = K_t/z_t, b_t^G = B_t^G/z_t,\ x_t\}$.
- Solved using a global, nonlinear solution method.
  - The policy functions are approximated using Chebychev polynomials and solved for using projection methods.
- Interest rates

$$R^F \equiv 1/q_t^F = 1/E_t\left[M_{t+1}(1 - x_{t+1}\tau_{t+1}^K)\right] \tag{13}$$

$$R^B = 1/q_t^G = 1/E_t\left[M_{t+1}(1 - x_{t+1}\tau_{t+1}^G)\right]. \tag{14}$$

Parameters for ω^i

- Our approach
  - in line with the business cycle accounting (Chari, Kehoe, and McGrattan, 2007), where "tax wedges" are identified.
  - We identify a proper combination of tax wedges that best accounts for an *ex ante* slowdown of economic growth and a low government bond yield.

Parameters

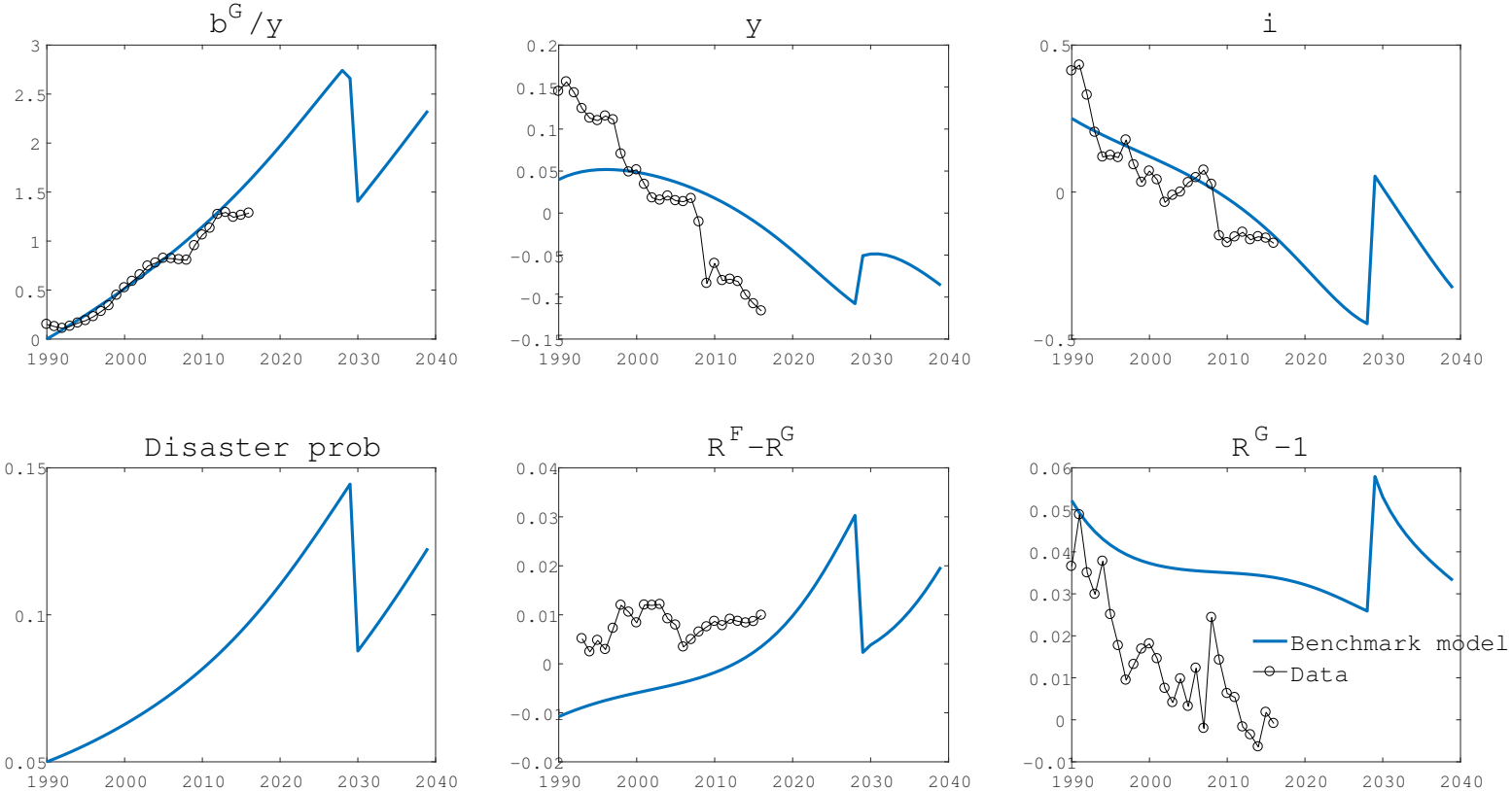
Yearly; Japan

Parameters	Values	Parameters	Values
IES utility ψ	1.5	Crisis prob d_0	0.05
