Government Debt

Trevor Gallen

Government Debt

- Government debt plays a special role in economic events
  - Frequently ubiquitously held within a country
  - Default can have far-ranging effects
- Worth discussing on its own

Definitions

- The government's nominal budget constraint looks like:

$$\underbrace{P_t G_t + TR_t + R_{t-1} B_{t-1}^G + B_{t-1}^G}_{\text{Expenditure}} = \underbrace{T_t + B_t^G + M_t - M_{t-1}}_{\textit{Revenue}}$$

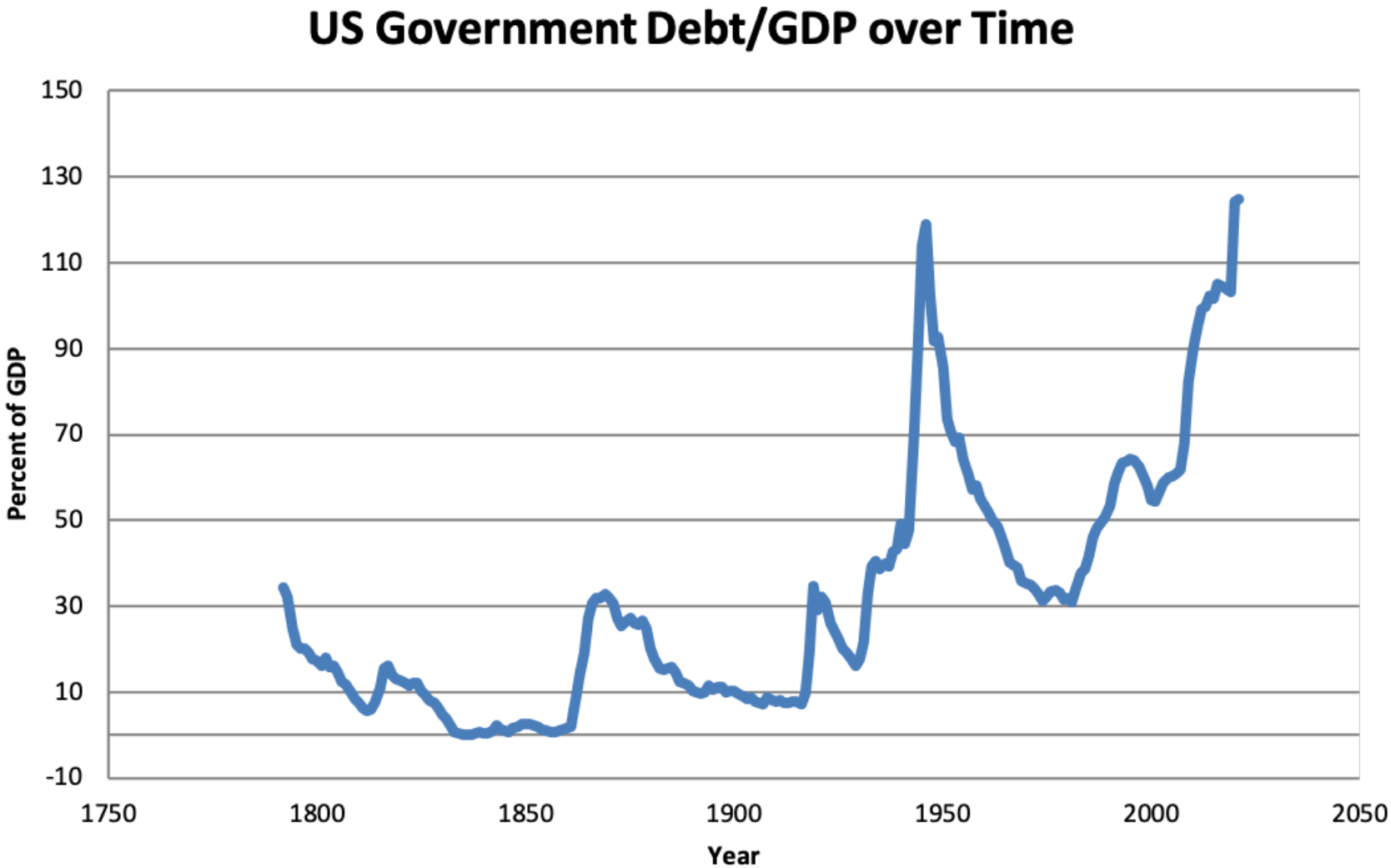
  Where:
  - Nom govt spending: $P_t G_t$
  - Nom govt transfers: TR_t
  - Nom govt interest payments: $R_{t-1} B_{t-1}^G$
  - Retiring govt bonds: B_{t-1}^G
  - Nom tax revenue: T_t
  - Nom new bonds issued: B_t^G
  - Printed money: $M_t - M_{t-1}$
- Could rewrite required deficit as:

$$\textit{Deficit} = B_t^G - B_{t-1}^G = P_t G_t + TR_t + R_{t-1} B_{t-1}^G - T_t - \Delta M_t$$

Definitions

- Debt is a stock of money owed: B^G_{t-1}
- Deficit is the change in the stock of money owed: $B^G_t - B^G_{t-1}$
- Let's look at some government debt over time
- What's right measure? Debt? Deficit? Debt/GDP?
- Let's look at Debt/GDP first, equivalent to Debt/Income

Definitions



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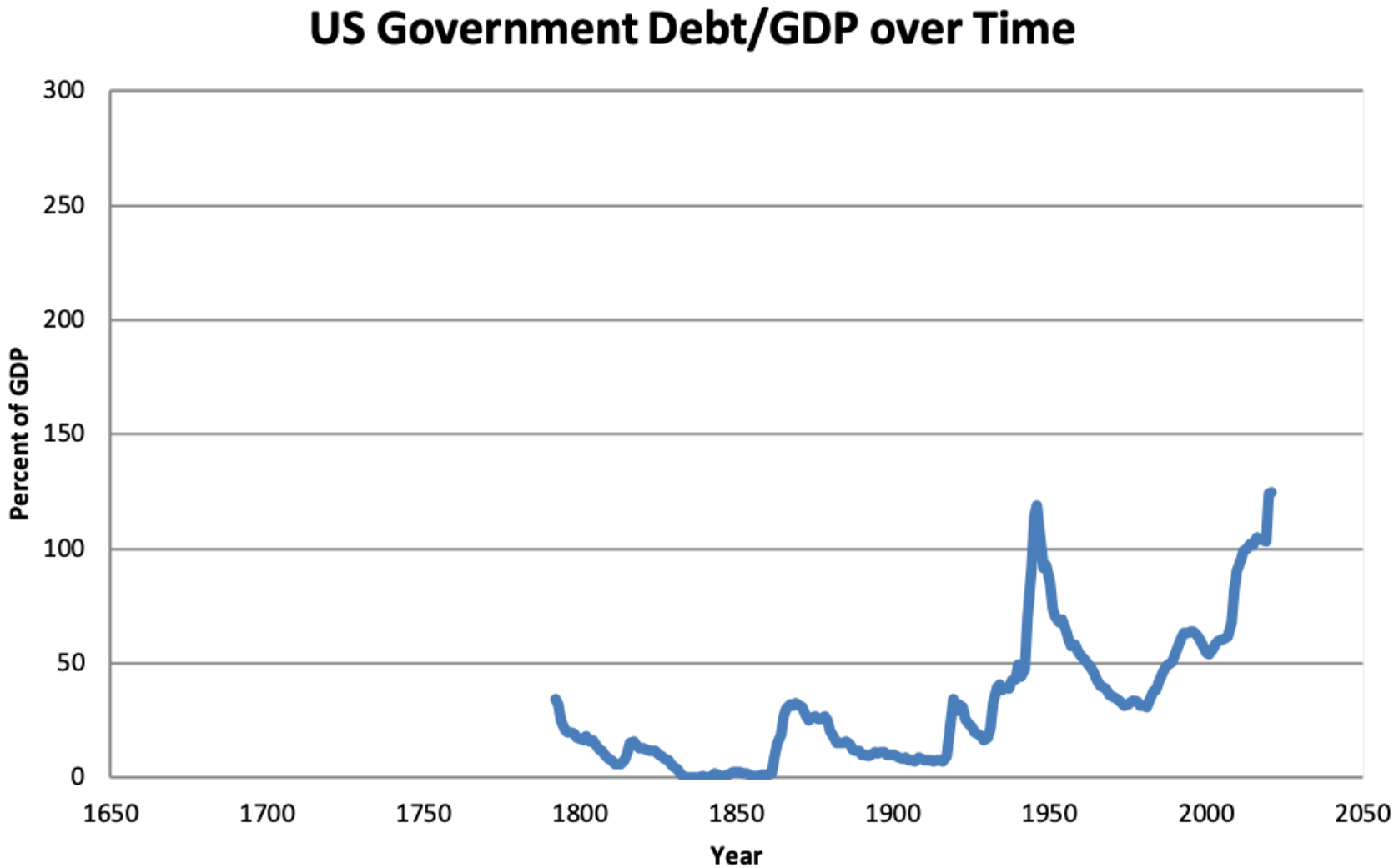

