Optimal Austerity

Juan Carlos Conesa
Stony Brook University

Timothy J. Kehoe
University of Minnesota
and Federal Reserve Bank of Minneapolis

Kim J. Ruhl
NYU Stern School of Business

June 2016

Fiscal Sustainability, XXI Century
Banco de España and Barcelona GSE

How do we design optimal fiscal policies for governments susceptible to sovereign debt crises like those experienced by

Mexico (1994–95)
Greece, Ireland, Italy, Portugal, Spain (2010–13)?

Debt crises are generated by lack of ability of government to commitment not to default

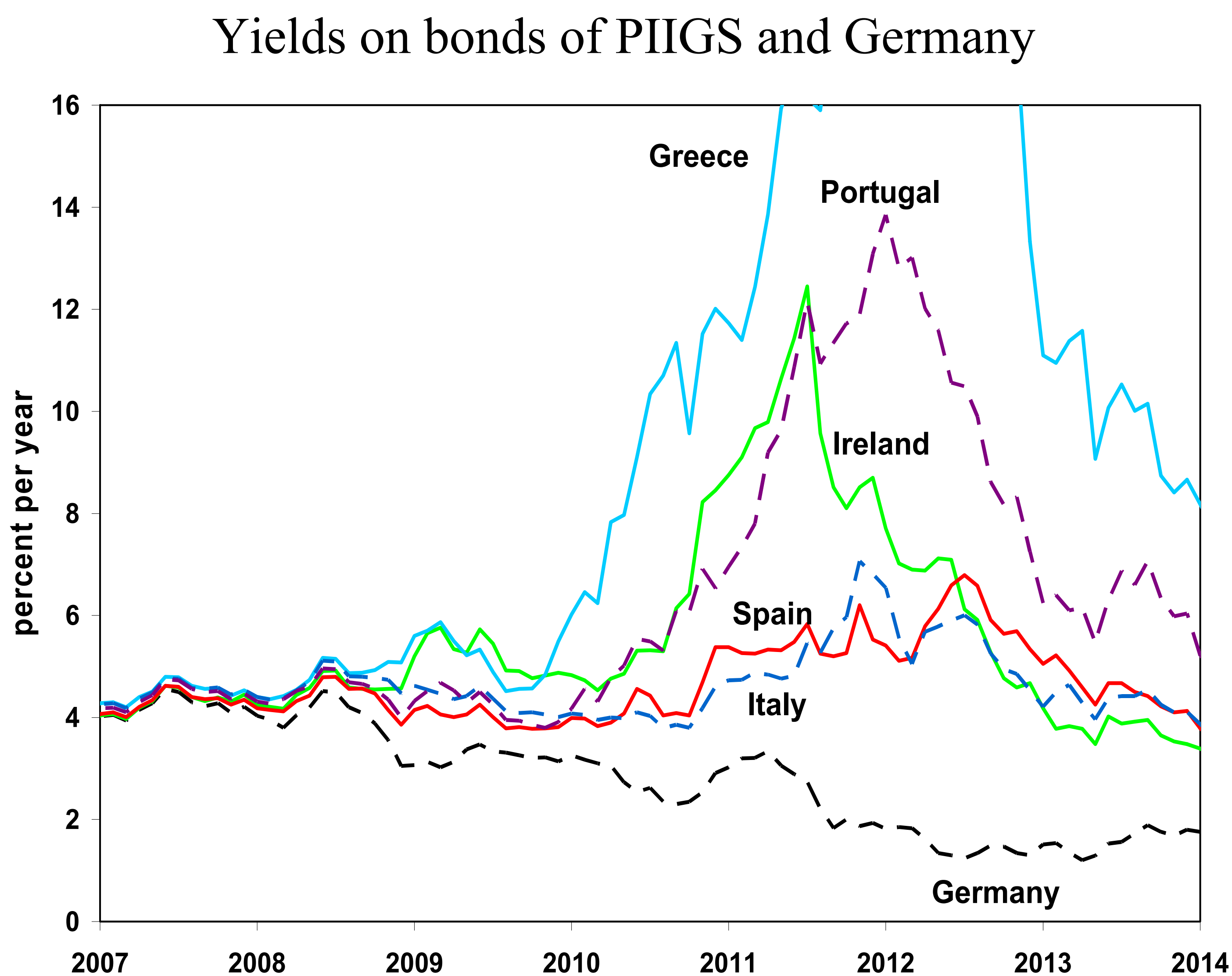
Suppose that government can commit to tax policy. Does this improve outcomes?

Results indicate that optimal fiscal policy depends on the institutions in place in a country.

Work in progress

Preliminary results indicate that there is a trade-off between commitment and flexibility in tax policy. Some commitment can improve outcomes, but too much hurts.

Depending on when and how a government can make commitments, for some initial levels of debt, a policy of making no commitments yields the best outcomes in terms of welfare.



Yields on 10-year government bonds

Model overview

- Representative household (no private capital)
- Benevolent government
- Risk-neutral international lenders

- Government borrows from international lenders
    - Default possible: no commitment to repay
    - Lenders may panic given sunspot

- Scenarios differ in when tax rate is set: different degrees of commitment, flexibility