Capital share α	0.3	Crisis prob d_1	1
Discount factor β	0.995	gov spending g	0.02
Utility weight on C ν	0.3	Tax weight on K ω^K	0.267
Trend growth of TFP μ	0.0179	Tax weight on C ω^C	0
SD of TFP shock σ_e	0.015	Tax weight on B ω^G	0.133
Depreciation δ	0.08	Tax weight on lump-sum ω^T	0.100

Simulation Method

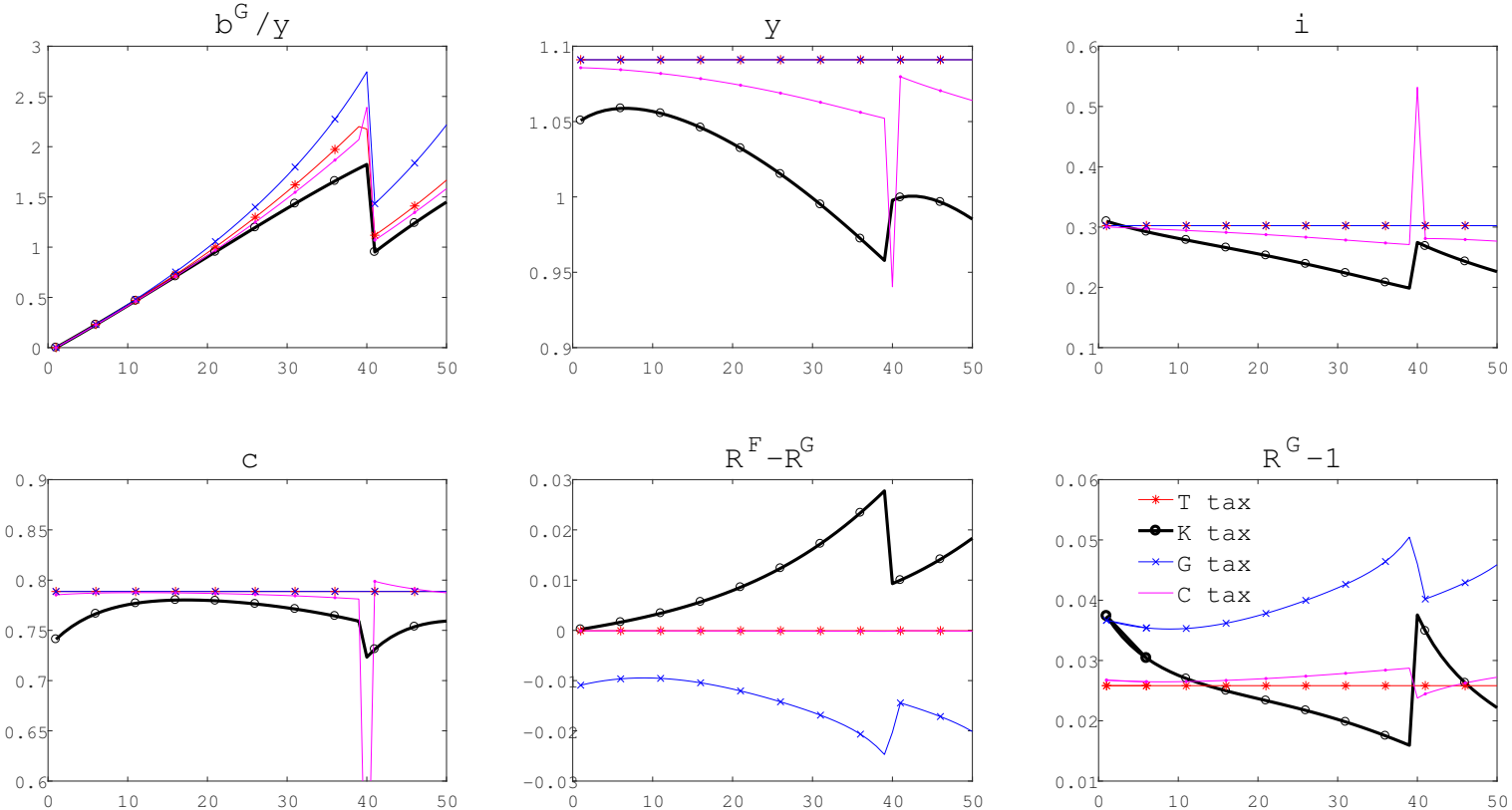
- Use the policy functions.
- Assume that b_t^G is zero and k_t is at its SS in 1990. No aggregate TFP shock.
- Normal times until crisis hits in 2030.
  - Agents do not know the timing.
  - They expect an increasing probability of default as b_t^G increases.
  - The timing does not matter for the simulated path of the economy before 2016, as long as crisis does not occur before the year.
- For y and i, we show deviations from their SS.
  - For the data on y and i, their SS is a linear trend for Y.

