

The Perils of Bilateral Sovereign Debt

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- 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

▶ IDS data

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- What are its welfare implications for borrowing governments?

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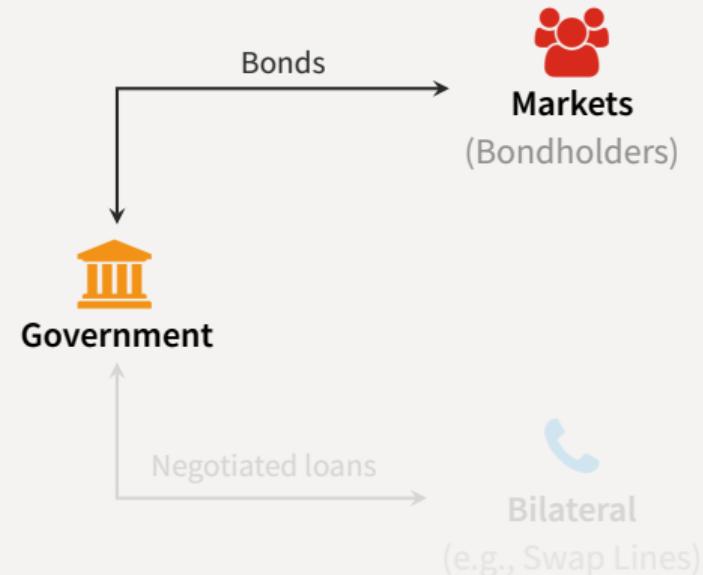
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Quantitative sovereign debt model with

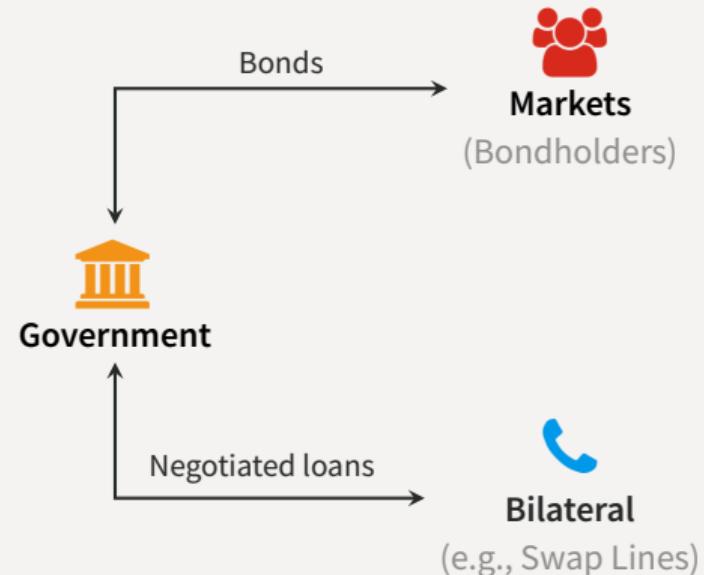
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- Large **bilateral** lender
 - 1. Superior enforcement
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 - 2. Bargained terms
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 - 3. Short-maturity loans
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(Horn et al., 2021)
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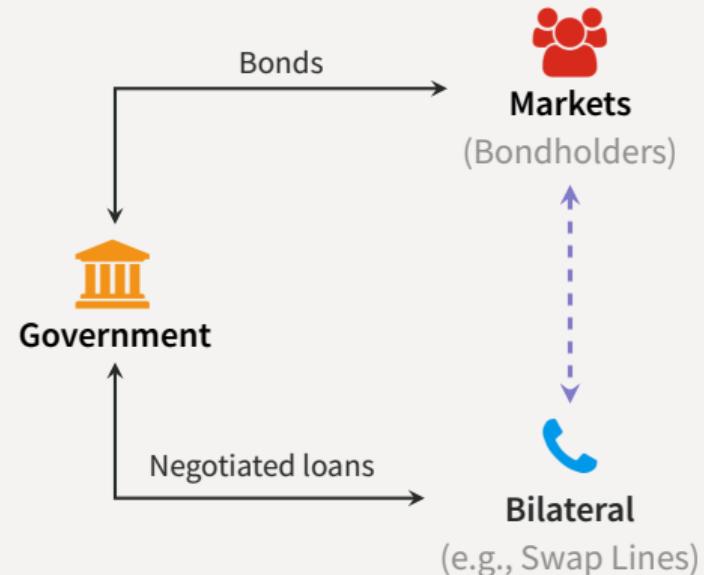
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Relational Overborrowing

Main findings

- Bilateral loans have significant effects on equilibrium outcomes
 - ... provide funding when other sources dry up (e.g. because of default risk) ▲
 - ... can also incentivize more **risk-taking** ▼
- If the rate on bilateral loans is decreasing in *market debt* [cross-elasticity]
 - ... government issues market debt more quickly, delevers more slowly
 - ... spends longer in the risky region
 - ... defaults more frequently
 - ... **welfare losses for the government**
- Cross-elasticity can emerge endogenously from **bargaining** ☎
 - ... at plausible values for bargaining weights
 - ... increased frequency of defaults dominates extra liquidity
 - ... **relational overborrowing**

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Theory

Bargaining and the Cross-Elasticity

- Two periods $t \in \{0, 1\}$, endowment $y(z)$ at $t = 1$, would like to consume at both dates.
- Owe m to senior lender, just issued b' at price q in markets.
- Nash bargaining with weight θ for the lender solves

