The Perils of Bilateral Sovereign Debt

Francisco Roldán
IMF

César Sosa-Padilla
Notre Dame & NBER

Southern Economic Association
Tampa, November 2025

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 (▶ IDS data)
  - … with claims to seniority and sometimes **opaque** terms

> **Questions**
> - How does the presence of a large senior lender affect sovereign debt markets?
> - What are its welfare implications for borrowing governments?

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 ▸ IDS data
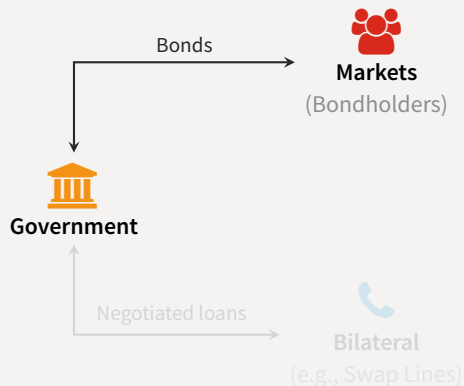 - … with claims to seniority and sometimes **opaque** terms

---

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

Quantitative sovereign debt model with

- Competitive creditors in private markets
- Large bilateral lender
  1. Superior enforcement
     [de-facto seniority]
  2. Bargained terms
     [price and quantity]
  3. Short-maturity loans

- Prime example: Central Bank swap lines
  (Horn et al., 2021)

- Focus on the interaction between both funding sources

Bonds

Markets
(Bondholders)

Government

Negotiated loans

Bilateral
(e.g., Swap Lines)

Evaluating Senior Official Creditors

Quantitative sovereign debt model with
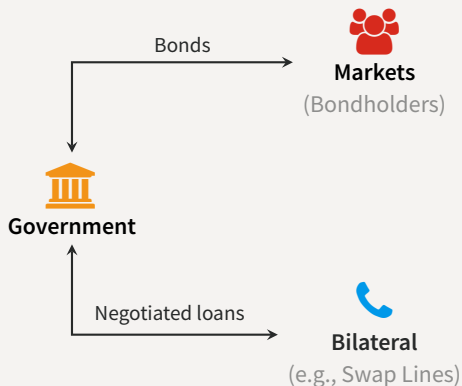
- Competitive creditors in private markets
- Large bilateral lender
    1. Superior enforcement
       [de-facto seniority]
    2. Bargained terms
       [price and quantity]
    3. Short-maturity loans

- Prime example: Central Bank **swap** lines
  (Horn et al., 2021)

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

Bonds → **Markets** (Bondholders)

Government

Negotiated loans → **Bilateral** (e.g., Swap Lines)

Quantitative sovereign debt model with
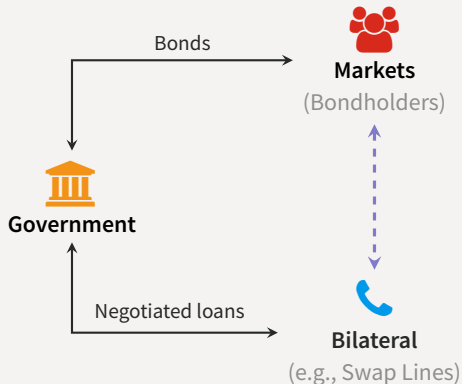
- Competitive creditors in private markets
- Large bilateral lender
  1. Superior enforcement
     [de-facto seniority]
  2. Bargained terms
     [price and quantity]
  3. Short-maturity loans

- Prime example: Central Bank **swap** lines
  (Horn et al., 2021)

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

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**

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
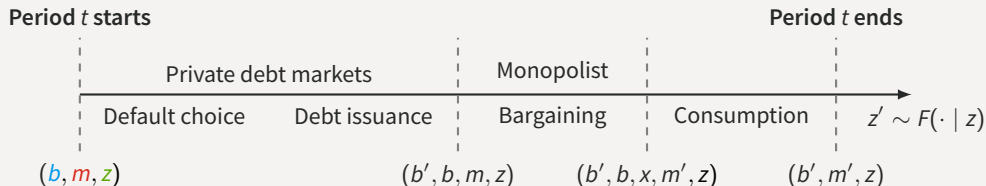
Relational Overborrowing

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**

Theory

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

Period t starts   **Period t ends**

Private debt markets   Monopolist

Default choice   Debt issuance   Bargaining   Consumption $z' \sim F(\cdot \mid z)$

