The Perils of Bilateral Sovereign Debt

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May 2025

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Official Sovereign Debt

- A large share of sovereign borrowing takes the form of official debt

  … Multilaterals, development banks, other governments

- Emergence of new bilateral creditors outside the Paris Club

  … with claims to seniority and sometimes **opaque** terms

Questions

- How does the presence of a large official lender affect sovereign debt markets?
- What are the welfare implications for borrowing governments?

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Evaluating Large Official Creditors

Quantitative sovereign debt model with

- Competitive creditors in private markets (bondholders)
- Large bilateral lender
  1. Superior enforcement technology
  2. Bargained borrowing terms (price and quantity)
  3. Short-maturity loans

- Prime example: Central Bank swap lines (Horn et al., 2021), also deposits, IMF programs…

- Focus on the **interaction** between both funding sources

  … presence of bilateral lender affects government behavior in debt markets

  … outcomes in debt markets affect threat points in bargaining

Relational Overborrowing

Main findings

- Bilateral loans small relative to debt but significant effects
  - … provide funding when other sources dry up (e.g. because of default risk)
  - … can also increase **risk-taking**
- Bilateral loans induce **relational overborrowing**
  - Surplus requires spreads – spreads require risk
- Welfare losses from presence of bilateral creditor (for realistic bargaining weights)

- Relational overborrowing explained by elasticity of bilateral terms to market spreads
  - … remains present in a model without bargaining
  - … model with exogenous bilateral terms useful for **optimal design**

Relational Overborrowing

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Literature

- Sovereign debt/default with interactions from ‘official’ debt
  … senior debt (Hatchondo, Martinez, & Onder 2017), senior debt with conditionality (Boz 2011, Fink & Scholl 2016), bailout agencies (Corsetti, Guimaraes & Roubini 2006, Kirsch & Rühmkorf 2017, Roch & Uhlig 2018), official debt (Arellano & Barreto 2024, Liu, Liu, & Yue 2025)

- Data on new official creditors
  … Horn, Reinhart & Trebesch 2021a, 2021b, Gelpern et al. 2021, Horn, Parks, Reinhart & Trebesch 2023

- Central Bank swap lines
  … among advanced economies (Bahaj & Reis 2021, Cesa-Bianchi, Eguren-Martin, & Ferrero 2022), data for emerging-market borrowers (Perks, Rao, Shin, & Tokuoka 2021)

Model

Environment

The government of a small open economy borrows from a monopolist and from markets

- Income $y(z_t)$ follows an AR(1) process in logs
  - … Only one good, representative risk-averse household, expected utility
- Renegotiate the swap m each period
  - … Involves a transfer x and a new loan size m'
  - … Swap is non-defaultable $\implies$ Repaying m is the natural threat point
- Should expect $x = \frac{1}{1+r}m' - m$
  - … Implicit interest rate r to vary over time
  - … Interest rate to reflect market power
  - … Interest rate to reflect outside options

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Warm-up: Bargaining with Monopolist Only

- At income state z and loan m, solve

$$\max_{x,m'} \underbrace{\mathcal{L}(x,m,m',z)^{\theta}}_{\text{Lender surplus}} \times \overbrace{\mathcal{B}(x,m,m',z)^{1-\theta}}^{\text{Government surplus}}$$

- Government (borrower) surplus

$$\mathcal{B}(x,m,m',z) = \underbrace{u(y(z)+x) + \beta\mathbb{E}\left[v(m',z') \mid z\right]}_{\text{agreement: receive } x\text{, owe } m'} - \underbrace{\left(u(y(z)-m) + \beta\mathbb{E}\left[v(0,z') \mid z\right]\right)}_{\text{threat point: repay } m\text{, clean slate}}$$

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- Value functions $v(m,z)$ and $h(m,z)$ encode expected outcomes of future rounds

