The Perils of Bilateral Sovereign Debt*

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Abstract

We study the interaction between private and official sovereign debts. The emergence of new official lenders not bound by the Paris Club institutional framework has raised concerns about their implications for the terms and seniority structure of sovereign debt. We evaluate this view in a quantitative sovereign default model augmented by the presence of a large senior creditor with whom borrowing terms are negotiated. The dynamics of the bilateral surplus endogenously lead the government to overborrow in markets and expose itself more intensely to sovereign risk, creating welfare losses. The model also implies a simple test to assess the welfare implications of new forms of bilateral sovereign debt.

JEL Classification F34, F41, G15
Keywords Sovereign debt, debt dilution, bilateral bargaining, official debt

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Introduction

A large fraction of sovereign borrowing in emerging-market economies takes the form of official debt, including loans from other governments, regional development banks, or multilateral institutions such as the IMF and the World Bank. The past few decades have witnessed the rise of new sovereign creditors operating outside of the Paris Club framework and with ambitions to redesign the financial architecture of sovereign debt (Horn et al., 2021b; Gelpern et al., 2021). The claims to senior creditor status by these new lenders as well as the opacity of their borrowing terms have raised concerns about welfare implications for borrowing countries (Horn et al., 2021a, 2023).

This paper evaluates such concerns in the context of a quantitative sovereign debt and default model, augmented by the presence of a large lender who offers an alternative source of funds. Relative to creditors in international capital markets, the large lender possesses a superior enforcement technology, which supports its claim to senior creditor status. In our baseline setup, we assume that borrowing terms with the large creditor are determined through bargaining, which gives a critical role to the dynamics of the bilateral relationship and its surplus.

We focus on the interaction between the market and the large lender as two possible sources of funds. While the availability of bilateral loans from the large lender affects the government's behavior in debt markets, outcomes in debt markets influence threat points in the bilateral negotiation. The interest rate charged by the large lender is therefore constrained by implicit competition from debt markets. But when default risk pushes up yields on marketable debt, the large lender is also able to charge a premium. Because there is lower or no default risk on this loan, such a premium only reflects the borrower's outside options.

The baseline model yields two main results: welfare losses and relational overborrowing. While bilateral loans can and are often used on the equilibrium path to avoid costly defaults, the borrowing country is worse off when the large lender is present. One reason for this is that the possibility of borrowing from the large lender while excluded from markets raises the value of default, which increases default incentives and lowers debt prices. But there is another, more fundamental reason. Even imposing the constraint that bilateral loans are unavailable during default, welfare for the government is still diminished by the presence of the large lender due to a "relational overborrowing" effect. Borrowing terms with the large lender are determined by splitting the bilateral surplus. This surplus is largest when sovereign risk is present and the government is paying high spreads on its debt, which is precisely when the large lender is most needed. Consequently, when it expects the government to face high spreads in the future, the large lender values the relationship more and is willing to invest in it by lending more cheaply. This endogenous elasticity of bilateral loan terms to indebtedness in markets acts as a countervailing force to the market discipline of spreads upon large issuances of debt. The presence of the large lender then leads the government to take on more debt in markets and to delever more slowly. The end result is an increase in the default frequency and therefore in spreads, which ultimately create welfare losses.

The dynamics and welfare effects we describe result from three critical assumptions regarding the large creditor and the funding it offers. Compared to competitive markets, we assume that it is more difficult (or impossible) to default on the large creditor, that its loans are of shorter maturity, and that the terms of borrowing result from bilateral bargaining rather than explicit competition and a zero-profit condition. The prime example of these are the Central Bank swap lines that Horn et al. (2021b) identify as one of the main forms under which official lending, largely from China, has returned to the fore since the 2000s.

Other forms of bilateral debt share these seniority and duration characteristics, including notably IMF programs and certain lines and repo facilities with large central banks such as the Fed or the ECB. In these cases, however, borrowing terms are fixed in advance by institutional frameworks such as the IMF surcharges policy (IMF, 2024). The Fed's liquidity lines typically involve a spread of 25bps over policy rates (Bahaj and Reis, 2023) and are reported in real-time on the FRB New York's website. We capture this feature in an extension of the model in which we replace the bargaining protocol by fixed rules for determining borrowing terms. This extension allows us to ask questions about the optimal design of these facilities and also sheds light on the dynamics underlying our main results.

