Costly Reforms and Self-Fulfilling Crises

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On 31 January 1995, U.S. President Bill Clinton organized a 48.8 billion USD loan package for Mexico with funds from the U.S. Exchange Stabilization Fund, the International Monetary Fund, the Bank for International Settlements, and the Bank of Canada.

Bailout required Mexican government

- to pay penalty interest rates
- to pledge its oil export revenues as collateral.

Bagehot (1873): Lend freely, at penalty interest rates, and on good collateral.

During 1995 and 1996, Mexican government reduced spending and increased taxes. It borrowed less than half of the loans offered, and, as it regained access to credit markets, paid back these loans by January 1997, three years ahead of schedule.

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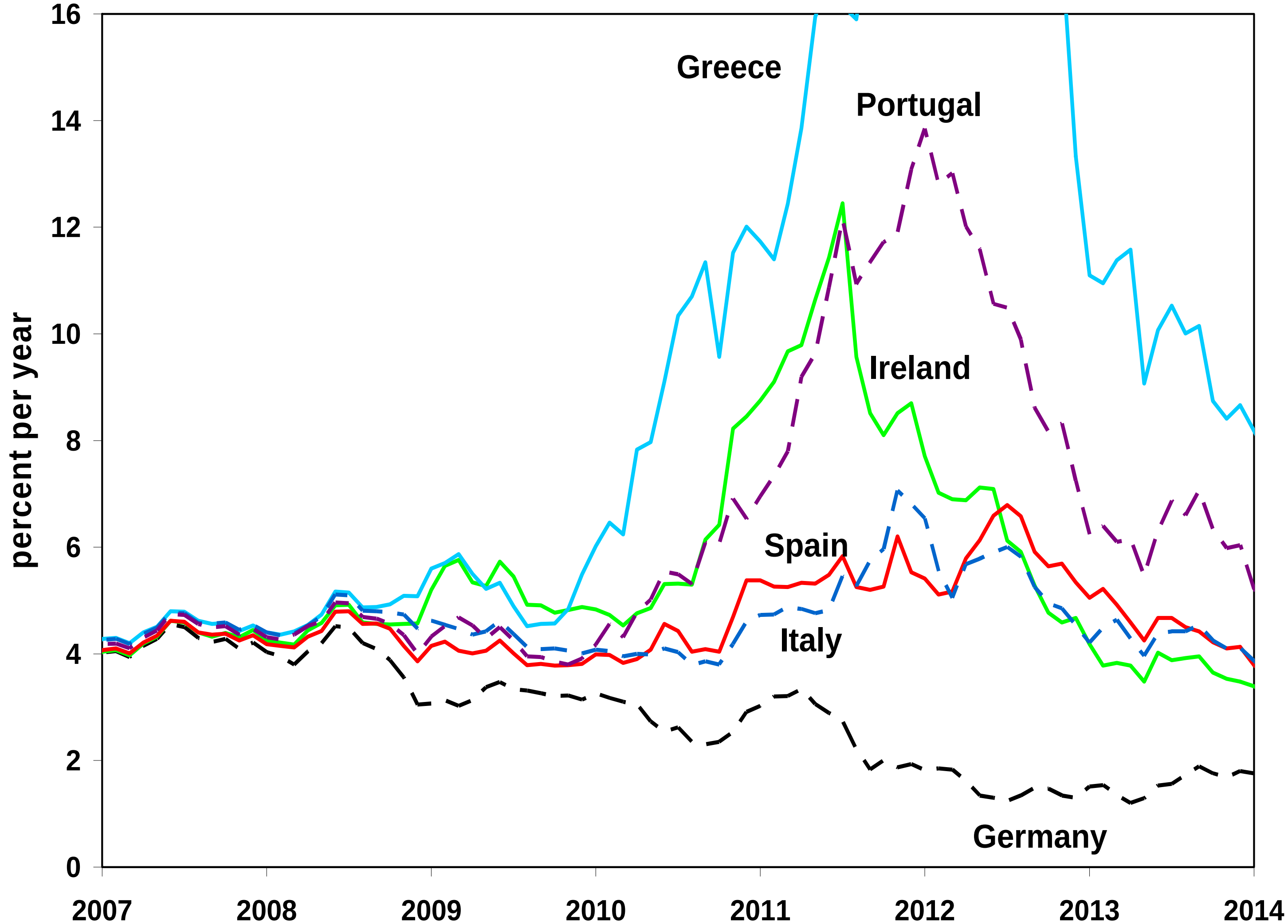
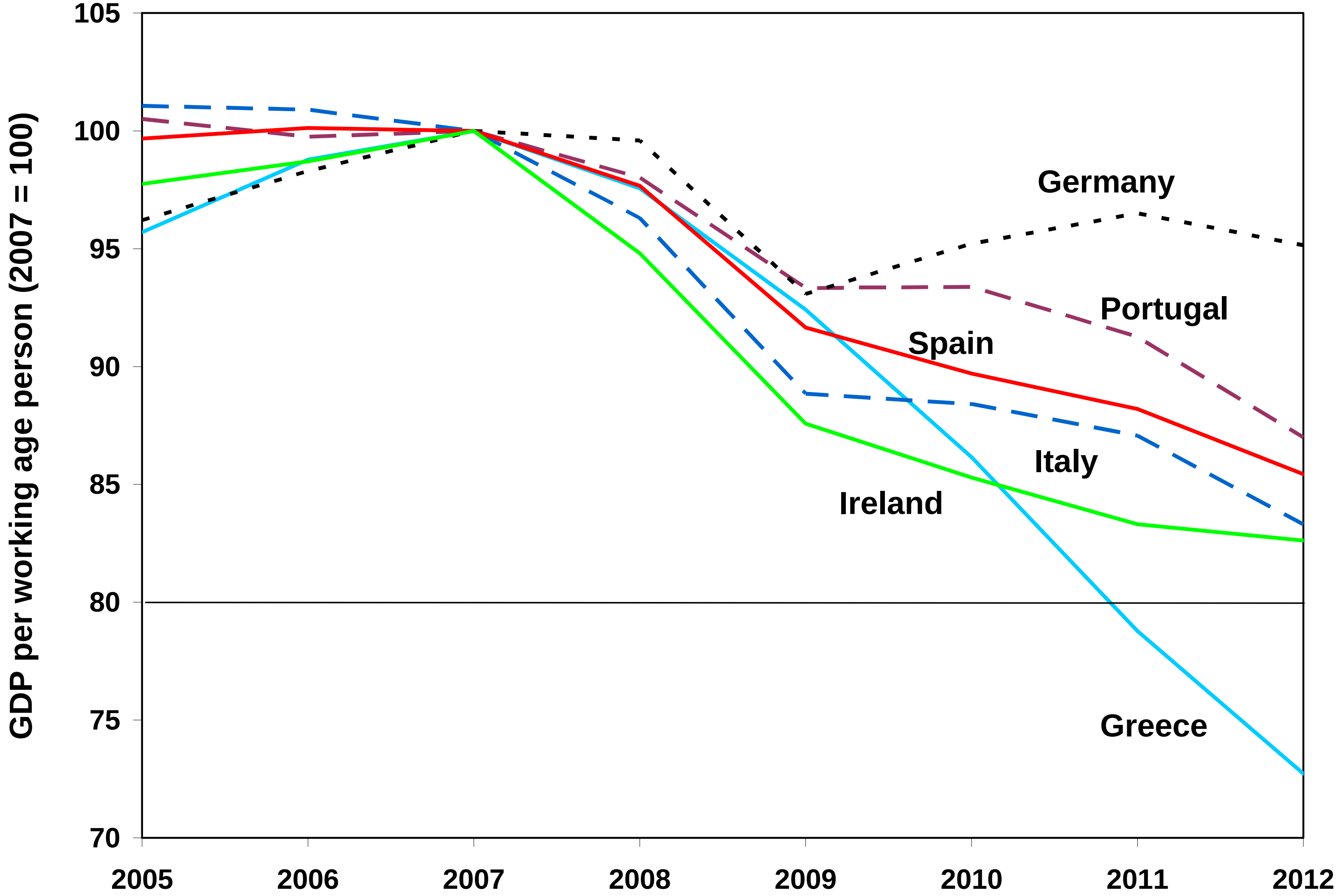
In contrast, the Eurozone debt crises, which started in 2010, are still ongoing.

Jumps in spreads on yields on bonds of PIIGS governments (over yields on German bonds)



Yields on 10-year government bonds

Greece is in a great depression, others PIIGS may be there soon



Real GDP per working-age person detrended by 2 percent per year

Data

Compared to Mexico in 1995, PIIGS have not made fiscal adjustments or structural adjustments.

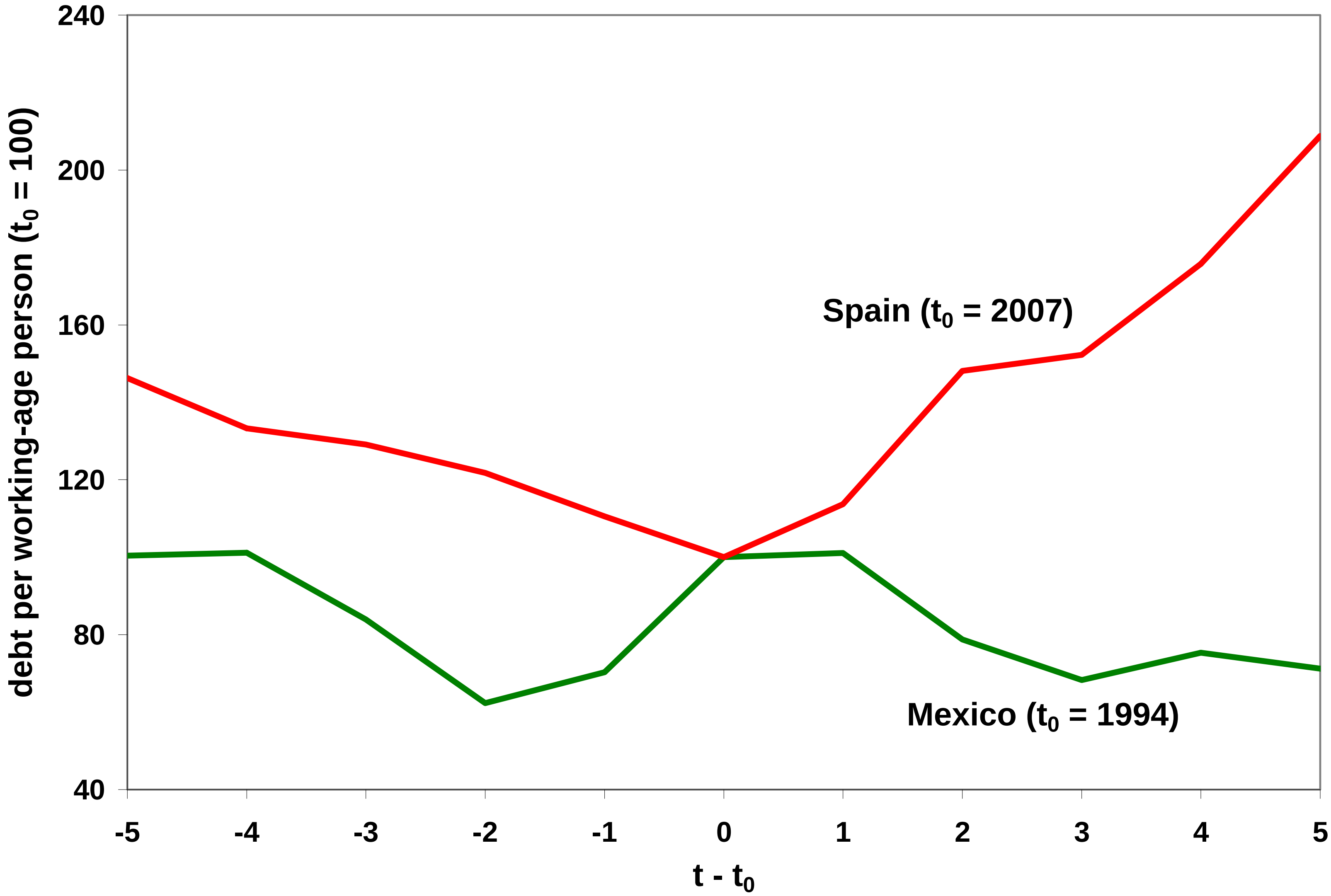
Hypothesis

Fear of losing next election prevents governments from making reforms necessary for recovery.

Study hypothesis using variants of Conesa-Kehoe (2012) model.