Debt accummulation $\rightarrow$ declines in y and Δy
A part of the output decrease can be explained by the concern of default.

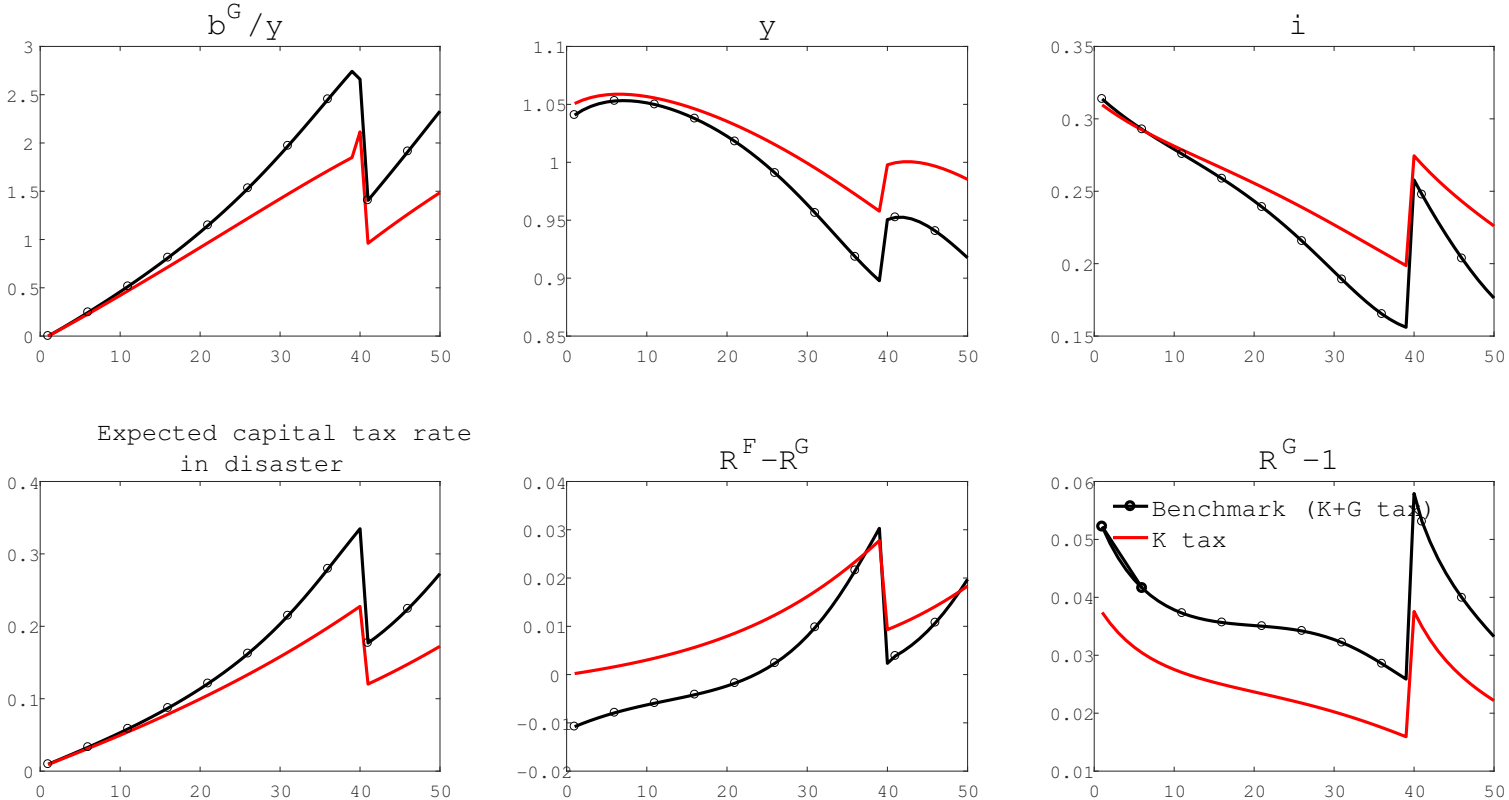


Different tax (ω^i) assumption

With G tax (partial default) only, the government bond yield should increase. But no real effect.