When the interest rate of the bilateral loan does not respond aggressively to indebtedness in debt markets, the relational overborrowing effect is muted or disappears. In this case, the fact that the large lender can help avoid defaults on marketable debt becomes the dominating force, and the equilibrium features lower default frequencies, better market financing terms, and welfare gains for the government.

A key quantity in the model is the government's bargaining power relative to the large lender. When the government can make take-it-or-leave-it offers (i.e., when it has full bargaining power), the large lender simply provides nondefaultable loans at the risk-free rate, recovering the model of Hatchondo, Martinez, and Onder (2017). In this case, the government's welfare is also higher relative to the equilibrium without the large lender. In our preferred calibration, however, such gains quickly dissipate as the government's bargaining power declines.

In the baseline model, we assume that the large lender is purely motivated by profits. In fact, it shares the objectives, risk attitudes, and intertemporal preferences of the competitive creditors who lend in debt markets. We take this assumption to focus on the pure effect of market structure but discuss in the context of the extension what to expect if the large lender had other motivations. However, the feedback from debt levels to the bilateral surplus which gives rise to the relational overborrowing effect will be present unless the large lender has a strong motivation to avoid default on the government's marketable debts. In this sense, our main results appear robust to a much more realistic description of the large lender in a specific application.

Quantitatively, the model shows how bilateral loans that are small relative to the stock of marketable debt can still have an important impact on outcomes in sovereign debt markets. The difference in maturities between bilateral loans and marketable debt is critical in generating this result. The longer maturity of debt means that the debt service coming due in a particular period is of the same order of magnitude as the amount coming due on the bilateral loan. As a result, changes in the interest rate of the bilateral loan have an impact on the current-period budget constraint of similar magnitude to changes in the interest rate on marketable debt. In an extension, we show that with short-term market debt, the relational overborrowing effect is again largely muted. In reality, bilateral loans such as swap lines are typically of a much shorter duration than marketable debt.

The model implies a simple heuristic for determining whether a particular type of bilateral debt is likely to be beneficial to the government. The welfare effects of bilateral loans are determined by the elasticity of their interest rate to the level of *market* debt. If bilateral loans become cheaper when market debts are high, the relational overborrowing effect is likely to be present. Conversely, if bilateral loans are cheaper when market debts are low, they are more likely to support debt sustainability. These forces act in addition to better-known effects operating through the value of default, as emphasized for example in the Lending Into Arrears policies of the IMF (2022).

Discussion of the Literature To be added.

Boz (2011); Dellas and Niepelt (2016); Fink and Scholl (2016); Hatchondo, Martinez, and Onder (2017); Kirsch and Rühmkorf (2017); Dovis and Kirpalani (2023); Arellano and Barreto (2025); Liu, Liu, and Yue (2025)

Kovrijnykh and Szentes (2007); Faria-e-Castro et al. (2024)

Perks et al. (2021); Bahaj and Reis (2021, 2023); Cesa-Bianchi et al. (2022)

Layout The rest of the paper is structured as follows. Section 2 presents some evidence on official and marketable debts in emerging markets. Section 3 then introduces our model, starting with the case in which only bilateral loans are available. Section 4 describes the main model in which both types of debt coexist, while Section 5 analyzes its equilibrium, and Section 6 describes the extension with fixed rules for the terms of bilateral loans. Finally, Section 7 concludes.

2. Data

3. Model with bilateral loans only

We begin our analysis by studying a simple model in which only bilateral loans are possible. This first model serves to clarify the dynamics of bargaining in bilateral lending and the strategy through which the large lender extracts surplus: subsidized terms while debt accumulates, combined with high interest rates when the debt stock becomes large and the borrower reduces leverage.

We model a small open economy borrowing from a monopolist. The economy receives an endowment stream $y(z)$ where the state z follows an AR(1) process. Loans are short-term and therefore effectively continuously renegotiated. At the start of t, let $v(m, z)$ represent the value attained by the government (or sovereign, or borrower) at income state z and owing m to the monopolist. The lender similarly attains a value $h(m, z)$.