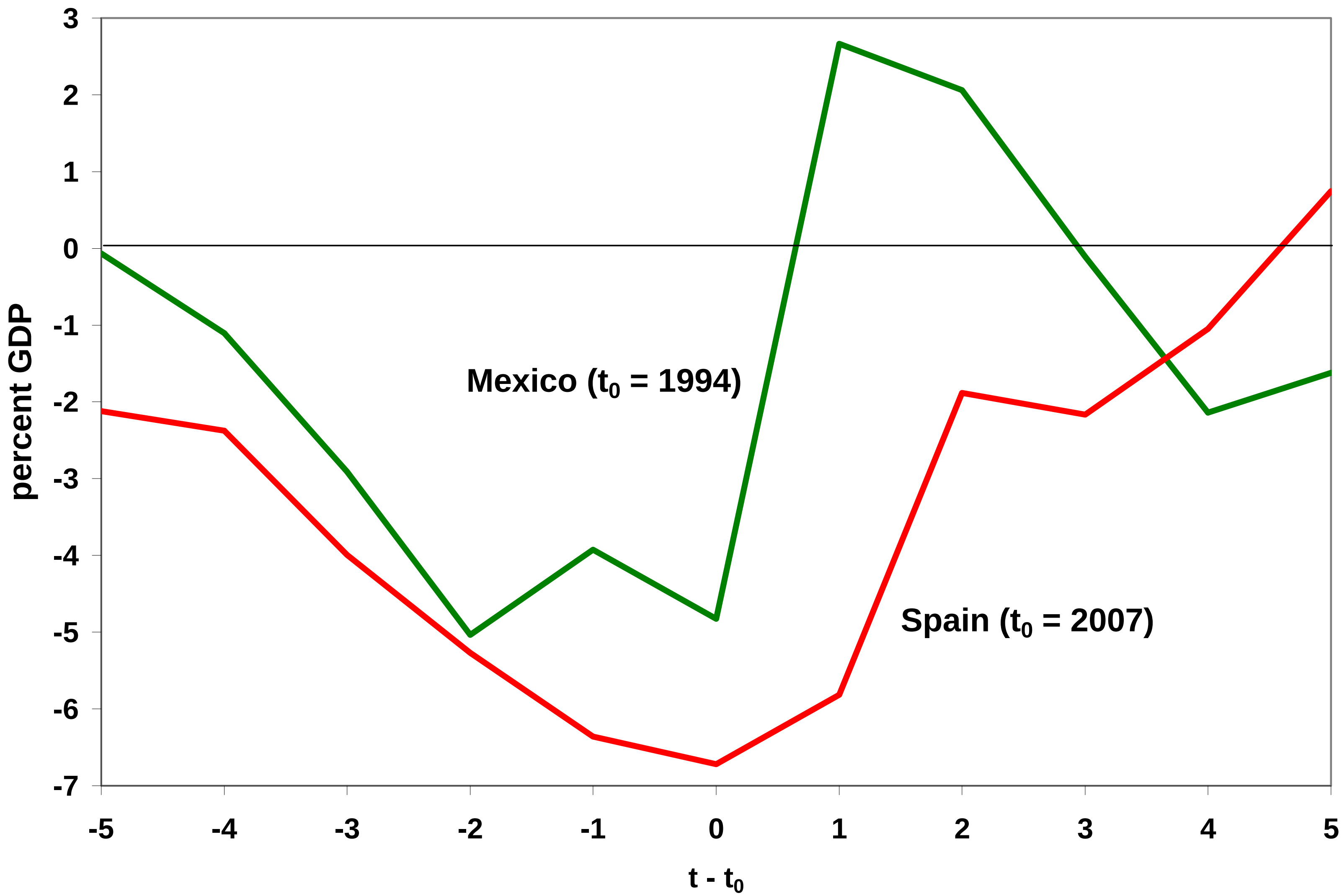
Focus on comparison between Mexico and Spain.

Debt continues to rise in Spain while it fell in Mexico



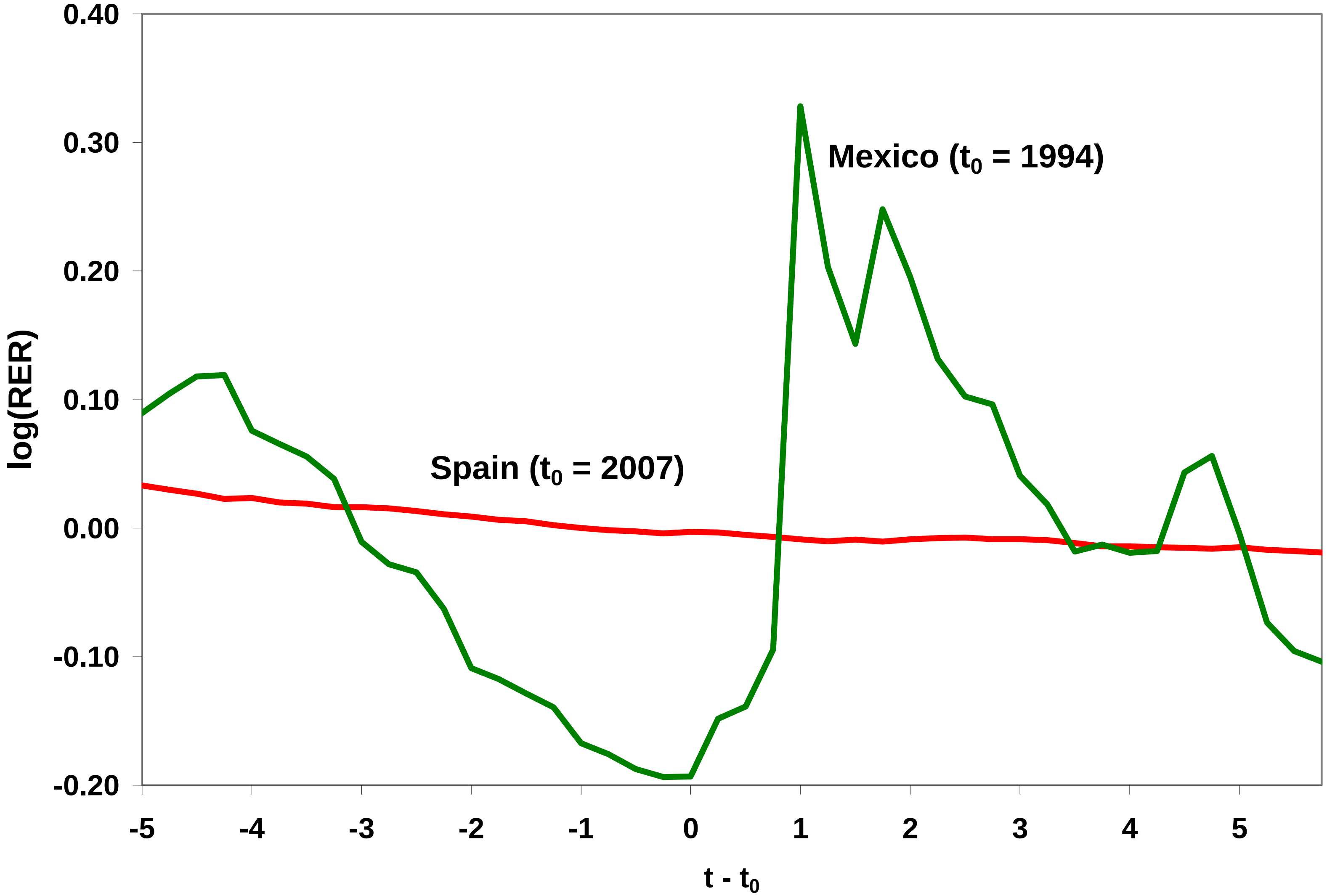
Real government debt per working age person

Reversal of trade deficit took 5 years in Spain, 1 in Mexico



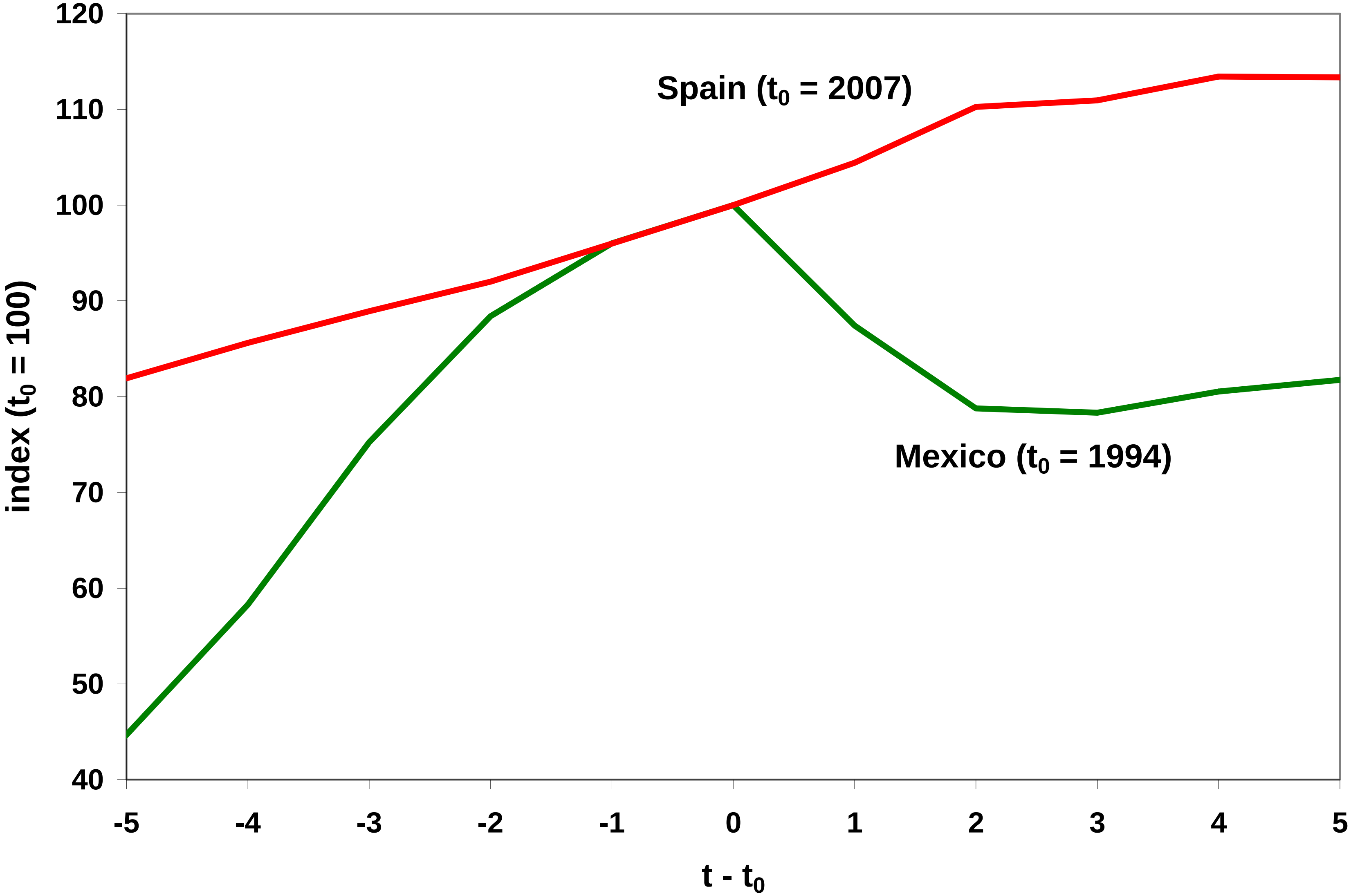
Trade balance

No adjustment of relative prices in Spain



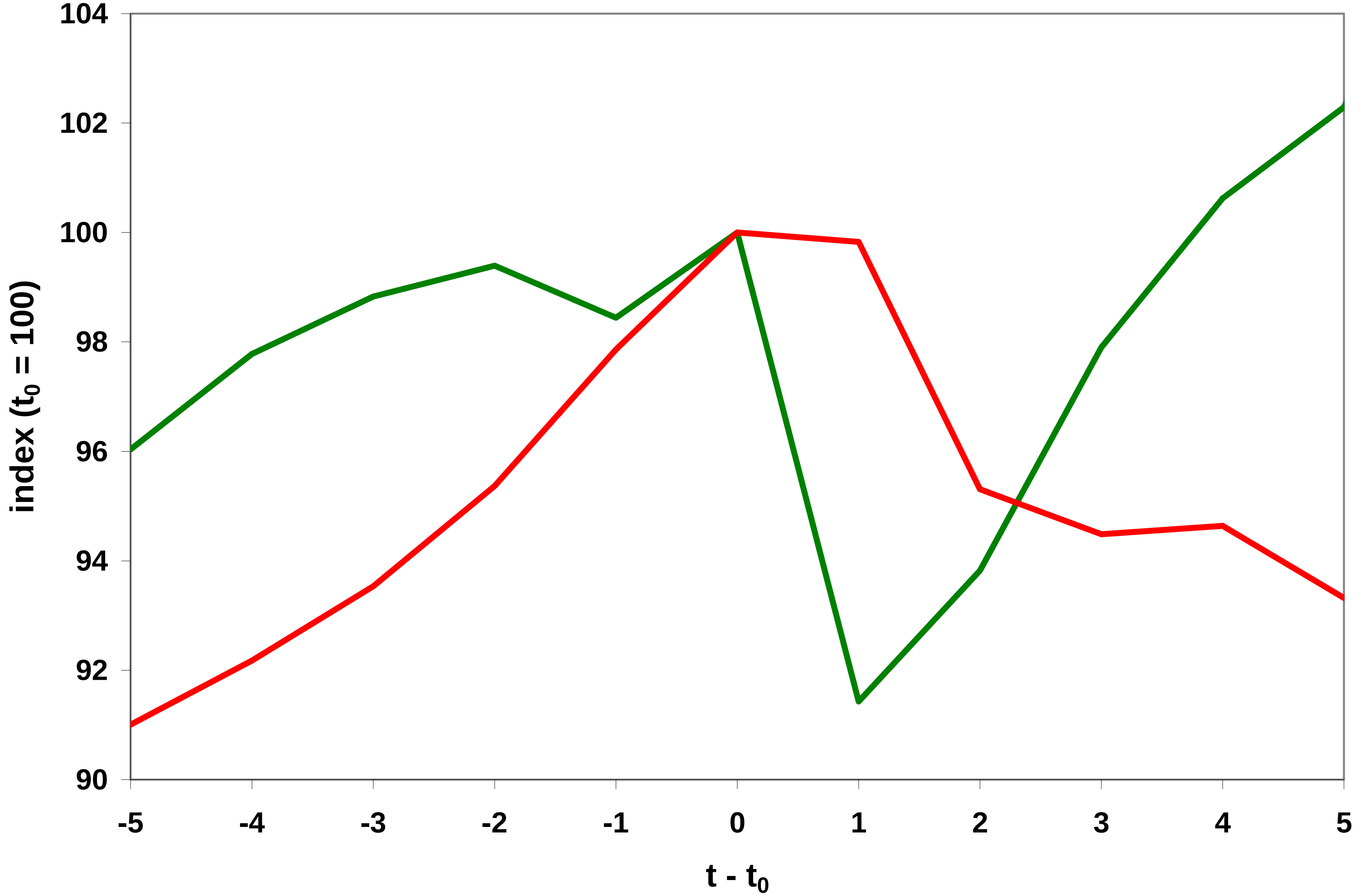
Real exchange rate

Little adjustment in real wages in Spain



Real wages

No recovery in Spain



Real GDP per working-age person

Main mechanism of our theory

Model characterizes two forces in opposite directions:

1. Run down debt (as in Cole-Kehoe)

2. Run up debt (consumption smoothing)

Which one dominates depends on parameter values and Troika policies.

Run down debt

In crisis zone run down debt if:

- Interest rates are high.
- Costs of default are high.

Run up debt

In recession run up debt if:

- Interest rates are low.
- Costs of default are low.
- Recession is severe.
- Probability of recovery is high.