K tax with G tax amplifies the output decrease, because b^G/y increases more rapidly.

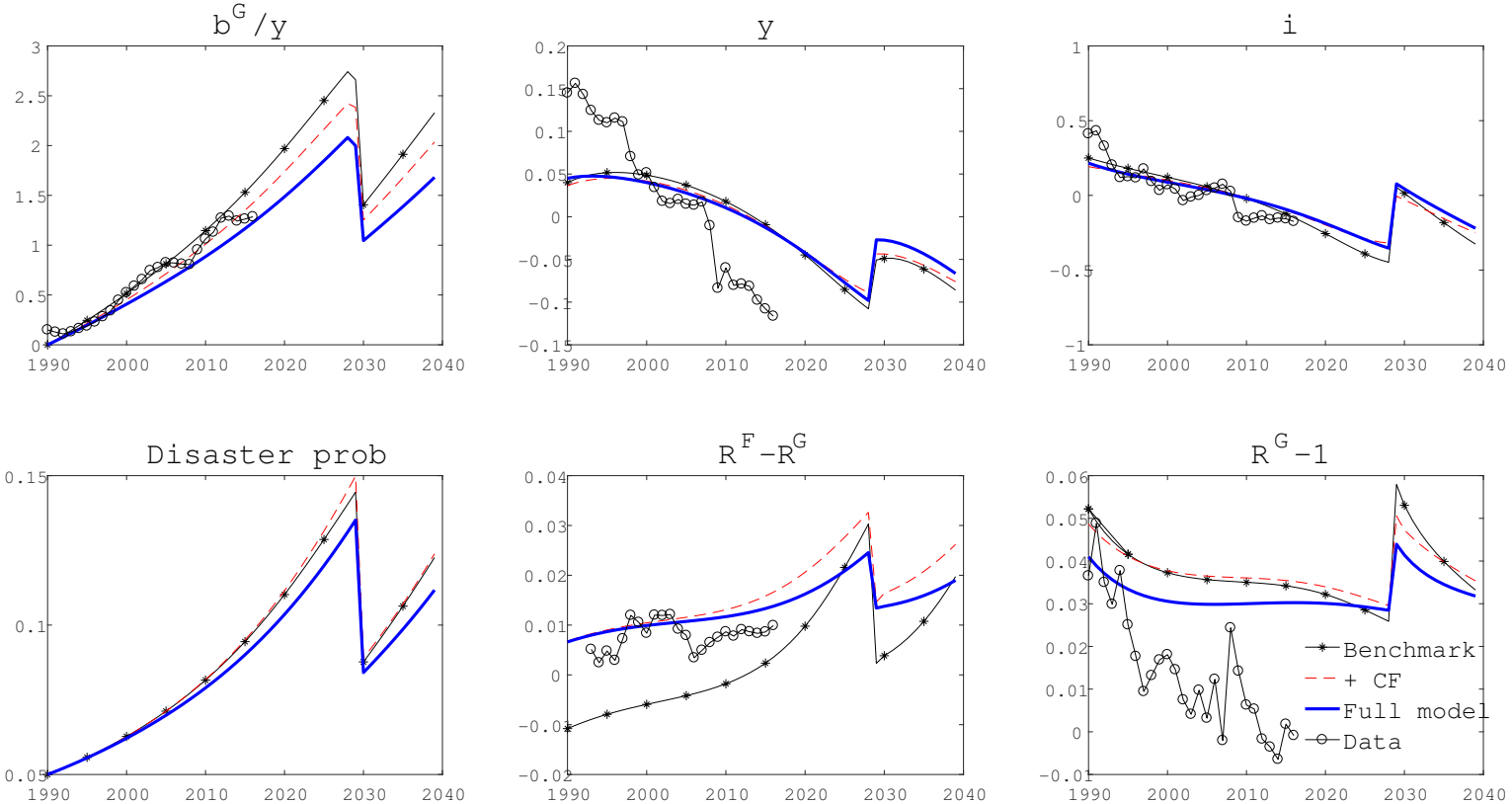


Model Extension

- As in Gourio (2013)
- Richer corporate capital structure
  - Firms issue corporate bonds and equity.
  - Bankruptcy losses $\theta = 0.7$, debt advantage $\chi = 1.042$
- Epstein-Zin preference
  - Risk aversion $\gamma = 10$, IES utility $\psi = 0.5$

Fits the credit spread and bond yield better

Milder decrease in i



We discuss supportive arguments for our assumption that people share the expectation of a capital levy when a government debt crisis occurs.