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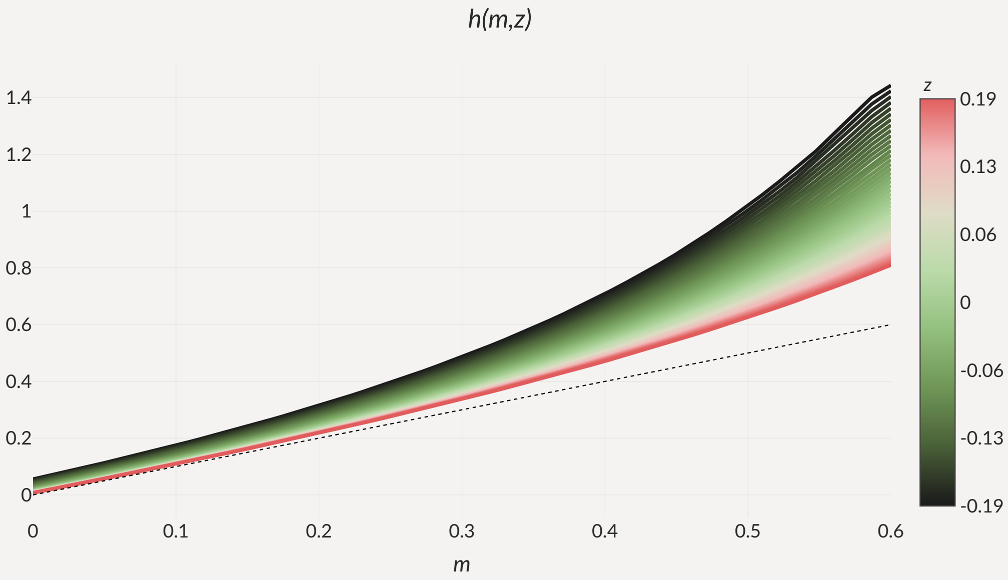
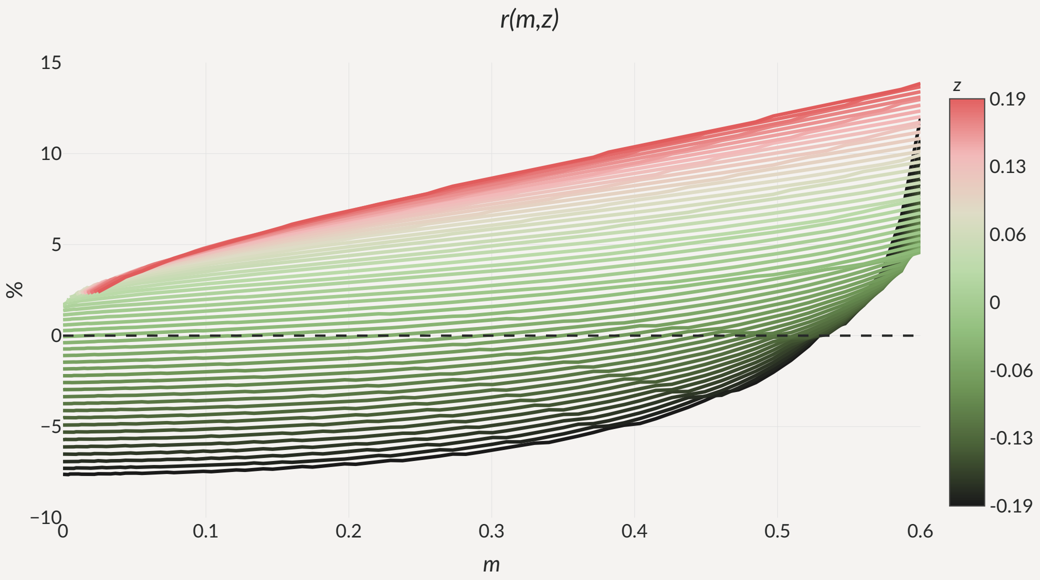
Monopolist Terms: Lender's Value Function



Monopolist Terms: Implicit Interest Rate



Monopolist Terms: Takeaways

key requirement:

threat point value decreasing in m

The threat point is less 'credible' when m is large

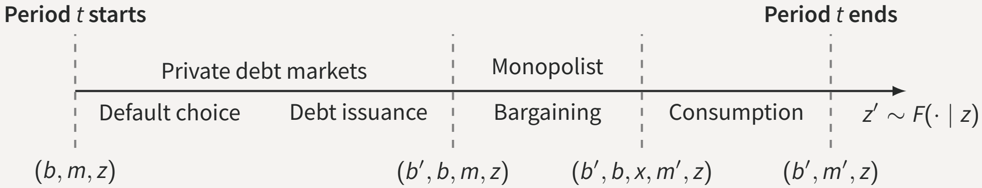
- This creates convexity in the lender's value function

  ... making the lender act 'as if' risk-loving

- The lender initially subsidizes the loan to induce indebtedness and high profits
  - Gamble for debt overhang

- Initial subsidy and high rates consistent with B's risk aversion – 'Participation constraint'

Timeline of Events



Borrowing from Markets

- Debt is a geometrically-decaying coupon

  … for each unit, get q, pay $\kappa, (1-\rho)\kappa, \dots (1-\rho)^{s-1}\kappa$
- Government enters first stage owing b in debt, m in swaps, income state z

$$v(b, m, z) = \max \left\{ v_R(b, m, z) + \epsilon_R, v_D(m, z) + \epsilon_D \right\}$$
$$v_R(b, m, z) = \max_{b'} w_R(b', b, m, z)$$

- Lenders in competitive markets need to anticipate interactions with the monopolist

$$q(b', b, m, z) = \beta_L \mathbb{E}\left[(1 - 1_{\mathcal{D}}(b', m', z')) (\kappa + (1-\rho) q(b'', b', m', z')) \mid z \right]$$
$$m' = m'(b', b, m, z)$$
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same sdf as monopolist

Bargaining Stage with Monopolist

- At state z, owing debt b bonds and m on the swap and having issued b'

Government surplus

$$\max_{x,m} \mathcal{L}_R(b', x, m, m', z)^{\theta} \times \mathcal{B}_R(b', b, x, m, m', z)^{1-\theta}$$

Lender surplus

- Lender's surplus

$$\mathcal{L}_R(b', x, m, m', z) = \underbrace{\left(a - x + \beta_L \mathbb{E}\left[h(b', m', z') \mid z\right]\right)}_{\text{agreement}} - \underbrace{\left(a + m + \beta_L \mathbb{E}\left[h(b', 0, z') \mid z\right]\right)}_{\text{threat point}}$$

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with $B(b', b, m, z) = q(b', b, m, z)(b' - (1-\rho)b) - \kappa b$

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- If default risk is low, not much role for monopolist
- Revenues from debt issuance $B(b', b, m, z)$ modulate the value of the threat point
  - … When $m - B(b', b, m, z)$ is large: government willing to borrow at high rates

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Quantitative Effects of Bilateral Loans

Calibration

- Calibrate to Argentina with only market (as in Roch & Roldán, 2023)