Conesa-Kehoe (2012) model

Agents:

Government

International bankers, continuum [0,1]

Consumers, passive (no private capital)

Conesa-Kehoe (2012) model

State of the economy: $s=(B,a,z_{-1},\zeta)$

B: government debt

a: private sector, $a=1$ normal, $a=0$ recession

z_{-1}: previous default $z_{-1}=1$ no, $z_{-1}=0$ yes

ζ: realization of sunspot

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

$1>A>0$, $1>Z>0$ parameters.

Model with no recovery (Cole-Kehoe 1996, 2000)

State of the economy: $s = (B, 1, z_{-1}, \zeta)$

B: government debt

z_{-1}: previous default $z_{-1} = 1$ no, $z_{-1} = 0$ yes

ζ: realization of sunspot

GDP: $y(1, z) = Z^{1-z}\bar{y}$

$1 > Z > 0$ parameter.

Model without crises

State of the economy: $s = (B, a, 1, \cdot)$

B: government debt

a: private sector, $a = 1$ normal, $a = 0$ recession

GDP: $y(a,1) = A^{1-a}\overline{y}$

$1 > A > 0$ parameter.

General model

Before period 0, $a=1$, $z=1$.

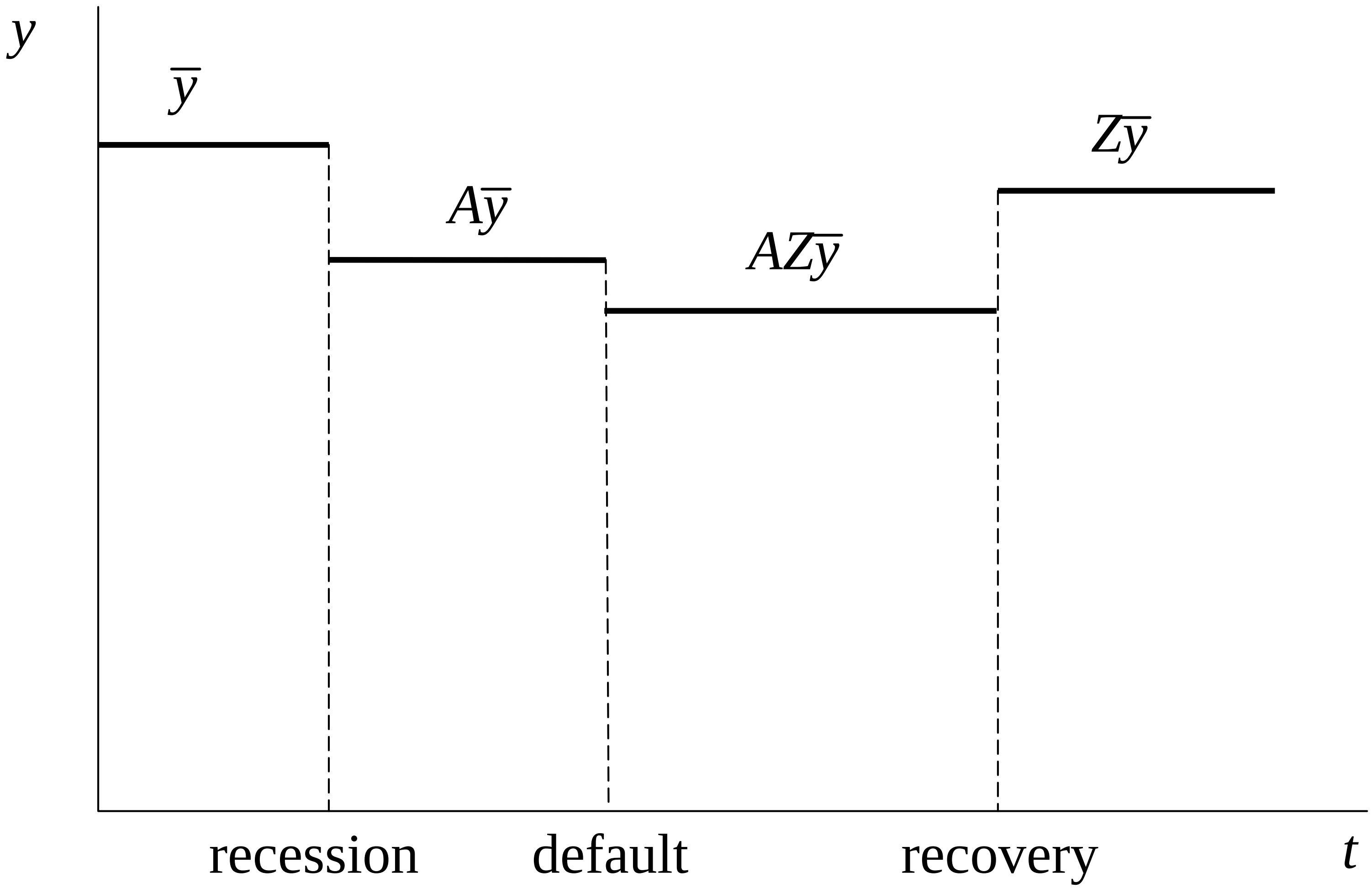
In $t=0$, $a_0=0$ unexpectedly, GDP drops from $\bar{y}$ to $A\bar{y}<\bar{y}$.

In $t=1,2,...,$ a_t becomes 1 with probability p.

$1-A$ is severity of recession. Once $a_t=1$, it is 1 forever.

$1-Z$ is default penalty. Once $z_t=0$, it is 0 forever.

A possible time path for GDP



Sunspot

Coordination device for international bankers' expectations.

$\zeta_t \sim U[0,1]$

B_t outside crisis zone: if ζ_t is irrelevant

B_t inside crisis zone: if $\zeta_t \geq 1-\pi$ bankers expect a crisis (π arbitrary)

Government's budget constraint

Government tax revenue is $\theta y(a,z)$, tax rate θ is fixed.

$$g + zB = \theta y(a,z) + q(B',s)B'$$

Consumers

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

International bankers

Continuum [0,1] of risk-neutral agents with deep pockets

First order condition and perfect foresight condition:

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

bond price = risk-free price × probability of repayment

Government's problem

Choose c, g, B', z to solve:

$$V(s) = \max \; u(c,g) + \beta EV(s')$$

$$\text{s.t. } c = (1-\theta) y(a,z)$$

$$g + zB = \theta y(a,z) + q(B',s)B'$$

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

Characterization of government's optimal debt policy

Four cutoff levels of debt: $\bar{b}(a)$, $\bar{B}(a)$, $a = 0,1$:

- If $B \leq \bar{b}(a)$, repay
- If $\bar{b}(a) < B \leq \bar{B}(a)$, default if $\zeta > 1 - \pi$
- If $B > \bar{B}(a)$, default

Most interesting case:

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

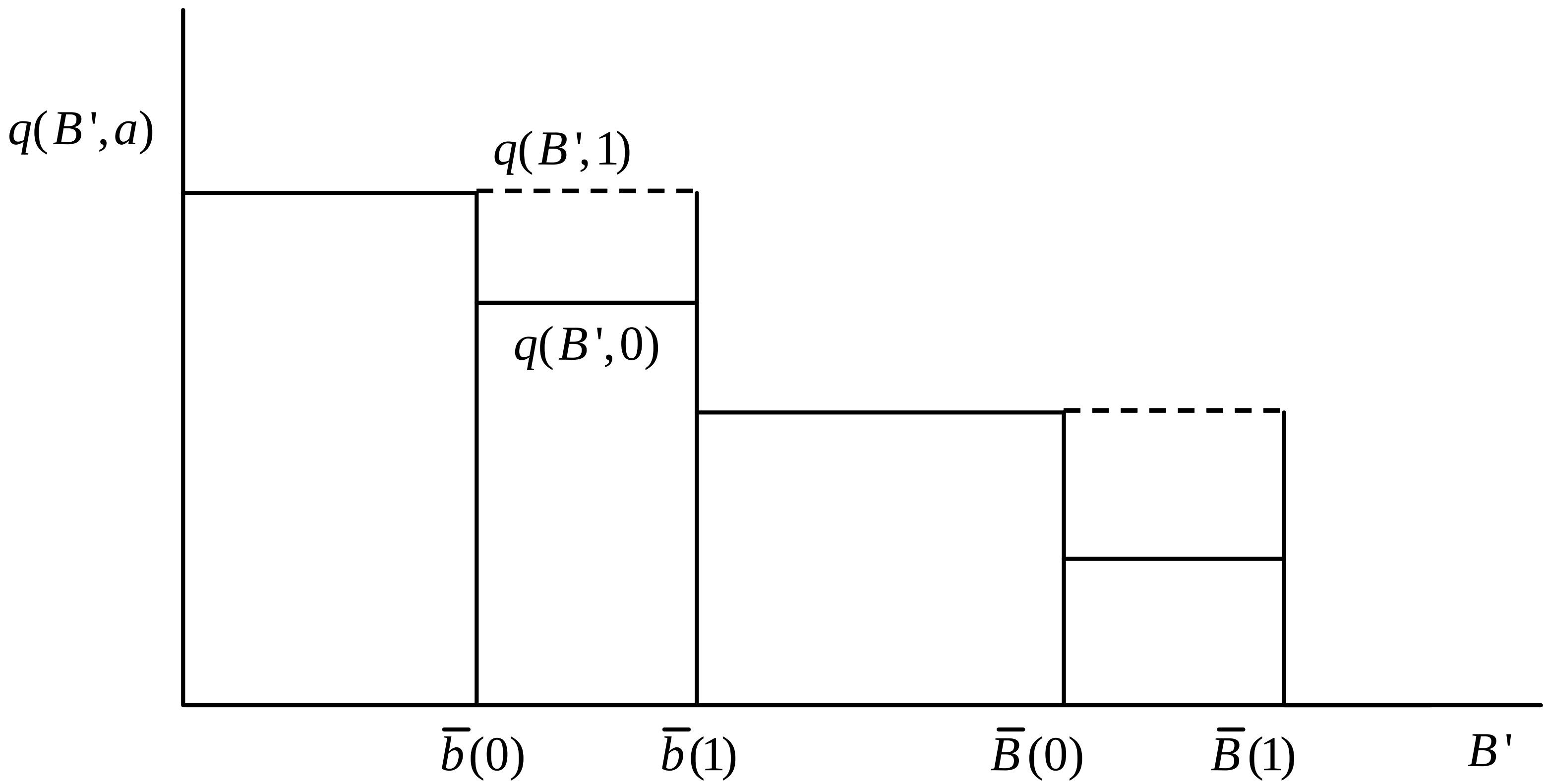
In normal times (as in Cole-Kehoe):

$$q(B',(B,1,1,\zeta)) = \begin{cases} \beta & \text{if } B' \le \bar{b}(1) \\ \beta(1-\pi) & \text{if } \bar{b}(1) < B' \le \bar{B}(1) \\ 0 & \text{if } \bar{B}(1) < B' \end{cases}$$

In a recession:

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

Bond prices as function of debt and a



Optimal debt policy via numerical experiments

$V(s)$ has kinks and $B'(s)$ is discontinuous because of discontinuity of $q(B',s)$.

$V(s)$ is discontinuous because government cannot commit not to default.

.

Maturity of debt in 2011

	Weighted average years until maturity
Germany	6.4
Greece	15.4
Ireland	4.5
Italy	6.5
Portugal	5.1
Spain	5.9

Think of results in terms of debt needing refinancing every year — say one-sixth, as in Spain.

Model with multi period bonds

The government's problem is to choose c, g, B', z to solve

$$V(s) = \max \quad u(c,g) + \beta EV(s')$$

$$\text{s.t. } c = (1-\theta)y(a,z)$$

$$g + z\delta B = \theta y(a,z) + q(B',s)\left(B' - (1-\delta)B\right)$$

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

Here $\delta \in [0,1]$ is the fraction of the stock of debt due every period.

Debt is memoryless, as in Hatchondo-Martinez (2010), Chaterjee-Eyigungor (2011).

Prices are also adjusted

In the case where $\bar{b}(0) < \bar{b}(1) < \bar{B}(0) < \bar{B}(1)$:

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

where $Eq' = Eq(B'(B',s),s')$.