Technology

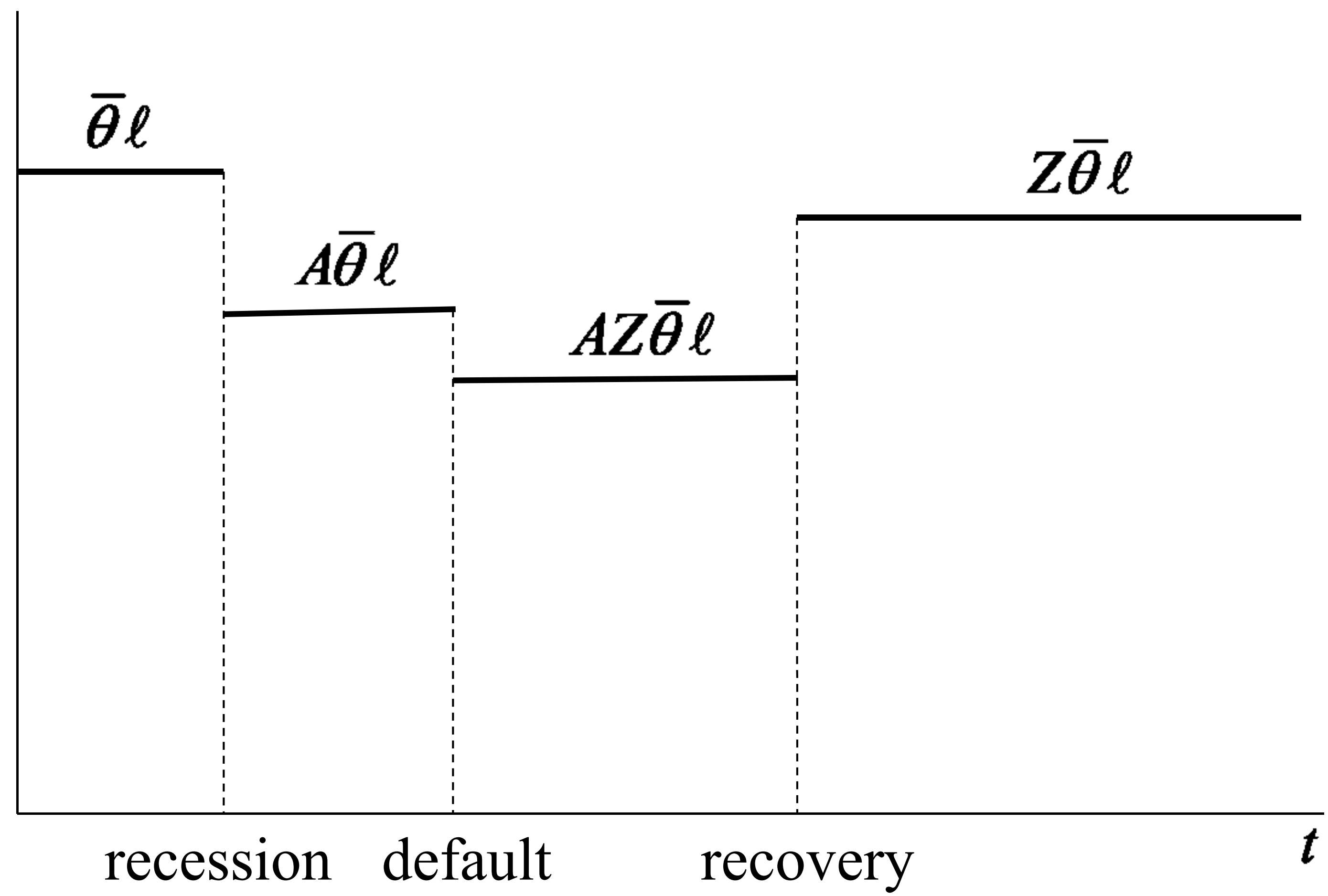
- Output: $y = \theta(a,z)\ell$
- Labor supplied by household
- Labor productivity: $\theta(a,z) = A^{1-a} Z^{1-z} \overline{\theta}$
  - $A < 1$, $Z < 1$
  - $a = 1$ normal times, $a = 0$ recession
  - $z = 1$ no default, $z = 0$ default

Evolution of output

$$y = \theta(a,z)\ell = A^{1-a} Z^{1-z} \overline{\theta} \ell$$

- Before period 0, $a = 1,\ z = 1$
- $t = 0$, unexpectedly $a_0 = 0$ (recession)
- $t = 1, 2, \ldots,\ a_t$ becomes 1 with probability p (recovery)
- Once $a_t = 1$, it is 1 forever
- If government defaults, $z_t = 0$, stays 0 forever

A possible time path for GDP



Households

- Supply labor, consume private and public consumption

$$u\left(c,\ell,g\right)=(1/\rho)\log\left[\mu c^{\rho}+(1-\mu)\left(1-\ell\right)^{\rho}\right]^{1/\rho}+\gamma\log\left(g-\overline{g}\right)$$

- No private savings
- Government taxes at rate τ
- No private savings, budget constraint is

$$c=(1-\tau)\theta(a,z)\ell$$

Lenders

- Continuum [0,1] of risk neutral agents with deep pockets
- Discount factor β pins down risk free rate
- First order condition + rational expectations

$$q(B',s) = \beta \times Ez(B'(s'), s', q(B'(s'), s'))$$

bond price = risk-free price × probability of repayment

Sunspot

- Coordination device for bankers' expectations
- $\zeta \sim U[0,1]$
- B outside crisis zone: ζ is irrelevant
- B inside crisis zone: if $\zeta \geq 1-\pi$ bankers panic and expect a crisis (π arbitrary)

Government

- Issues debt B', fraction δ of debt is due each period
- Timing of choice of labor tax τ differs across scenarios
- Choice of whether or not to default z occurs after auction of debt
- Labor supply, output, private consumption, provision of public good determined by

$$c = (1-\tau)\theta(a,z)\ell(a,z,\tau)$$

$$g + z\delta B = \tau\theta(a,z)\ell(a,z,\tau) + q(B',s)\big(B' - (1-\delta)B\big)$$

$$z = 0 \text{ if } z_{-1} = 0$$

($\ell(a,z,\tau)$ is household's labor supply)

- Cannot commit not to default

Timing 1: Constant taxes

government chooses τ at $t = 0$ knowing B_0

---

a, ζ realized, $s = (B, a, z_{-1}, \zeta; \tau)$

$\downarrow$

government offers B'