	Parameter	Value
Sovereign's discount factor	β	0.9504
Sovereign's risk aversion	γ	2
Preference shock scale parameter	χ	0.02
Lender's bargaining power	θ	0.5
Risk-free interest rate	r	0.01
Duration of debt	ρ	0.05
Income autocorrelation coefficient	ρ_z	0.9484
Standard deviation of y_t	σ_z	0.02
Reentry probability	ψ	0.0385
Default cost: linear	d_0	-0.24
Default cost: quadratic	d_1	0.3

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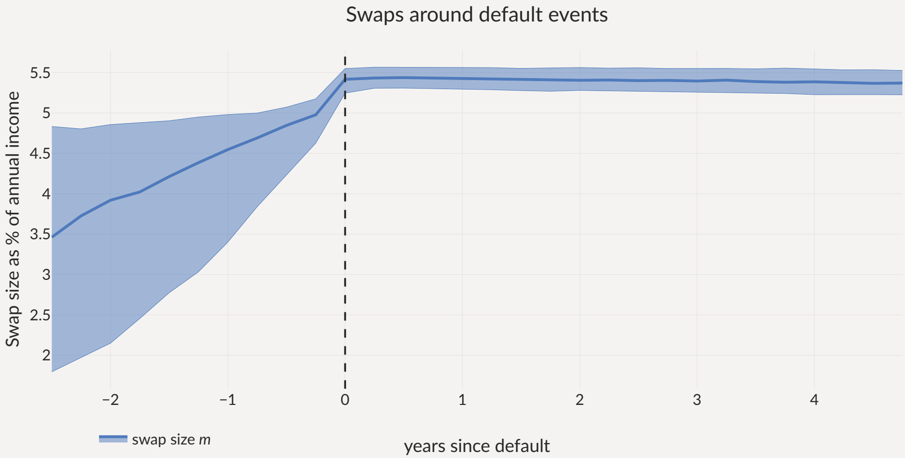
How Do Bilateral Loans Affect Equilibrium?

	Only market	Both, $\theta = 0.25$	Both, $\theta = 0.5$
Avg spread (bps)	804	1,841	2,396
Std spread (bps)	470	1,099	1,541
$\sigma(c)/\sigma(y)$ (%)	111	111	110
Debt to GDP (%)	21.4	20.8	20.2
Loan to GDP (%)	0	3.74	3.32
Corr. loan & spreads (%)	–	53.8	62.2
Default frequency (%)	6.53	13.0	14.7
Welfare gains (rep)	–	-0.082%	-0.41%

When Is the Loan Used?

Limited More

- Loans shoot up before *and during* defaults



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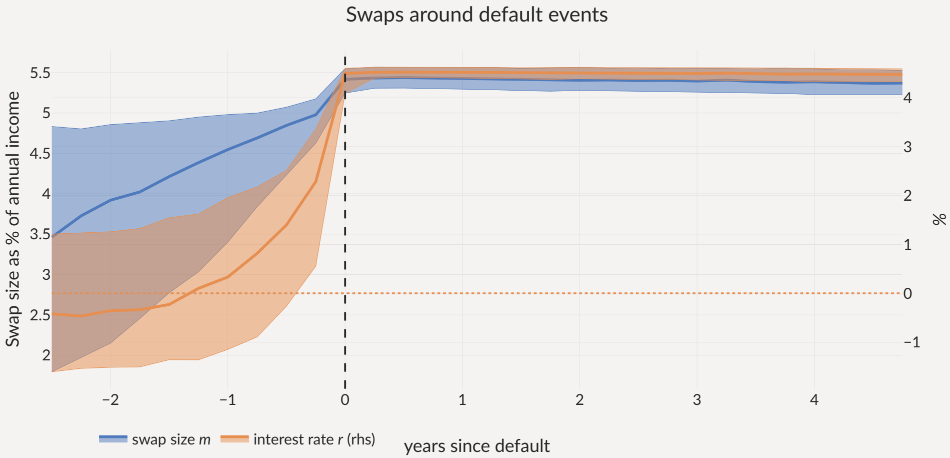

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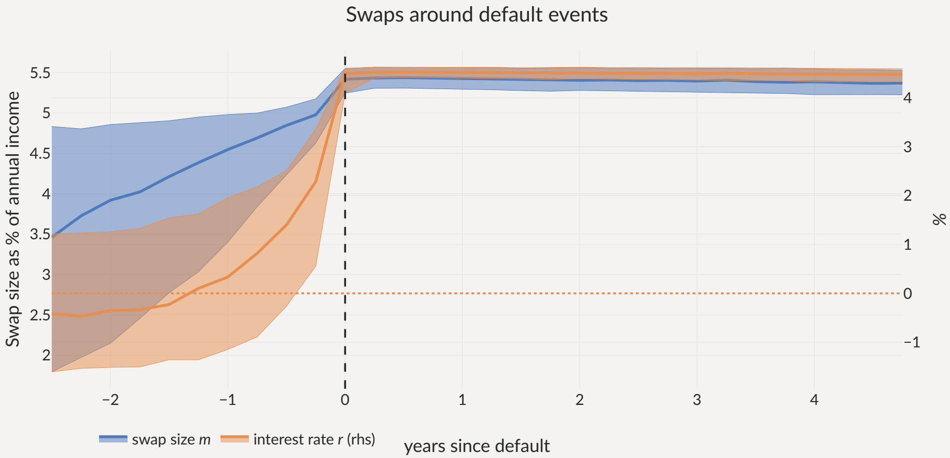