In some experiments, we modify Conesa-Kehoe (2012) model so that government is less patient than consumers and international bankers

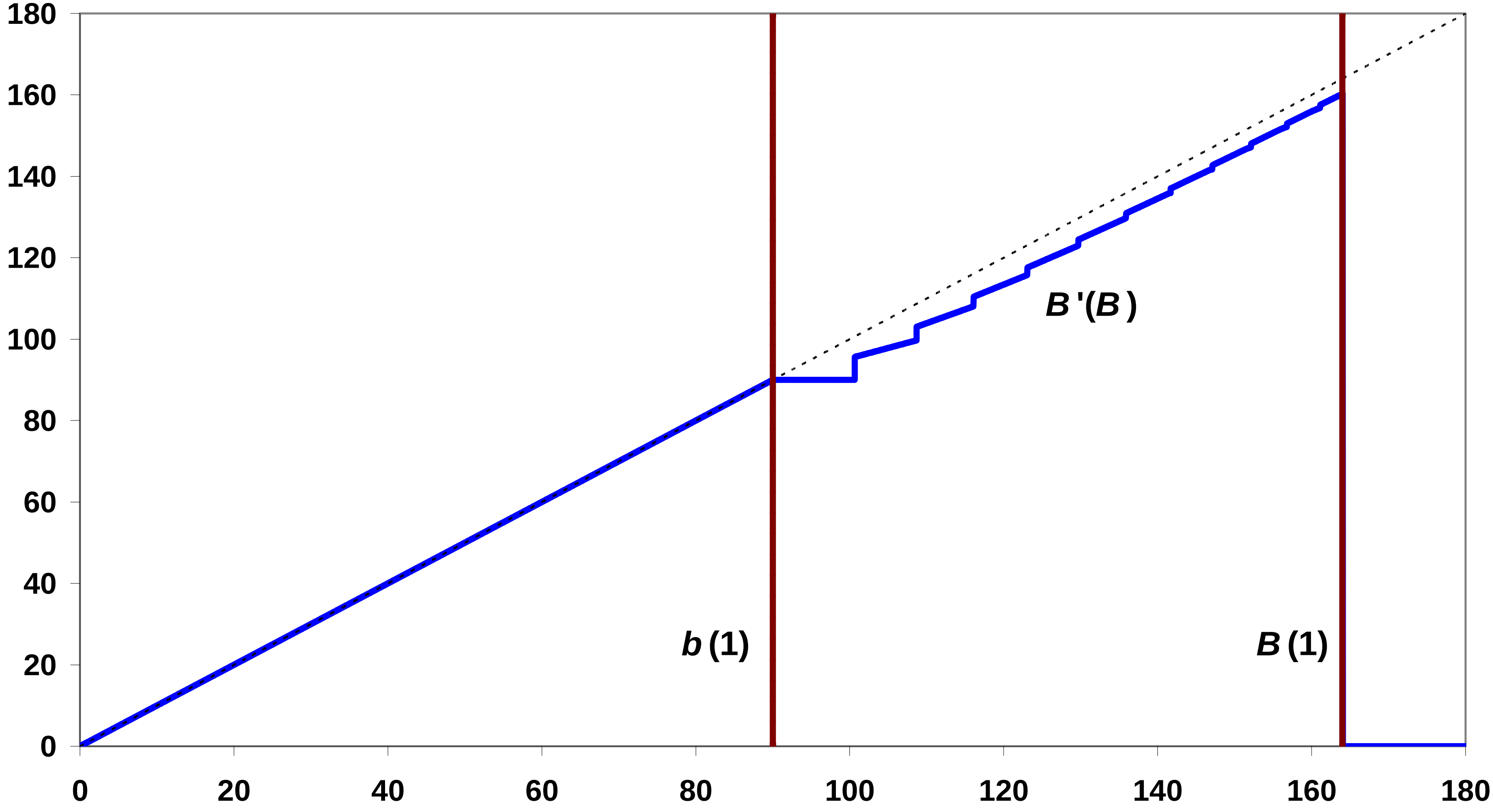
$$\beta_g < \beta_p$$

Quantitative analysis in a numerical model

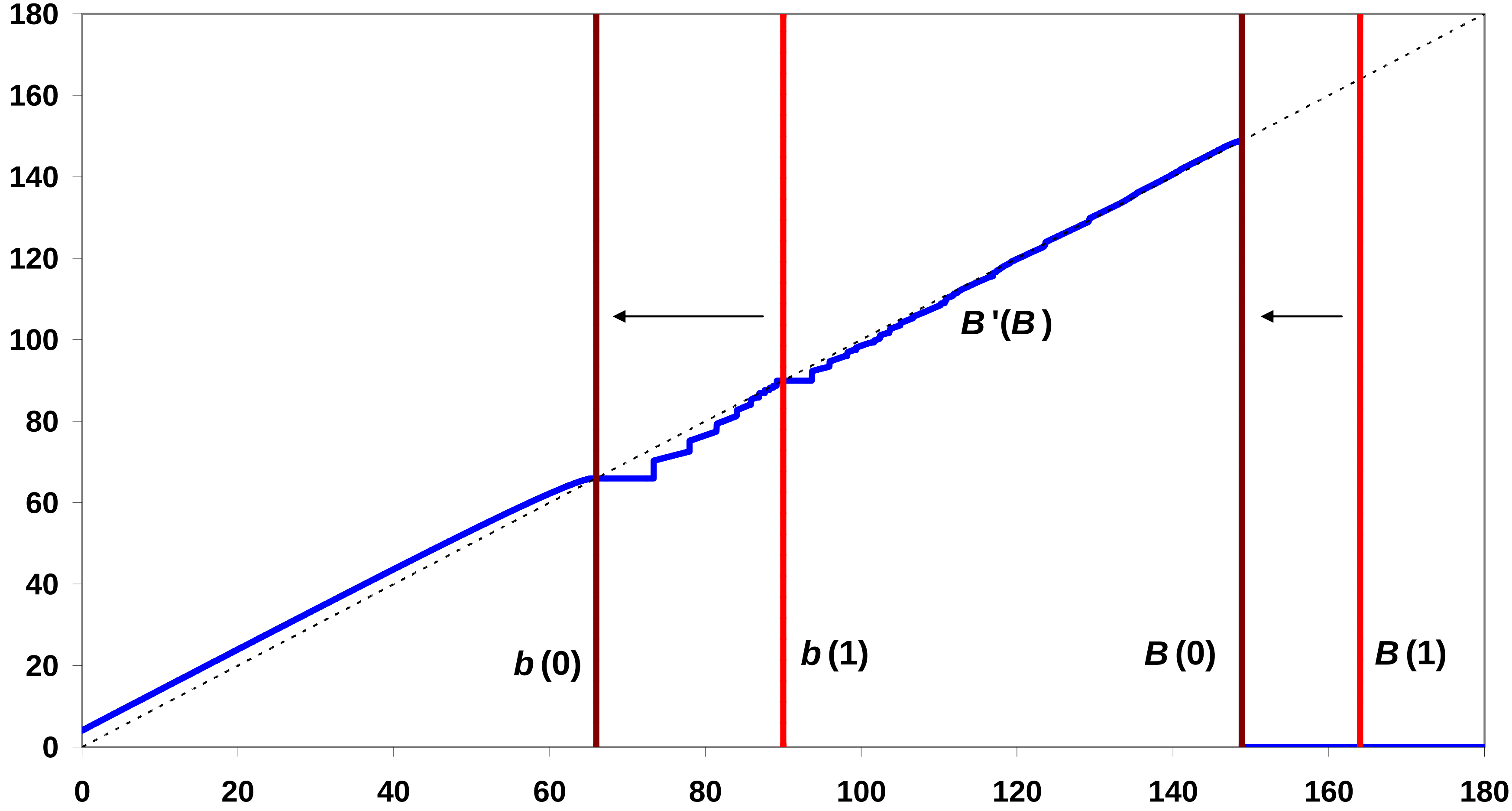
$$u(c, g) = \log c + \gamma \log(g - \bar{g})$$

Parameter	Value
A	0.90
Z	0.95
p	0.20
$\beta_p = \beta_g$	0.96
π	0.03
γ	0.25
θ	0.40
$\bar{y}$	100
$\bar{g}$	28
δ	0.17

Results: The benchmark economy in normal times



Then, a recession hits…



Do governments gamble for bailouts?

Fourth actor: Troika (European Commission, ECB, IMF)

π_b: probability of a bailout in event of a crisis

π_d: probability of a default in event of a crisis, $\pi_b + \pi_d = 1$

Country's GDP is

$$y(a, z_b, z_d) = A^{1-a} Z_b^{1-z_b} Z_d^{1-z_d} \bar{y},$$

where $1 > Z_b > Z_d > 0$.

Troika buys bonds during the bailout at price $q_b \leq \beta$ until $B \leq \bar{b}(a)$.

Suppose that $q_b = 0.90$.

Before the recession, 2008, the crisis zone is

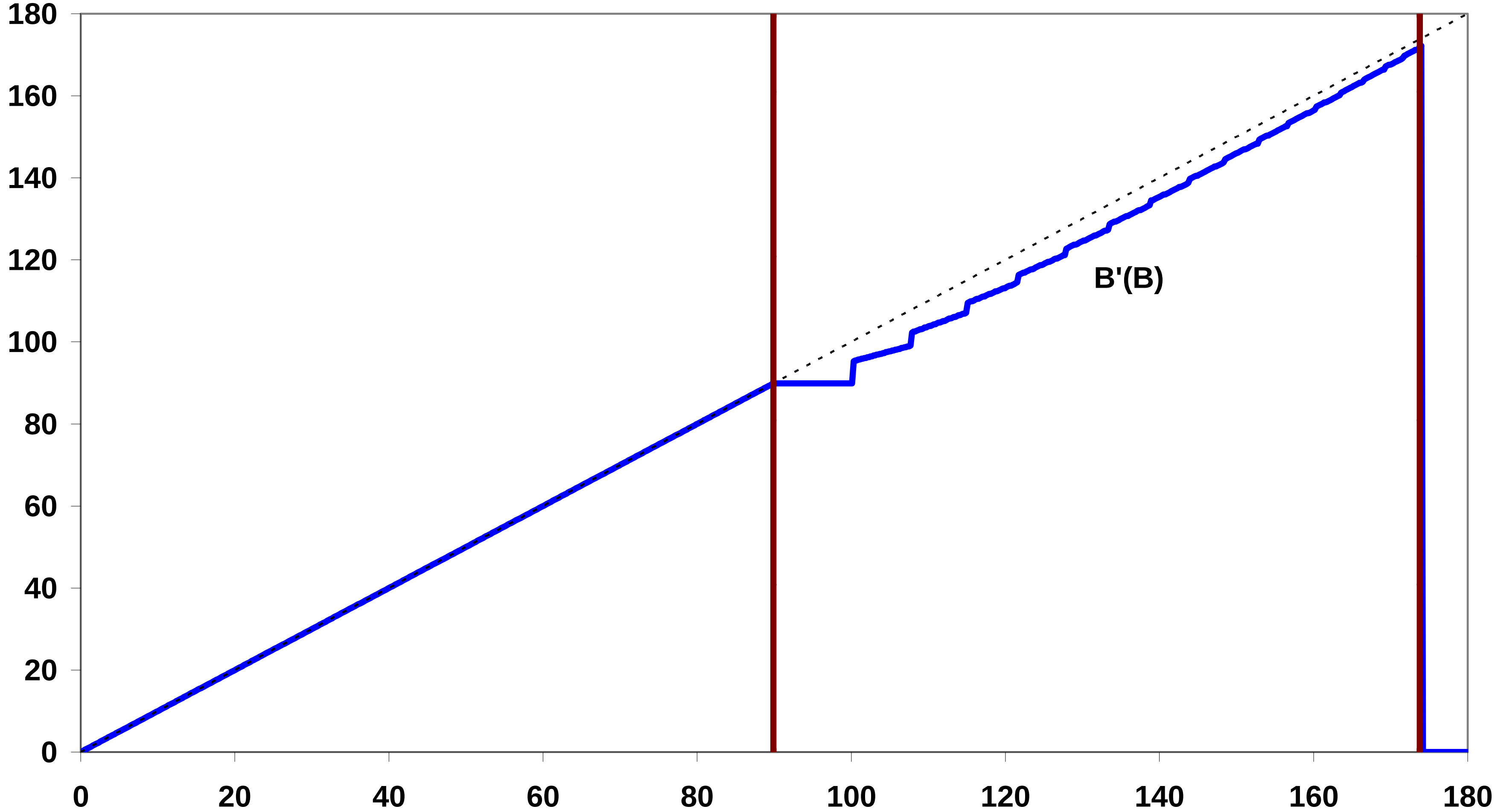
$$\bar{b}(100) = 90.0 < B \leq \bar{B}(100, 0.931) = 173.9.$$

Here, $q = \beta(1-\pi) = 0.931$.

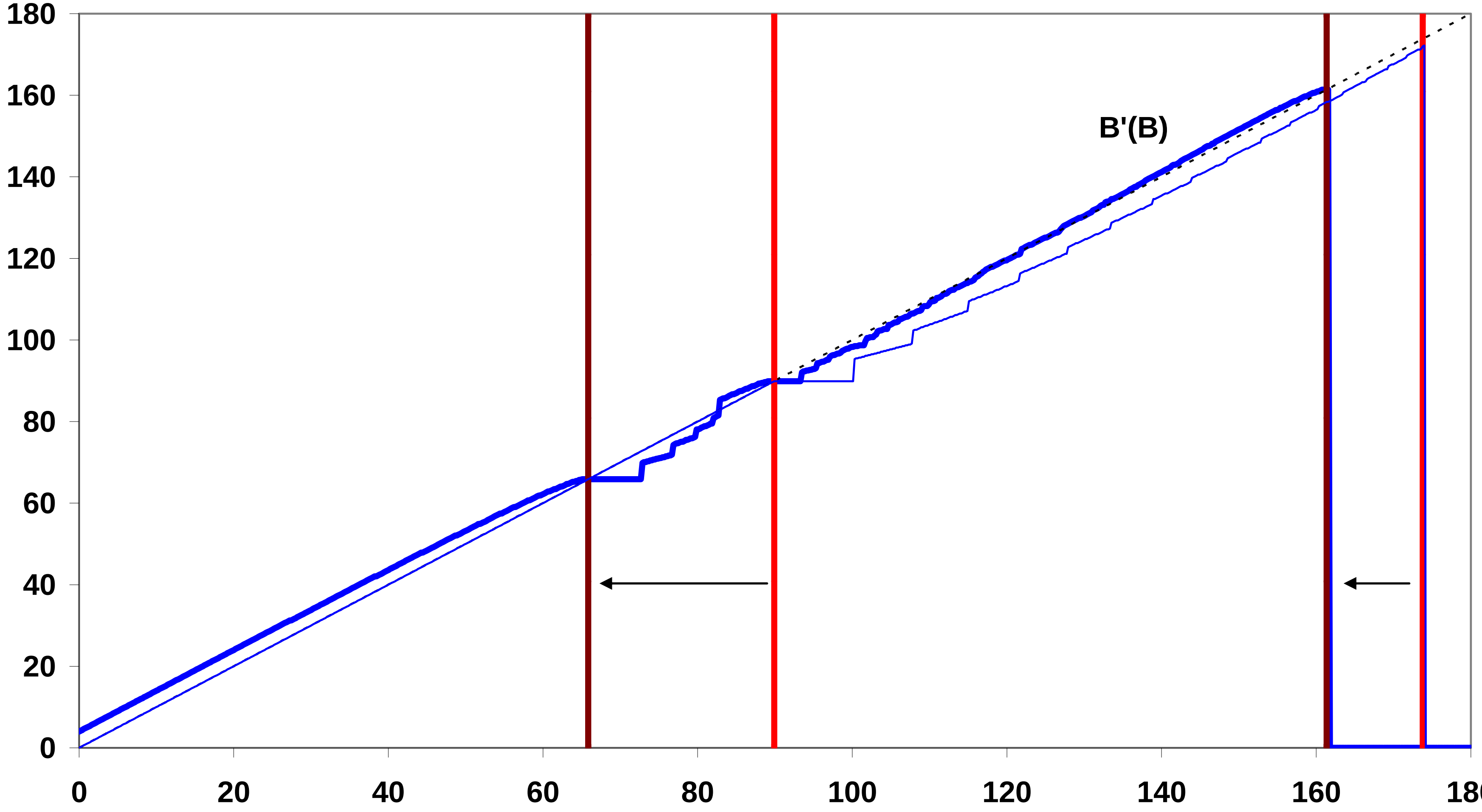
After recession hits unexpectedly in 2008, the crisis zone drops to

