The Perils of Bilateral Sovereign Debt

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August 2026

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 often **opaque** terms
- Parts of official debt not fully reported in standard debt datasets
  … Central Bank swap lines are a leading example

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

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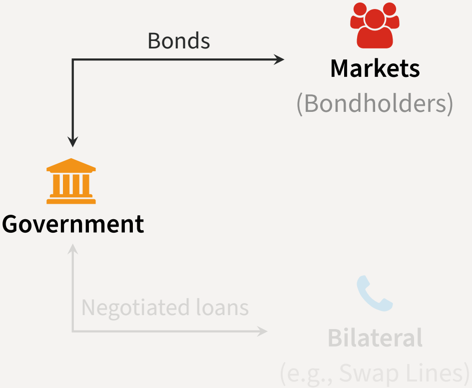
Evaluating Senior Official Creditors

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. Renegotiated every period
       [short-maturity loans]

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

- Focus on the interaction between both funding sources



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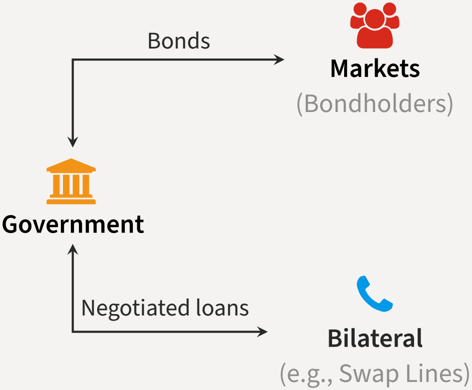

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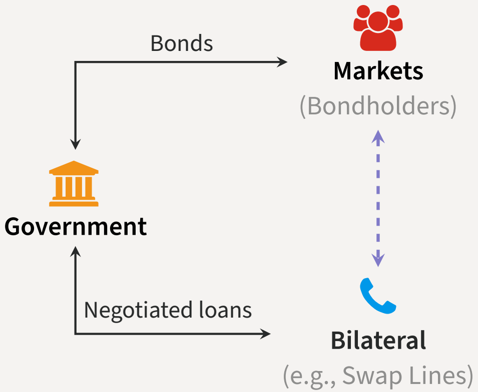

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Main findings

- Bilateral loans have significant effects even when amounts are small
  - … they provide funding when default risk makes market debt costly ▲
  - … but they can also generate more **risk-taking** ▼
- If bilateral terms improve after larger *market* issuances [cross-elasticity]
  - … government issues market debt more quickly, delevers more slowly
  - … spends longer in the risky region + defaults more frequently
  - … this worsens debt dilution
  - … welfare losses for the government
- The cross-elasticity can emerge endogenously from bargaining
  - … market issuance changes cash on hand and the bargaining threat point
  - … **relational overborrowing**

Relational Overborrowing

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Literature

- Sovereign debt/default with interactions from ‘official’ debt
  - … senior debt (Hatchondo, Martinez & Önder 2017), senior debt with conditionality (Boz 2011, Fink & Scholl 2016), bailout agencies (Corsetti, Guimarães & Roubini 2006, Kirsch & Rühmkorf 2017, Roch & Uhlig 2018), official debt (Dellas & Niepelt 2016, Arellano & Barreto 2024, Liu, Liu & Yue 2025, Galli 2026), the role of China (Kondo, Swaziek, & Sosa-Padilla 2026, Gamboa 2023)

- 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)

Roadmap

- Two Minimal Models
  - Bargaining and the Cross-Elasticity
  - The Cross-Elasticity and Debt Dilution
- Quantitative Model
  - Endogenous Bargaining
- Programming the Large Lender
- Concluding remarks

Two Minimal Models

Two Minimal Models

Bargaining and the Cross-Elasticity

Bargaining Induces a Cross-Elasticity

- Two periods $t \in \{0, 1\}$, endowments $y_0 < y_1$
- Government discount factor β, lender's discount factor $\beta_L > \beta$
- **Bargaining** transfer x at $t = 0$; repayment $x(1+r)$ at $t = 1$. Weight ϑ for lender

$$\max_{x,r} \mathcal{L}(x, r)^{\vartheta} \times \mathcal{B}(x, r; y_0, y_1)^{1-\vartheta}$$

where

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

$$\mathcal{B}(x, r; y_0, y_1) = \underbrace{u(y_0 + x) + \beta u(y_1 - x(1+r))}_{\text{agreement}} - \underbrace{(u(y_0) + \beta u(y_1))}_{\text{threat point}}$$

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Bargaining Induces a Cross-Elasticity