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Limiting Loans in Default

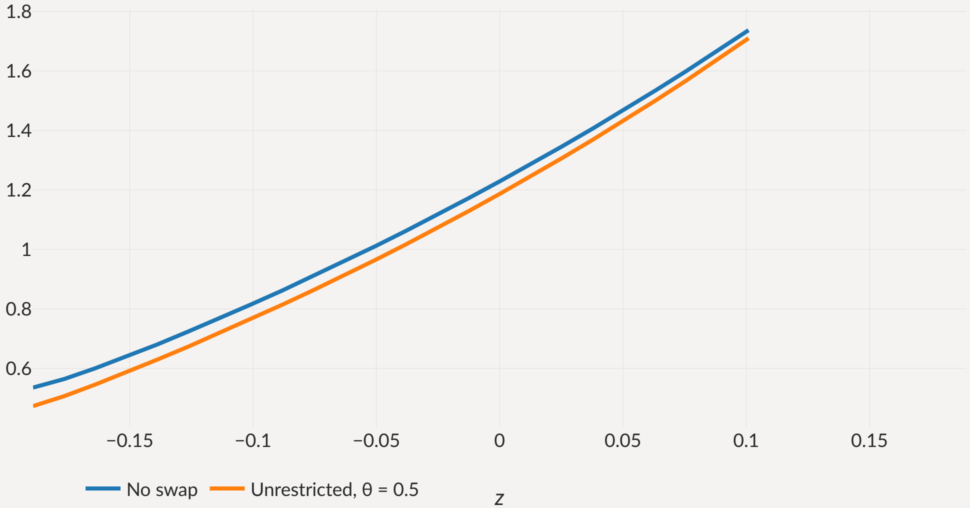
- **Limited**: entire loan must be repaid while in default $\Gamma(m) = 0$

	Only market	Unrestricted, $\theta = 0.5$	Limited, $\theta = 0.5$
Avg spread (bps)	804	2,396	1,216
Std spread (bps)	470	1,541	779
$\sigma(c)/\sigma(y)$ (%)	111	110	113
Debt to GDP (%)	21.4	20.2	21.7
Loan to GDP (%)	0	3.32	1.05
Corr. loan & spreads (%)	–	62.2	69.4
Default frequency (%)	6.53	14.7	9.34
Welfare gains (rep)	–	-0.41%	-0.084%

Default Barriers with Loans

- **Unrestricted**: default barrier moves inward, **Limited**: marginal impact

Debt levels at which $\mathscr{P}(b,m,z)$ crosses 50%



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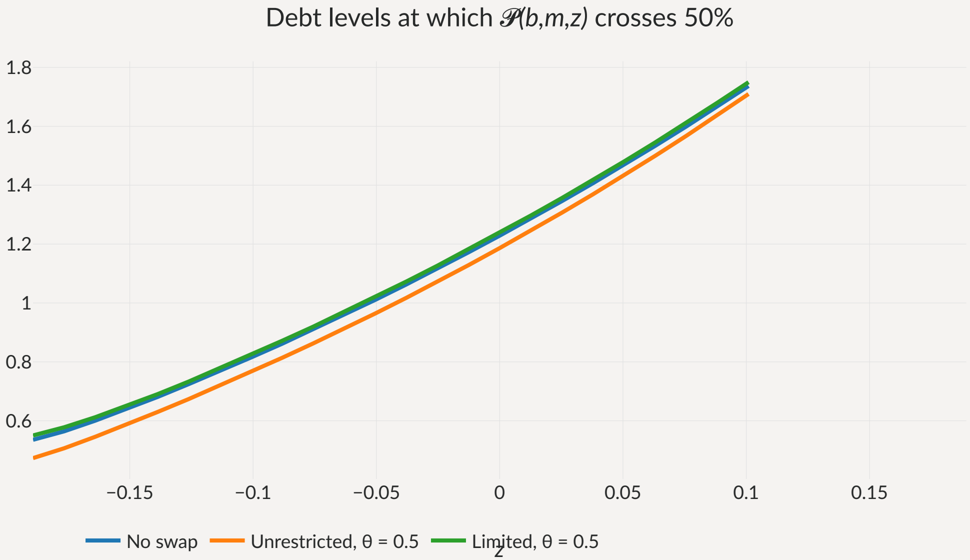
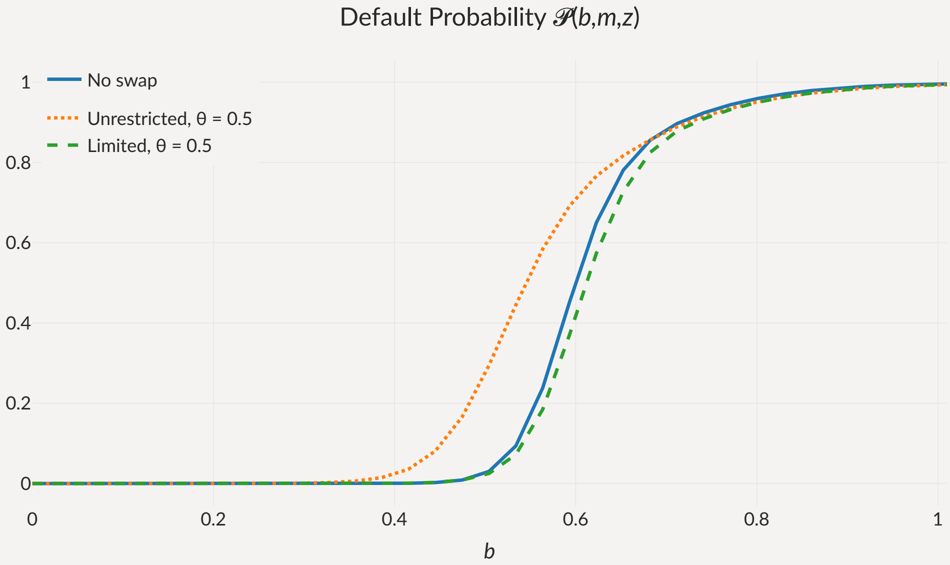