$$\bar{b}(90) = 66.0 < B \leq \bar{B}(90, 0.931) = 161.4.$$

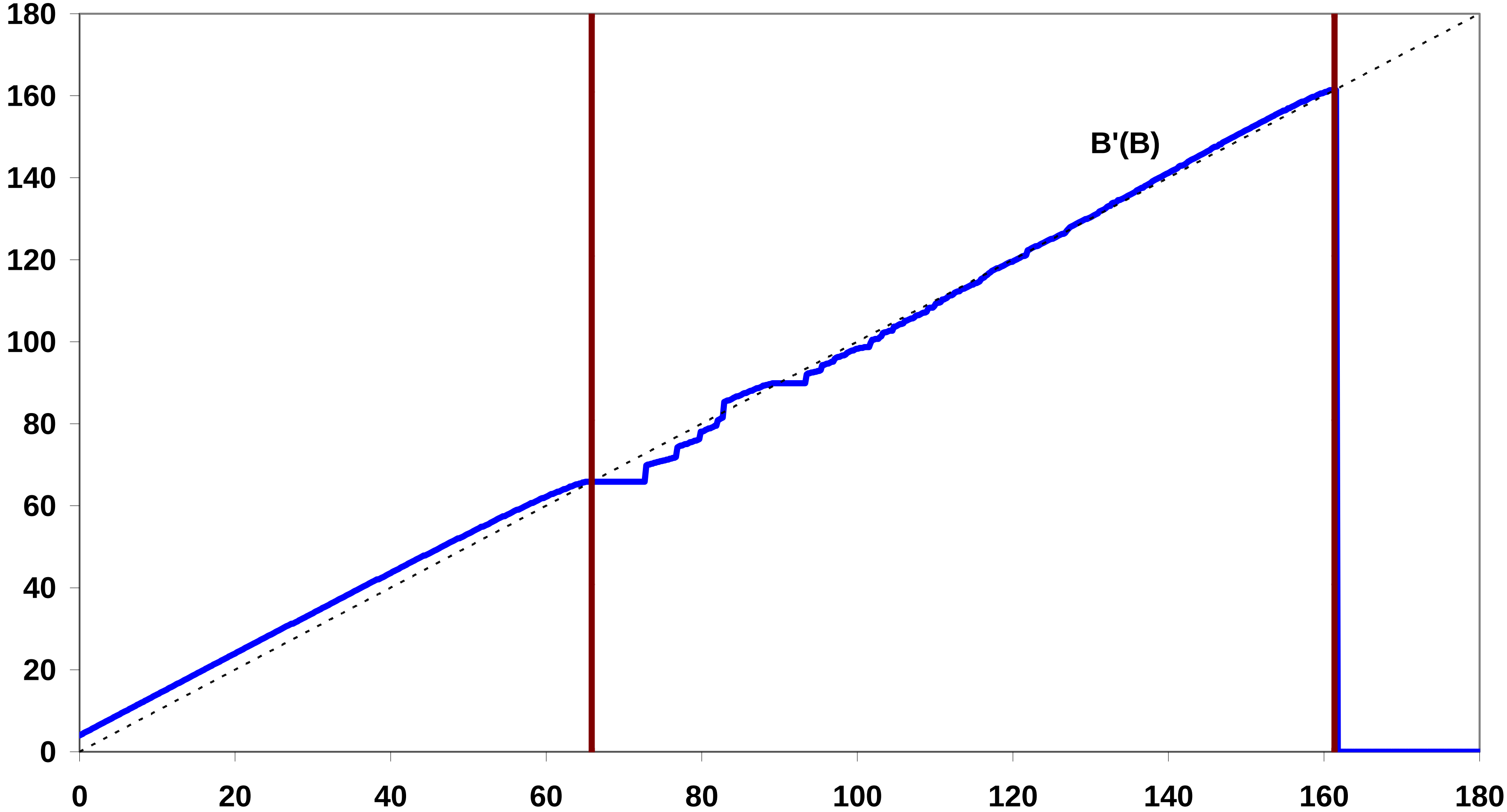
In normal times, the government runs down its debt in the crisis zone.



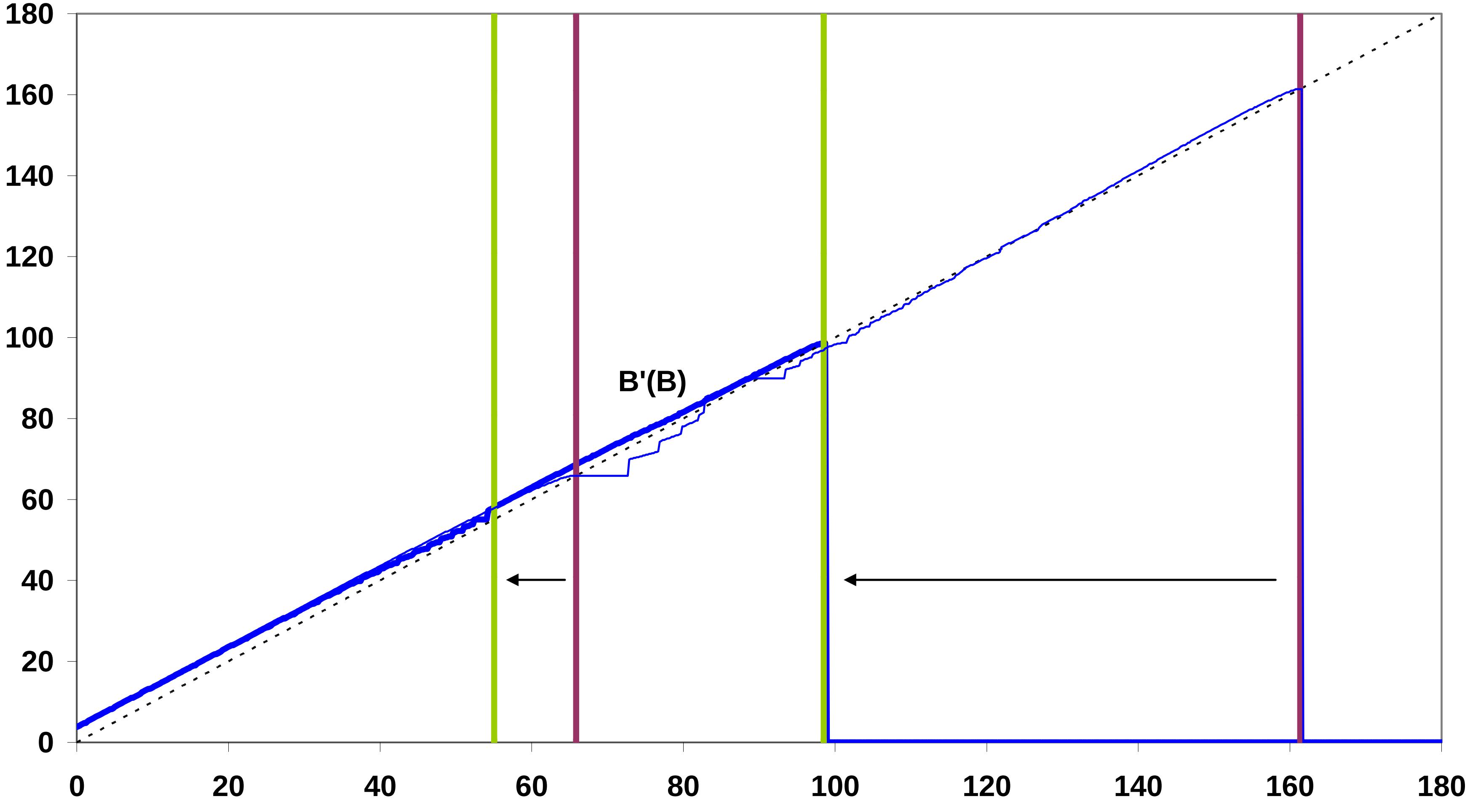
Then a recession hits,



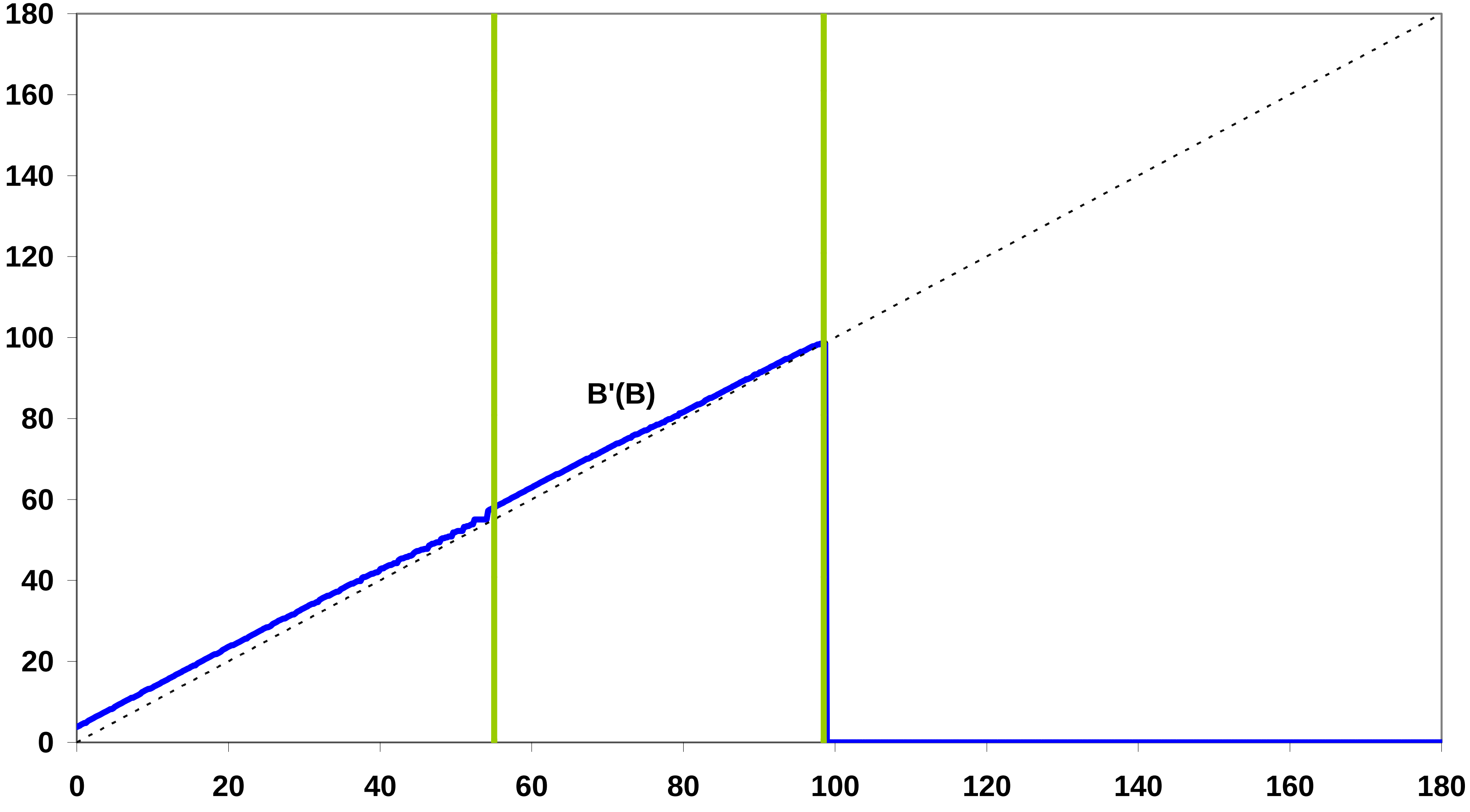
…and the government gambles for redemption if debt is high.



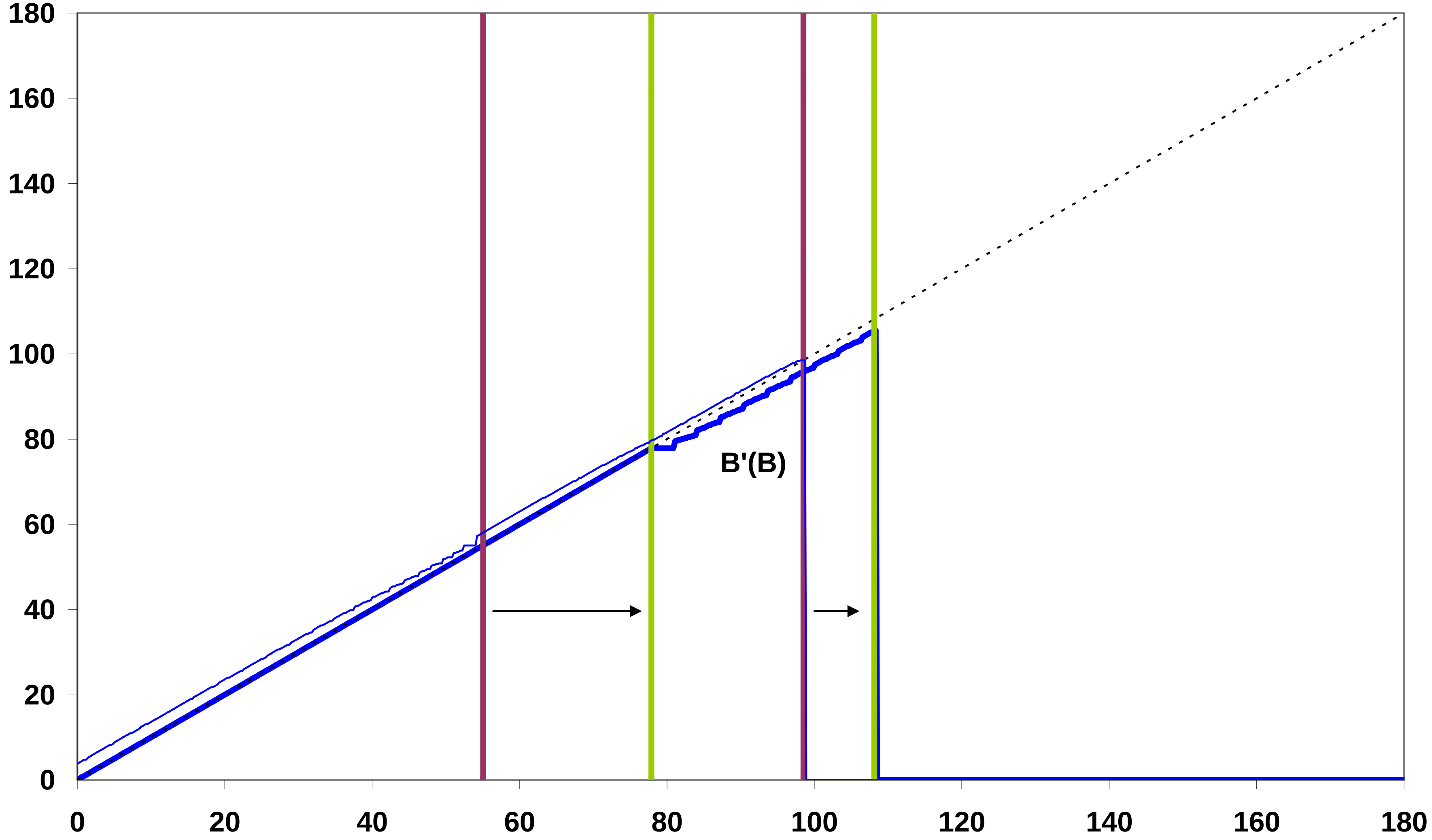
If the Troika offers a bailout during a crises,