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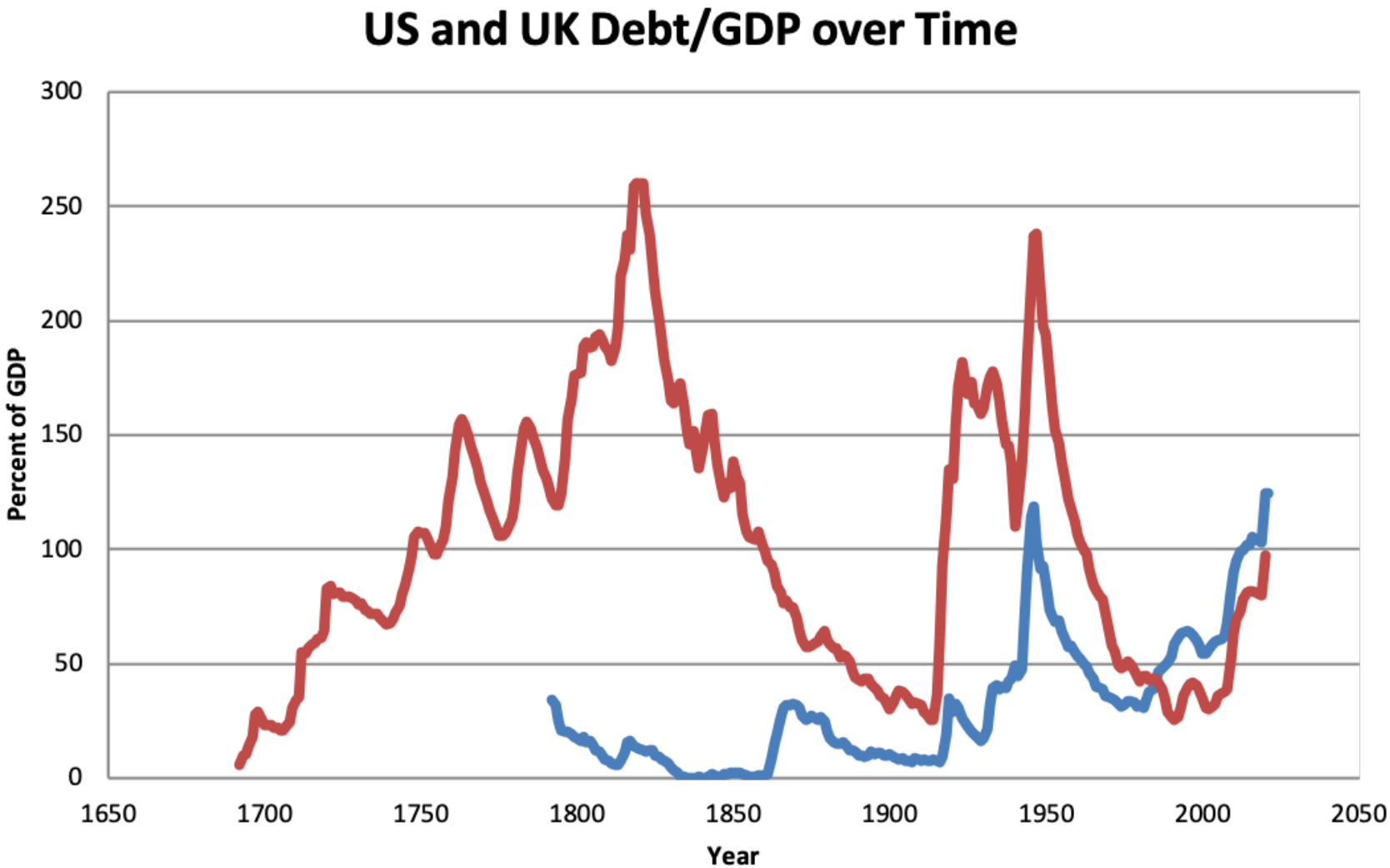

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- Note that debt owed by the US is in excess of 100% of GDP
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- For the whole path of B_t^G

Intertemporal Budget Constraint

- Could combine debt issuance to get:

$$\underbrace{\sum_{\tau=0}^{\infty} \frac{P_{t+\tau} G_{t+\tau} + TR_{t+\tau}}{(1+R)^{\tau}}}_{\text{NPV expenditures}} = \underbrace{\sum_{\tau=0}^{\infty} \frac{T_{t+\tau} + \Delta M_{t+\tau}}{(1+R)^{\tau}}}_{\text{NPV Income}} + \underbrace{B_t}_{\text{Initial Debt}}$$

- Important: if RHS is growing faster than LHS, unlikely to be a problem

- Easier to think of LHS as fraction of GDP $\tau Y_{t+\tau}$

Sustainability

- So, sustainability of debt does not mean that $B_t^G < Y_t$
- It means that debt is not exploding as a fraction of GDP
- What is maximum sustainable debt?

$$D^{max} = \tau \sum_{t=0}^{\infty} \left(\frac{1+g}{1+r} \right)^t Y_0 = \frac{1}{1 - \frac{1+g}{1+r}} Y_0$$

- So if $\tau = 0.05$, $g = 0.02$, $r = 0.04$, $Y = 1$, max debt *without default* is 2.6x GDP
- So if $\tau = 0.05$, $g = 0.01999$, $r = 0.02$, $Y = 1$, max debt *without default* is 100,000x GDP
- If $r \leq g$, maximum sustainable debt is infinite
- Suggests that in current environments, debt isn't so costly

Interest Rates and Growth Rates

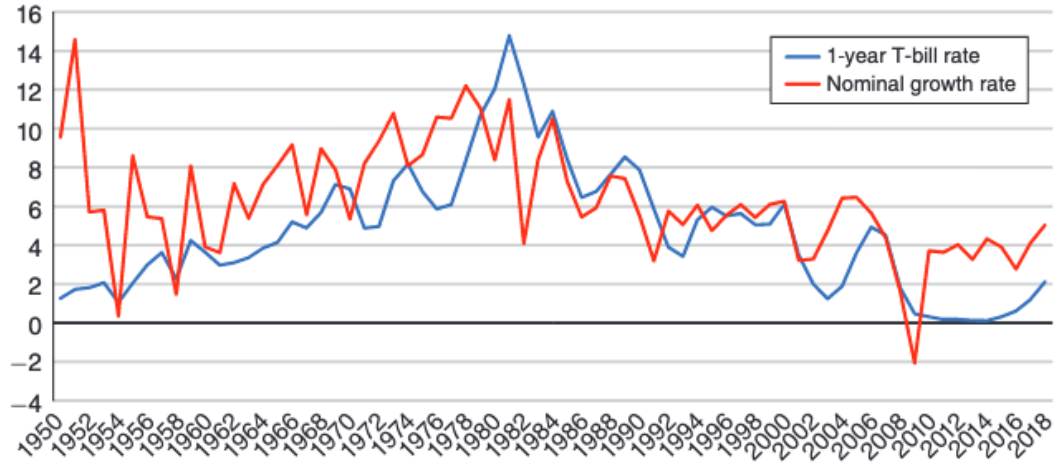

Figure 1. Nominal GDP Growth Rate and 1-Year T-Bill Rate, 1950–2018

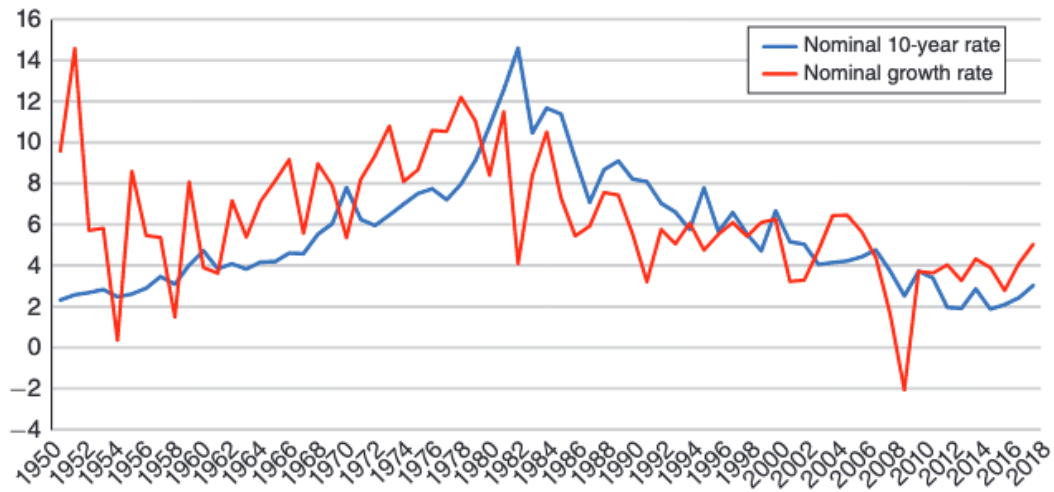

Figure 2. Nominal GDP Growth Rate and 10-Year Bond Rate, 1950–2018

Blanchard

- $$d_t = \frac{1+r}{1+g} d_{t-1} + x_t$$
- Where d_t is debt/gdp, r is interest rate, g is growth rate of GDP, and x is (non-interest expenditures)-income (primary deficit)
- Let's say we pay for programs but borrow to pay interest, so x is zero