Debt Tolerance with Loans

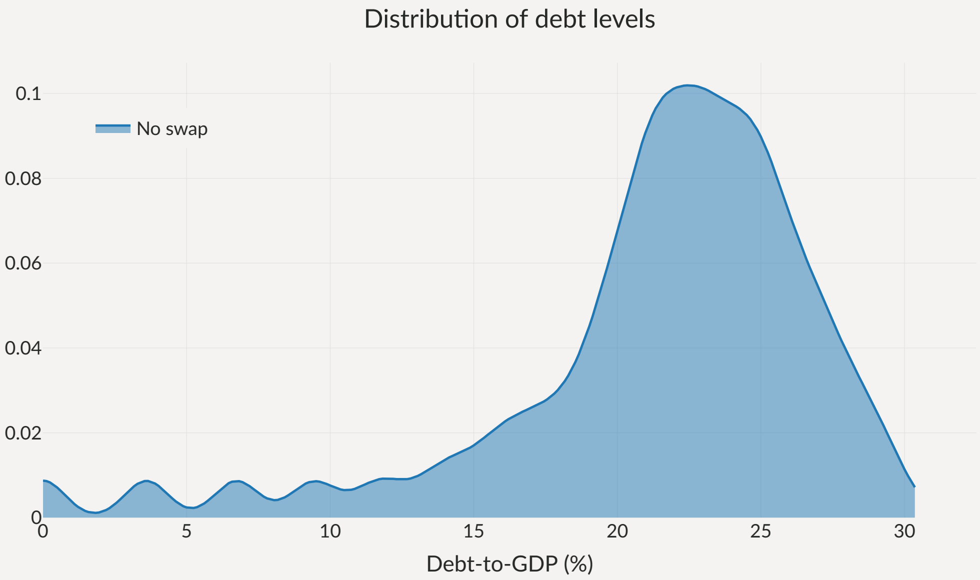
- **Unrestricted**: default more often, **Limited**: marginal impact



If **Limited** loans help repay the debt,

Why are there more defaults with loans?

Debt Levels with Loans



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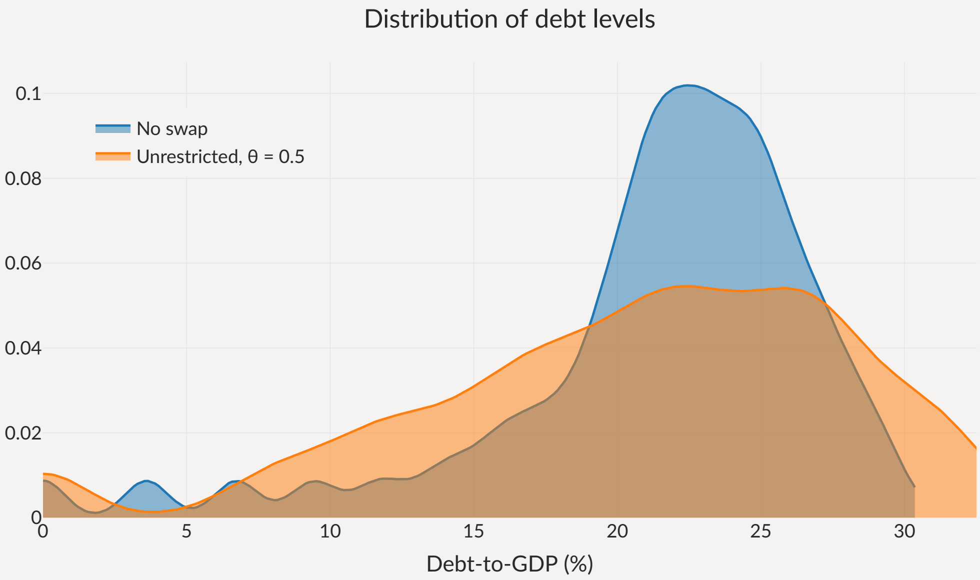