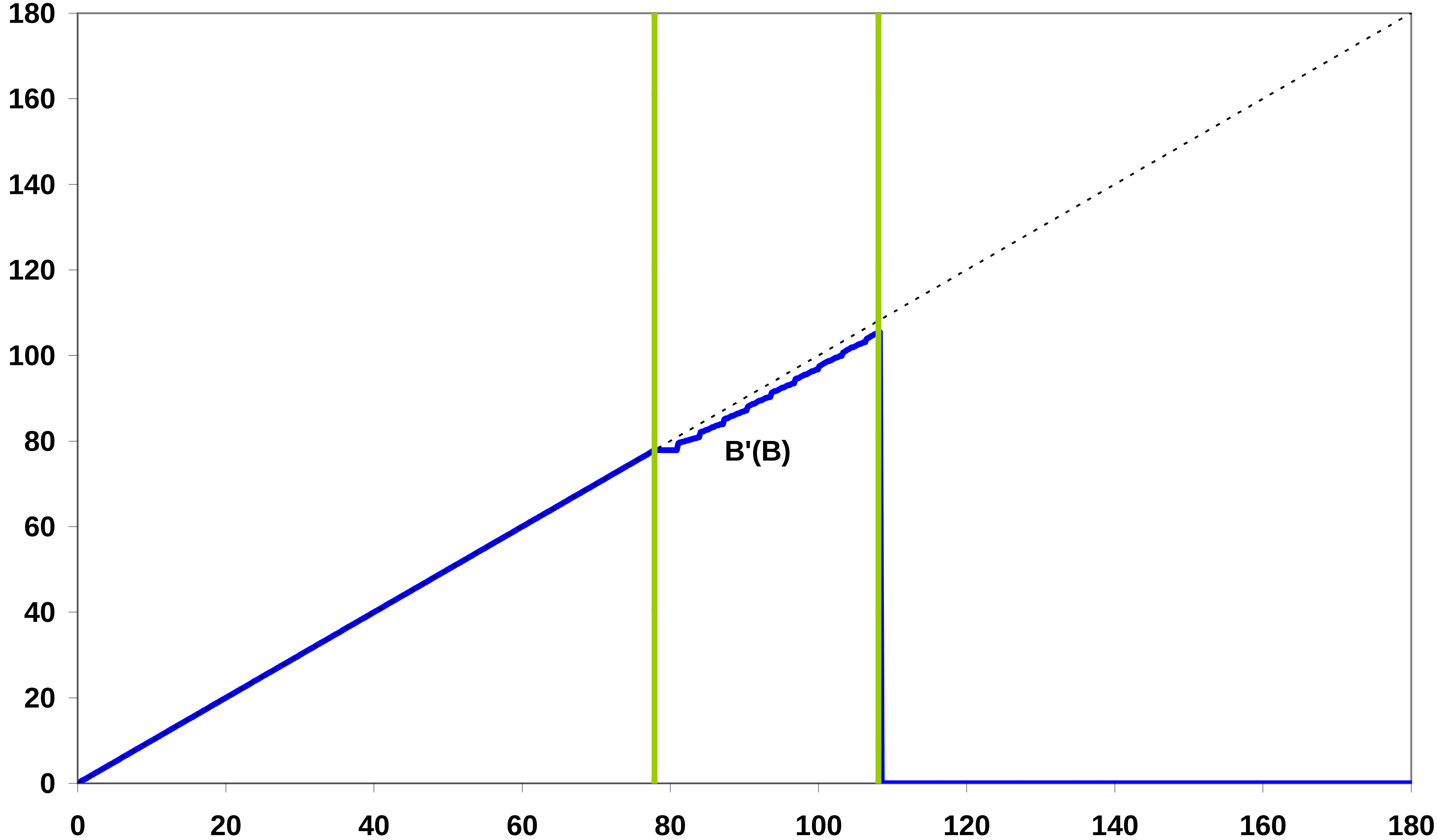
…the government continues to gamble for redemption, or it defaults.



When the recession ends,

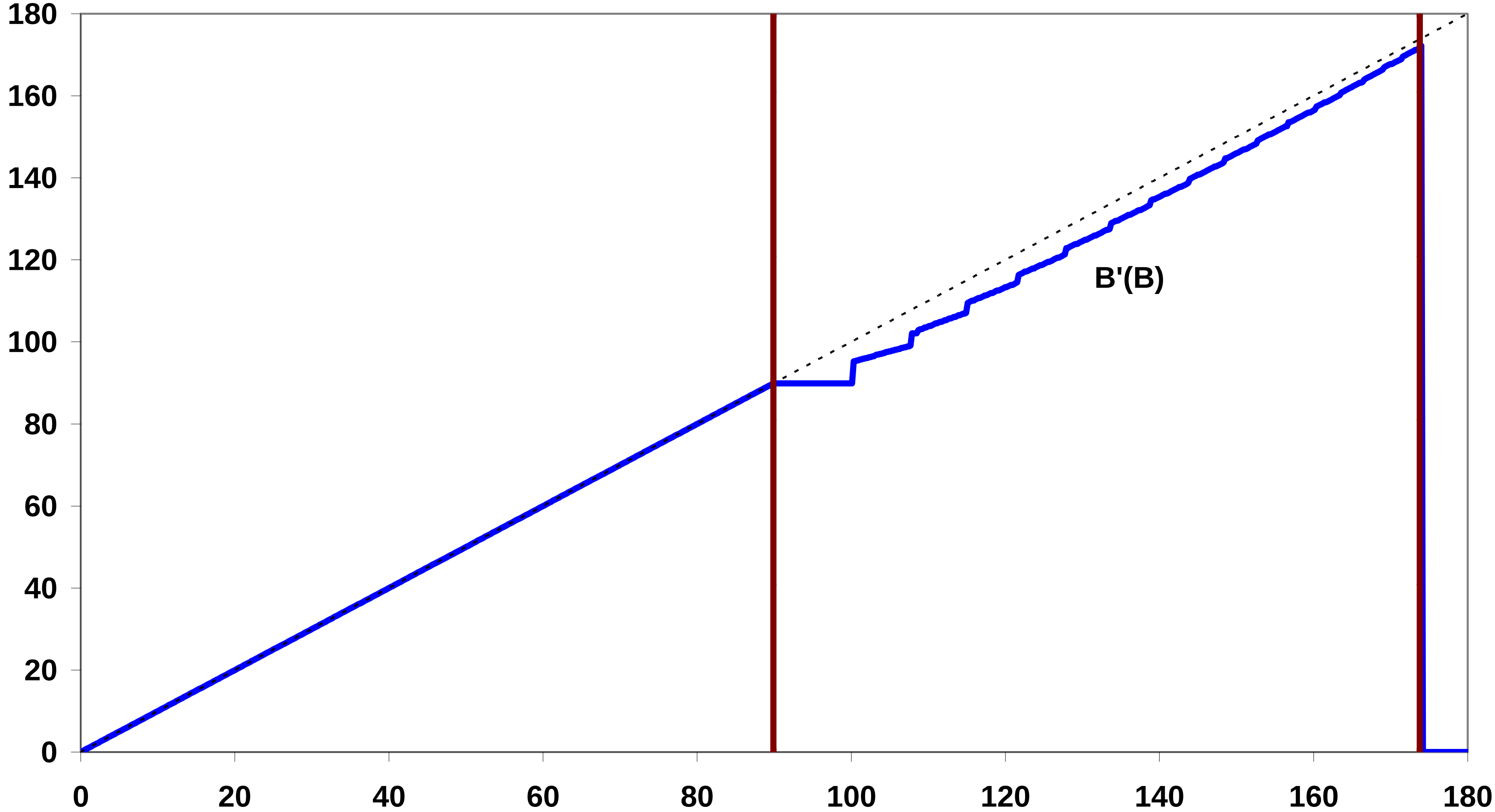


…the government runs down its debt if it is in the crisis zone.



Suppose that $q_b = 0.85$.

In normal times, the government runs down its debt in the crisis zone.