$\downarrow$

bankers choose to buy B' or not, q determined

$\downarrow$

government chooses z, which determines y, c, and g

maximum commitment, minimum flexibility

Timing 2: Ex ante commitment

government chooses τ knowing B and a

$\downarrow$

ζ realized, $s = (B, a, z_{-1}, \zeta, \tau)$

$\downarrow$

government offers B'

$\downarrow$

bankers choose to buy B' or not, q determined

$\downarrow$

government chooses z, which determines y, c, and g

taxes set to avoid panic are too high if favorable sunspot realization

Timing 3: Intermediate commitment

a, ζ realized, $s = (B, a, z_{-1}, \zeta)$

$\downarrow$

government offers B' and chooses τ

$\downarrow$

bankers choose to buy B' or not, q determined

$\downarrow$

government chooses z, which determines y, c, and g

can use taxes to avoid panic but set low otherwise

Timing 4: No commitment

a, ζ realized, $s=(B,a,z_{-1},\zeta)$

↓

government offers B'

↓

bankers choose to buy B' or not, q determined

↓

government chooses z and τ , which determines y, c, and g

if default occurs, can set tax rates low

no commitment, maximum flexibility

What sorts of commitments are feasible?

Example from Mexico this year

Luis Videgaray (Secretary of Finance) and Augustín Carstens (Governor of the Banco de México) went on television on 17 February 2016 to make commitments to fiscal and monetary policy for rest of 2106.

Characterization of government's optimal debt policy

- Four cutoff levels of debt: $\bar{b}(a),\ \bar{B}(a),\ a = 0,1$:
- If $B \le \bar{b}(a)$, repay
- If $\bar{b}(a) < B \le \bar{B}(a)$, default if $\zeta > 1 - \pi$
- If $B > \bar{B}(a)$, default

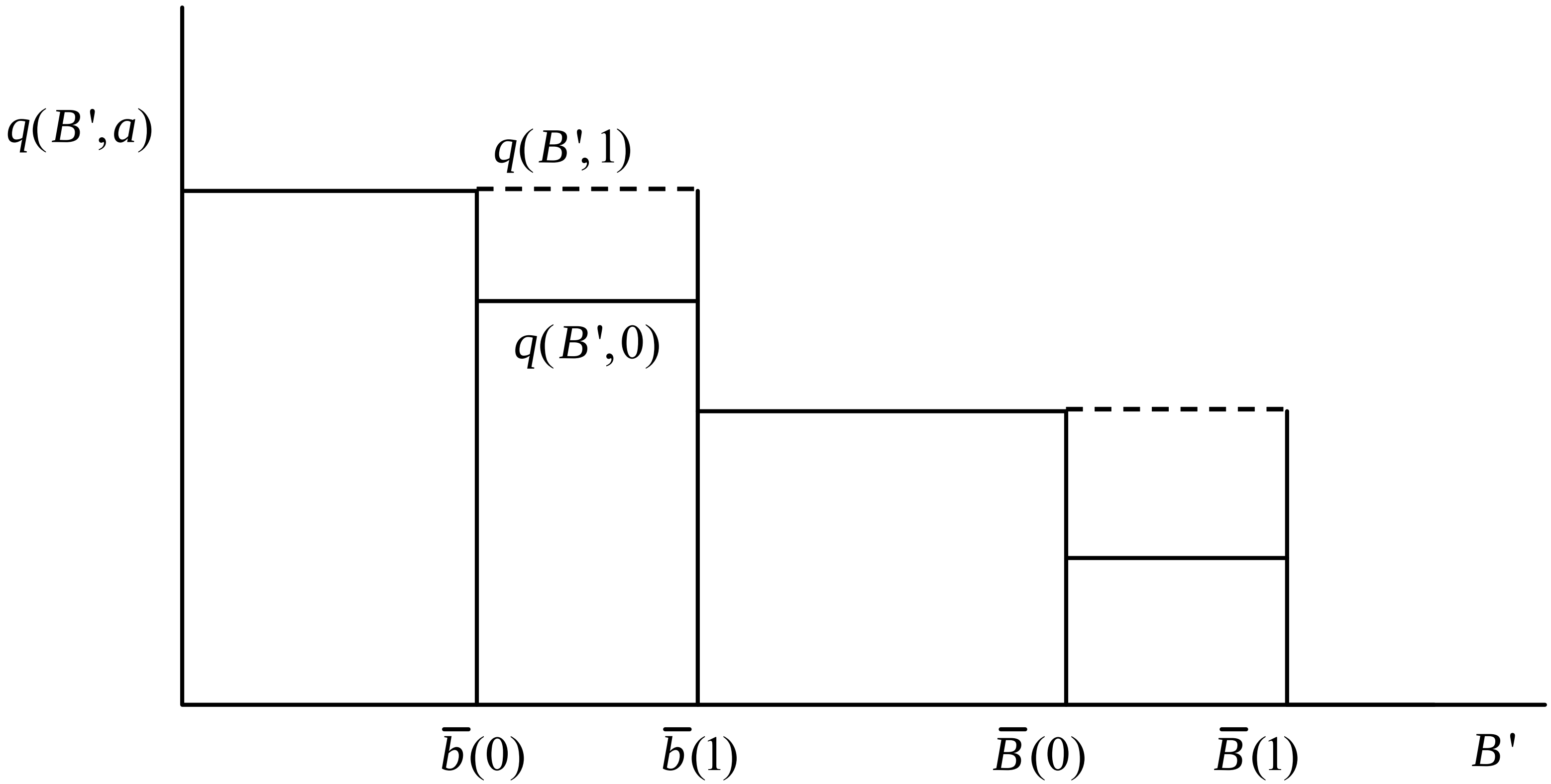
- Focus on case where

$$\bar{b}(0) < \bar{b}(1) < \bar{B}(0) < \bar{B}(1)$$

Bond prices

$$q(B',s)=\begin{cases}\beta\left[\delta+(1-\delta)q'(\cdot)\right] & \text{if } B'\le \bar{b}(0)\\ \beta\left(p+(1-p)(1-\pi)\right)\left[\delta+(1-\delta)q'(\cdot)\right] & \text{if } \bar{b}(0)<B'\le \bar{b}(1)\\ \beta(1-\pi)\left[\delta+(1-\delta)q'(\cdot)\right] & \text{if } \bar{b}(1)<B'\le \bar{B}(0)\\ \beta p(1-\pi)\left[\delta+(1-\delta)q'(\cdot)\right] & \text{if } \bar{B}(0)<B'\le \bar{B}(1)\\ 0 & \text{if } \bar{B}(1)<B'\end{cases}$$