Debt under zero primary deficit

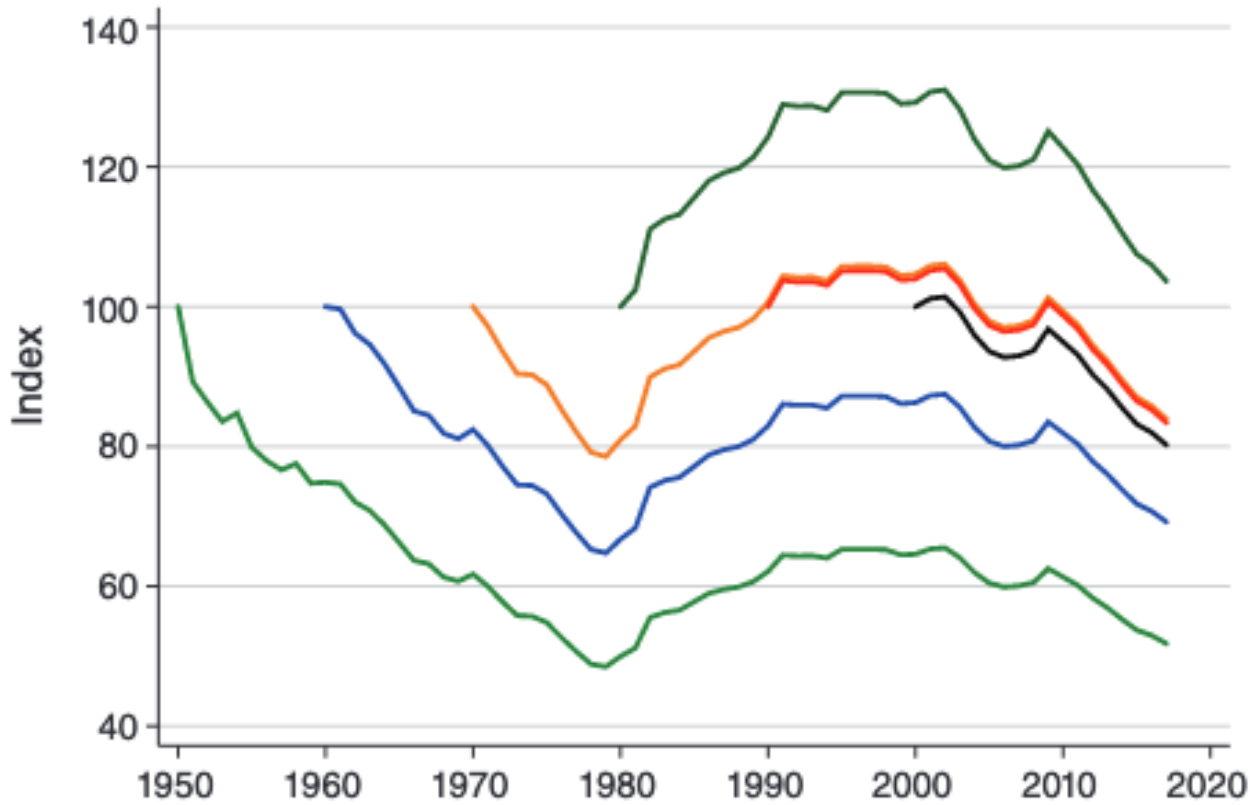

Figure 5. Debt Dynamics, with Zero Primary Balance, Starting in Year *t*, Using the Non-Tax Adjusted Rate

Public Debt

- When r is small, public debt is cheap
- But sometimes that leads to disaster: sovereign default (implicit or explicit)
- Let's visit more

Issues in Measurement

- Who owns debt matters
  - "External" debt held by foreigners
  - "Internal" debt held domestically
  - Within "internal," government vs. public
- 50% of debt held by private domestic investors
- 24% held domestically by government
- 26% held by foreign investors
  - 4.6% by Japan
  - 3.8% by Mainland China
  - 1.6% by UK

When countries can't pay, what happens?

- Sometimes countries can't (or won't) pay
- What happens?
  - Inflation (or debasement, currency crash)
    - If need nominal currency, can always pay
    - If need real currency, inflation is one method
  - External debt default: no longer pay debt obligations to foreigners (typically in another country's currency)
  - Internal debt default: no longer pay debt obligations to domestic holders (typically in own currency)