(b, m, z) (b', b, m, z) (b', b, x, m', z) (b', m', z)

Timeline of Events

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

Period t starts ... **Period t ends**

Private debt markets | Monopolist

Default choice | Debt issuance | Bargaining | Consumption | $z' \sim F(\cdot \mid z)$

(b, m, z) | (b', b, m, z) | (b', b, x, m', z) | (b', m', z)

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

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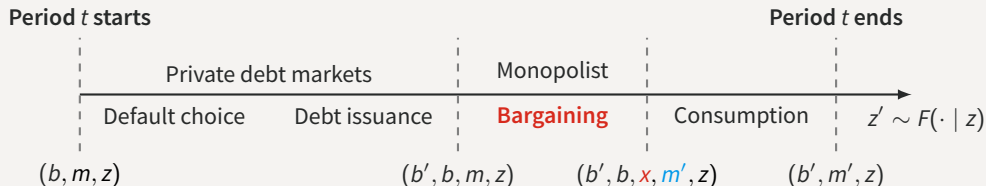
- If repaid, issue new (long-term) debt b' in markets at price q [coupon rate κ, maturity $1/\delta$]

Period t starts   **Period t ends**

	Private debt markets	Monopolist		

Default choice   **Debt issuance**   Bargaining   Consumption $z' \sim F(\cdot \mid z)$

(b, m, z) (b', b, m, z) (b', b, x, m', z) (b', m', z)

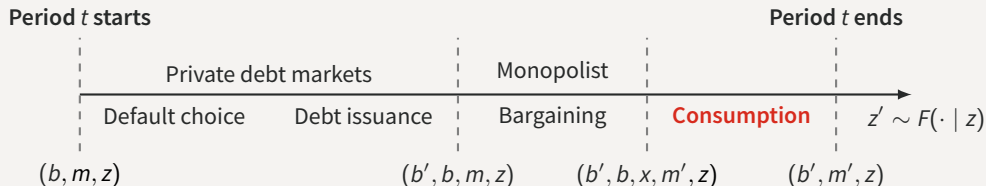$$q(b', b, m, z) = \beta_L \mathbb{E}\left[(1 - 1_{\mathcal{D}}(b', m', z'))(\kappa + (1 - \delta)q(b'', b', m', z')) \mid z\right]$$

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

Period t starts   **Period t ends**

	Private debt markets		Monopolist		
Default choice	Debt issuance		**Bargaining**	Consumption	$z' \sim F(\cdot \mid z)$

(b, m, z) (b', b, m, z) (b', b, x, m', z) (b', m', z)

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

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

Period t starts

Period t ends

| Private debt markets | Monopolist | |
| Default choice | Debt issuance | Bargaining | **Consumption** | $z' \sim F(\cdot \mid z)$ |

(b, m, z)

(b', b, m, z)

(b', b, x, m', z)

(b', m', z)

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

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

4

Exogenous Bilateral Terms

- Explore interest rate rules of the form

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

- Two versions

Size-dependent	Risk-inducing
$\alpha_0 > 0, \alpha_b = 0, \alpha_m > 0$	$\alpha_0 > 0, \alpha_b < 0, \alpha_m \geq 0$

- First-order condition for bonds

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

- Explore interest rate rules of the form

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

- Two versions

Size-dependent	**Risk-inducing**
$\alpha_0 > 0, \alpha_b = 0, \alpha_m > 0$	$\alpha_0 > 0, \alpha_b < 0, \alpha_m \geq 0$