- First-order conditions for bargaining problem

$$u'(y_0 + x) = \frac{\vartheta}{1-\vartheta}\frac{\mathcal{B}(x,r;y_0,y_1)}{\mathcal{L}(x,r)}$$

Surplus sharing

$$u'(y_0 + x) = \frac{\beta}{\beta_L}u'\left(y_1 - x(1+r)\right)$$

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$$\boxed{\frac{\partial r}{\partial y_0} = -\frac{\vartheta\beta_L\frac{\partial\mathcal{B}}{\partial y_0}}{\vartheta\beta_L\frac{\partial\mathcal{B}}{\partial r} - (1-\vartheta)\beta\frac{\partial\mathcal{L}}{\partial r}u'(c_1) + (1-\vartheta)\beta\mathcal{L}u''(c_1)x} < 0}$$

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- **Later** y_0, y_1 are given by market debt dynamics, so
  - Recent issuances: increases y_0 and decreases y_1, makes you stronger

    Legacy debt: lowers y_0 and y_1, typically makes you weaker

Two Minimal Models

The Cross-Elasticity and Debt Dilution

Debt Dilution with Non-defaultable Loans

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

$$c_0 = q(b+d)b \quad c_1 = q(b+d)d + \phi(b, d, m)m \quad c_2(z) = \begin{cases} y(z) - m - (b+d), & \text{repayment} \\ y(z) - m - \xi(z), & \text{default} \end{cases}$$

with

$$q(b+d) = \mathbb{P}\left(b + d \leq \xi(z)\right) \qquad \text{and} \qquad m \leq \bar{m}$$

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

Commitment: Choose d internalizing effect on initial prices

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

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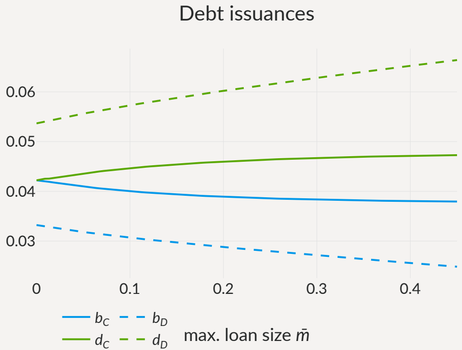
not under discretion

Debt Dilution with Non-defaultable Loans and Cross-Elasticity

Dilution 'wedge': discretion omits $u'(c_0)q'(b+d)b \implies d_D > d_C$

Cross-elasticity: $\phi_d > 0$ rewards d through better bilateral terms and widens $d_D - d_C$ as loan capacity grows

Debt Dilution with Non-defaultable Loans and Cross-Elasticity



Takeaways

- Bargaining can induce a cross-elasticity from market debt to loan terms

  … through threat-point manipulation

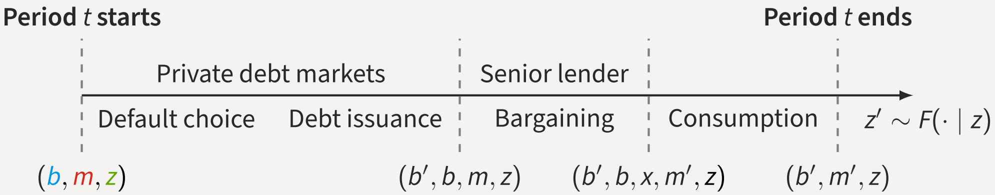
- The cross-elasticity worsens the debt dilution problem

  … it can also create welfare losses if strong enough

Quantitative Model

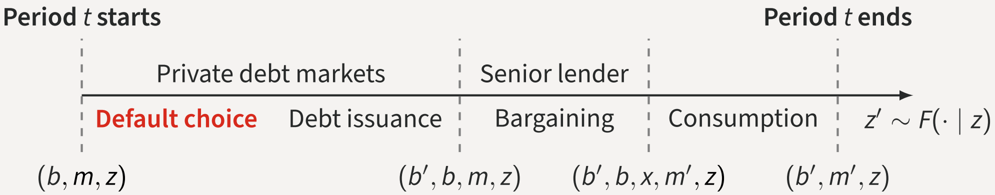
Timeline of Events

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



Timeline of Events

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



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

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 | Senior lender

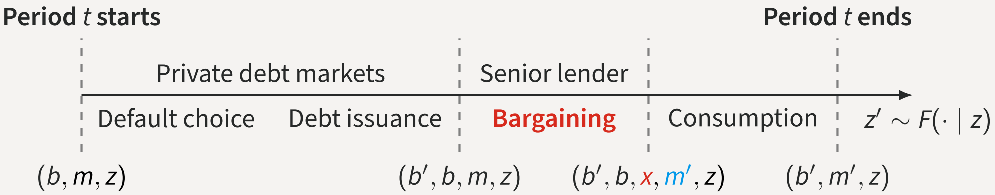
Default choice | **Debt issuance** | Bargaining | Consumption | $z' \sim F(\cdot \mid z)$