Defaults are not uncommon

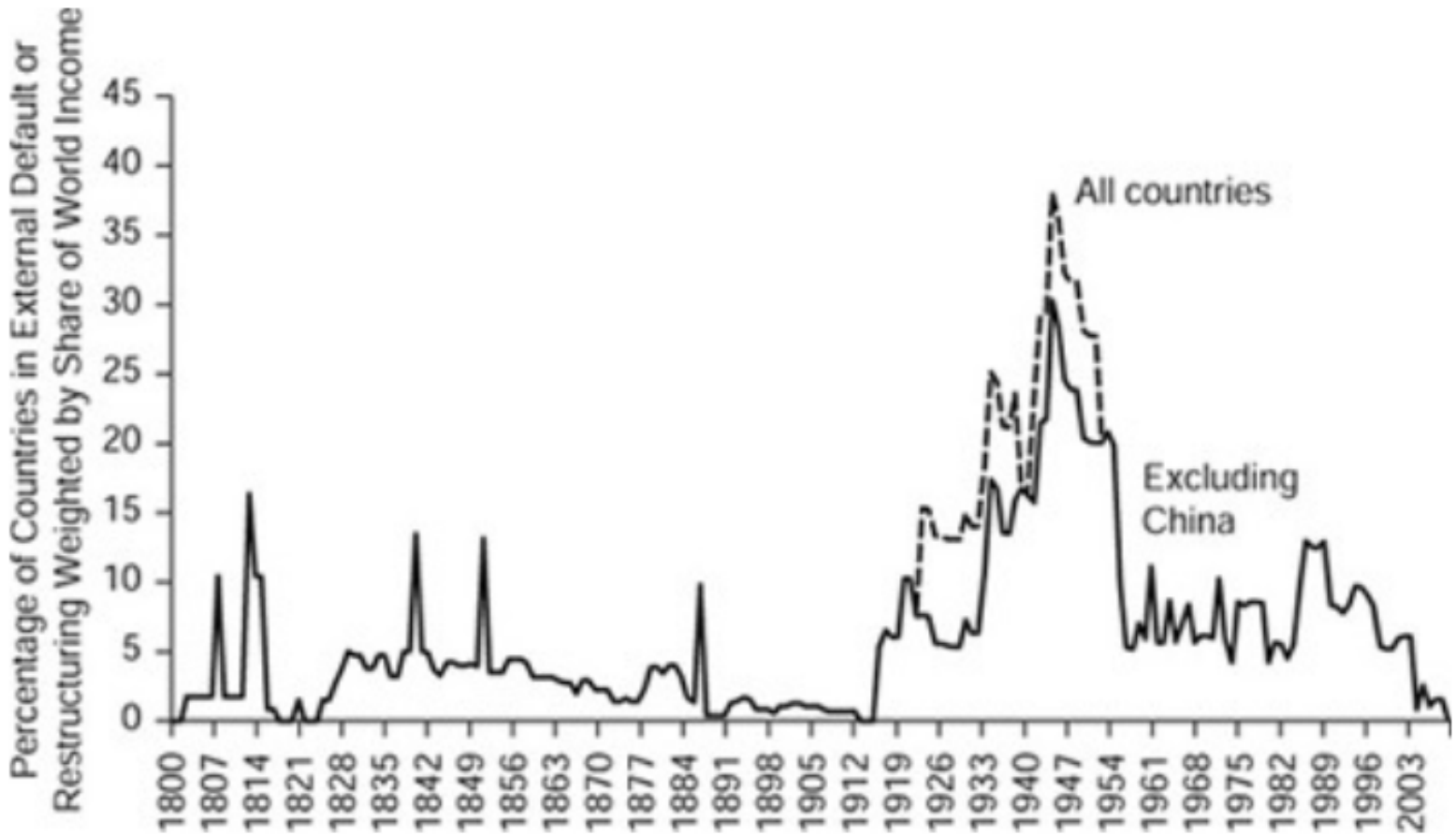

Figure 5.2. Sovereign external debt: Countries in external default

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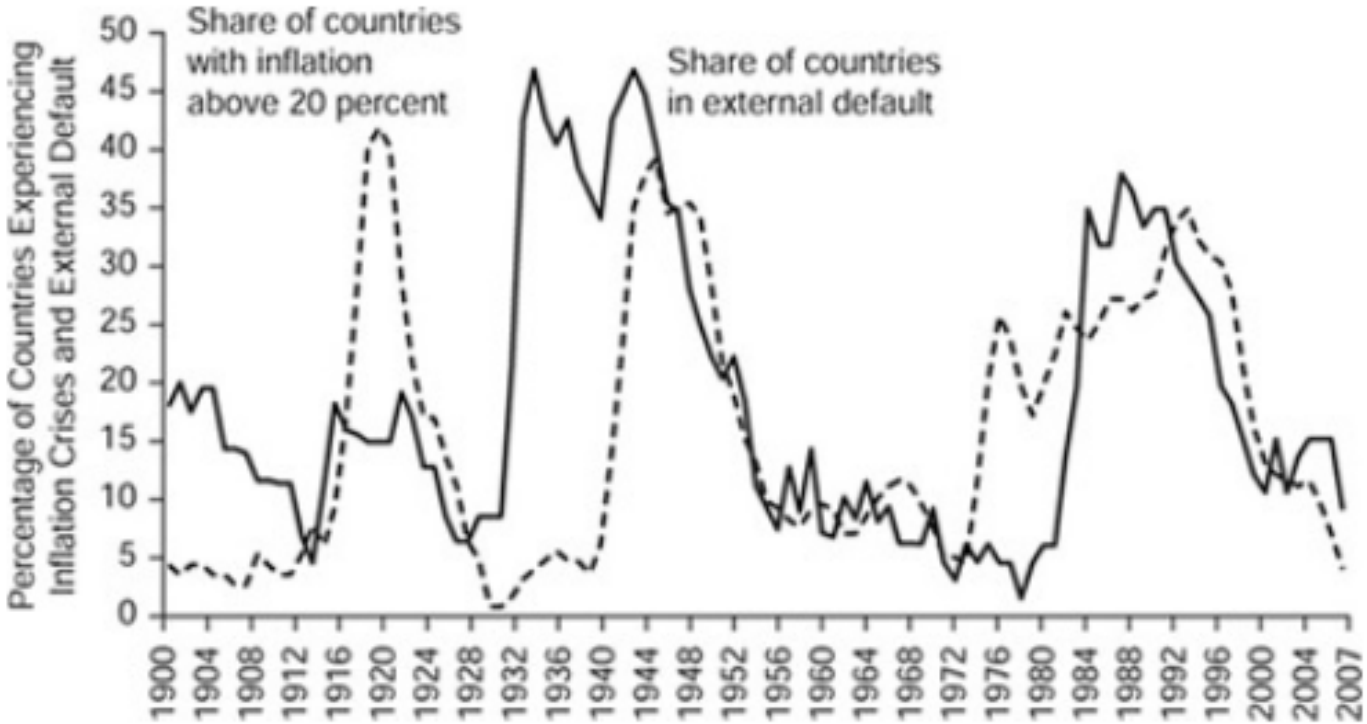


Figure 5.4. Inflation crises and external default, 1900–2007.

Serial Defaulting

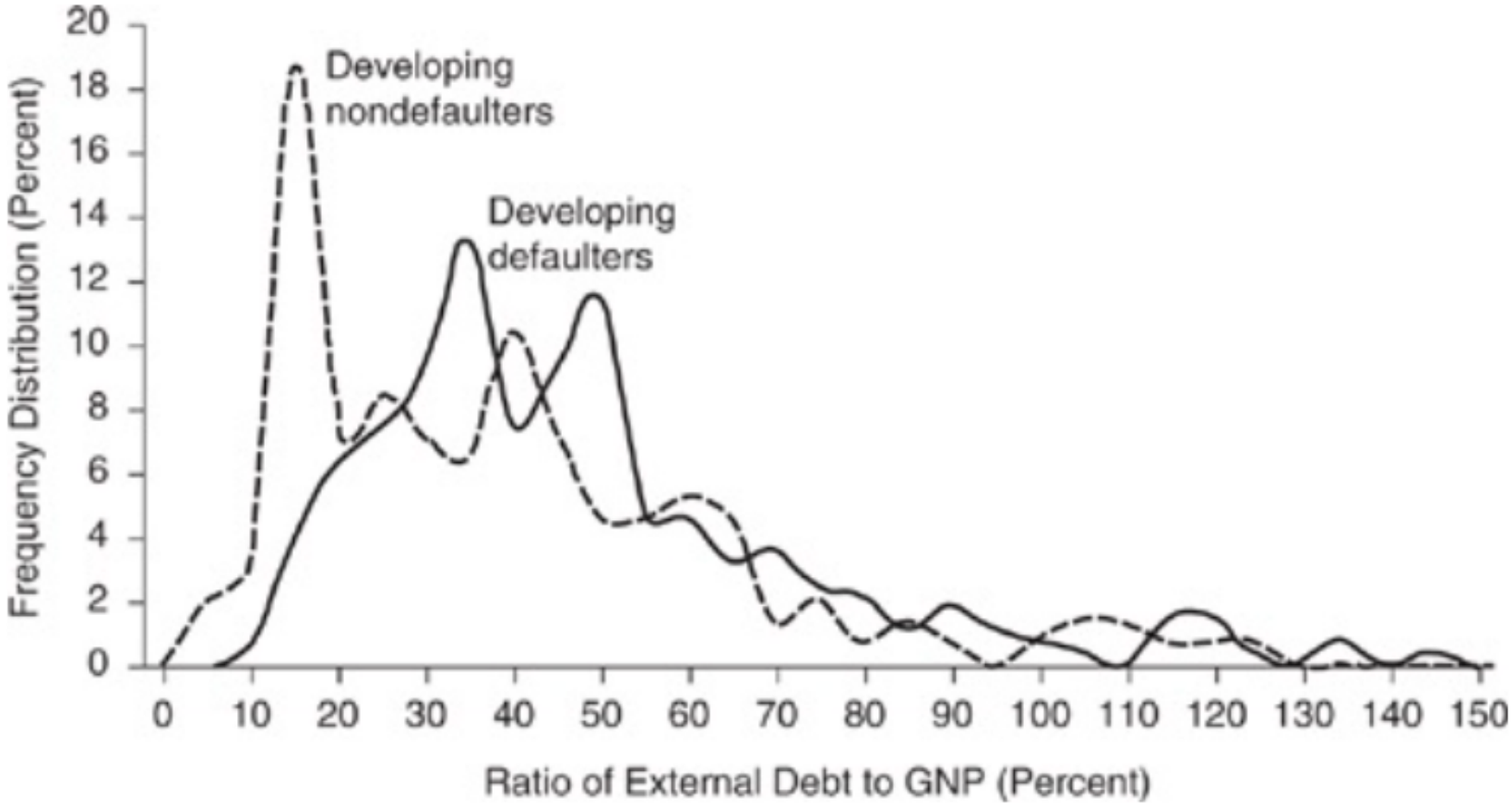
- "Debt intolerance is a syndrome in which weak institutional structures and a problematic political system make external borrowing a tempting device for governments to employ to avoid hard decisions about spending and taxing."

- Idea is that the political structure of some countries makes defaulting under low debt thresholds "desirable"

External Debt at the Time of Default: 1970-2008

Range of External Debt/GDP	Percent of total defaults
$<$40%	19.4%
41-60%	32.3%
61-80%	16.1%
81-100%	16.1%
$>$100%	16.1%

Serial Defaulting



Issues with Foreign Debt-I

- Russian revolution in 1918 repudiated 16 billion rubles in foreign debt
- For the next 80 years, debtholders and their descendants fought to get paid
- Czarist assets frozen (eventually used to pay creditors)
- Could not raise money on public markets throughout its existence (governmental and private loans occurred)
- Eventually settled in 1996

Issues with Foreign Debt-II

- In 2001 Argentina defaulted on debt issued in US
- Paid roughly $0.27 on the dollar (very steep)
- In 2005, 76% agreed, but 24% were holdouts
- Reopened in 2010 and got down to 8% holdouts
- Holdout creditors great nusiance

A Hedge Fund Has Physically Taken Control Of A Ship Belonging To Argentina's Navy

Joe Weisenthal Oct 4, 2012, 4:28 AM

The above ship is the ARA Libertad, a training ship owned by the Argentine navy.

Issues with Foreign Debt-II

- Eventually it was decided that holdouts had strong legal standing, because Argentina deliberately gave up sovereignty
- Holdouts by and large paid in full
- Reopened in 2010 and got down to 8% holdouts
- Holdout creditors great nuisance
- Couldn't pay holdouts full amount (RUFO)
- Couldn't not pay holdouts (pari passu)
- Eventually resolved circa 2016

Are "vulture" funds bad?