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

where

$$\mathcal{L}(m, x, r) = \underbrace{-x + \beta_L(x + m)(1 + r)}_{\text{agreement}} - \underbrace{m}_{\text{threat point}}$$

$$\begin{aligned} \mathcal{B}(b', m, x, r) &= \underbrace{u(qb' + x) + \beta \mathbb{E} [u(y(z) - (x + m)(1 + r) - f(b'))]}_{\text{agreement}} \\ &\quad - \underbrace{(u(qb' - m) + \beta \mathbb{E} [u(y(z) - f(b'))])}_{\text{threat point}} \end{aligned}$$

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Bargaining and the Cross-Elasticity

- First-order conditions for bargaining problem

$$u'(q\mathbf{b}' + x) = \frac{\theta}{1-\theta} \frac{\mathcal{B}(\mathbf{b}', \mathbf{m}, x, r)}{\mathcal{L}(\mathbf{m}, x, r)}$$

$$u'(q\mathbf{b}' + x) = \frac{\beta}{\beta_L} \mathbb{E} [u' (y(z) - (x + m)(1 + r) - f(\mathbf{b}'))]$$

- Can prove that

$$\frac{\partial x}{\partial q} \leq 0 \quad \text{and} \quad \frac{\partial r}{\partial q} \leq 0$$

- Intuition: large part of surplus comes from the term

$$u(q\mathbf{b}' + x) - u(q\mathbf{b}' - \mathbf{m})$$

... higher q induces lower curvature, reduces surplus

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Debt Dilution with Undefaultable Loans

Issue long bonds b at $t = 0$, short bonds d and loans m at $t = 1$, repay at $t = 2$

$$c_0 = q(b, d)b \quad c_1 = q(b, d)d + \phi(b, d, m)m \quad c_2(z) = y(z) - m - \min\{h(z), b + d\}$$

with

$$q(b, d) = \mathbb{P}(b + d \leq h(z)) = p(b + d) \quad \text{and} \quad m \leq \bar{m}$$

to maximize $\sum_{t=0}^2 \mathbb{E}[u(c_t)]$

Commitment: Choose d internalizing effect on initial prices

$$u'(c_0) \underbrace{p'(b + d)b}_{\text{past prices}} + u'(c_1) \left(\underbrace{p(b + d)}_{\text{revenue}} + \underbrace{p'(b + d)d}_{\text{current prices}} + \underbrace{\phi'_d(b, d, m)m}_{\text{cross-elasticity}} \right) = \mathbb{E}[u'(c_2)]$$

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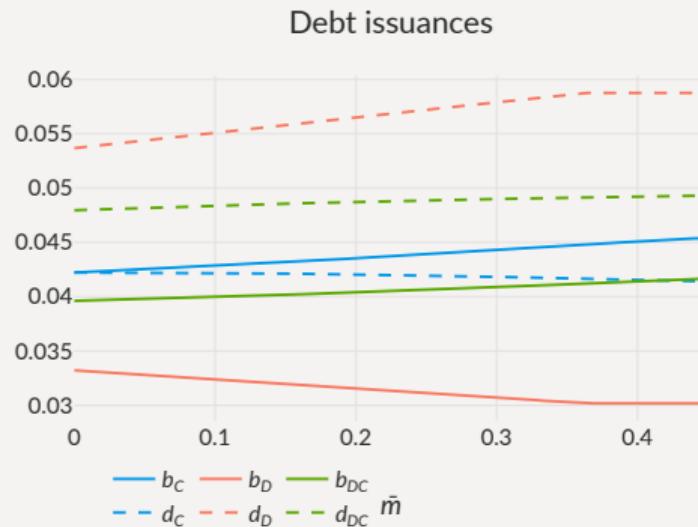
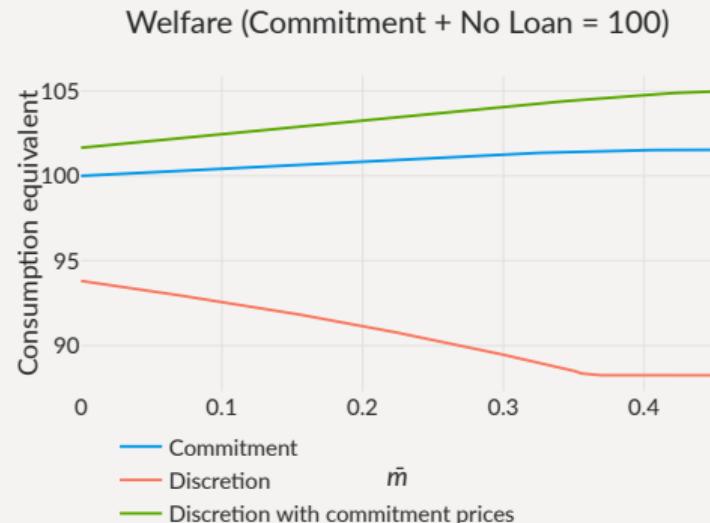
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Debt Dilution with Undefaultable Loans and Cross-Elasticity