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

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

Timeline of Events

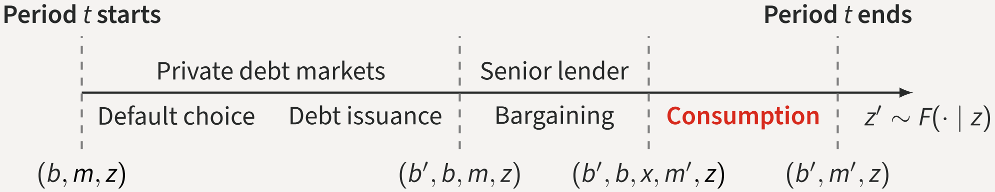
- Meet with senior lender, decide any transfers x and new/remaining balance m'



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

Timeline of Events

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



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

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

Calibration

- Standard sovereign-default calibration: match Argentina 1993–2001 using the model without bilateral loans

	Parameter	Value
Sovereign's discount factor	β	0.9607
Sovereign's risk aversion	γ	2
Preference shock scale: default	χ	0.025
Preference shock scale: issuance	χ_b	0.005
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	-0.2514
Default cost: quadratic	d_1	0.292

	Data	Model
Avg spread (bps)	815	740
Std spread (bps)	443	485
Debt to GDP (%)	17.4	18.1

Note moments from pre-default samples

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Quantitative Model

Endogenous Bargaining

Bargaining Stage with Senior Lender

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

Government surplus

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

Lender surplus

- Lender's surplus

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

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

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

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same sdf as markets

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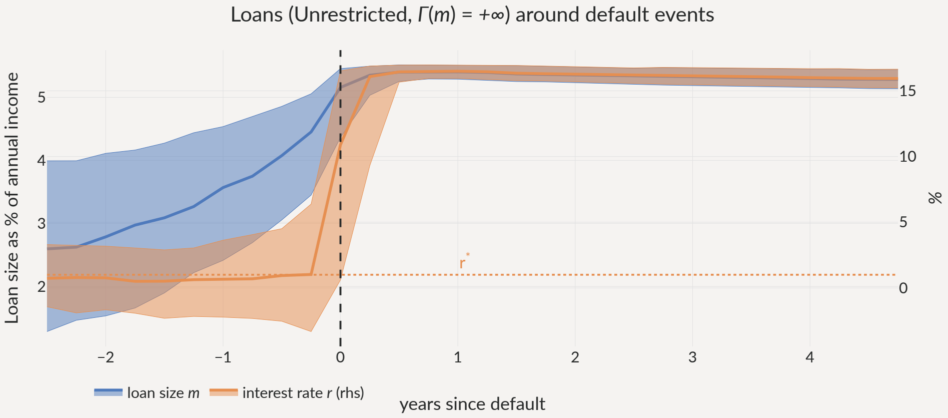
Usage of Loans

- Sharp acceleration before defaults, maxed out *in* default if possible



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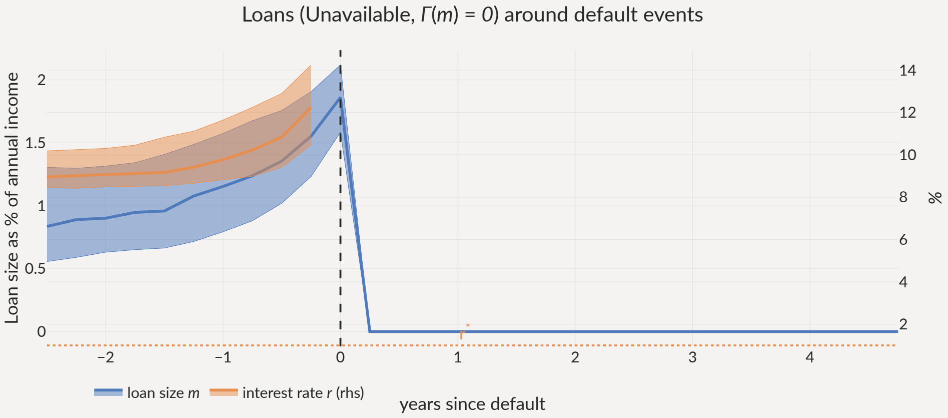

Limiting Loans in Default

- **Limited**: cannot borrow in default $\Gamma(m) = m$ **Unavailable**: $\Gamma(m) = 0$