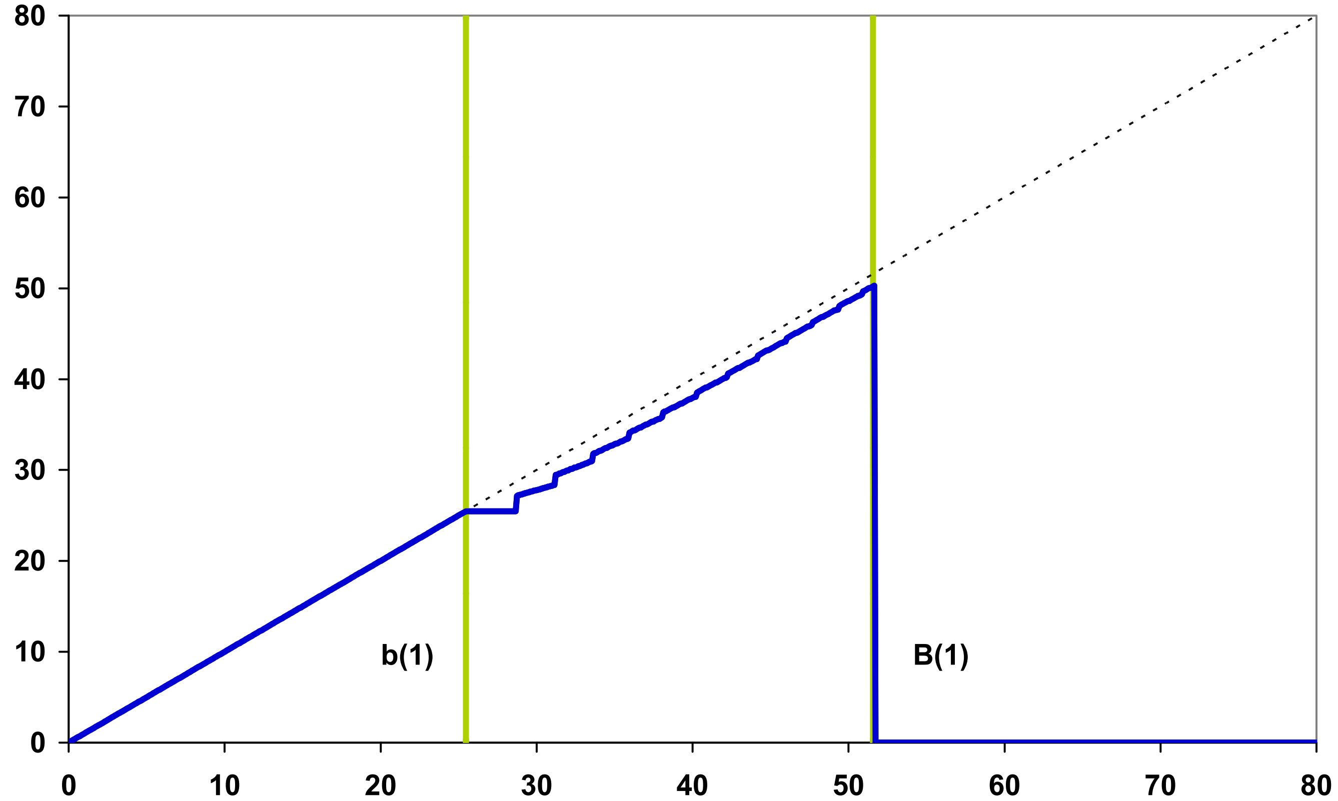
Bond prices as function of debt and *a* when δ = 1