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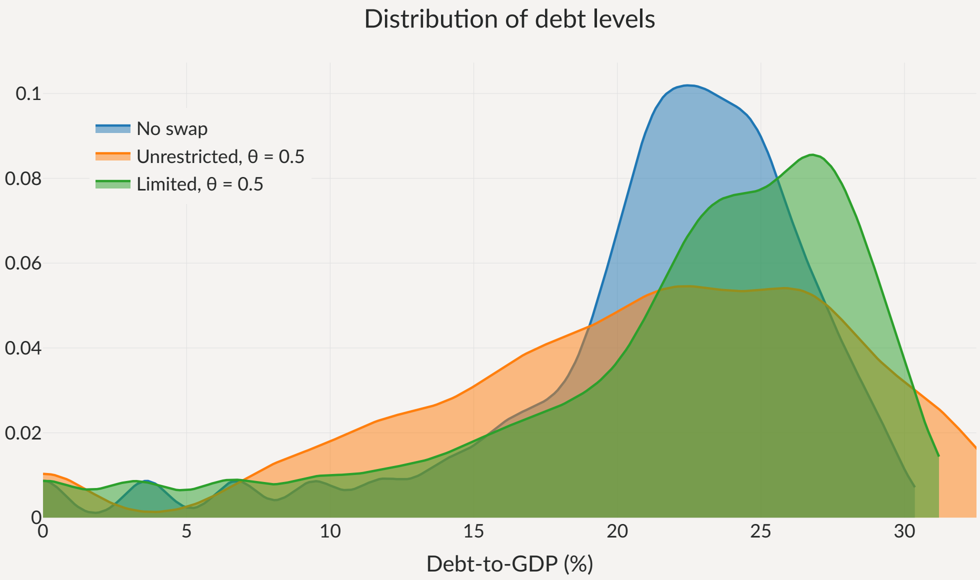
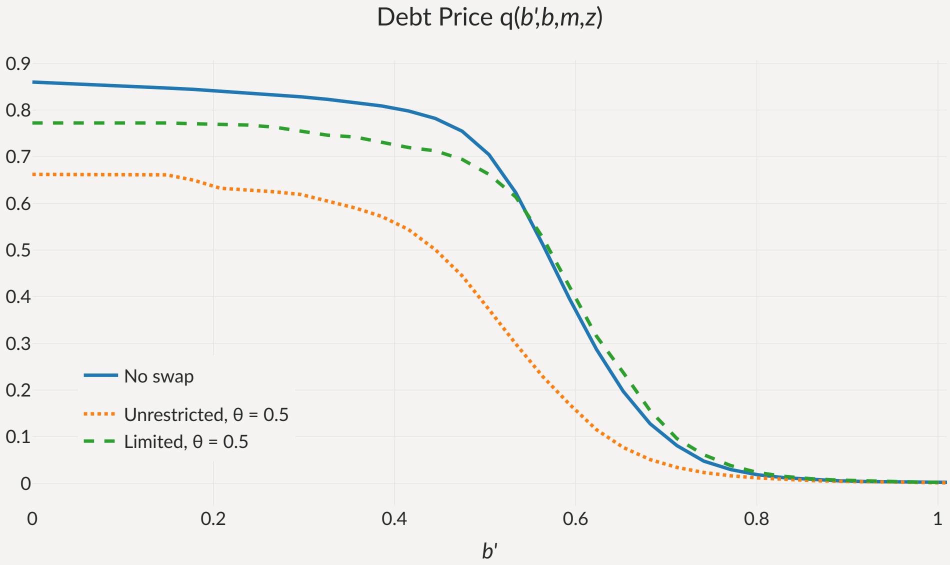


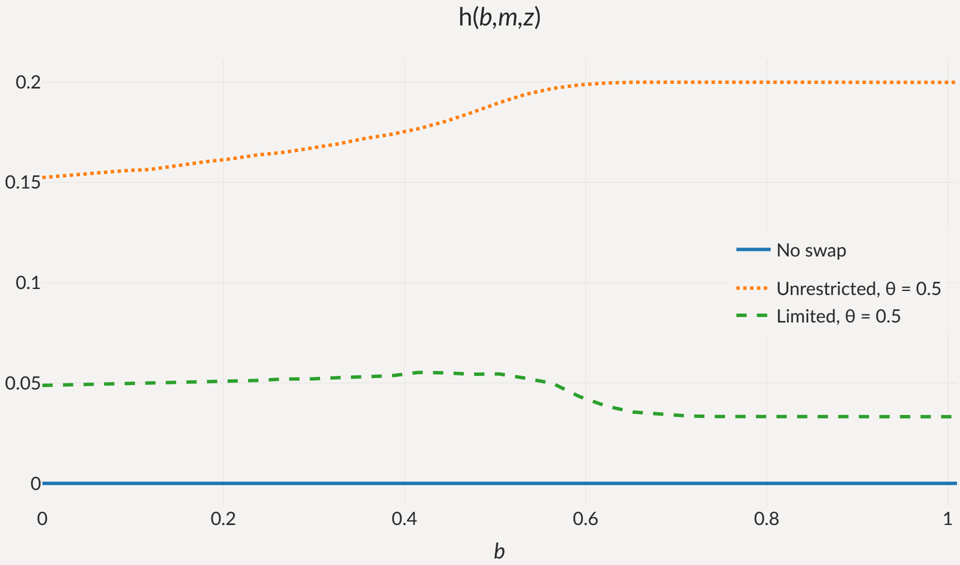
Debt Prices with Loans

Lower prices with same default rates: relational overborrowing similar to debt dilution