	Only market	**Unrestricted,** $\Gamma(m) = +\infty$	**Limited,** $\Gamma(m) = m$	**Unavailable,** $\Gamma(m) = 0$
Avg spread (bps)	630	1,398	1,209	650
Std spread (bps)	474	894	860	381
$\sigma(c)/\sigma(y)$ (%)	104	99	100	104
Debt to GDP (%)	16.4	17.6	17.6	18
Loan to GDP (%)	0	2.44	2.22	0.903
Loan spread (bps)	–	-298	-126	523
Corr. loan & spreads (%)	–	68.9	67.7	63.8
Default frequency (%)	5.03	9.55	9.04	5.28
Welfare gains (rep)	–	-0.095%	-0.038%	0.12%

Limiting Loans in Default

- Default rates: ↑ with loans (less with Limited/Unavailable)

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Std spread (bps)	474	894	860	381
$\sigma(c)/\sigma(y)$ (%)	104	99	100	104
Debt to GDP (%)	16.4	17.6	17.6	18
Loan to GDP (%)	0	2.44	2.22	0.903
Loan spread (bps)	–	-298	-126	523
Corr. loan & spreads (%)	–	68.9	67.7	63.8
Default frequency (%)	5.03	9.55	9.04	5.28
Welfare gains (rep)	–	-0.095%	-0.038%	0.12%

Limiting Loans in Default

- Debt: ↑ with loans

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Limiting Loans in Default

- Welfare: Unrestricted/Limited ↓; Unavailable ↑

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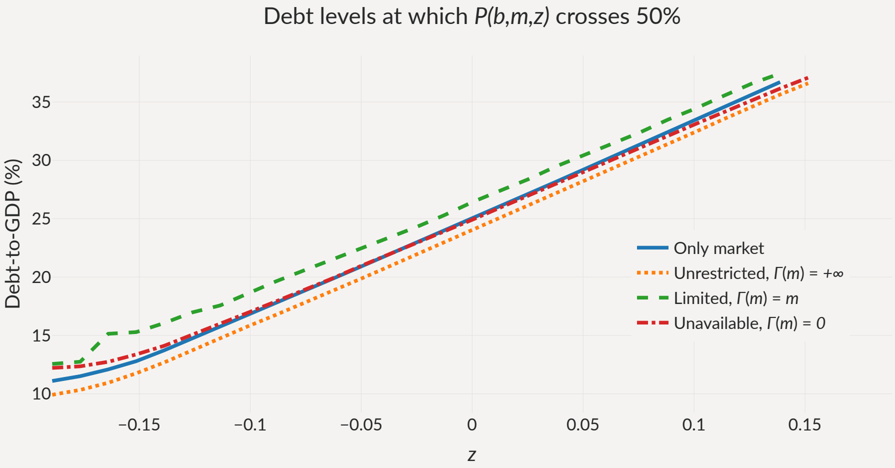
Default Barriers with Loans

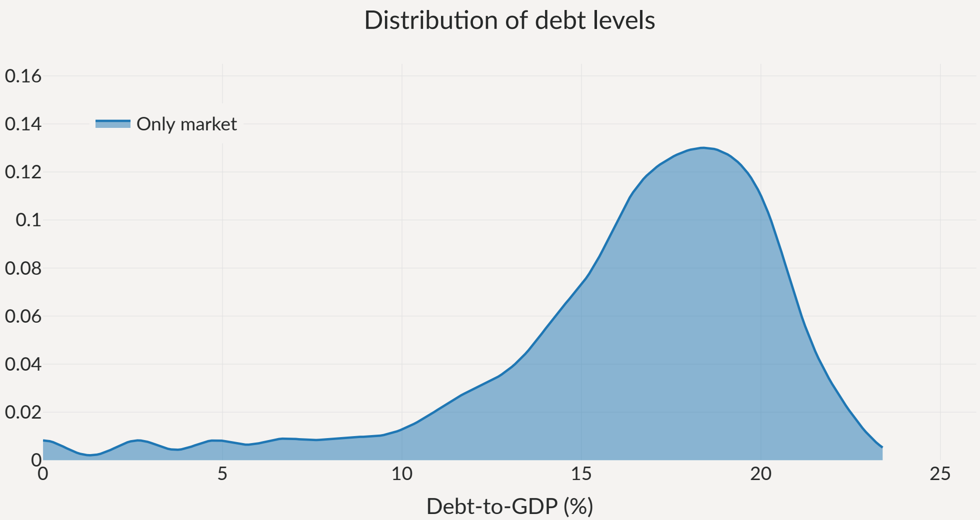
- Debt capacity changes little; higher default frequencies mainly come from future borrowing behavior