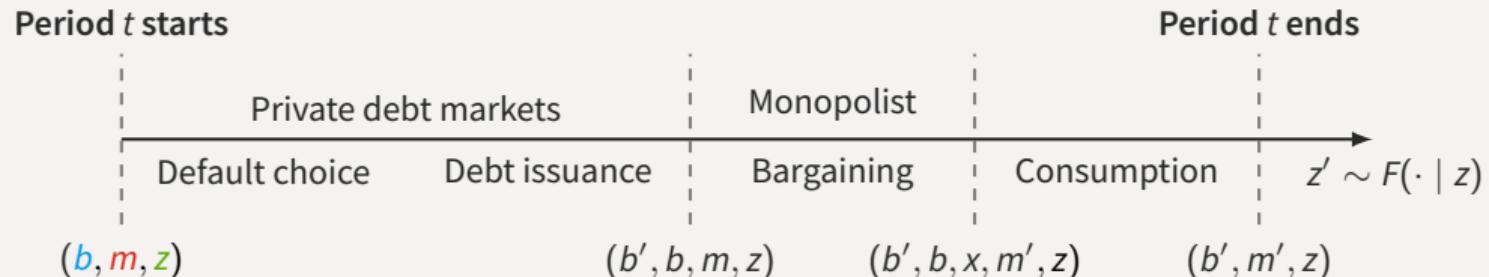
Takeaways

- Bargaining can induce a cross-elasticity from market debt to loan terms
 - ... through threat-point manipulation
- The cross-elasticity worsens the debt dilution problem
 - ... it can also create welfare losses if it strong enough

Quantitative Model

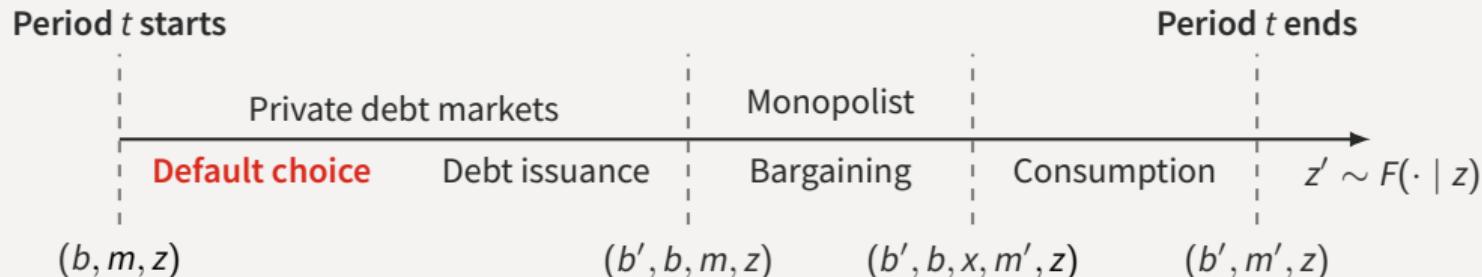
Timeline of Events

- Enter period t owing b to bondholders, m to monopolist, income $y(z)$



Timeline of Events

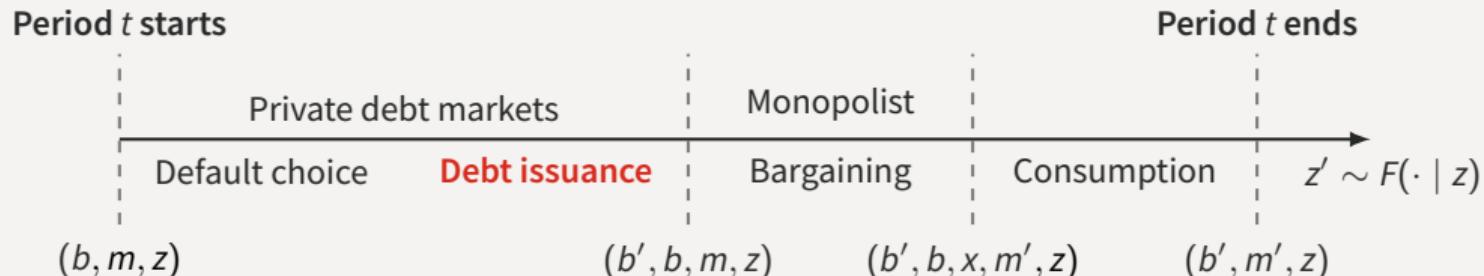
- Choose to **repay** or **default** the *market* debt subject to convex output costs



$$v(b, m, z) = \max \{ v_R(b, m, z) + \epsilon_R, v_D(m, z) + \epsilon_D \}$$

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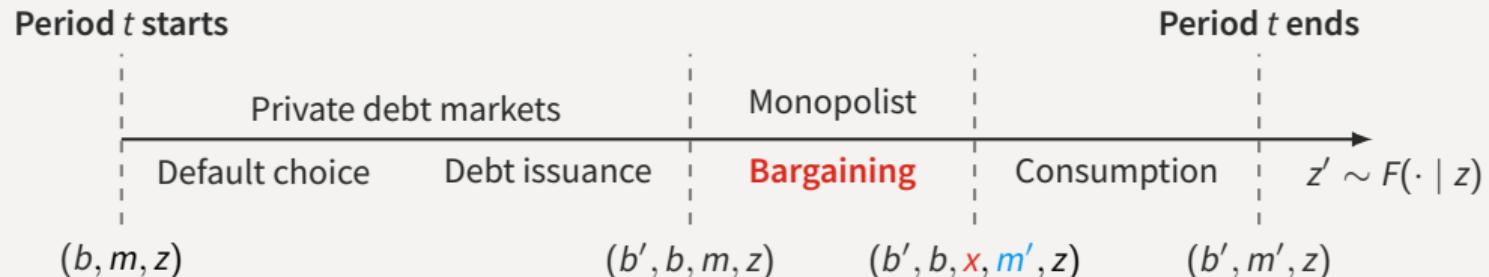
- If repaid, issue new (long-term) debt b' in markets at price q [coupon rate κ , maturity $1/\delta$]



$$q(b', b, m, z) = \beta_L \mathbb{E} [(1 - \mathbf{1}_D(b', \mathbf{m}', z')) (\kappa + (1 - \delta) q(\mathbf{b}'', b', \mathbf{m}', z')) | z]$$