- History: Europe during the Interwar Period
- History: Postwar Japan
- Optimal Taxation under the Lack of Commitment
- Reduced Form of a Financial Crisis
- Political Considerations
- Note on Natural Disasters

← Tax decision at the time of the crisis is not a simple optimization by the government, but rather a result of complex political and economic interactions among policy stakeholders. People may equally weigh historical precedents, lessons from optimal tax theory, and political charms in populist arguments when they assess the plausibility of a tax change in the crisis period.

- History: Europe during the Interwar Period (Eichengreen, 1989)
  - Public debt overhang due to the war debt of World War I
  - Active debate on the capital levy
    - This exemplifies the strength of the *ex post* temptation for policymakers to introduce a one-time capital levy when government debt builds up.
  - Failure (Austria, Hungary, Germany, France, and UK).
    - The closest to success in Italy and Czechoslovakia.
    - Democratic decision-making, leading to delay and capital flight

- History: Postwar Japan (Eichengreen, 1989; Kawamura 2013)
  - Repayment of internal debts inherited from wartime
    - 267% of national income in 1944.
    - More than 99% was internal debt.
  - MOF, not necessarily the occupating GHQ, tried to avoid default by the capital levy
    - unlike the argument by Eichengreen (1989)
    - obsessed with avoiding the default because it was regarded as a big shame
  - Capital levy (wealth tax)
    - Progressive 25 to 90% tax rates
    - on lands, houses, government bonds, deposits, machinery, etc
  - "With important elements of democracy in suspension, the levy could be quickly and effectively implemented" (Eichengreen, 1989) with the deposit blockade and the withdrawal of legal tender status of old yen, helping govt seize the wealth.
    - Estimated revenue was 43.5 billion yen, while GBO was 140.8 billion yen in 1945.
    - Seigniorage revenue immediately after World War II: almost 29% of GDP (Hattori and Oguro, 2016)

- Optimal Taxation under the Lack of Commitment
  - The government does not have the full ability to commit *ex ante* to or not to impose a certain type of tax when a debt crisis occurs.
  - Once-and-for-all capital levy has no distortionary effect on economic activity *ex post facto* in theory.
    - In general, optimal taxation theory (Chamley, 1986; Chari, Christiano, and Kehoe, 1994) shows that the optimal tax rate on capital stock or capital income can be positive only in the first period when the government renews the tax schedule.

- Political Considerations
  - The government should face uncontrollable economic turmoil because investors lose confidence in government debt.
    - The government is then forced to use any means to raise a large amount of tax revenue.
    - A sufficient amount can be raised only by imposing a capital levy and a tax on GBOs.
    - Not by the income tax.
  - Another political charm of a capital levy is that it is effective at reducing wealth inequality.
    - Voting rights have been extended to the poor since the early 20th century.

- Another Interpretation – a Financial Crisis
  - A reduced form of a financial crisis associated with an abrupt decline in the real value of government debt.
  - The fall in government debt will make banks and other financial institutions insolvent and lead to a financial crisis,
    - causing a reduction in the aggregate value of capital stock.
  - This reduction in capital value works as if it were a capital levy from the perspective of investors.

- Note on Natural Disasters
  - Japan frequently experiences natural disasters such as earthquakes and tsunamis.
  - A natural disaster is considered to work as a capital levy in our model because it demolishes the capital stock that private agents hold.
  - 3 important differences
    - Natural disasters are by nature local events.
    - The risk of a natural disaster is irrelevant to the size of government debt, making it hard to explain the decline in the growth rate of output as debt accumulated from the early 1990s.
    - Capital destruction

Better to impose consumption tax (VAT) always?
Choose τ^C to maintain the target b with the maximum $\tau^C = 0.50$.

	b/y	y	$R^F - R^G$	$R^G - 1$	U
Data	0.4913 (1.1032)	–	0.0079	0.0213	–
Model					
Benchmark	1.251	1.000	0.0012	0.0389	0
T tax	0.974	1.091	-0.0001	0.0259	0.0123
Always C tax	0.885	1.266	-0.0001	0.0037	0.003

Higher welfare $\rightarrow$ better to introduce transitory high tax

Future Work

- Hyper-inflation?
  - Another way of default
  - Nominal model
- Open economy
  - Domestic and external debt
- Uncertainty about a crisis
- Heterogeneous agent model
  - K and G tax influence the holding of assets, which plays an important role in the self-insurance of heterogeneous households.