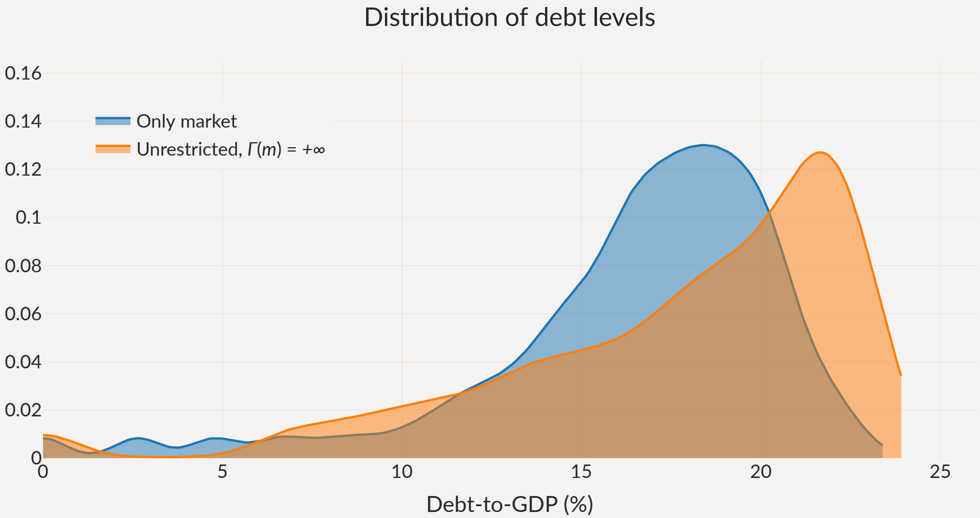
If Loans help repay the debt,

Why are there **more** defaults with loans?