Timeline of Events

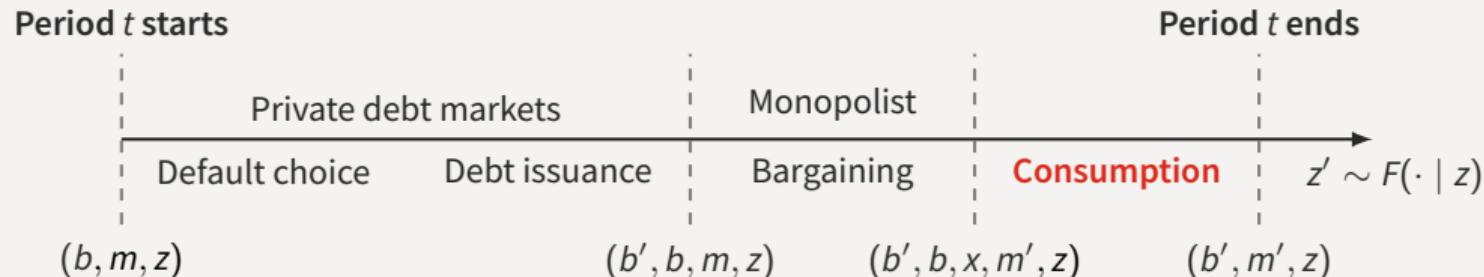
- Meet with senior lender, decide any transfers x and new/remaining balance m'



$$r(x, m', m) = \frac{m'}{x + m} - 1$$

Timeline of Events

- Consume **output** plus **revenues from debt issuance** plus **transfers** minus **debt service**



$$c_R = y(z) + q(b', b, m, z)(b' - (1 - \delta)b) + x_R(b', b, m, z) - \kappa b$$

$$c_D = y(z) - h(z) + x_D(m, z); \quad x_D(m, z) \leq \Gamma(m)$$

Exogenous Bilateral Terms

Programming the Large Lender: Possible Rules

- Explore interest rate rules of the form

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

- Two versions

Size-dependent

$$\alpha_0 > 0, \alpha_b = 0, \alpha_m > 0$$

Risk-inducing

$$\alpha_0 > 0, \alpha_b < 0, \alpha_m \geq 0$$

- First-order condition for bonds

$$u'(c) \left(q + \frac{\partial q}{\partial b'} i + \frac{1}{1+r_b} \frac{\partial m'}{\partial b'} + \frac{\partial \frac{1}{1+r_b}}{\partial b'} m' \right) = \beta \mathbb{E} \left[v_b(b', m', z') + v_m(b', m', z') \frac{\partial m'}{\partial b'} \mid z \right]$$

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Equilibrium with Exogenous Rules

- ‘Only market’ standard calibration to Argentina 1993-2001

	Only market	Size dependent r	Risk inducing r
Avg spread (bps)	714	623	921
Std spread (bps)	399	315	552
$\sigma(c)/\sigma(y)$ (%)	113	115	115
Debt to GDP (%)	22.5	23.5	22.8
Loan to GDP (%)	0	0.71	0.972
Loan spread (bps)	–	682	1,264
Corr. loan & spreads (%)	–	62.5	48.1
Default frequency (%)	5.72	5.13	6.92
Welfare gains (rep)	–	0.21%	-0.079%

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⬇️ with size dependent

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- Welfare:

↑ with size dependent

↓ with risk-inducing

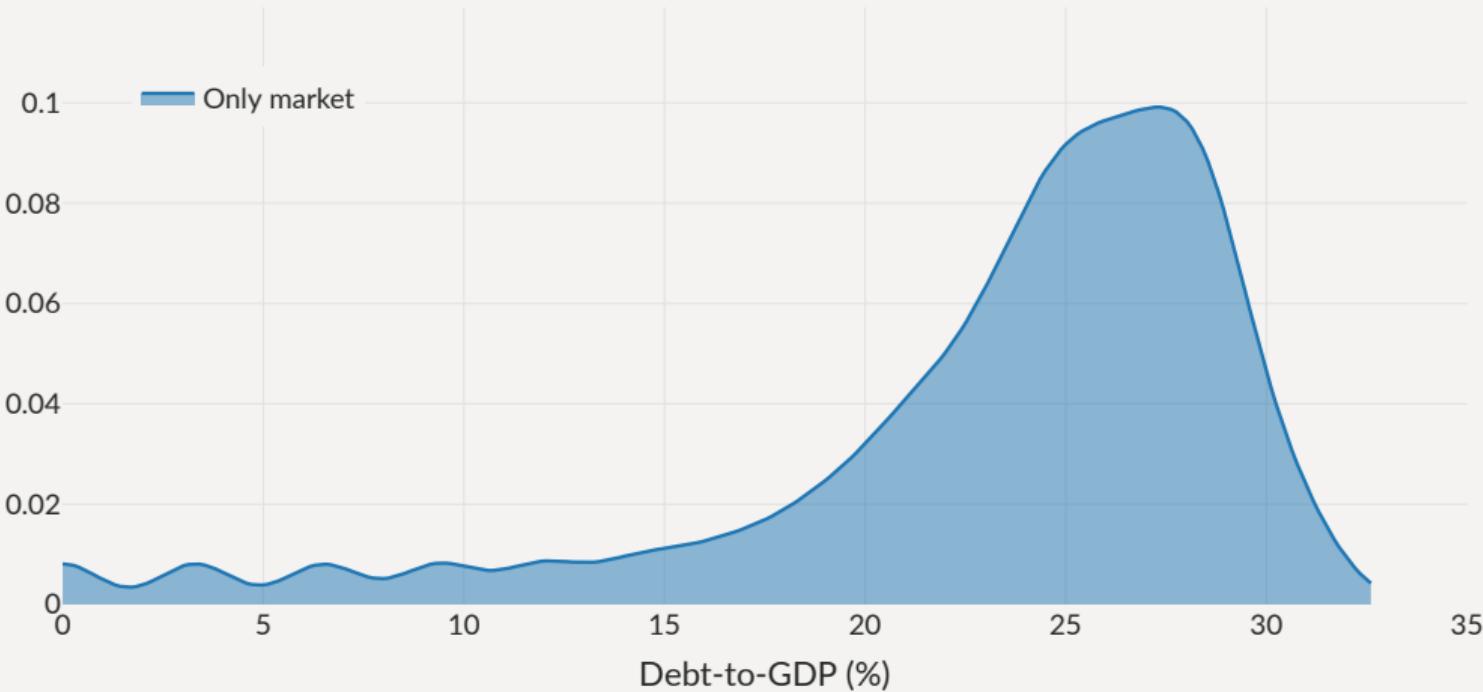
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Default barriers with Exogenous Bilateral Rules



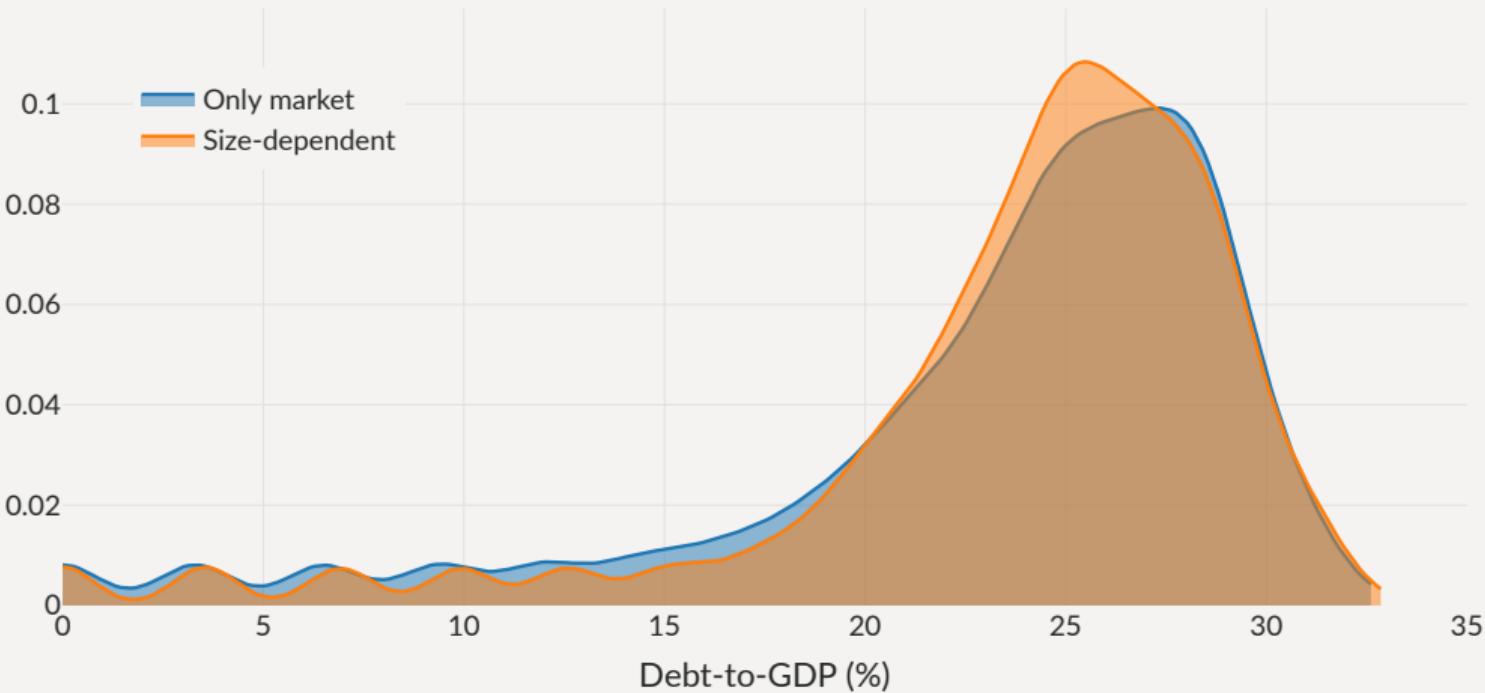
Debt Levels with Exogenous Bilateral Rules