- Con: gum up the works, lock out Argentina for 5-10 extra years, slow growth
- Pro: Raises cost of default ex-ante (deters)
- Con: Raises cost of default ex-post ("no point" in punishing ex-post (except future ex-ante!))
- Pro: Partially resolves coordination issues for "the little guy"

Issues with Foreign Debt-III

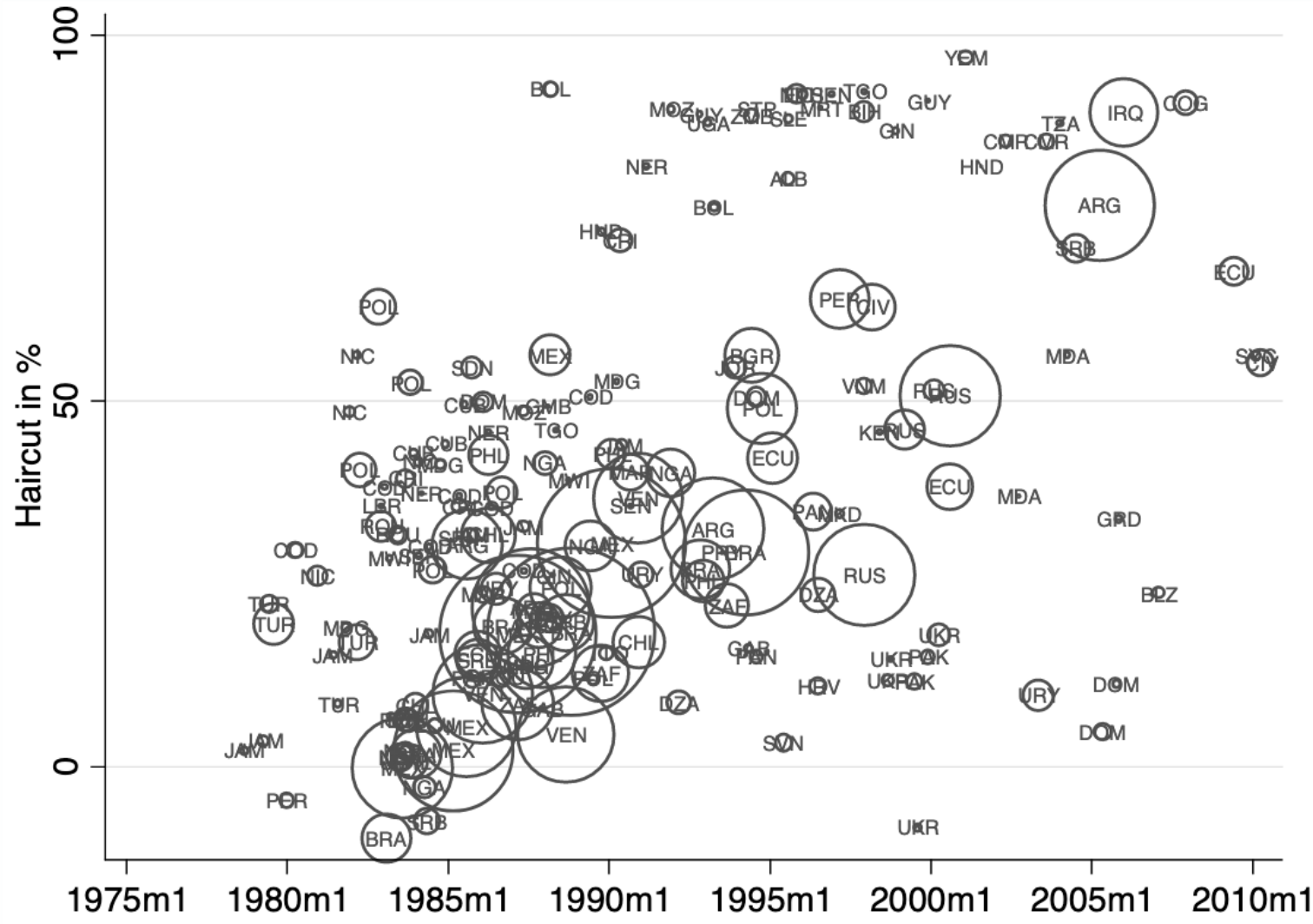
- From 1832-1949, Newfoundland independent (circa fifth-oldest parliament)
- Went into debt $>$300% of GDP, deficits of 10% of GDP
- Pressured by UK and Canada to be absorbed by Canada
- Syncs with gunboat diplomacy

Costs of Foreign debt

- Some papers attempt to estimate the costs of foreign default
- Let's look at a few

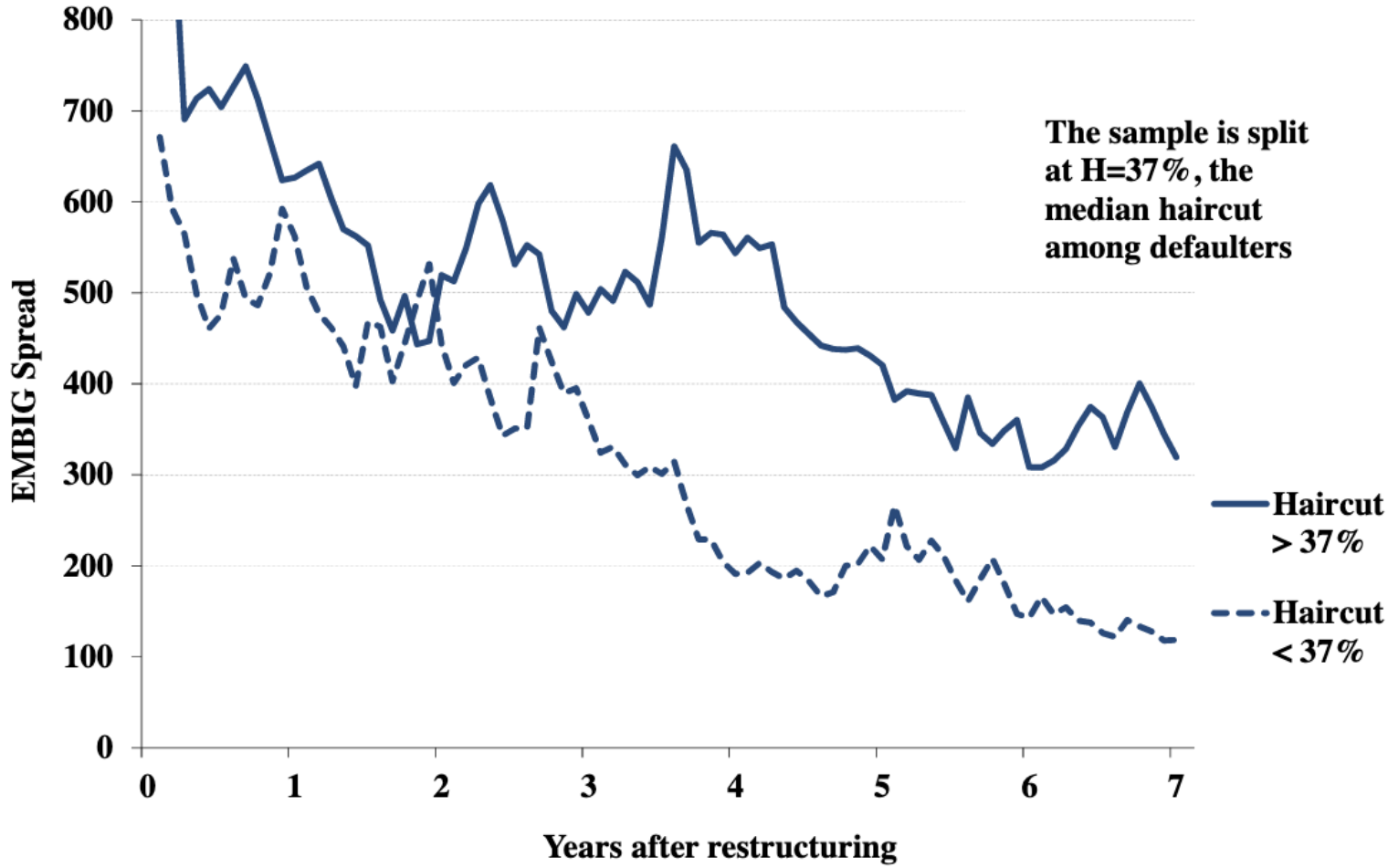
Cruces and Trebesch 2013

Figure 1: Haircuts and Deal Volumes over Time



Cruces and Trebesch 2013

Figure 3: Haircut Size and Post-Restructuring Spreads



Andrade and Chhaochharia 2017

- Some stock prices are sensitive to sovereign default risk
- In Greek default, 97% of bondholders accepted a 60% haircut on claims(!)
- Idea: look at firms that have low asset tangibility, and high bank dependence or bank dependence on PIIGS
- Find that such firms (which make up $\sim$70% of assets are very vulnerable to default (act as if default would destroy 12% of productive assets(!))
- Similar, but for Argentina:
  - Exposure to Argentine default suggests big losses to firm values (1% increase in default, equity values drop by 0.55%!)

Andrade and Chhaochharia 2017

Table 2
Do firms vulnerable to financial intermediation disruption have higher sovereign risk betas? (Stock level)

Panel A: Vulnerability score

Dependent variable: Excess stock returns	(1)	(2)	2010–2013 (3)	GIIPS only (4)
Δ Spread	−0.127***	−0.097**	−0.086**	−0.087***
	(3.27)	(2.55)	(2.37)	(2.51)
Δ Spread × Vulnerability score		−0.086***	−0.078***	−0.079***
		(3.48)	(3.27)	(3.33)
Vulnerability score		−0.004	0.001	0.000
		(0.54)	(1.47)	(0.24)
MKT	1.020***	1.021***	1.065***	1.001***
	(29.15)	(26.34)	(16.19)	(19.88)
SMB	0.386***	0.391***	0.381***	0.382***
	(8.07)	(7.79)	(4.86)	(5.00)
HML	−0.232***	−0.256***	−0.153*	−0.164**
	(4.49)	(4.68)	(1.69)	(2.07)
WML	−0.224***	−0.216***	−0.245***	−0.303***
	(7.00)	(7.00)	(5.69)	(7.13)

Kuvshinov and Zimmermann 2019

- Try to compare like countries based on probability of default but some defaulted
- Let's look at their results

Kuvshinov and Zimmermann 2019

Table 4
Impact of sovereign default on GDP.