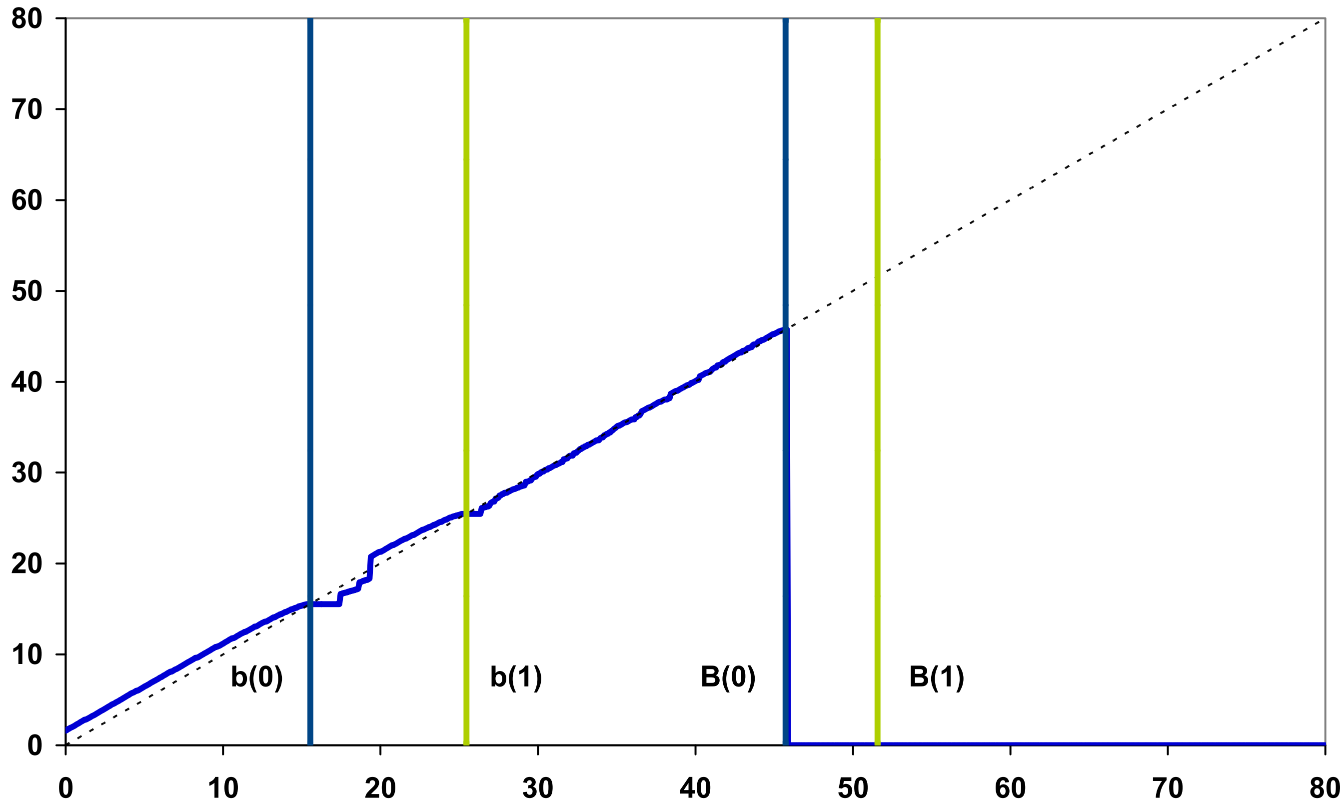
Parameter	Value	Target
A	0.90	productivity loss of a recession = 10%
Z	0.95	default penalty in Cole and Kehoe (1996)
p	0.20	assumption: expected recovery 5 years
β	0.98	yield on safe bonds = 2 percent annual
π	0.03	real interest rate in crisis zone = 5 percent annual
δ	1/6	average debt maturity = 6 years
γ	0.10	average government revenues/output = 25%
μ	0.08	average hours worked = 30%
ρ	0.50	assumption
$\bar{g}$	6.00	assumption: 2/3 of gov. expenditure in the benchmark necessary