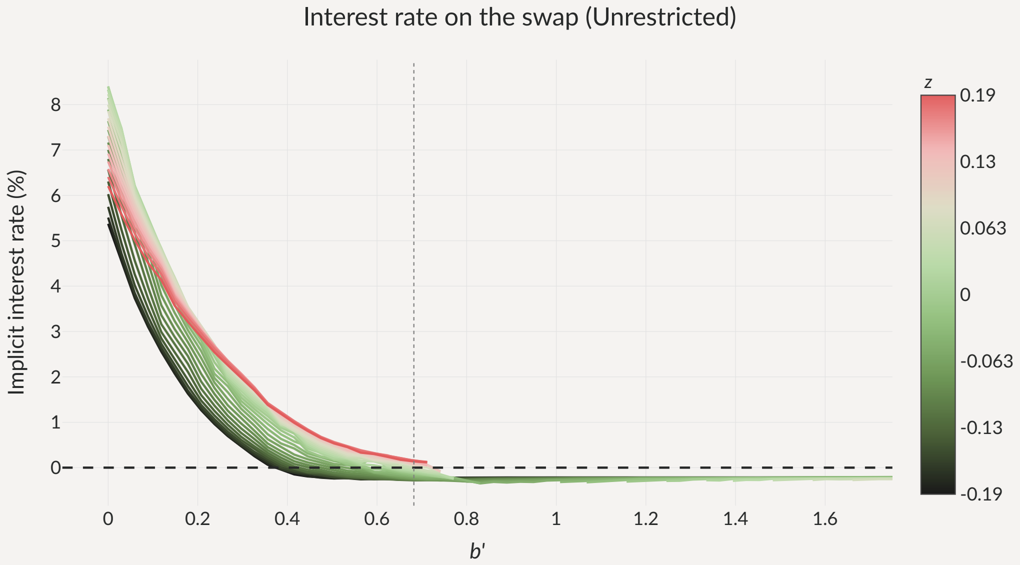
Monopolist's Profits

Monopolist's profits increasing in debt (cond. on repayment) – surplus requires spreads > 0



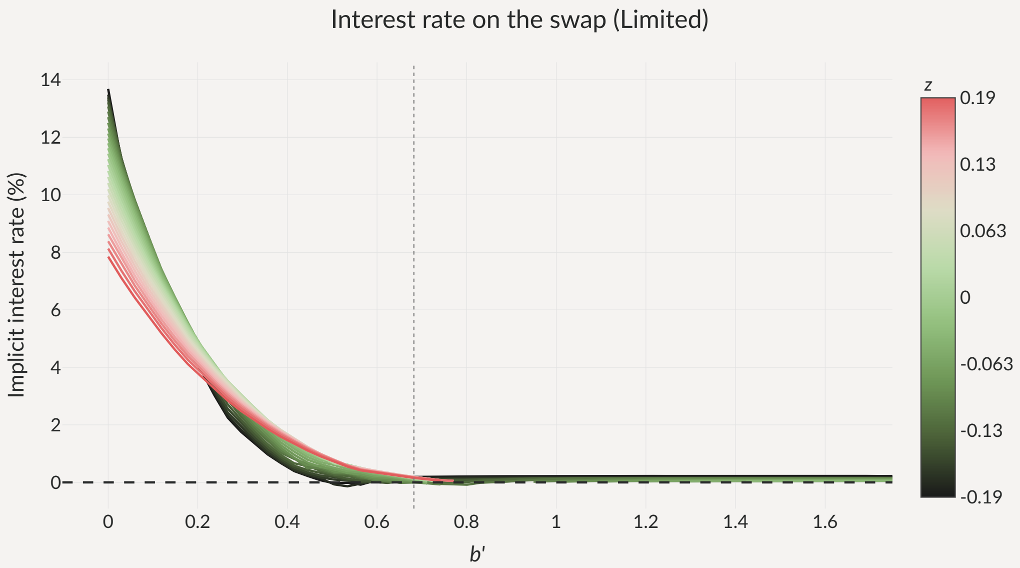
Risk-taking Incentives

Surplus on loan requires spreads > 0: monopolist provides incentives for risk taking



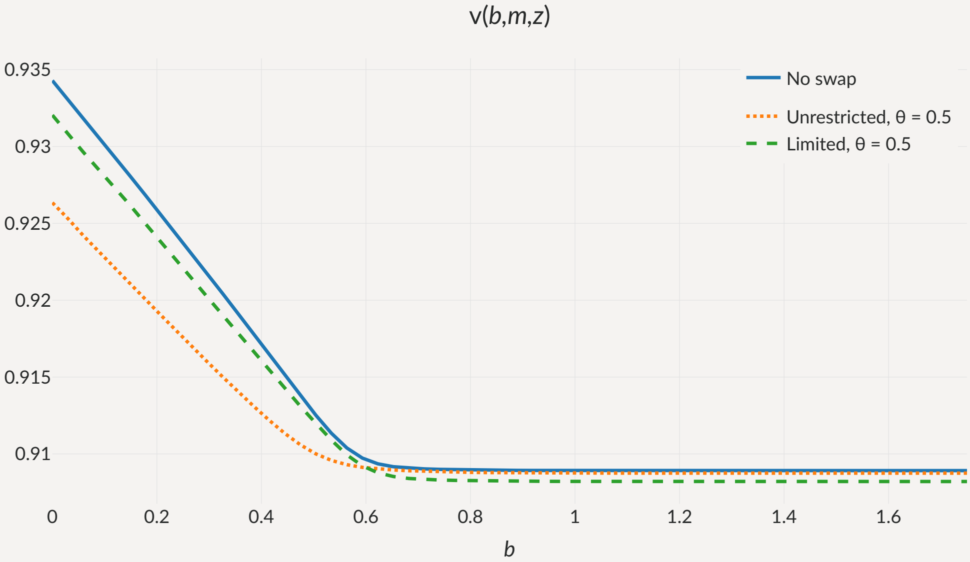
Risk-taking Incentives

Surplus on loan requires spreads > 0: monopolist provides incentives for risk taking