Distribution of debt levels



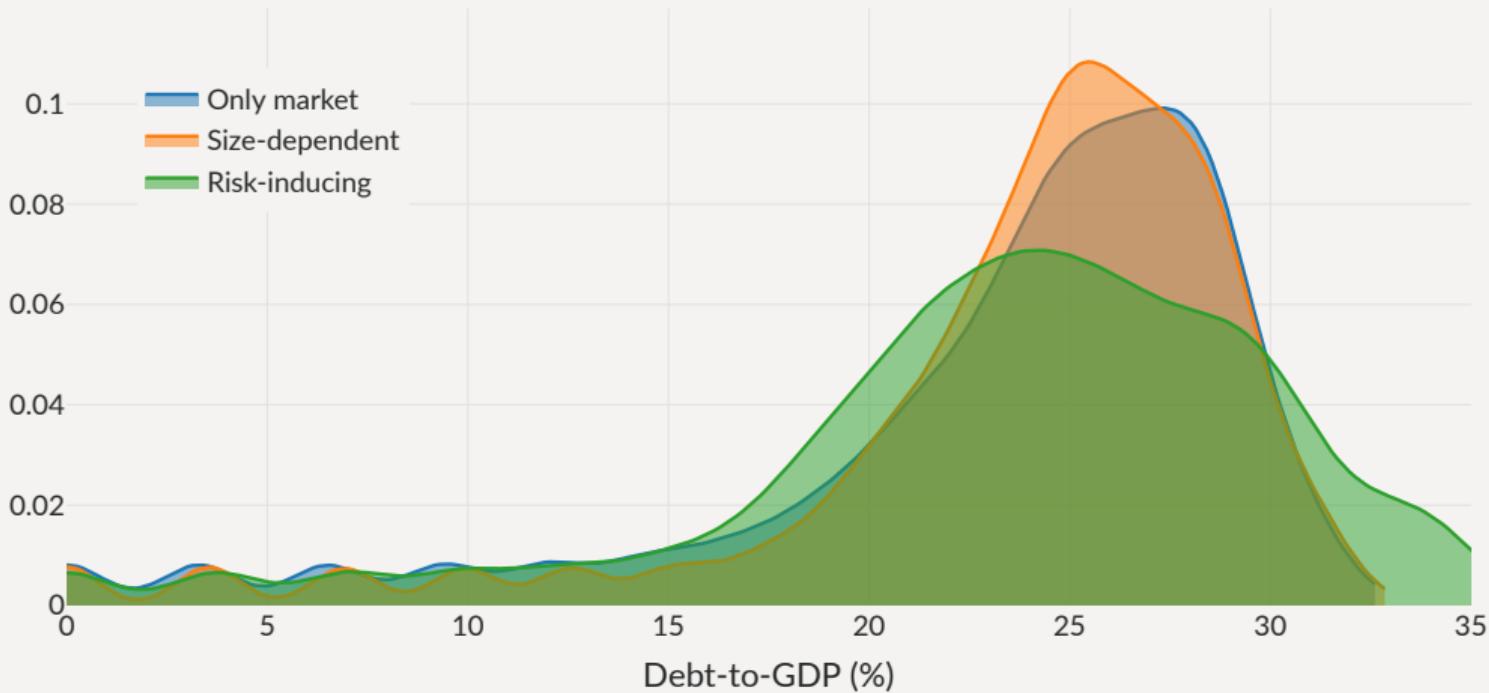
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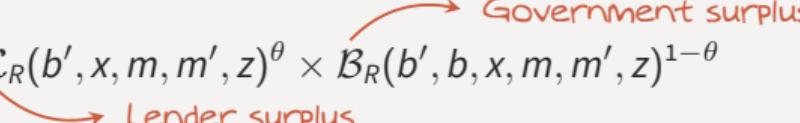


Endogenous Bargaining

Bargaining Stage with Monopolist

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

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



- Lender's surplus

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

- Government's surplus

$$\begin{aligned} \mathcal{B}_R(b', b, x, m, m', z) &= \underbrace{u(y(z) + B(b', b, m, z) + x)}_{\text{agreement}} + \beta \mathbb{E}[v(b', m', z') | z] \\ &\quad - \underbrace{(u(y(z) + B(b', b, m, z) - m) + \beta \mathbb{E}[v(b', 0, z') | z])}_{\text{threat point}} \end{aligned}$$