- First-order condition for bonds

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

- Explore interest rate rules of the form

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

- 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

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

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%

Equilibrium with Exogenous Rules

· Default rates: ↓ with size dependent   ↑ with risk-inducing

	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%

Equilibrium with Exogenous Rules

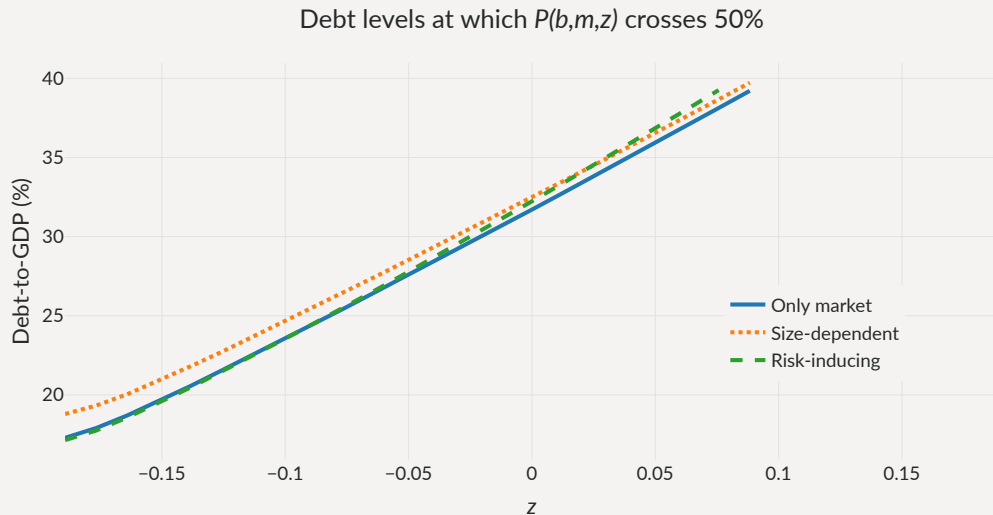- Spreads: ↓ with size dependent   ↑ with risk-inducing

	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%

Equilibrium with Exogenous Rules

- Welfare: **↑** with size dependent   **↓** with risk-inducing

	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%**

Debt levels at which *P(b,m,z)* crosses 50%

Debt Levels with Exogenous Bilateral Rules

Distribution of debt levels

Only market

Debt-to-GDP (%)

Debt Levels with Exogenous Bilateral Rules

Distribution of debt levels

Distribution of debt levels

Endogenous Bargaining

Bargaining Stage with Monopolist

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

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

Government surplus

Lender surplus

- Lender's surplus

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

- Government's surplus

$$\mathcal{B}_R(b',b,x,m,m',z) = \underbrace{u(y(z)+B(b',b,m,z)+x) + \beta\mathbb{E}\left[v(b',m',z') \mid z\right]}_{\text{agreement}}$$

$$- \underbrace{(u(y(z)+B(b',b,m,z)-m) + \beta\mathbb{E}\left[v(b',0,z') \mid z\right])}_{\text{threat point}}$$

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

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

same sdf as markets

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

- Government's surplus

$$\mathcal{B}_R(b', b, x, m, m', z) = \underbrace{u(y(z) + B(b', b, m, z) + x) + \beta \mathbb{E}\left[v(b', m', z') \mid z\right]}_{\text{agreement}}$$

$$- \underbrace{(u(y(z) + B(b', b, m, z) - m) + \beta \mathbb{E}\left[v(b', 0, z') \mid z\right])}_{\text{threat point}}$$

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

- 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

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

- Government's surplus

$$\mathcal{B}_R(b', b, x, m, m', z) = \underbrace{u\big(y(z) + B(b', b, m, z) + x\big) + \beta \mathbb{E}\left[v(b', m', z') \mid z\right]}_{\text{agreement}}$$

$$- \underbrace{\big(u\big(y(z) + B(b', b, m, z) - m\big) + \beta \mathbb{E}\left[v(b', 0, z') \mid z\right]\big)}_{\text{threat point}}$$

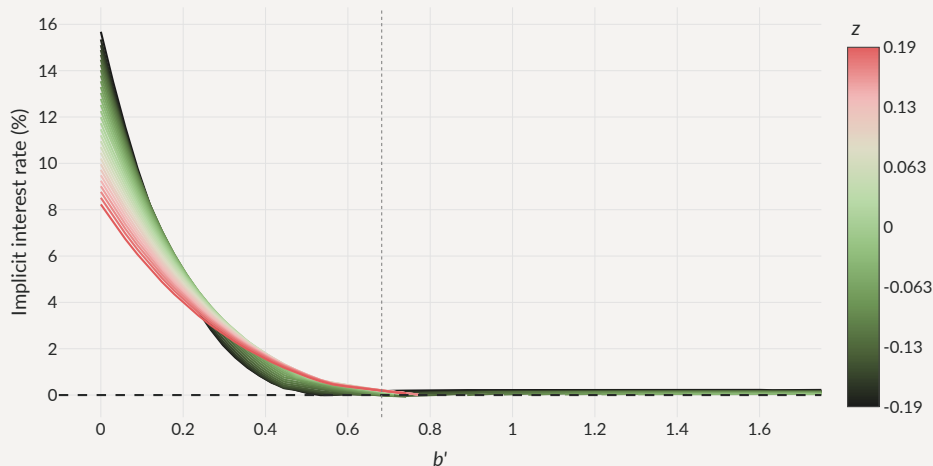with $B(b', b, m, z) = q(b', b, m, z)(b' - (1 - \delta)b) - \kappa b$