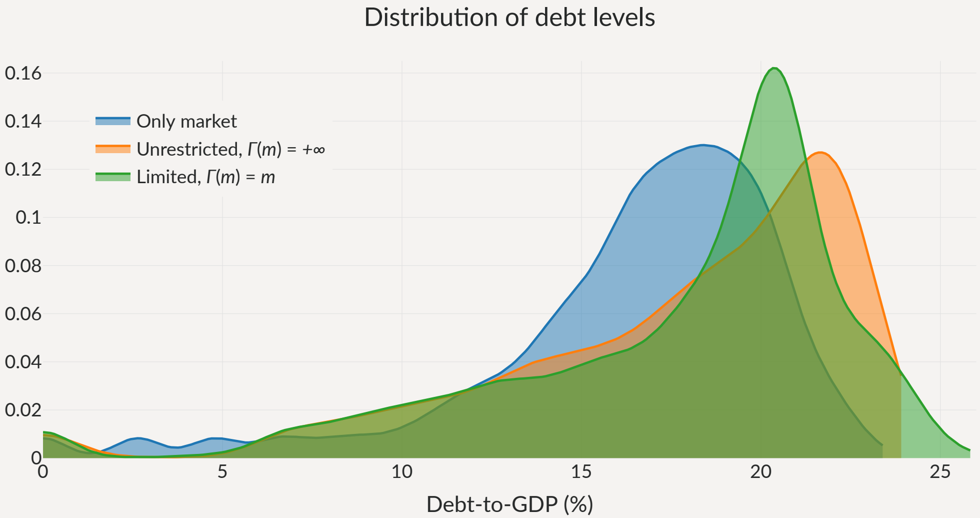
Debt Levels with Loans



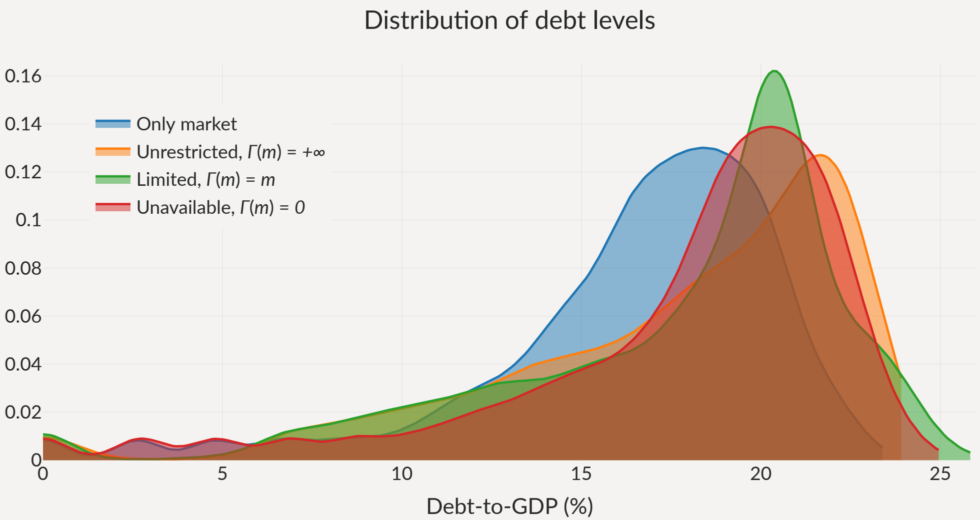
Debt Levels with Loans



Debt Levels with Loans

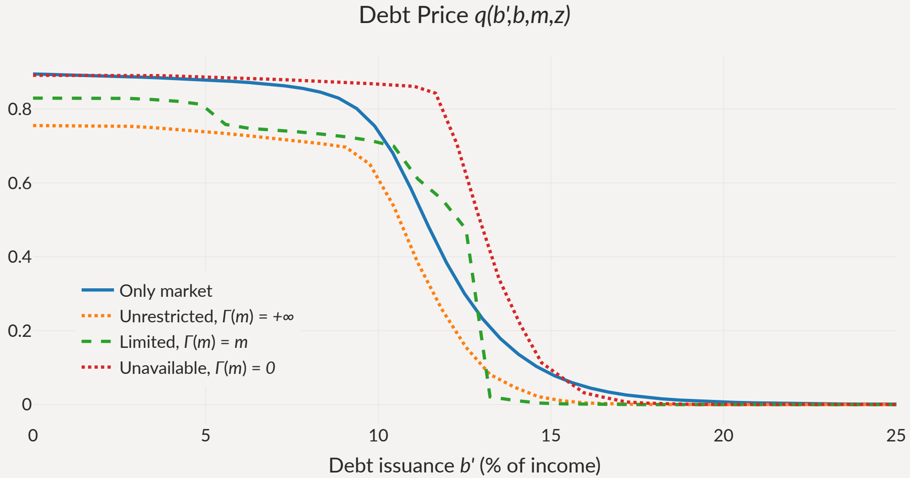


Debt Levels with Loans



Debt Prices with Loans

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



Government's surplus

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

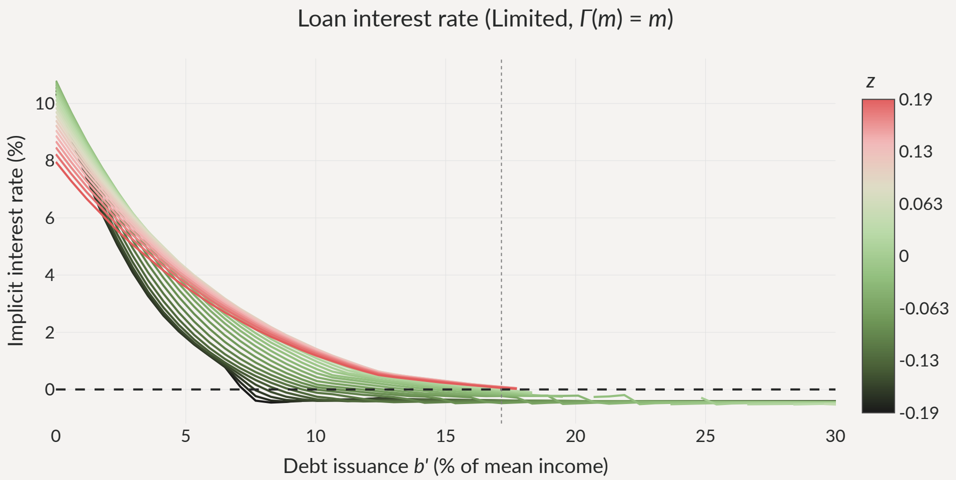
$$u\left(c_A\right) - u\left(c_T\right) \simeq u'(y(z) + B(b', b, m, z) - m) \cdot (x + m)$$

- Net market financing $B(b', b, m, z)$ modulates the value of the threat point
    - Large net financing leaves the government **strong** in bargaining
    - Deleveraging or low-price issuance leaves the government **weak** in bargaining

Risk-taking Incentives

▸ Drawings

Threat-point manipulation: increase market b' to reduce bilateral r **cross-elasticity**



Relational Overborrowing and the Cross-elasticity

Government's Euler equation for bonds

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

- An extra bond:

  … yields marginal revenue $q+\frac{\partial q}{\partial b'}i$ [standard debt-Laffer curve effect]

  … makes you **stronger** in bargaining now

  … affects the amount m' borrowed from the senior lender

  … affects terms of borrowing with the senior lender

  … makes you **weaker** in bargaining later

Relational Overborrowing and the Cross-elasticity

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- An extra bond:

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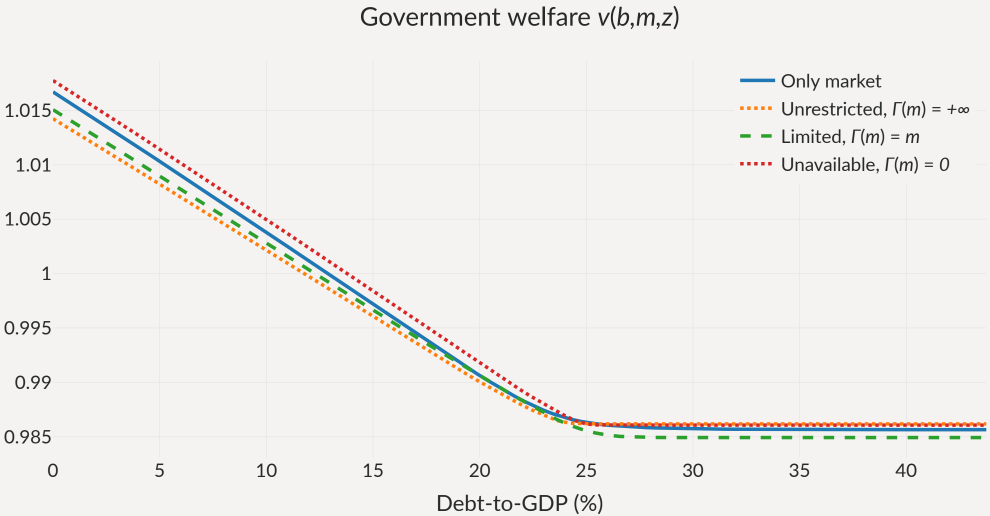
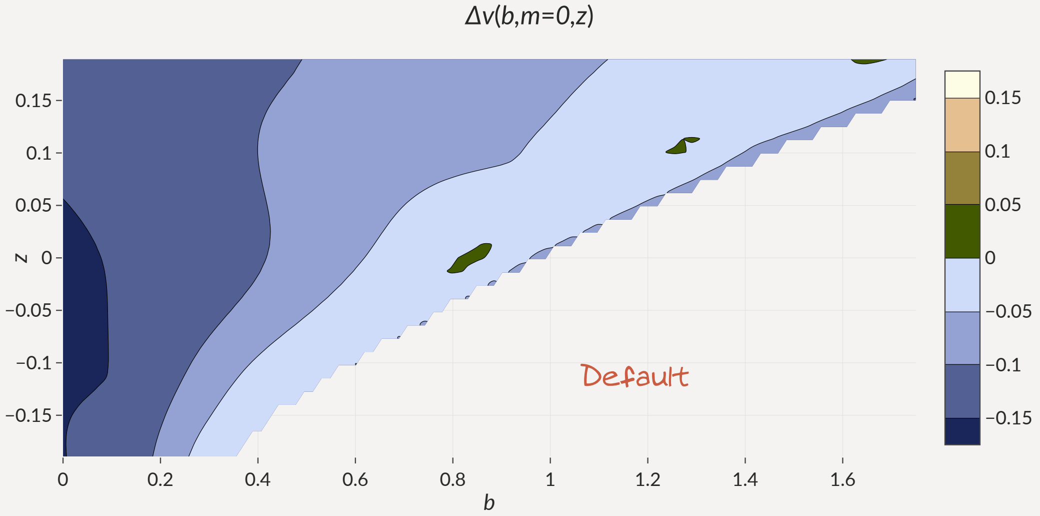
Welfare Effects of Bilateral Loans

Bilateral loans reduce value at most debt levels when $\vartheta = 0.5$



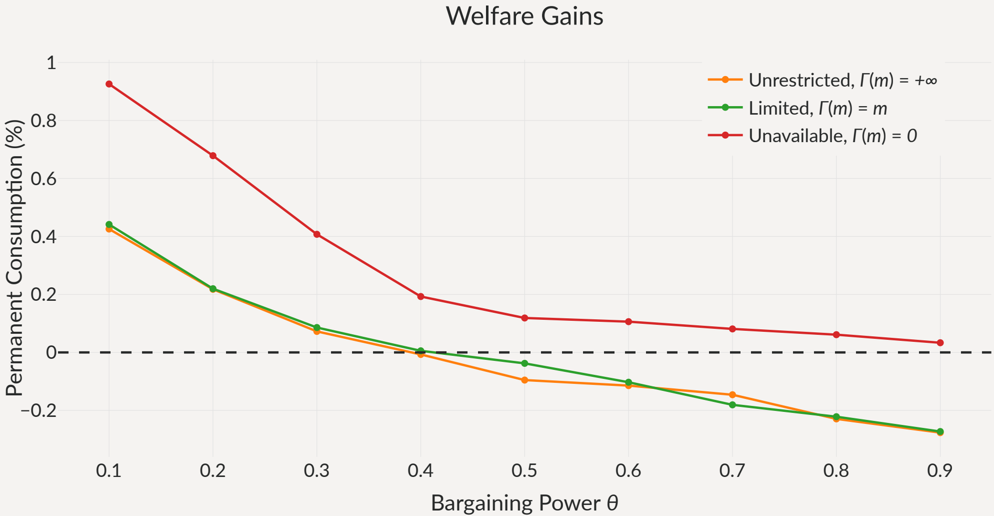
Welfare Effects of Bilateral Loans (cont'd)