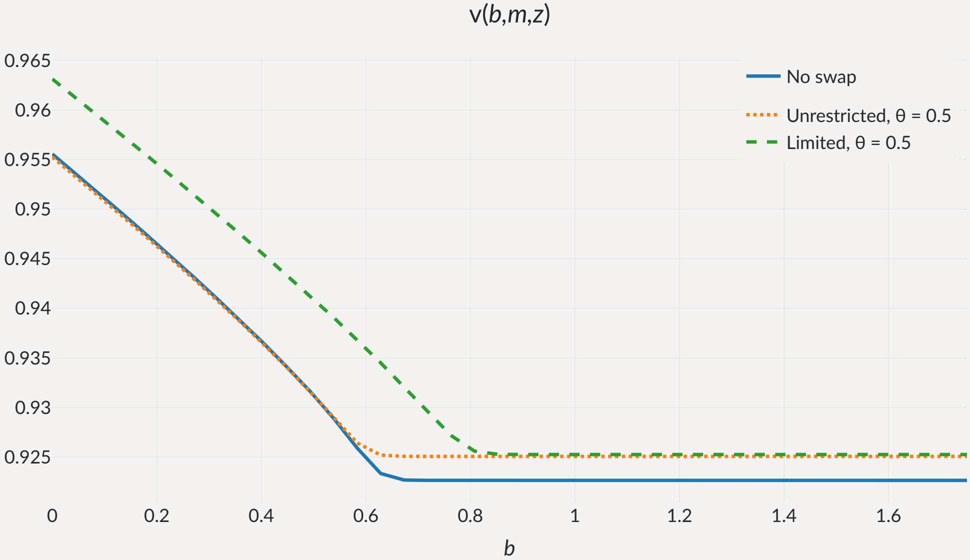
Welfare Effects of Bilateral Loans

Limited $\succcurlyeq$ Unrestricted, but…



Welfare Effects of Swap Lines — Short-term Debt

Short-term debt: swaps beneficial – interest on the swap small wrt to *whole* debt stock



Programming the Large Lender

Possible rules

- Bargaining over bilateral terms endogenously leads to punishment for deleveraging

- Explore interest rate rules of the form

$$r(b', m') = \max\{r, \alpha_0 + \alpha_b b' + \alpha_m m'\}$$

- Two versions
    - Risk-inducing rule: $\alpha_0 > 0, \alpha_b < 0, \alpha_m = 0$
    - Size-dependent (similar to surcharges): $\alpha_0 > 0, \alpha_b = 0, \alpha_m > 0$

Equilibrium with Exogenous Rules

	Only market	Size dependent r	Risk inducing r	Limited, $\theta = 0.5$
Avg spread (bps)	802	635	1,118	1,211
Std spread (bps)	454	241	1,051	753
$\sigma(c)/\sigma(y)$ (%)	112	120	118	113
Debt to GDP (%)	21.5	25.8	21.9	21.8
Loan to GDP (%)	0	2.32	1.37	1.05
Loan spread (bps)	–	836	2,267	408
Corr. loan & spreads (%)	–	50.2	43.6	70.1
Default frequency (%)	6.27	5.13	7.56	9.17
Welfare gains (rep)	–	0.61%	-0.094%	-0.084%

Concluding remarks

The Perils of Bilateral Sovereign Debt

- Simple model with monopolist/fringe structure

- Strong interaction between two markets for sovereign debt

  … even if swaps are not used intensely on the equilibrium path

- Market power crucial in model

  … how to discipline in model?

  … how to affect in reality?

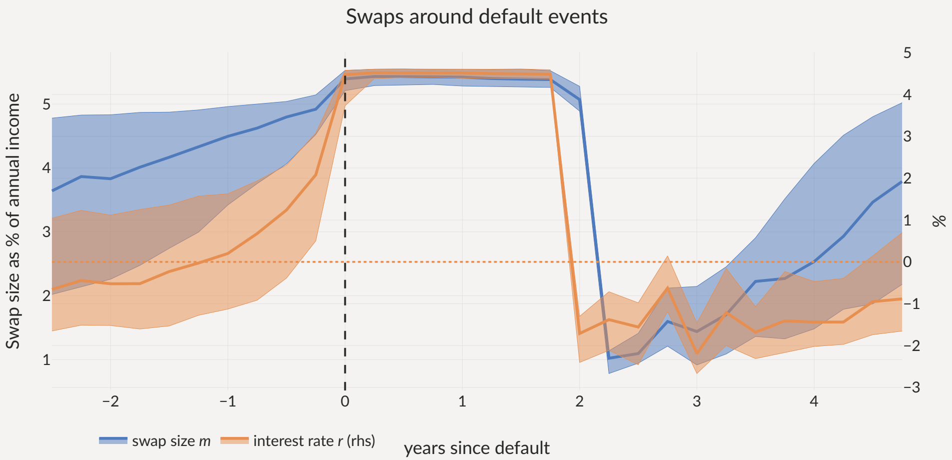
- Large welfare effects, policy challenges
  - How to limit their use during defaults?
  - Relational overborrowing – more gains from fiscal rules, state-contingent debt?

- Simple test to determine welfare gains of a new instrument

When is the Swap Used?

Back

- Further conditioning on default events lasting exactly two years



When is the Swap Used?

Back

- With Limited: $\Gamma(m) = m$