1. Constant taxes (taxes set with commitment at $t = 0$)

Policy function in normal times: debt

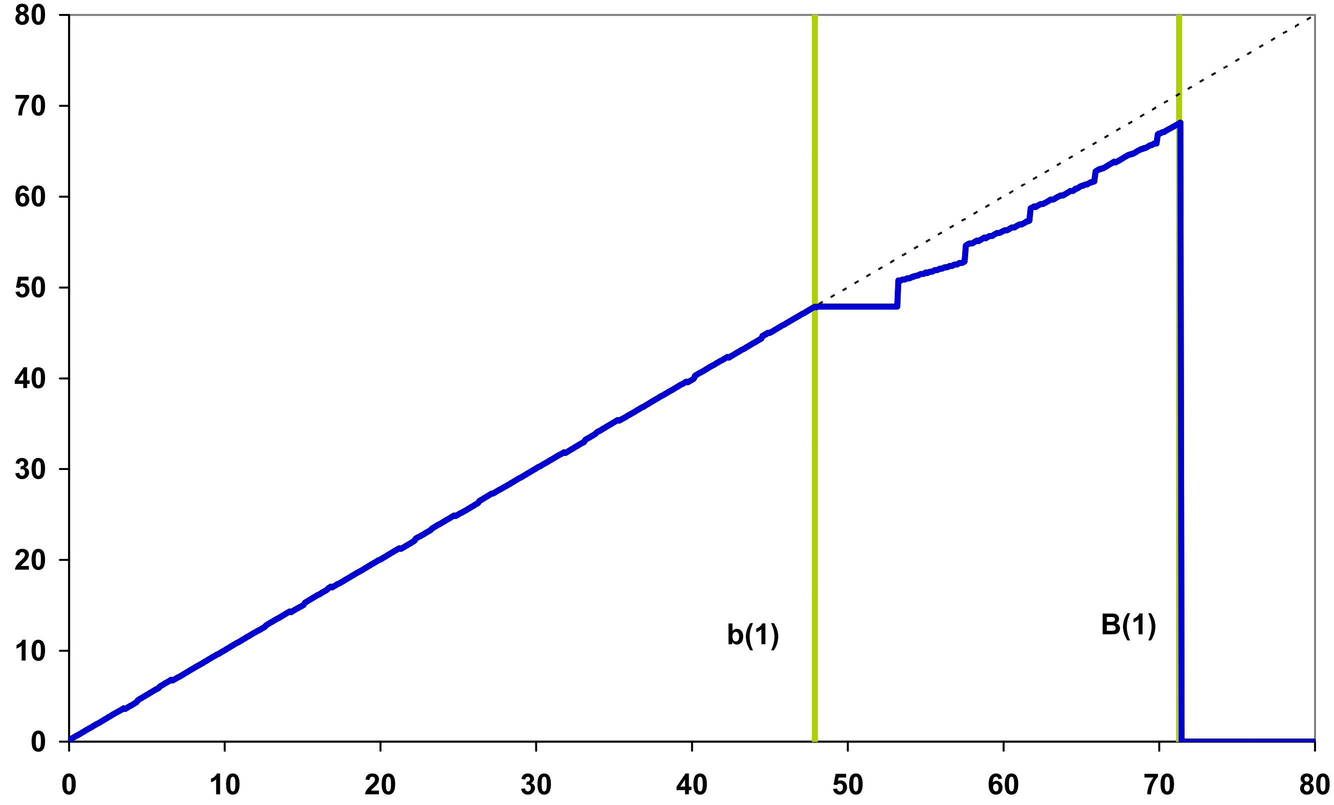


Policy function in recession: debt

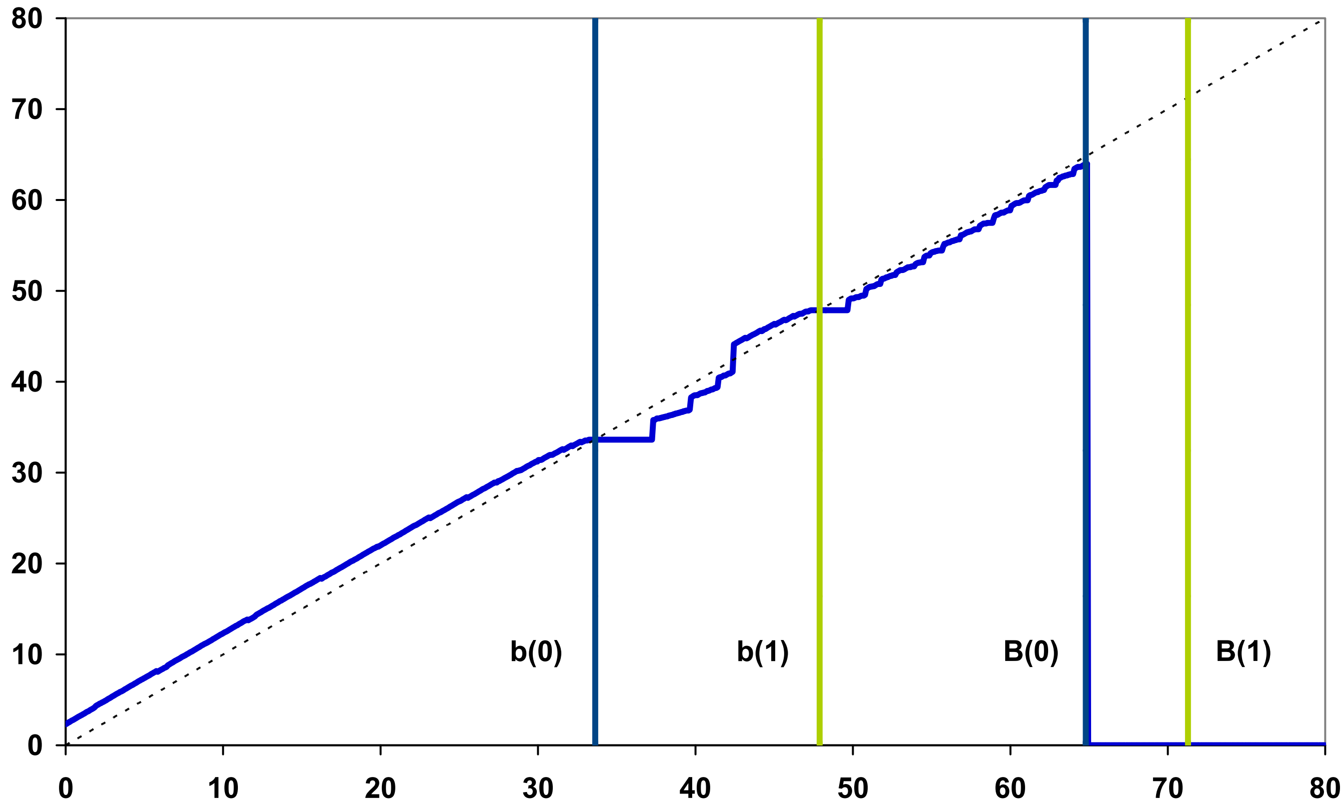


4. No commitment (taxes set after lenders decide to panic or lend)

Policy function in normal times: debt

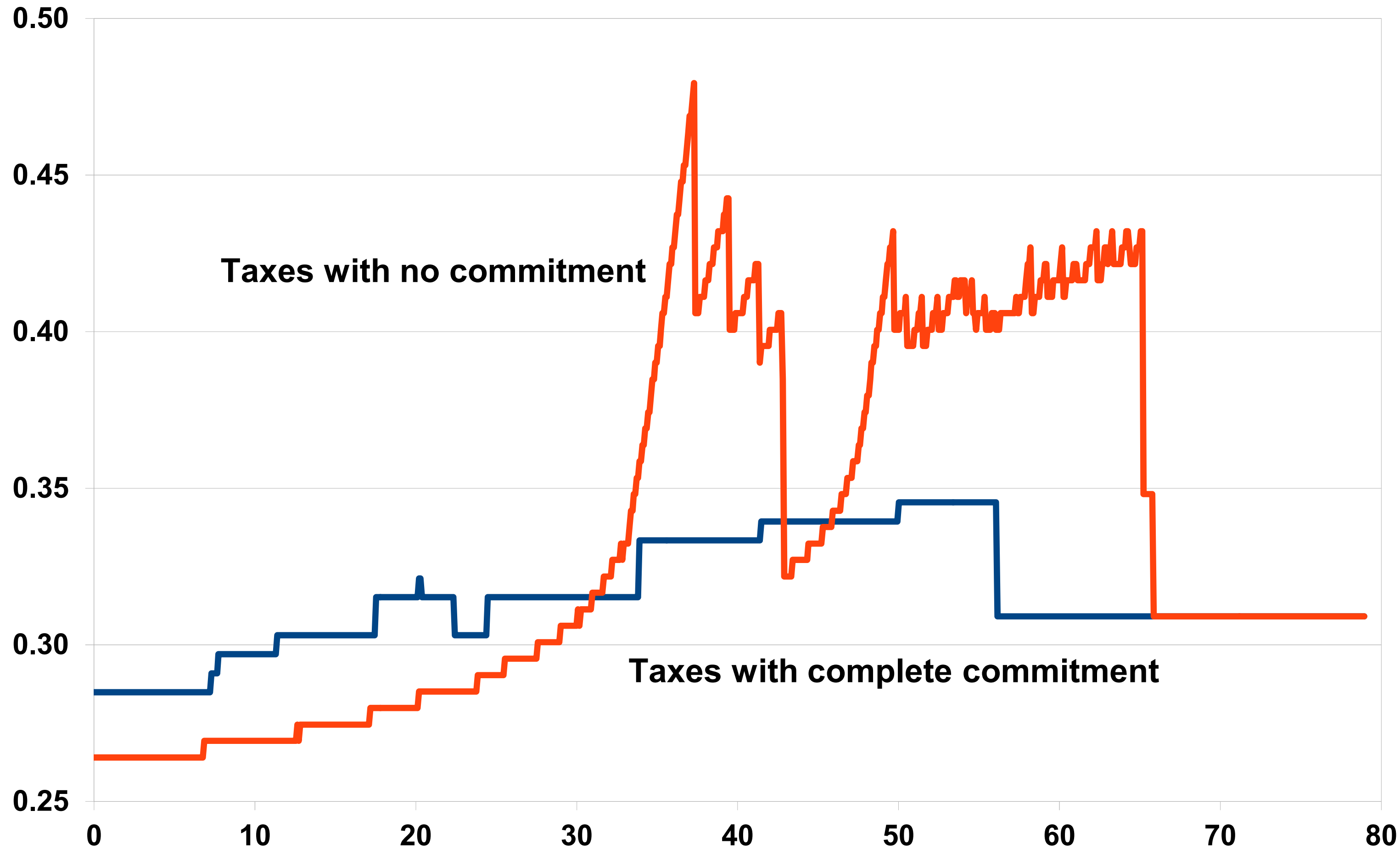


Policy function in recession: debt



Policy function in normal times: taxes

Policy function in recession: taxes



No commitment provides higher welfare at all debt levels than constant taxes.

A high labor tax can eliminate the possibility of default in timing 1, but yields low welfare. For high enough debt level it is better to set taxes low and default immediately.

Similarly, ex ante commitment and intermediate commitment provide higher welfare at all debt levels than constant taxes.

Intermediate commitment (commitment after the realization of the sunspot) provides higher welfare than ex ante commitment (commitment at the beginning of the period).

Setting high taxes only after an unfavorable realization of the sunspot allows the government to set lower taxes after a favorable realization of the sunspot, providing higher welfare than the commitment to high taxes at the beginning of the period.