At the beginning of period t, borrower and lender negotiate over the terms of the loan. In the absence of default, payment of the full amount m extinguishes any debts and serves as a natural threat point. We use a simple Nash bargaining framework and set θ as the lender's bargaining power. The outcome of this negotiation is a transfer x and a new loan size m' determined by the solution to

$$\max_{x,m'} \mathscr{L}(x, m, m', z)^{\theta} \times \mathscr{B}(x, m, m', z)^{1-\theta} \tag{1}$$

where $\mathscr{L}$ and $\mathscr{B}$ represent the lender and borrower surplus functions. It will be useful to keep track of the implicit interest rate of the loan r which satisfies $x = \frac{1}{1+r}m' - m$.

After negotiations are concluded and transfers settled, consumption takes place. The lender finances the transfer x with a constant endowment a and thus consumes $c_L = a - x$. Conversely, the borrower receives the transfer so $c = y(z) + x$. Under risk neutral preferences for the lender,

$$\begin{aligned}\mathscr{L}(x, m, m', z) &= a - x + \beta_L \mathbb{E}\left[h(m', z') \mid z\right] - \left(a + m + \beta_L \mathbb{E}\left[h(0, z') \mid z\right]\right) \\ &= -x - m + \beta_L \mathbb{E}\left[h(m', z') - h(0, z') \mid z\right]\end{aligned}$$

and similarly

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

where β_L and β are the discount factors of the lender and borrower, respectively. The borrower's utility function u is increasing and concave.

Notice that the choice of m' only involves continuation values v and h, while the choice of x only involves flow payoffs. Given a choice of m', the first-order condition for x is

$$\mathscr{B}(x, m, m', z)\theta = \mathscr{L}(x, m, m', z)u'(y(z) + x)(1 - \theta)$$

Given the solution $x(m,z), m'(m,z)$ to (1), the value functions satisfy

$$\begin{aligned} v(m,z) &= u(y(z) + x(m,z)) + \beta \mathbb{E}\left[v(m'(m,z),z') \mid z\right] \\ h(m,z) &= a - x(m,z) + \beta_L \mathbb{E}\left[h(m'(m,z),z') \mid z\right] \end{aligned} \tag{2}$$

Finally, we normalize $a = 0$, which allows us to interpret $h(m,z)$ as the expected present discounted value of transfers along the equilibrium path, or the lender's total expected profits.

3.1 *Equilibrium with bilateral loans only*

We solve the model with bilateral loans only at a parametrization that illustrates the forces at play. We choose $\theta = 0.5$ so the surplus is split equally between borrower and lender; we also set $\beta = \beta_L$ to isolate consumption smoothing and bargaining from the frontloading motive that would result if the borrower was relatively impatient, which in sovereign debt models tends to be the relevant case.

Figure 1 summarizes the terms of the new loan for each level of income z and initial loan size m. Unsurprisingly, the borrower economy delevers in high-income states and receives positive transfers in low-income ones. The monopolist makes intense use of the interest rate to extract surplus. When both debt and income are low, the monopolist offers subsidized and even negative rates. The benefit of incurring this cost is to induce high levels of debt, which make the borrower's threat point more costly to exercise. Once the loan size is large, repaying it in full becomes difficult and the monopolist is able to charge much higher interest rates.