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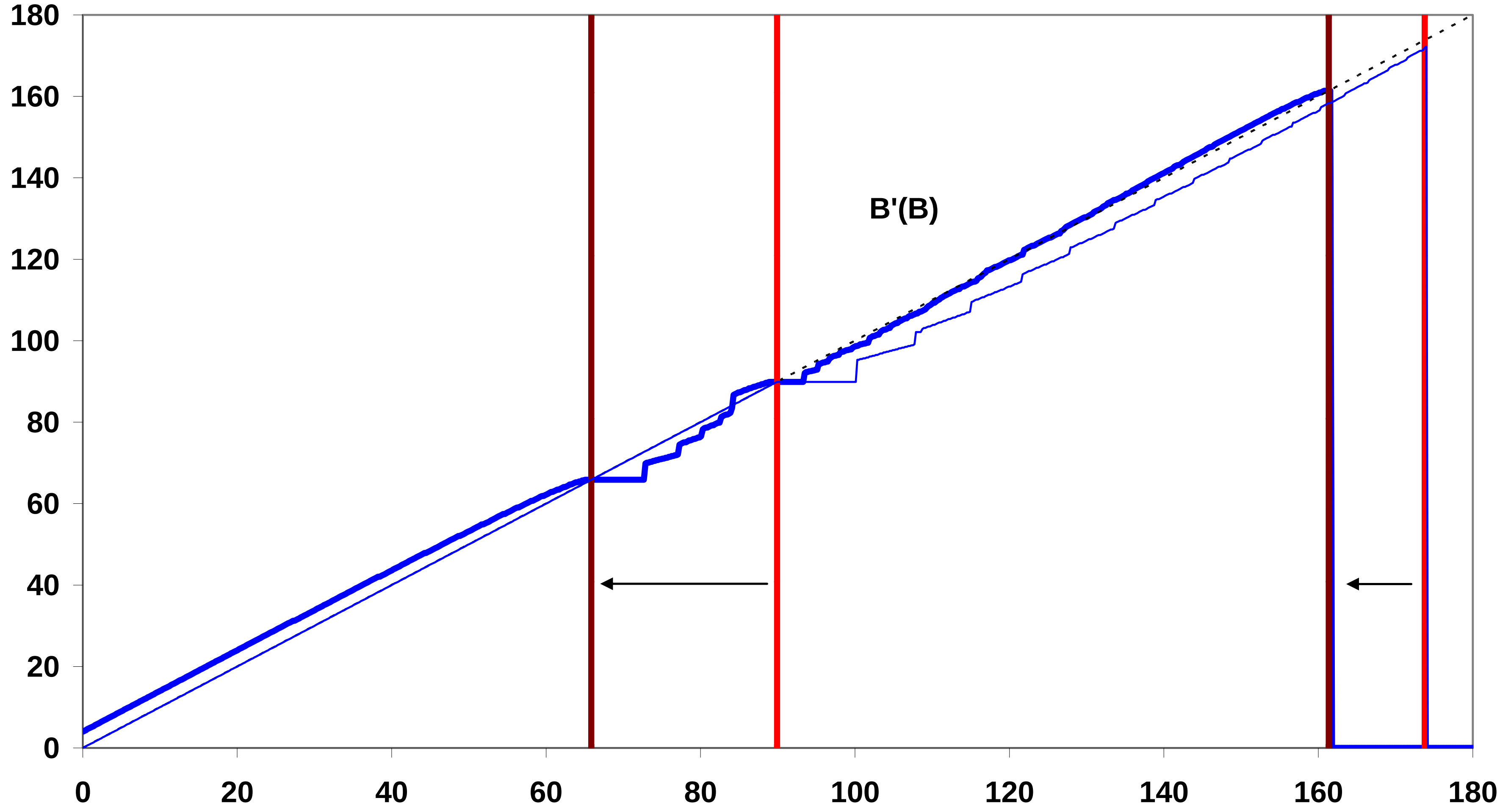
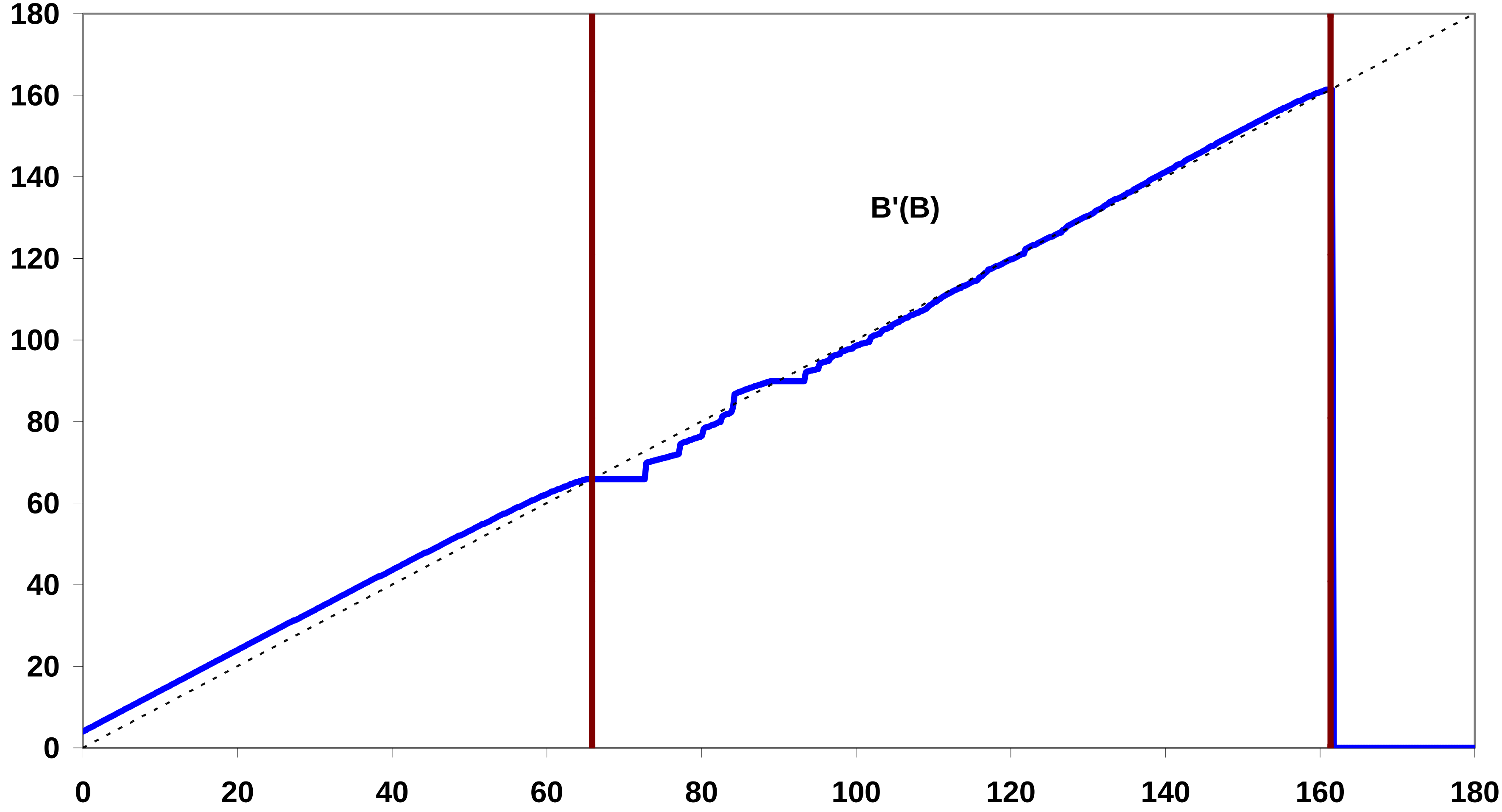
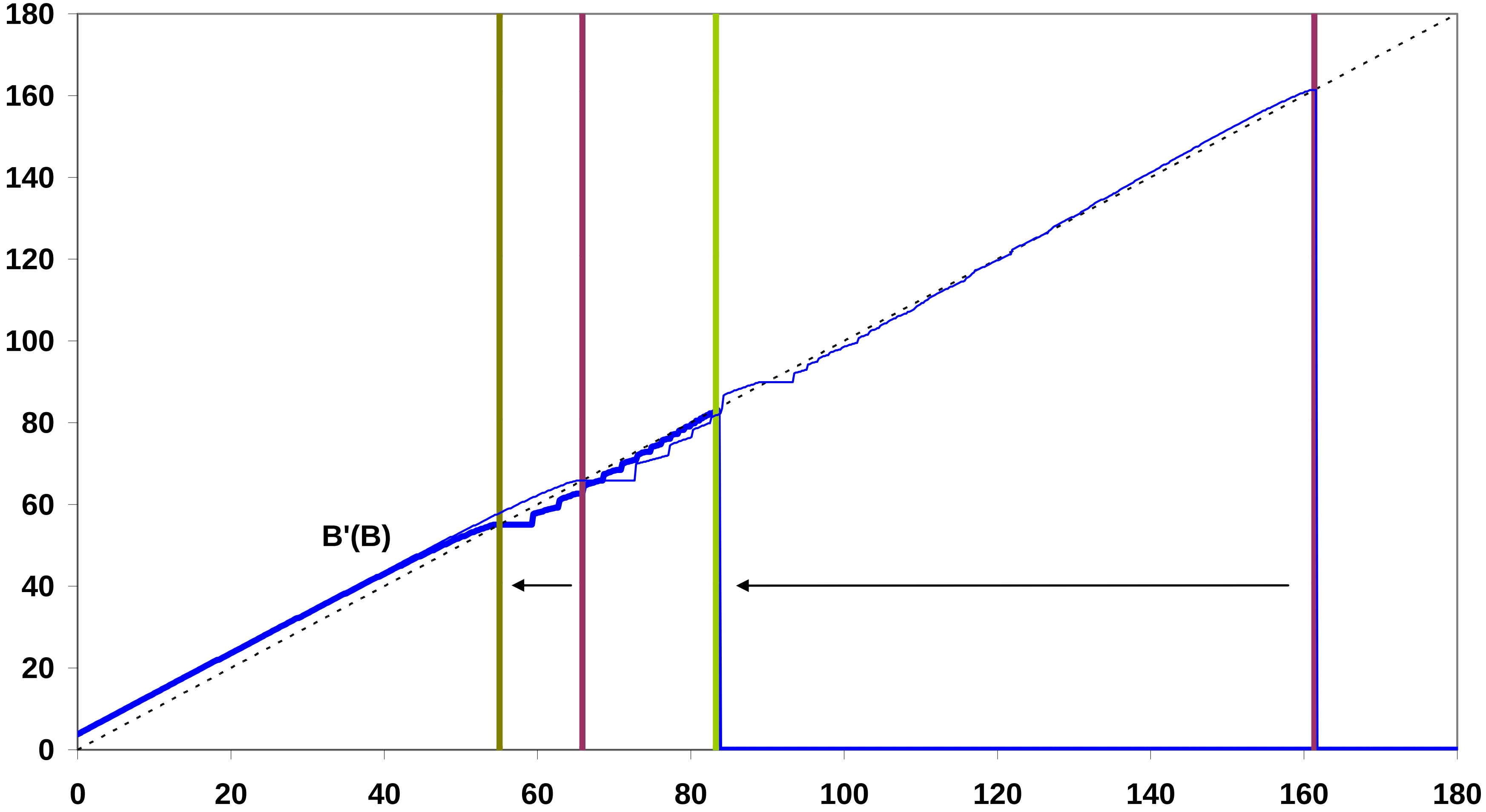


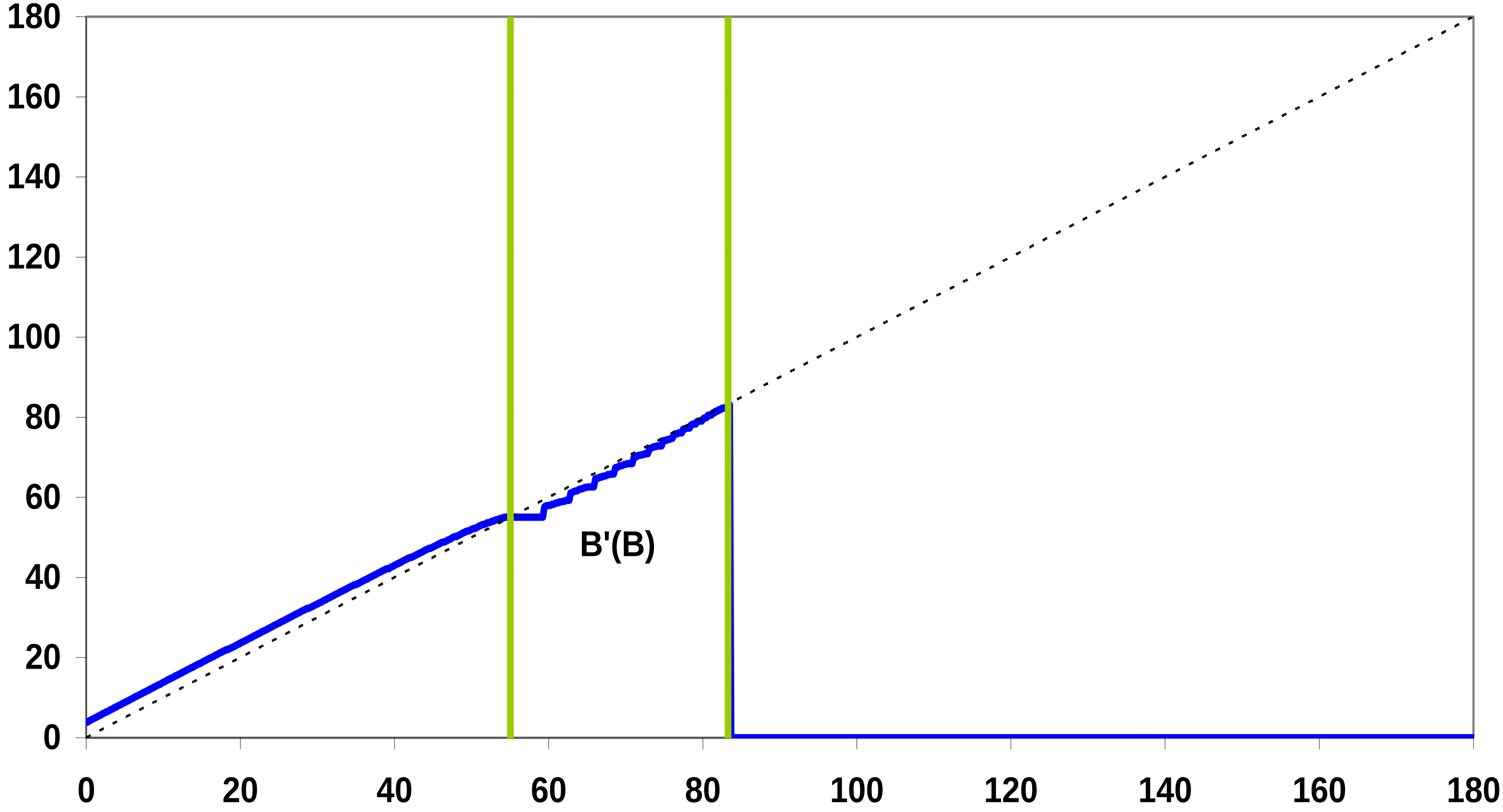
…and the government gambles for redemption if debt is high.



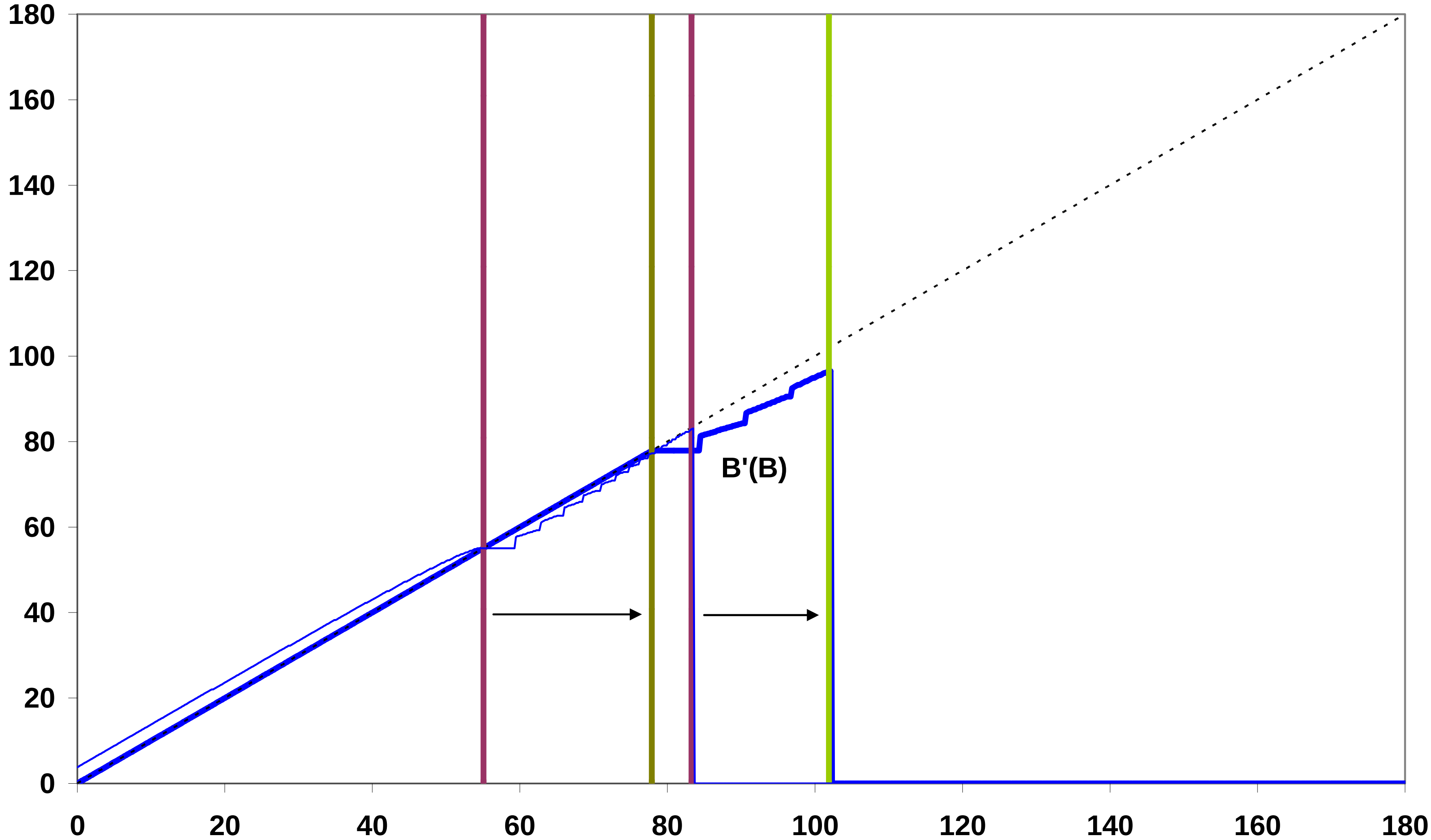
If the Troika offers a bailout during a crises,