Otherwise, comparing the welfare levels of optimal policy under ex ante commitment, intermediate commitment, and low commitment depends on parameter values, especially on the initial level of debt, B_0.

Determination of cutoff levels with no commitment:

$$V_{nc}^{n}(B, B', \tau_{nc}(B, B')) \geq V_{nc}^{d}(B', \tilde{\tau}^{d}(B')).$$

Here $\tilde{\tau}^{d}(B')$ is the tax rate in the initial period of default that takes into account that the government receives B' in new lending. The lower cutoff is determined by

$$V_{nc}^{n}(B, 0, \tau_{nc}(B, 0)) \geq V_{nc}^{d}(0, \tau^{d}).$$

athough the tax rate actually set in equilibrium is $\tau_{nc}(B, B')$.

Notice that the ability to set low taxes after panic makes default more attractive, but the ability to set high taxes after panic can eliminate the need for default without actually having to set the high taxes.

Determination of cutoff levels with ex ante commitment (and intermediate commitment):

$$V_{ac}^{n}(B, B', \tau_{ac}(B, B')) \geq V_{ac}^{d}(B', \tau_{ac}(B, B')).$$

Since the same, high tax rate shows up on both sides of the inequality, default is much less attractive with commitment than it is with no commitment.

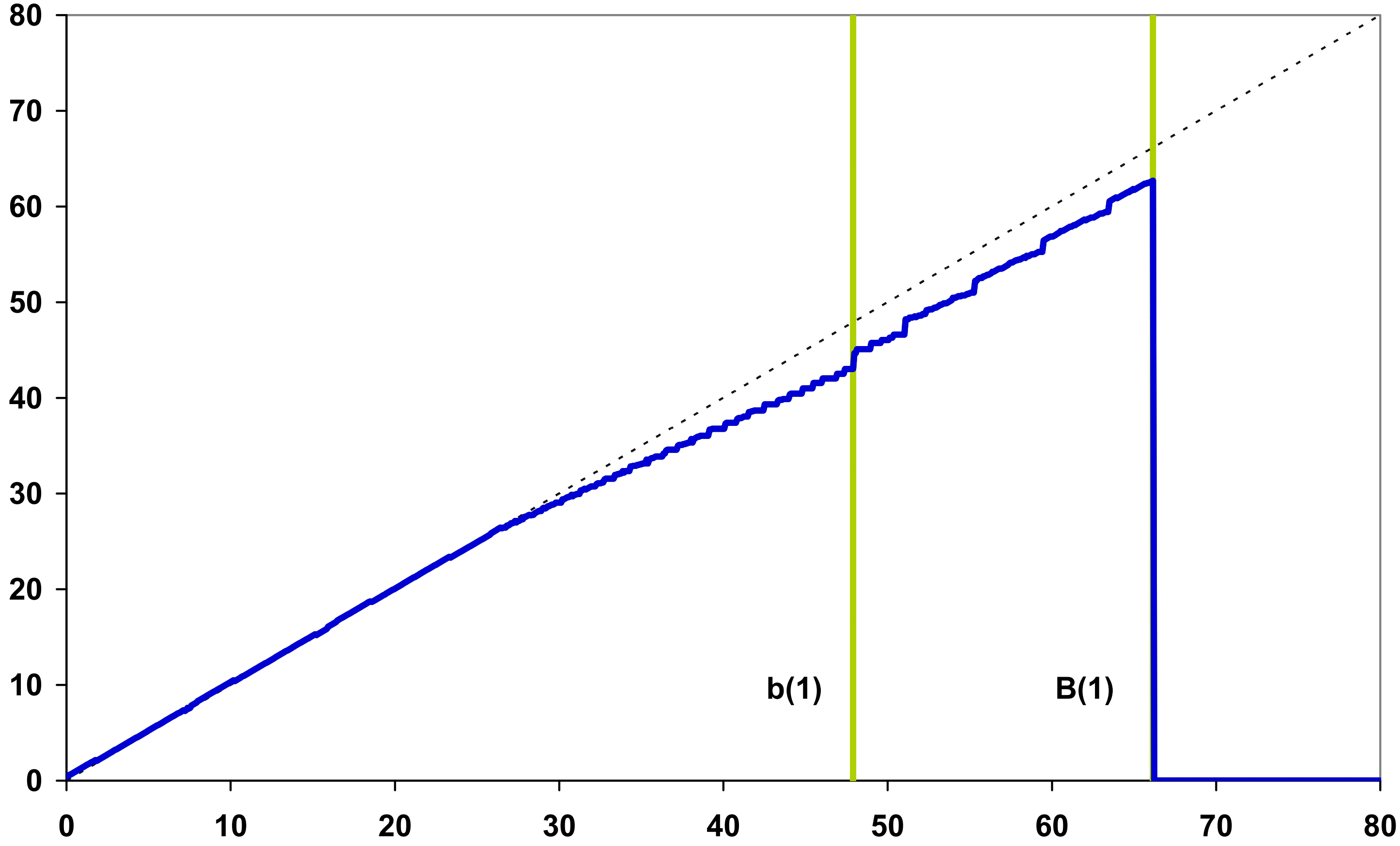
With ex ante commitment the safe zone of debt is further divided into two zones:

The unconstrained safe zone, where the government sets taxes ignoring the possibility of a crisis. Taxes are constant.

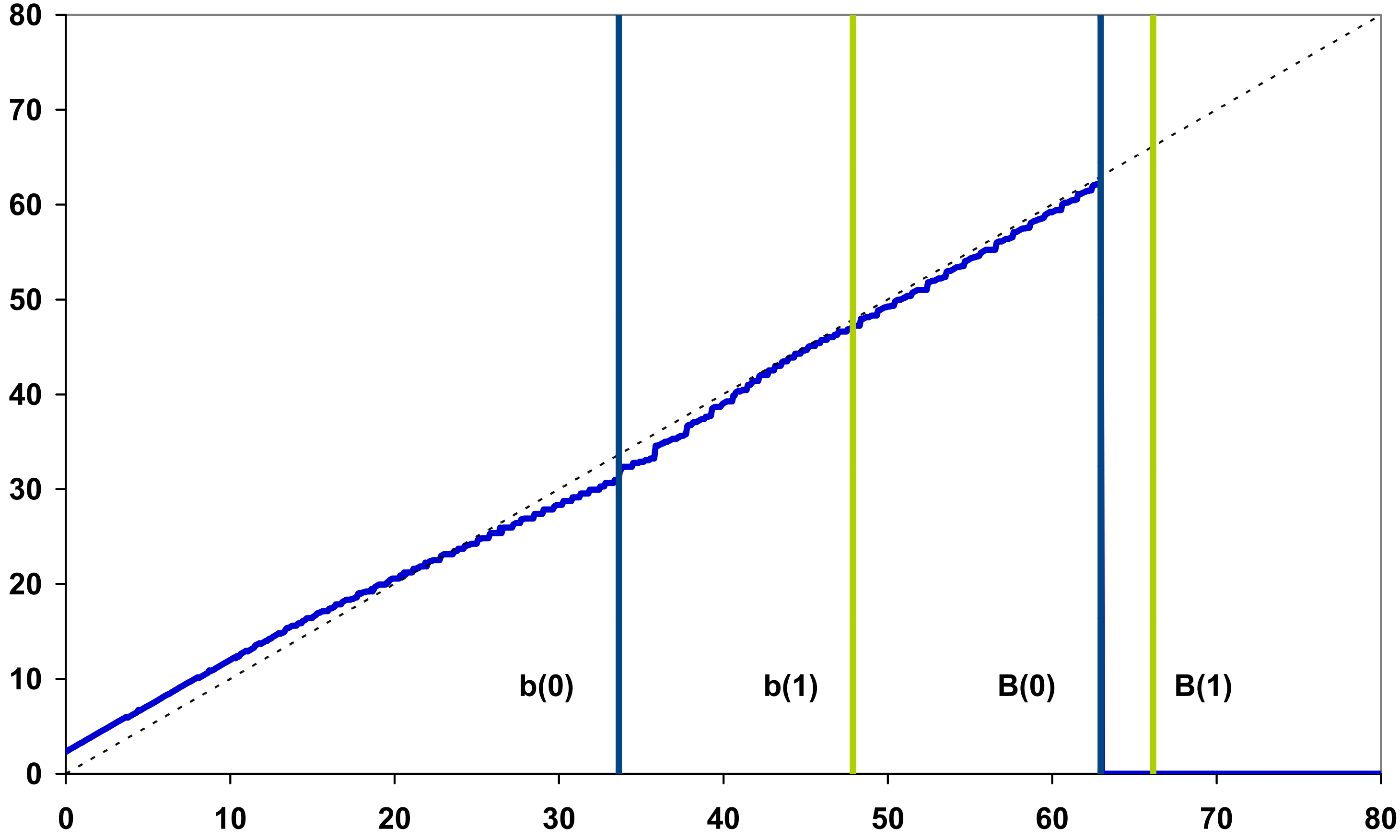
The constrained safe zone, where the government sets taxes higher to eliminate the possibility of a crisis.

In normal times, the government runs down debt if it is in constrained safe zone even though yields on bonds do not indicate the danger of a crisis.

Policy function in normal times: debt



Policy function in recession: debt



With some level of commitment in tax policy, optimal fiscal policy requires some austerity — high taxes, government surpluses — to avoid debt crises.