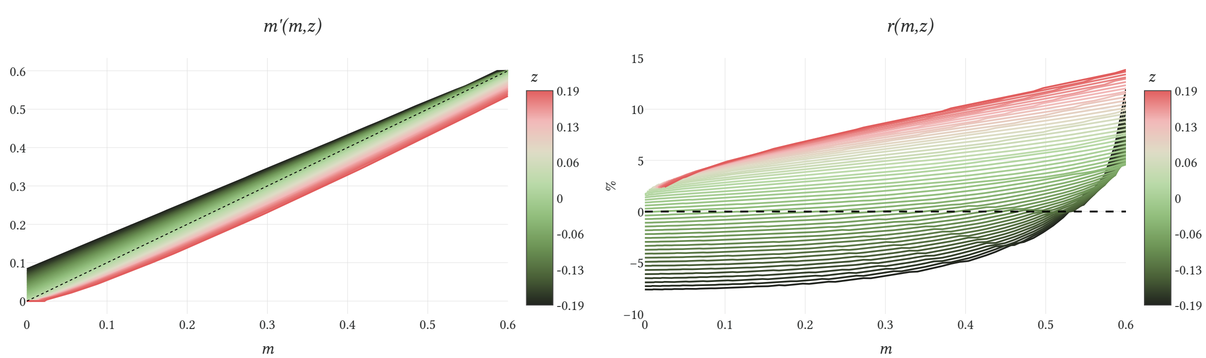

FIGURE 1: MONOPOLIST'S TERMS WITH $\theta = 0.5$

Figure 2 shows the value functions v and h for borrower and lender. As indebtedness m increases, the borrower's threat point becomes less credible. This increases the total surplus available (new transfers are more valuable) but also makes the lender 'stronger' in the negotiation. This allows the lender to charge higher interest rates. This effect creates convexity in the lender's profits and, hence, in the value function h.

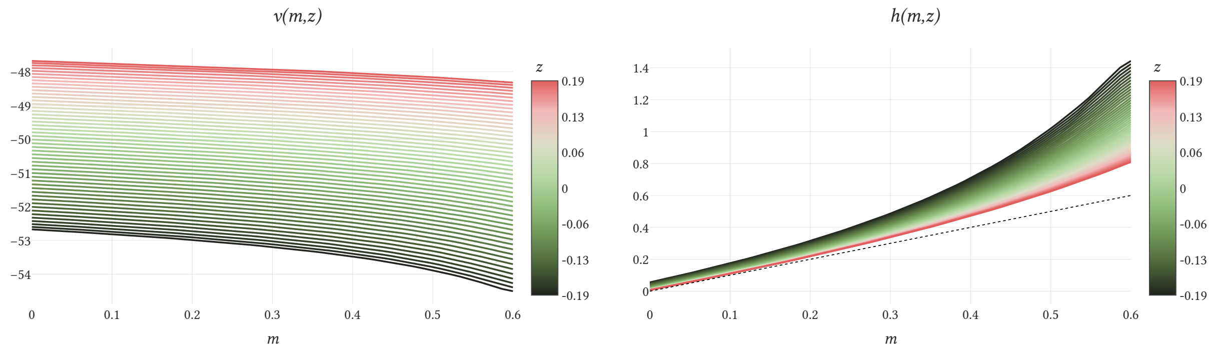

FIGURE 2: VALUE FUNCTIONS, $\theta = 0.5$

Convexity in the lender's value function implies endogenously risk-loving behavior. In equilibrium, the lender gambles for debt overhang. Subsidizing new loans in order to induce high indebtedness only pays off if the borrower's income takes a long time to recover. If the borrower receives a favorable income shock quickly, the loan is repaid before the monopolist has had an opportunity to raise rates and collect profits.

Figure 3 shows a simulation path, which further clarifies the lender's strategy. The loan is subsidized on the way up and, once debt has accumulated, the interest rate can increase to extract profits from the borrower. The borrower government anticipates these dynamics: the relationship between the initial subsidy and the expected high rates later on is disciplined by the requirement to deliver part of the surplus to the borrower, depending on the value of θ.