Positive islands appear near the default boundary, where loans can postpone default.



Bargaining Power and Welfare

Welfare gains dissipate quickly as the senior lender's bargaining weight rises.



Programming the Large Lender

Possible Rules

- Explore interest rate rules of the form

$$r(b', m', b) = \max\{r^{\star}, a_0 + a_b(b' - (1 - \delta)b) + a_m m'\}$$

- Three versions

Size-dependent

$a_0 > 0, a_b = 0, a_m > 0$

no cross-elasticity

Risk-inducing

$a_0 > 0, a_b < 0, a_m \geq 0$

mimics bargaining

Optimal

(for borrower welfare)

$a_0 \geq 0, a_b > 0, a_m > 0$

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Equilibrium with Exogenous Rules

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

	Only market	Size dependent r	Risk inducing r	Optimal r	Limited, $\vartheta = 0.5$
Avg spread (bps)	630	413	831	227	1,209
Std spread (bps)	474	240	447	130	860
$\sigma(c)/\sigma(y)$ (%)	104	105	104	106	100
Debt to GDP (%)	16.4	17.3	17.1	17.7	17.6
Loan to GDP (%)	0	0.727	0.486	2.56	2.22
Loan spread (bps)	–	662	296	516	-126
Corr. loan & spreads (%)	–	49.4	-29.2	38.9	67.7
Default frequency (%)	5.03	3.2	6.19	1.92	9.04
Welfare gains (rep)	–	0.15%	-0.097%	0.69%	-0.038%

Note Statistics from each ergodic distribution

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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 when bilateral balances are much smaller than market debt

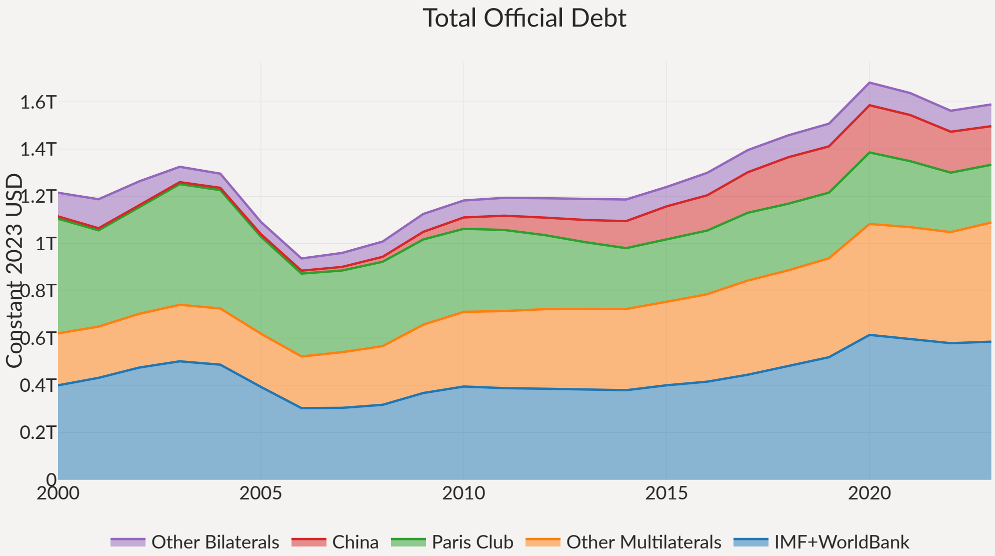
- **Dangerous** when bilateral terms improve after larger *market* issuances
  - … the cross-elasticity erodes the disciplining role of spreads
  - … sequential bargaining is a plausible source of the cross-elasticity

- Transparent, pre-specified rules can reverse the force
  - … size-dependent and optimal rules improve welfare while preserving lender profits
  - … Practical diagnostic: ask how bilateral rates respond to market issuance or spreads

Scan to find the paper

A New Landscape for Official Sovereign Debt

Back



Risk-taking Incentives

Back