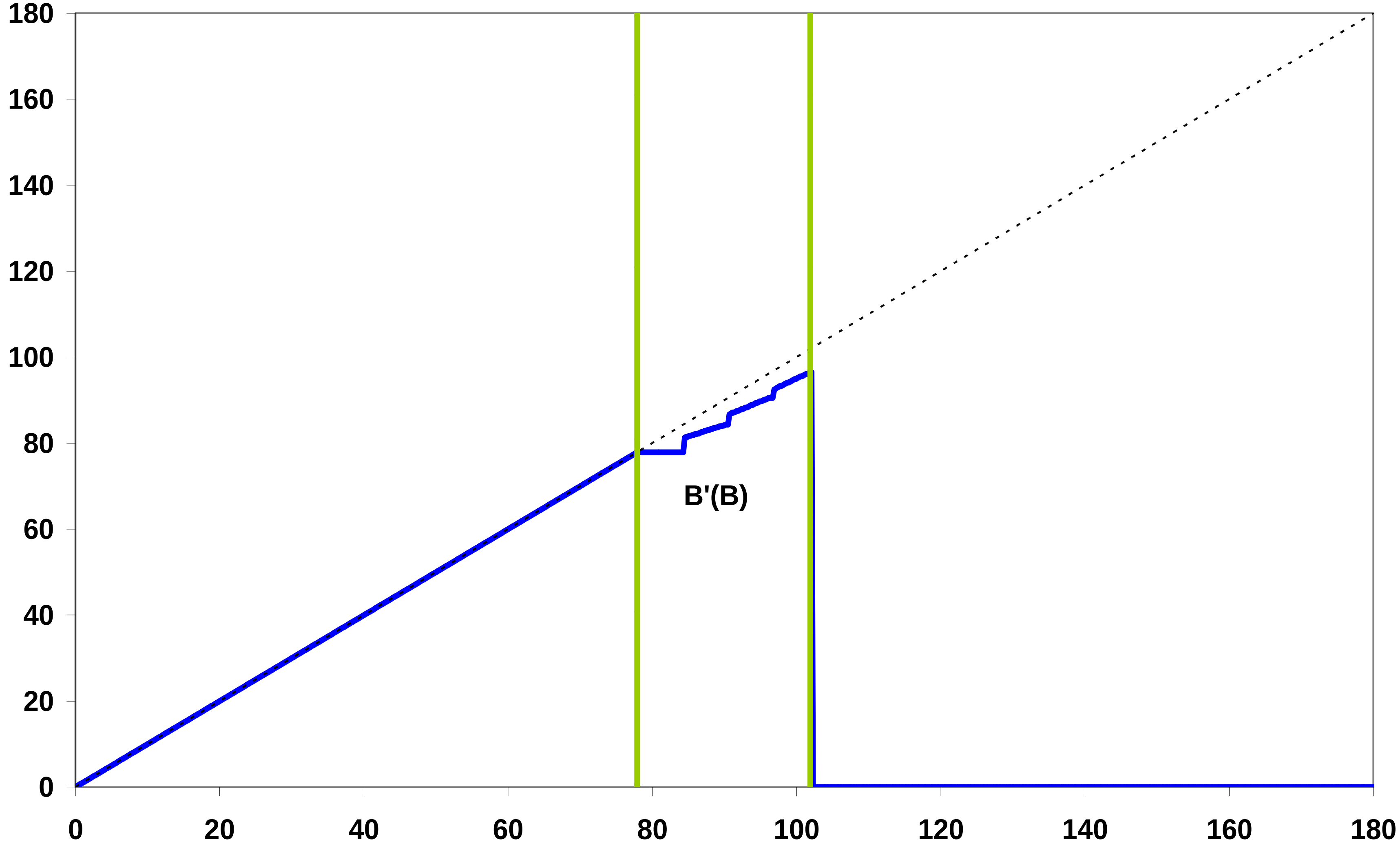
…the government defaults unless debt is low.



When the recession ends,



…the government runs down its debt if it is in the crisis zone.



Tax reforms

Increasing θ allows the government to run down its debt and exit the crisis zone.

Notice that the optimal level of θ is not constant because the utility function is nonhomothetic.

If income to be spent on c and g is $y(a,z)-B+qB'$, optimal g is

$$g=\overline{g}+\gamma(y(a,z)-B+qB'-\overline{g})=(1-\gamma)\overline{g}+\gamma(y(a,z)-B+qB')$$

,

Suppose that a government is considering a tax reform that raises θ from 0.40 to 0.45 or to 0.50. Whether or not such a reform is beneficial depends on $y(a,z) - B + qB'$.

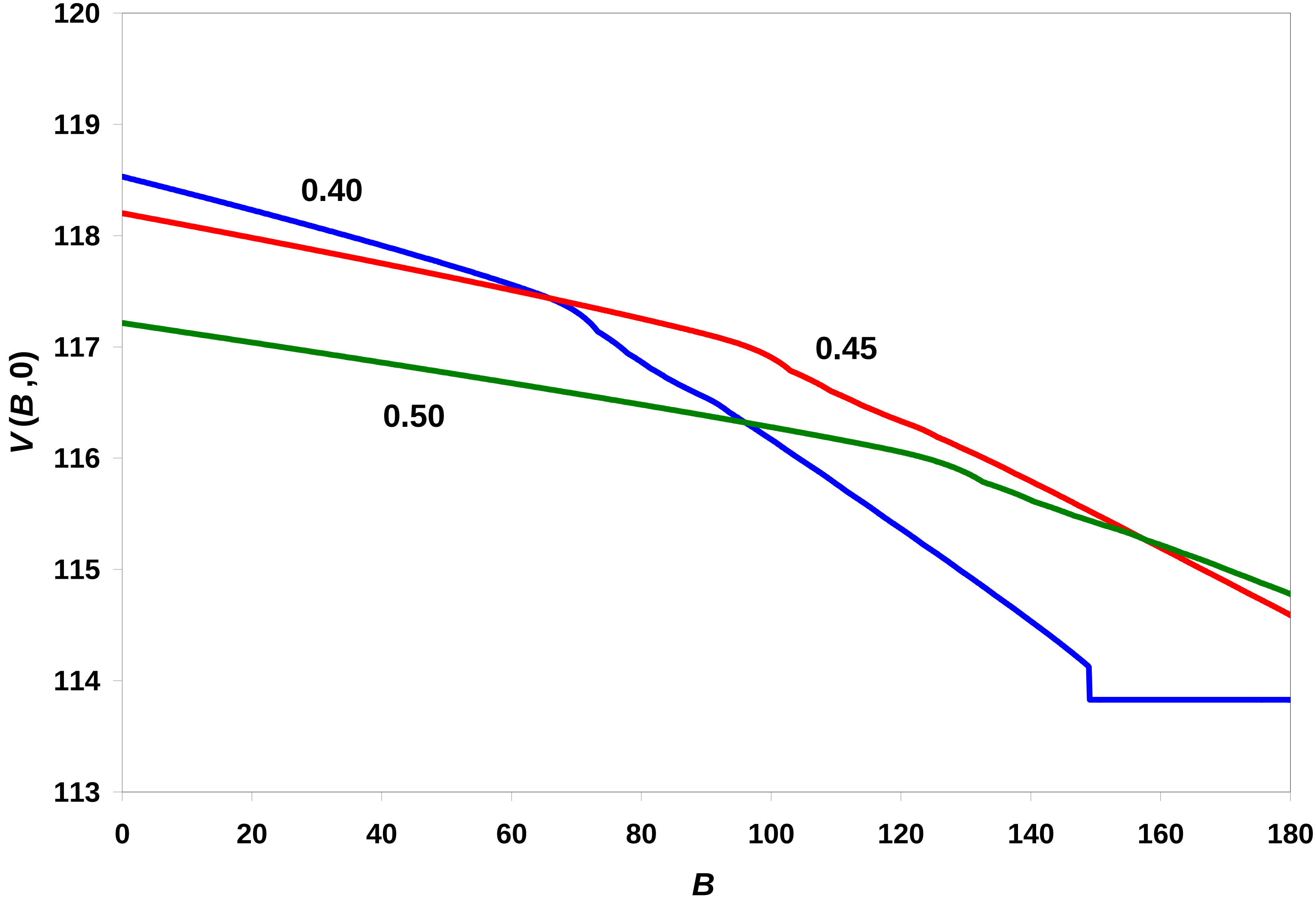
A higher tax rate θ is more attractive for high levels of debt B for two reasons:

- $y(a,z) - B + qB'$ is lower and g is an inferior good.

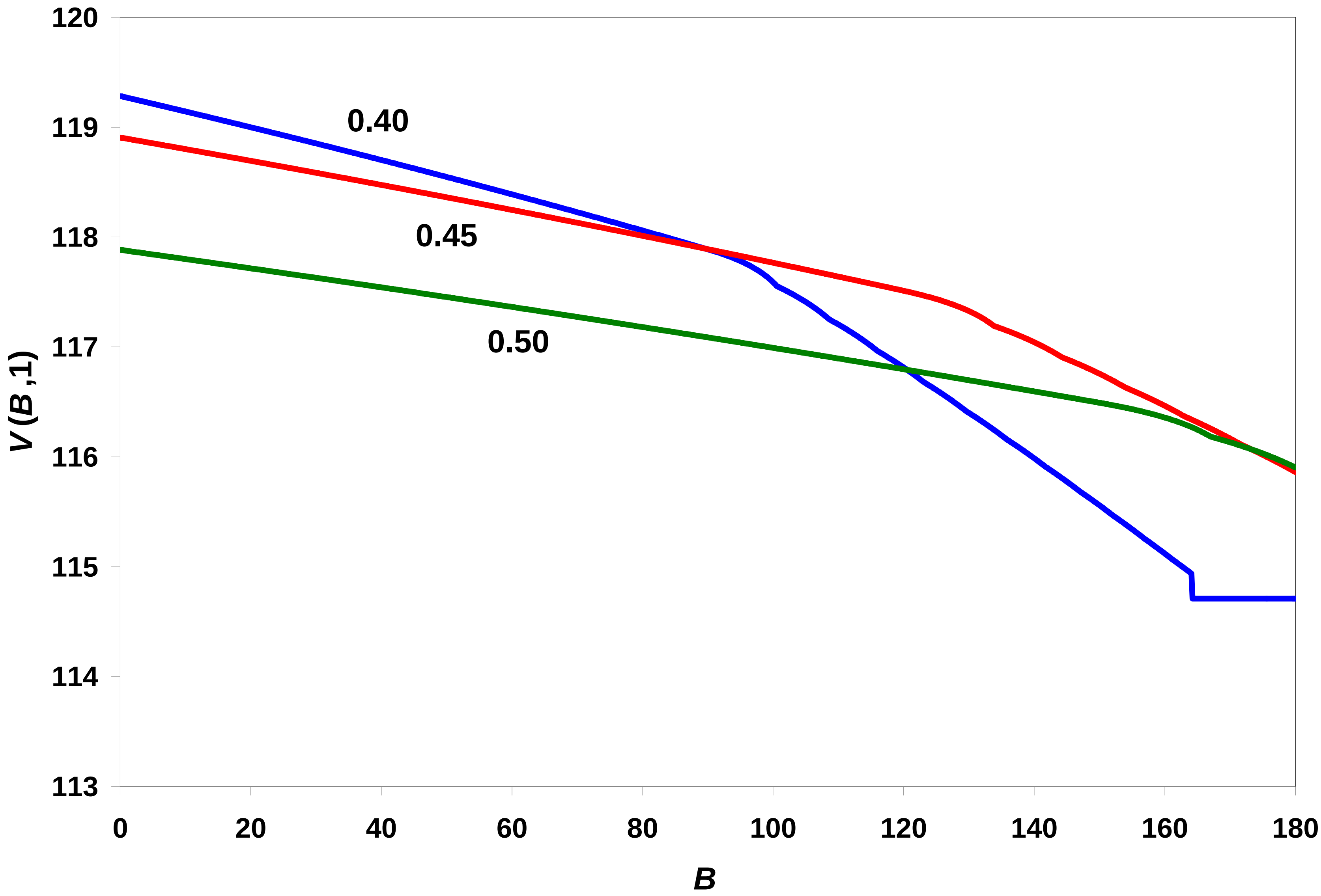
- It is less painful to set g and B' lower to exit the crisis zone.

Furthermore, a higher tax rate θ is more attractive when $y(a,z)$ is lower.

recession


120
119
118
117
116
115
114
113
0
20
40
60
80
100
120
140
160
180
B
V(B,0)
0.40
0.45
0.50

normal times



Other results

Reforms that increase p encourage even more gambling for redemption.

Reforms that decrease utility weight γ or essential expenditures $\overline{g}$ discourage gambling for redemption.

Reforms that increase β_g discourage gambling for redemption.

Reforms that decrease Z_d (collateral) discourage gambling for redemption.

How else can the government be irresponsible?

Government can overestimate the level $\bar{y}$ to which recovery will take lead — encourages more borrowing

Government can overestimate the probability of recovery — does not encourage more borrowing.

Panglossian borrowers

Krugman (1998), Cohen and Villemot (2010)

The government is overly optimistic about the probability of a recovery:

$$p^g > p$$

where p is the probability that international lenders assign to a recovery.

Proposition: Suppose that

$$q(B', s) = \beta\left(p + (1 - p)(1 - \pi)\right)$$

or

$$q(B', s) = \beta p(1 - \pi).$$

Then holding p^g fixed and lowering p results in lower $B'(B, s)$.

Similarly, holding p fixed and increasing p^g results in lower $B'(B, s)$.

We could also analyze the case where the government is overly optimistic about the probability of a self-fulfilling crisis:

$$\pi^g < \pi$$

and obtain similar results.

Bottomline:

Optimistic governments feel the market charges too much of a premium and hence want to reduce debt.

Pessimistic governments (or governments with private information about the low probability of recovery) want to increase debt.