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same sdf as markets

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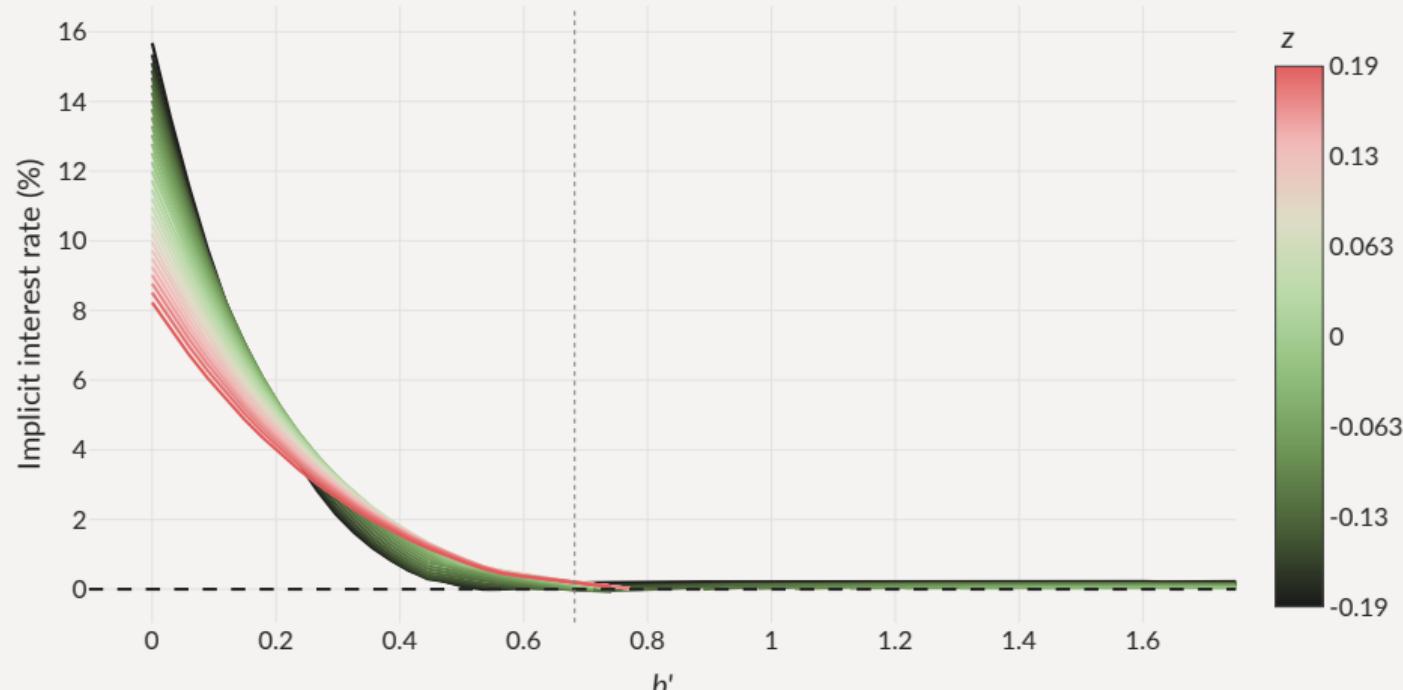
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- Revenues from debt issuance $B(b', b, m, z)$ modulate the value of the threat point
 - After large revenues (high q , high b'), gov't flush with cash, **strong** in bargaining
 - After bad issuance (low q or low b'), gov't **weak** in bargaining

Threat point manipulation: increase market b' to reduce bilateral r

Loan interest rate (Limited)