Government's surplus

$$\mathcal{B}_R(b', b, x, m, m', z) = u\big(y(z) + B(b', b, m, z) + x\big) + \beta\mathbb{E}\left[v(b', m', z') \mid z\right]$$
$$- \big(u\big(y(z) + B(b', b, m, z) - m\big) + \beta\mathbb{E}\left[v(b', 0, z') \mid z\right]\big)$$

- 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

10

Threat point manipulation: increase market *b′* to reduce bilateral *r*
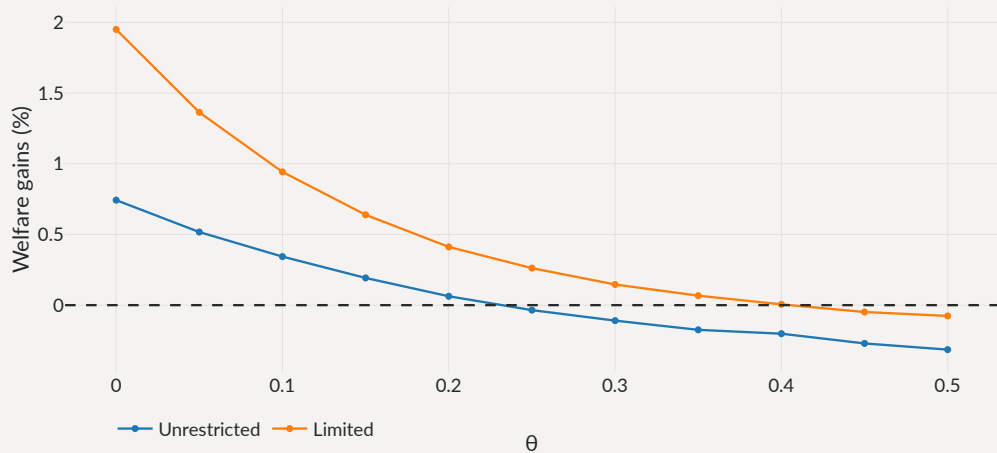

Loan interest rate (Limited)

Limiting Loans in Default

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

	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
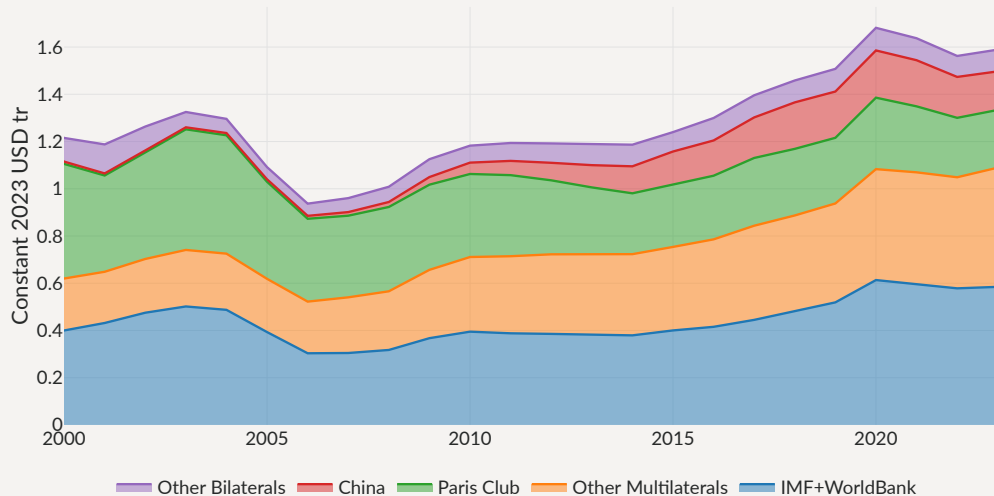 - … or a boost to the gains of fiscal rules, state-contingent debt…

Scan to find the paper

Total Official Debt

Legend: Other Bilaterals, China, Paris Club, Other Multilaterals, IMF+WorldBank

Y-axis: Constant 2023 USD tr

Loan drawings *m'* (Limited)