Year	1	2	3	4	5	6	7	8
Unconditional	−3.33***	−4.91***	−4.95***	−4.91***	−5.49***	−5.93***	−5.98***	−5.98***
	(0.64)	(0.97)	(1.06)	(1.24)	(1.34)	(1.53)	(1.70)	(1.88)
Conditional	−2.73***	−4.04***	−3.83***	−3.59***	−4.11***	−4.35***	−3.90***	−3.62**
	(0.57)	(0.92)	(1.01)	(1.14)	(1.27)	(1.45)	(1.56)	(1.78)
IPSWRA	−2.69***	−3.85***	−3.63***	−3.44***	−3.74***	−3.48**	−2.98	−2.27
	(0.60)	(1.01)	(1.16)	(1.34)	(1.54)	(1.77)	(1.92)	(2.18)
Observations	2609	2609	2609	2609	2609	2609	2609	2609
Defaults	92	92	92	92	92	92	92	92

Controls matter! (Hard problem)

Kuvshinov and Zimmermann 2019

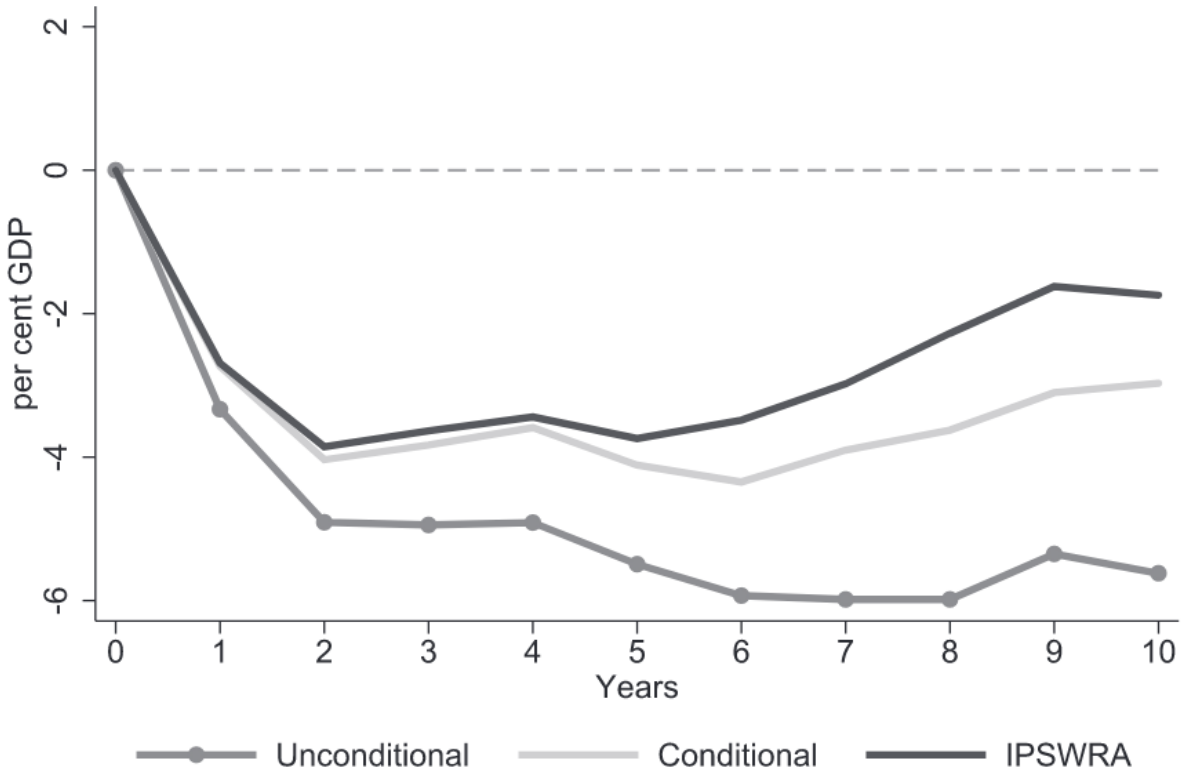


Fig. 2. Impact of sovereign default on GDP.
Notes: Cumulative treatment effect, GDP per capita growth. Unconditional specification controls for country fixed effects only. Conditional and IPSWRA specifications control for country fixed effects and the full list of variables in Online Appendix Table A1.1.

While effects level off, loss of ≈33% of GDP over the course of 10 years!

Kuvshinov and Zimmermann 2019

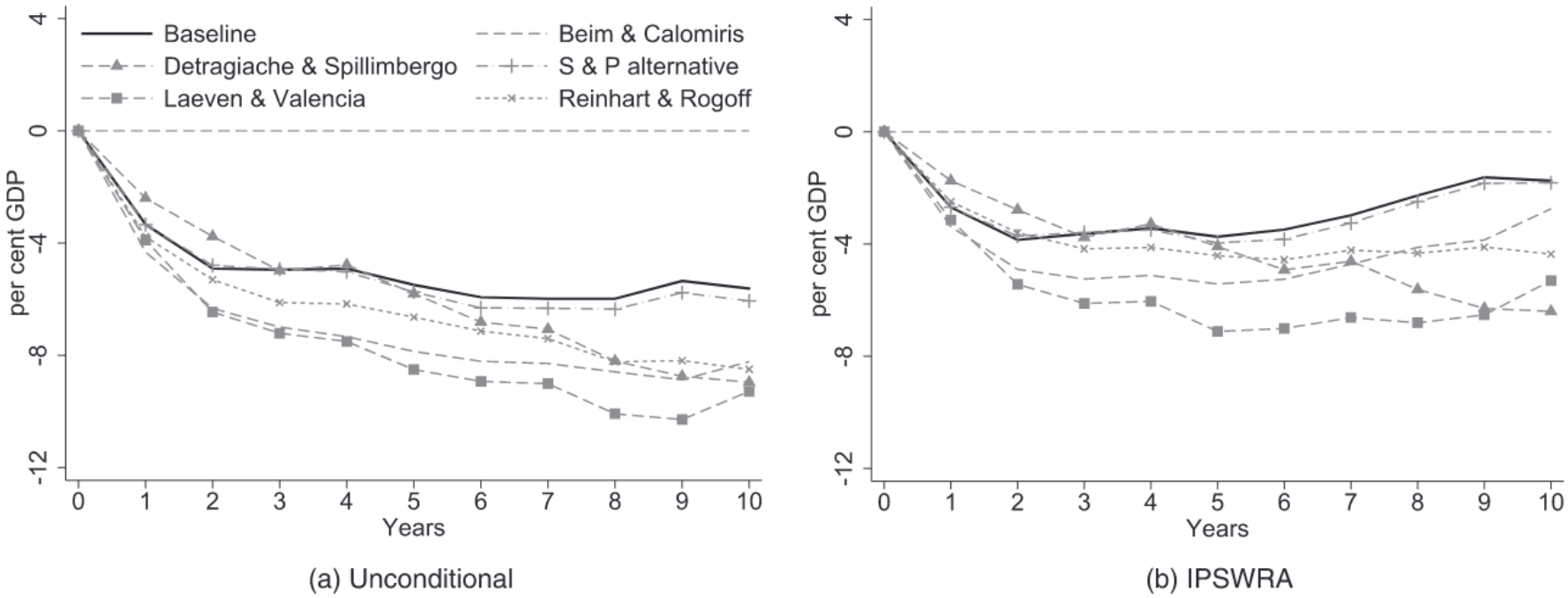
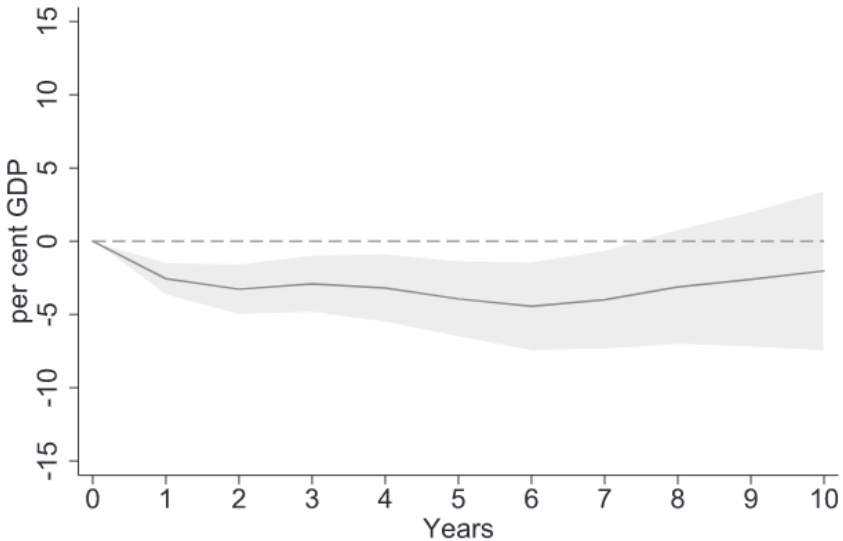