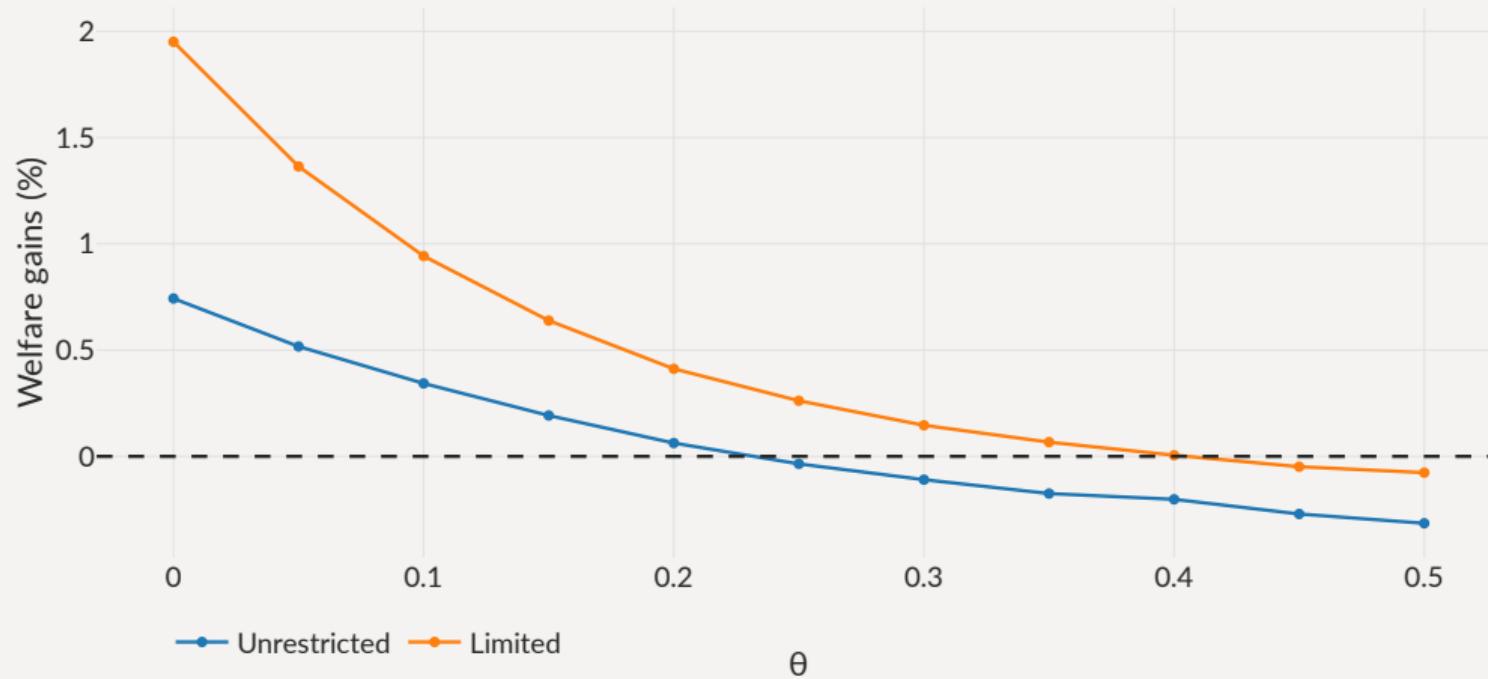


Limiting Loans in Default

- 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)	714	2,105	1,038
Std spread (bps)	399	1,331	612
$\sigma(c)/\sigma(y)$ (%)	113	109	113
Debt to GDP (%)	22.5	21.2	22.5
Loan to GDP (%)	0	3.02	1.06
Loan spread (bps)	-	-429	536
Corr. loan & spreads (%)	-	67.5	71.1
Default frequency (%)	5.72	13	7.72
Welfare gains (rep)	-	-0.43%	-0.2%

Bargaining Power and Welfare



Concluding remarks

The Perils of Bilateral Sovereign Debt

- Simple model of borrowing from **markets** and a **senior bilateral lender**
 - ... strong interaction between two markets for sovereign debt
 - ... even if bilateral loans are **not** used intensely on the equilibrium path
- **Dangerous** when bilateral interest rate responds negatively to *market debt*
 - ... cross-elasticity induces risk-taking, more defaults, welfare losses
 - ... Bargaining as an example of situation where cross-elasticity emerges
- Cross-elasticity constitutes a simple test to assess welfare gains of **new** instruments
 - ... or a boost to the gains of fiscal rules, state-contingent debt...

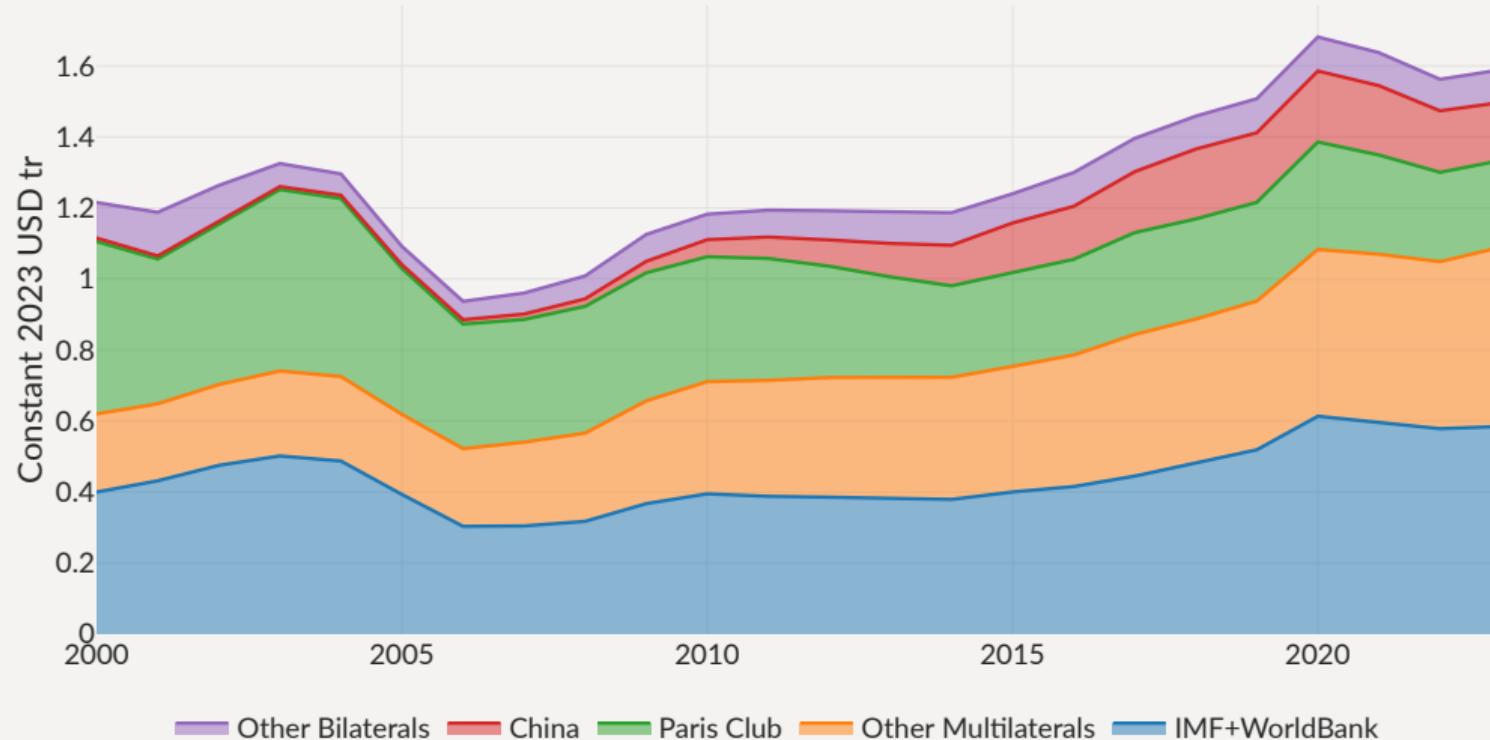


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A New Landscape for Official Sovereign Debt

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Total Official Debt



Loan drawings m' (Limited)