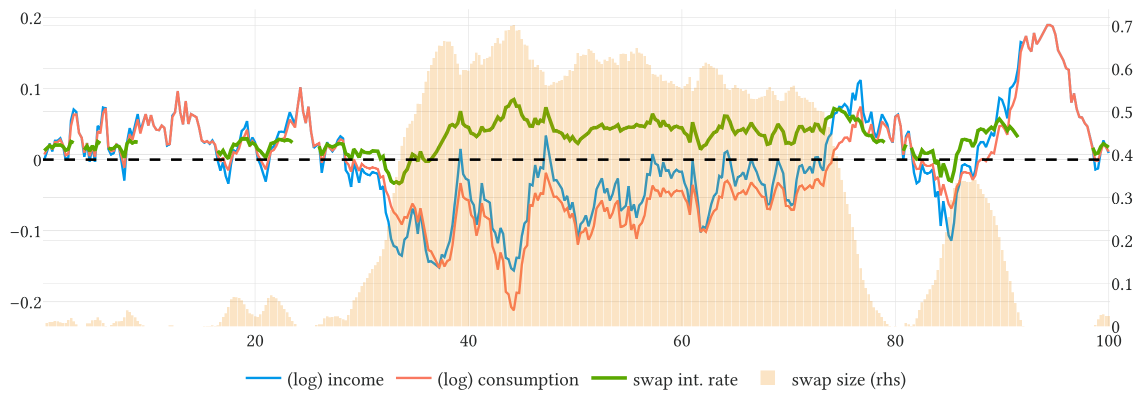

FIGURE 3: SIMULATED PATH, $\theta = 0.5$

Figure 13 in the Appendix, which simulates a model with $\theta = 0$, shows that when the borrower holds all the bargaining power, it is able to borrow at rate β_L^{-1} at all times. Because rates do not go up once the loan is large, they cannot be negative when it is still small. This effectively recovers an income fluctuations problem at the risk-free rate without default.

4. Model with bilateral loans and defaultable debt

In this section we present the full version of our model, in which the borrowing government has access to the monopolist as well as a competitive fringe of lenders. Default on the debt b held by competitive lenders is possible, subject to standard output costs of default. However, for the same reasons as before, bilateral loans m cannot be defaulted.

A period takes place as follows.

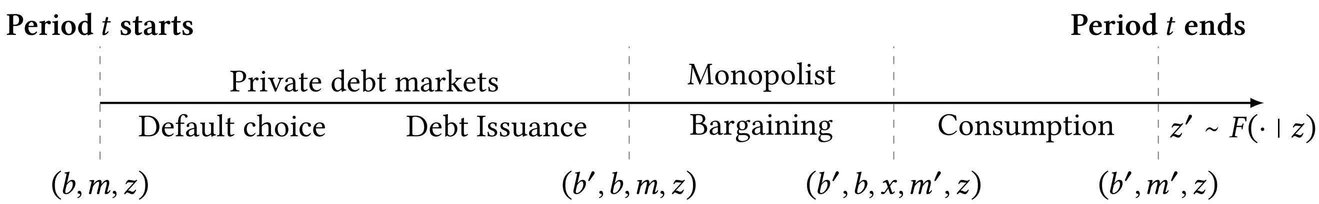

Figure 4: Timeline of events while not in default

At the start of t, the government owes m to the monopolist, b to the fringe, and observes the exogenous state z. Additionally, the economy can be in default ($\zeta = D$) or in repayment ($\zeta = R$). Let $v(b, m, z)$ and $h(b, m, z)$ represent the government's and the monopolist's value functions at the beginning of a period, when there is no default.

Private markets In the morning of t, first, the government decides default for the current period if it is in good standing with the market.

$$v(b, m, z) = \max \{v_R(b, m, z) + \epsilon_R, v_D(m, z) + \epsilon_D\} \tag{3}$$

where the ϵ's follow a Type 1 Extreme Value distribution, yielding closed forms for $v(b, m, z)$ and the ex-post default probability $\mathscr{P}(b, m, z)$

$$\begin{aligned} v(b, m, z) &= \chi \log \Big(\exp(v_D(m, z)/\chi) + \exp(v_R(b, m, z)/\chi) \Big) \\ \mathscr{P}(b, m, z) &= \frac{\exp(v_D(m, z)/\chi)}{\exp(v_D(m, z)/\chi) + \exp(v_R(b, m, z)/\chi)} \end{aligned}$$

If it is not in default, the government issues new debt b' to the fringe of lenders understanding the value of entering negotiations with the monopolist having issued debt b'

$$v_R(b, m, z) = \max_{b'} w_R(b', b, m, z) \tag{4}$$

where debt is a perpetuity of geometrically-decaying coupons (Leland, 1998; Hatchondo and Martinez, 2009; Arellano and Ramanarayanan, 2012). A unit of debt issued at t promises to repay $\kappa(1-\delta)^{s-1}$ is period $t+s$, effectively making a unit issued at t a perfect substitute for $(1-\delta)$ units issued at $t-1$. We normalize $\kappa = r + \delta$ so that the price of debt equals 1 when the government repays with certainty.