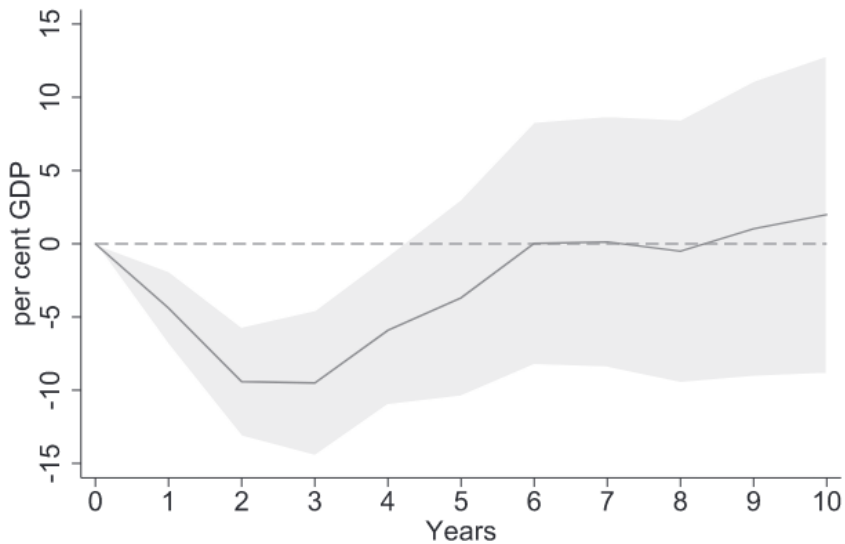
Fig. 3. Cost estimates for different definitions of sovereign default.
Notes: The baseline definition uses *Standard & Poor's* data, Beim & Calomiris groups default spells less than 5 years apart together, Detragiache & Spillimbergo definition is based on arrears to total debt, Laeven & Valencia focus on sovereign crises, Reinhart & Rogoff takes the data on defaults and distressed restructurings from Reinhart and Rogoff (2011b), and S & P alternative drops defaults which occur when the country is still in default on another type of debt.