The price faced by the borrower government reflects its lenders' expectations of repayment, discounted with a risk-neutral kernel

$$q(b',b,m,z) = \frac{1}{1+r}\mathbb{E}\left[(1-\mathbb{1}_{\mathscr{D}}(b',g_m(b',b,m,z),z'))\left(\kappa+(1-\rho)q(b'',b',g_m(b',b,m,z),z')\right)\mid z\right] \tag{5}$$

where $\mathbb{1}_{\mathscr{D}}(b,m,z)$ denotes the government's default policy as perceived by lenders, $b'' = g_b(b', g_m(b',b,m,z),z')$ is the expected debt issuance in the following period and $g_m(b',b,m,z)$ is the expected result of negotiations with the monopolist, to happen in the afternoon.

Bilateral loan In the afternoon of t, the government meets with the monopolist to negotiate the loan m. As before, the outcome of their negotiation is a transfer x and new loan size m' which solve the following Nash bargaining problem

$$\begin{gathered}\max_{m',x} \mathscr{L}_R(b',x,m,m',z)^{\theta}\ \mathscr{B}_R(b',b,x,m,m',z)^{1-\theta} \\ \text{or} \\ \max_{m',x} \mathscr{L}_D(x,m,m',z)^{\theta}\ \mathscr{B}_D(x,m,m',z)^{1-\theta}\end{gathered} \tag{6}$$

As before the monopolist's surplus is

$$\begin{aligned}\mathscr{L}_R(b',x,m,m',z) &= -x-m+\beta_L\mathbb{E}\left[h(b',m',z')-h(b',0,z')\mid z\right] \\ \mathscr{L}_D(x,m,m',z) &= -x-m+\beta_L\mathbb{E}\left[\psi\left(h(0,m',z')-h(0,0,z')\right)+(1-\psi)\left(h_D(m',z')-h_D(0,z')\right)\mid z\right]\end{aligned}$$

while the borrower's surplus now also reflects outcomes in debt markets

$$\begin{aligned}\mathscr{B}_R(b',b,x,m,m',z) &= u(y(z)+P(b',b,m,z)+x)-u(y(z)+P(b',b,m,z)-m)+ \\ &\quad+\beta\mathbb{E}\left[v(b',m',z')-v(b',0,z')\mid z\right] \\ \mathscr{B}_D(x,m,m',z) &= u(y_D(z)+x)-u(y_D(z)-m)+ \\ &\quad+\beta\mathbb{E}\left[\psi\left(v(0,m',z')-v(0,0,z')\right)+(1-\psi)\left(v_D(m',z')-v_D(0,z')\right)\mid z\right]\end{aligned}$$

where the function $y_D(z) = y(z) - \xi(z)$ is output in default and P summarizes net transfers from the competitive lenders received in the morning. Our assumptions on debt maturity yield $P(b',b,m,z) = q(b',b,m,z)(b'-(1-\rho)b)-\kappa b$. In default, opportunities to reaccess markets arrive with probability ψ. The bargaining problems yield new terms for the bilateral loan $x_R(b',b,m,z)$, $m'_R(b',b,m,z)$ and $x_D(m,z)$, $m'_D(m,z)$ respectively in repayment and in default.

The most important way in which the presence of debt markets affects the bargaining stage is through the revenues from debt issuance $P(b', b, m, z)$. These revenues modulate the government's threat point: after a successful issuance which raises large revenues, the government is in a strong position to negotiate as repaying m is less costly.

After the negotiation is done and transfers settled, consumption takes place. The borrower's value functions for entering negotiations are given by

$$\begin{aligned} c_\zeta(b', b, m, z) &= y(z) + P(b', b, m, z) + x_\zeta(b', b, m, z) \\ w_R(b', b, m, z) &= u(c_R(b', b, m, z)) + \beta \mathbb{E}\left[v\left(b', m'_R(b', b, m, z), z'\right) \mid z\right] \\ w_D(m, z) = v_D(m, z) &= u(c_D(m, z)) + \beta \mathbb{E}\left[\psi v\left(0, m'_D(m, z), z'\right) + (1-\psi) v_D\left(m'_D(m, z), z'\right) \mid z\right] \end{aligned} \tag{7}$$

while for the monopolist we have

$$\begin{aligned} h(b, m, z) &= \mathscr{P}(b, m, z) h_D(m, z) + (1 - \mathscr{P}(b, m, z)) h_R(b'(b, m, z), b, m, z) \\ h_R(b', b, m, z) &= a - x_R(b', b, m, z) + \beta_L \mathbb{E}\left[h(b', m'_R(b', b, m, z), z') \mid z\right] \\ h_D(m, z) &= a - x_D(m, z) + \beta_L \mathbb{E}\left[\psi h(0, m'_D(m, z), z') + (1-\psi) h_D(m'_D(m, z), z') \mid z\right] \end{aligned} \tag{8}$$