Many different ways of trying to solve

Kuvshinov and Zimmermann 2019



(a) Default and no systemic banking crisis

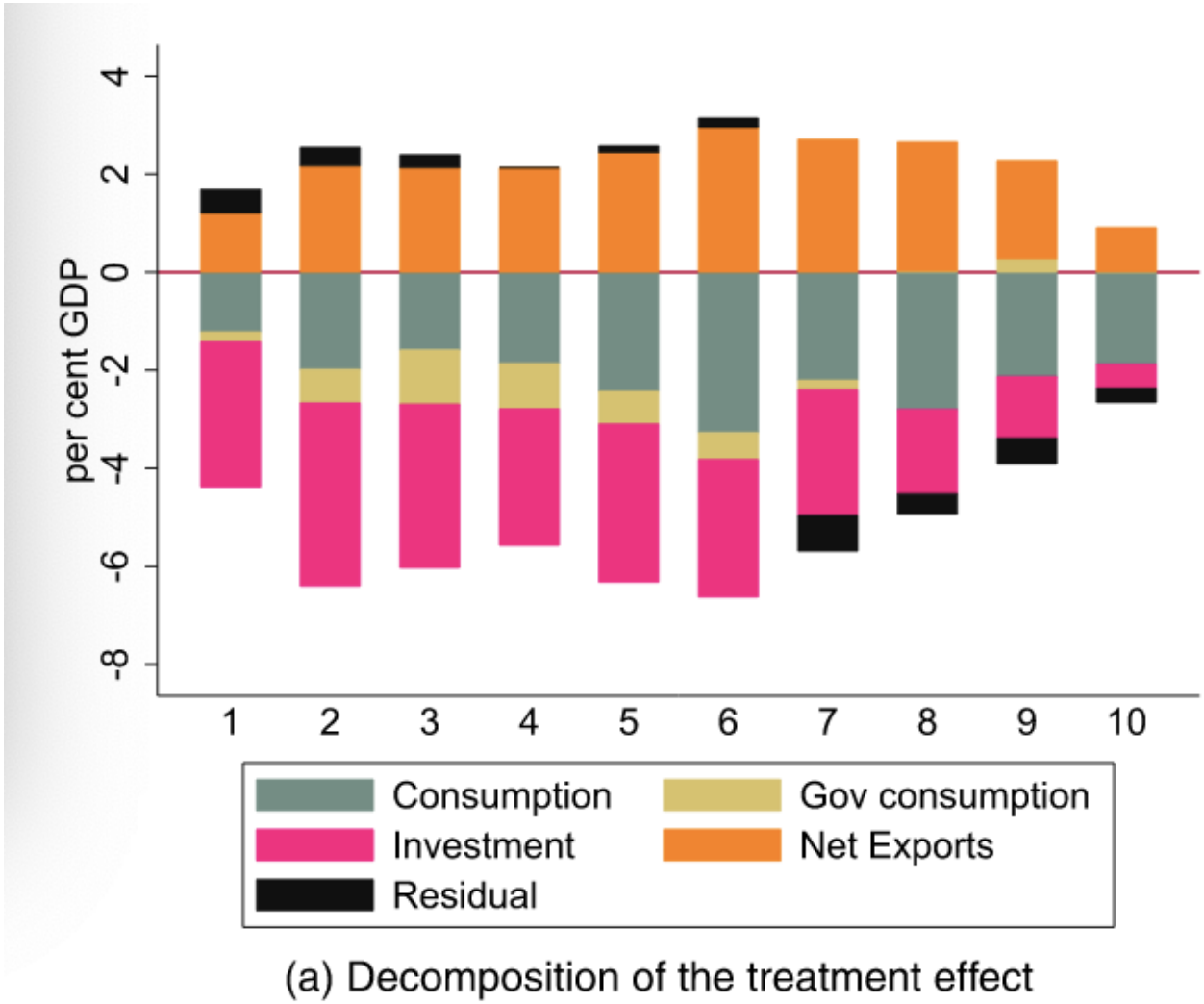


(b) Default and systemic banking crisis

Fig. 6 Cost of sovereign default and systemic banking crises

Enormous heterogeneity in response depending on banking crisis

Kuvshinov and Zimmermann 2019



(a) Decomposition of the treatment effect

Effect on exports positive, but domestic effects outweigh

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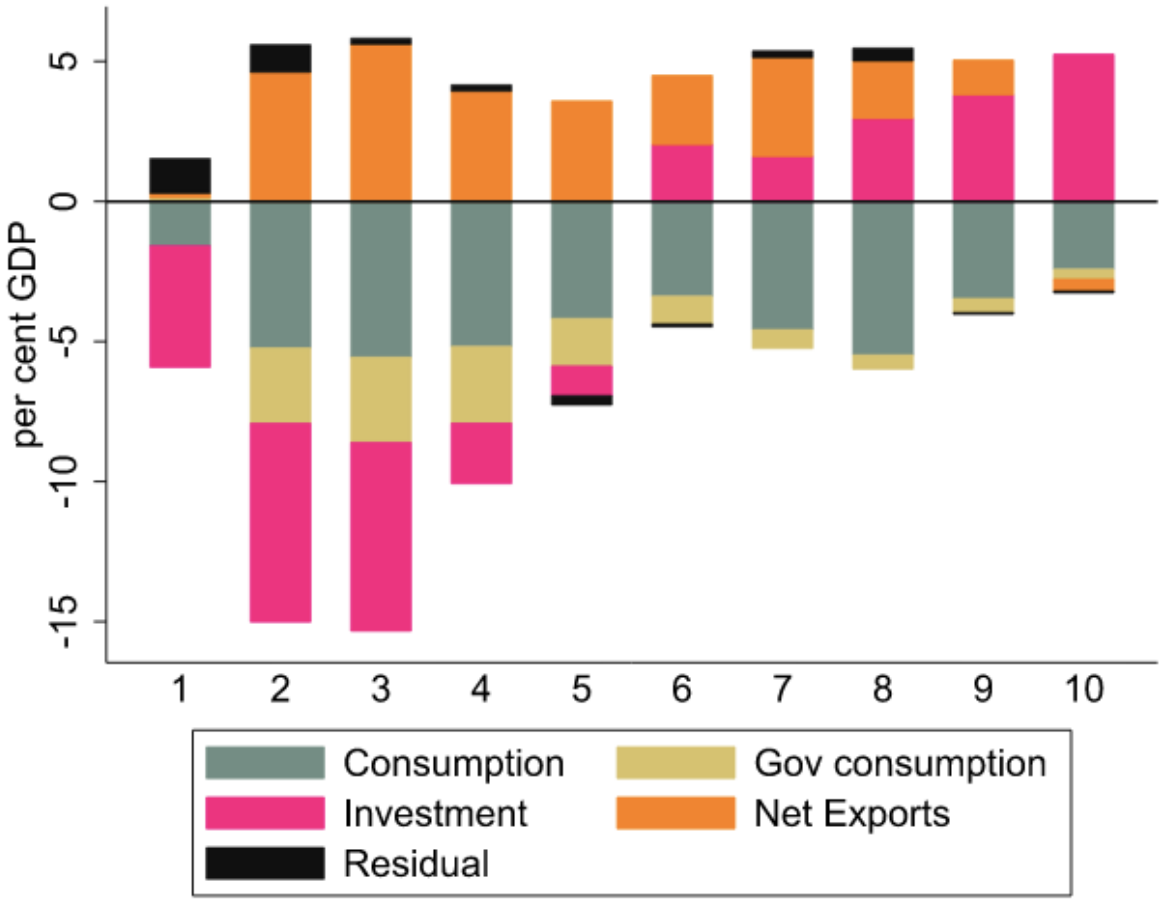
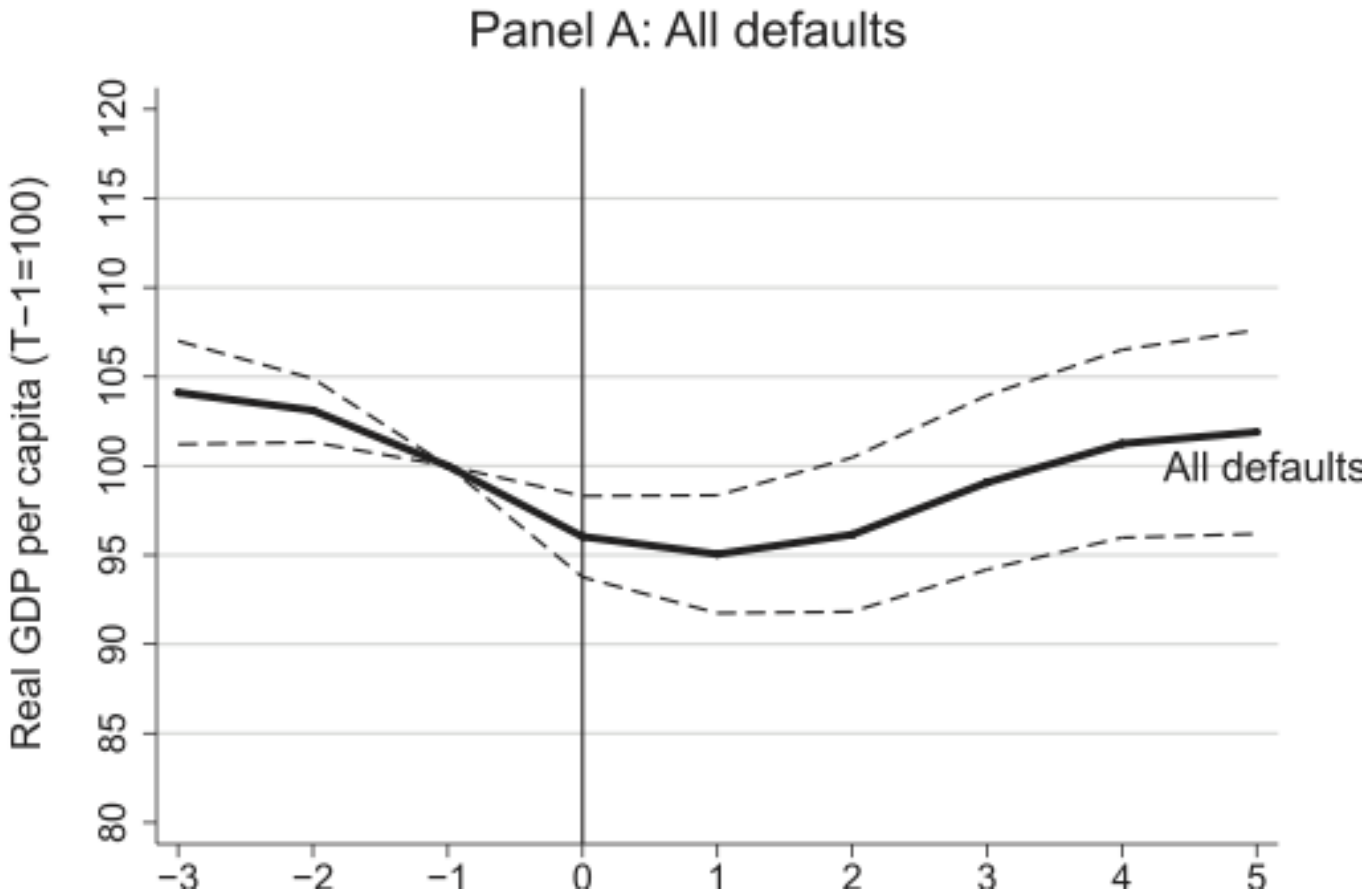


Same, but for sovereign banking crisis. Kill investment and consumption

Cruces Zabel 2017



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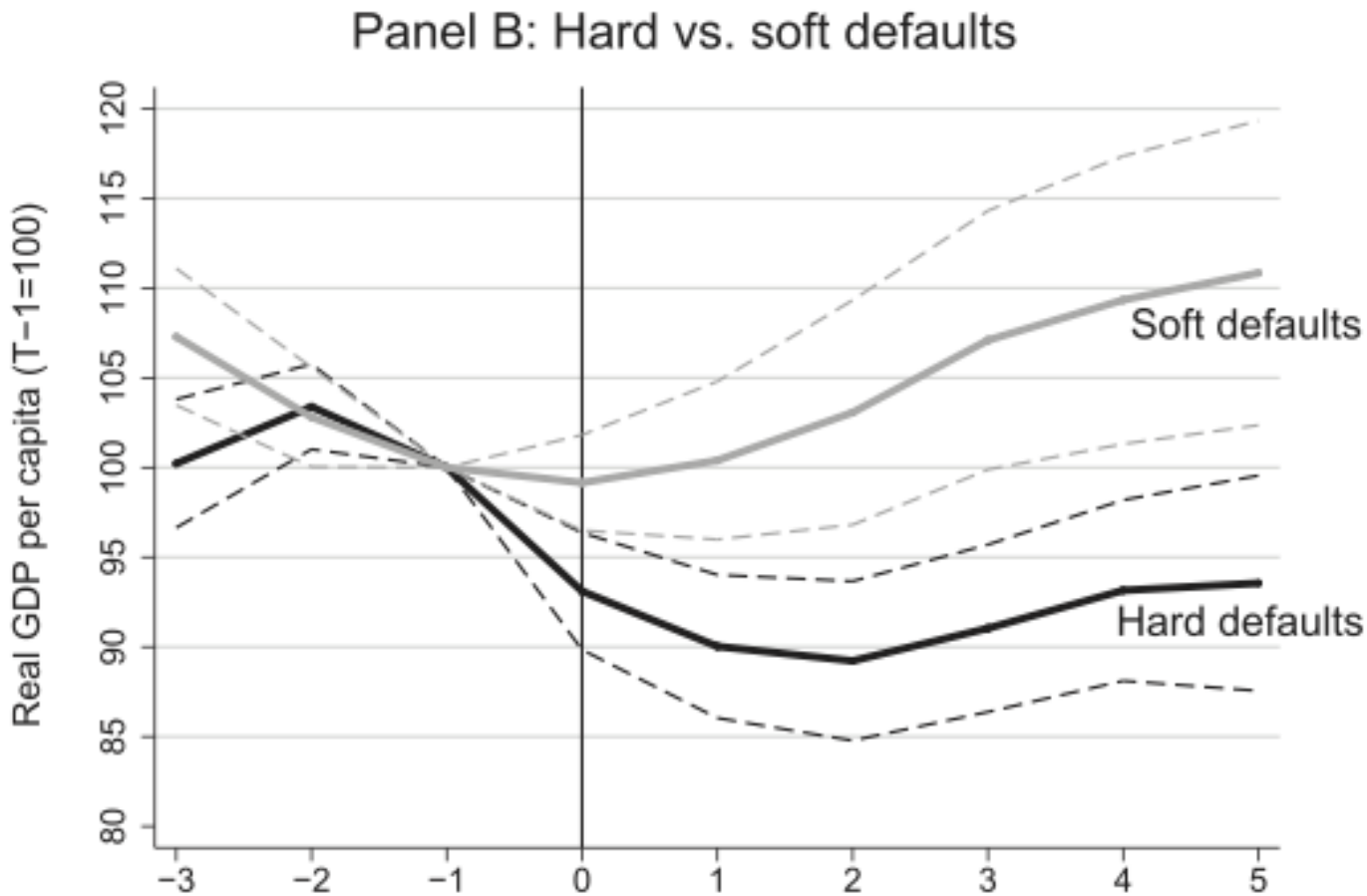

Thoughts

- Government debt is potentially useful!
- If your government is responsible, tool for good, not burdensome in current regime
- But governments default all the time
- The economic costs of default are not small, and the political consequences are even larger
- There are no free lunches: the worse the default, the worse the consequences
- Using vs playing with fire