5. Quantitative results

We parametrize our model at a quarterly frequency following standard strategies in the sovereign default literature (most parameters taken from the calibration to the 2001 Argentina default in Roch and Roldán, 2023). Table 1 summarizes our parametrization.

Table 1: Baseline parameter values

	Parameter	Value
Sovereign's discount factor	β	0.9504
Sovereign's risk aversion	γ	2
Preference shock scale parameter	χ	0.025
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

Table 2 presents some statistics from simulating the model with and without bilateral loans, for different values of the lender's bargaining weight θ. Statistics correspond to pre-default samples of 35 quarters and the term 'loans' refers to bilateral loans m. Welfare gains are reported in equivalent consumption terms and calculating averaging the ergodic distribution of the only-market equilibrium conditional on repayment, comparing with the economies with both types of debt at $m = 0$. The leftmost column corresponds to the equilibrium with only market debt and as such generates the business-cycle properties of Argentina in the years preceding its 2001 default.

Table 2: Business cycle statistics with and without bilateral loans

	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%

The remaining columns show that even with a relatively large bargaining weight for the government, the presence of bilateral dramatically boosts the frequency of default. As a consequence, the government pays higher and more volatile spreads, despite slightly lower debt levels and relatively modest amounts borrowed from the large lender. As a result, even with $\theta = 0.25$ the government prefers the equilibrium in which the large lender is not present.

Part of this increase in default frequency is due to an improvement in the value of default when the large lender is present. Figure 5 compares an economy with access to market debt and bilateral loans but with current level $m = 0$, on the left, to an economy in which only the market is available, on the right. It shows that the presence of the large lender raises the option value of default: the economy with access to bilateral loans defaults at lower levels of debt (or higher levels of income) than the one without it.

Moreover, since the large lender keeps a share of the surplus generated by the loan, the borrower economy is somewhat reluctant to use it. In a typical simulation path, conditional on no default the amount borrowed bilaterally is 3.3% of annual income with a standard deviation of 1.6%. Figure 6 shows that this changes significantly around default events: the loan size m shoots up around the moment of default. The large lender heavily subsidizes this accumulation of bi-

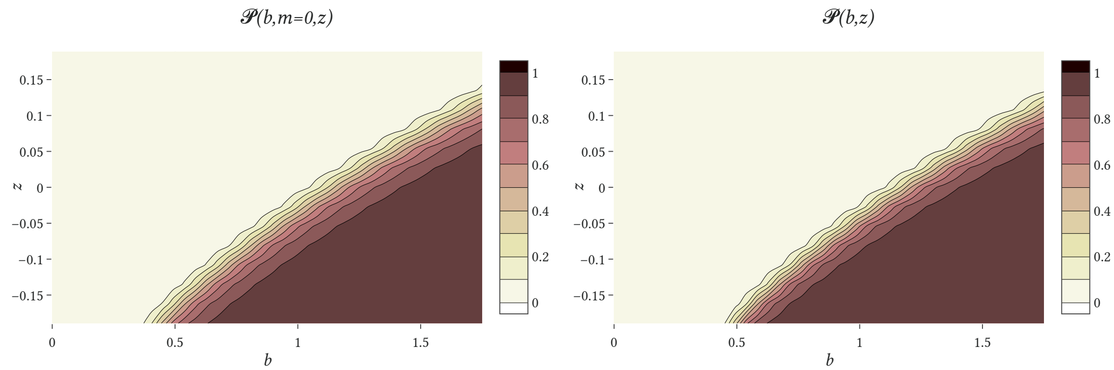

FIGURE 5: DEFAULT PROBABILITY AT $m = 0$ WITH (LEFT) AND WITHOUT (RIGHT) BILATERAL LOANS

lateral debt. As before, the large lender provides negative interest rates at first, while bilateral

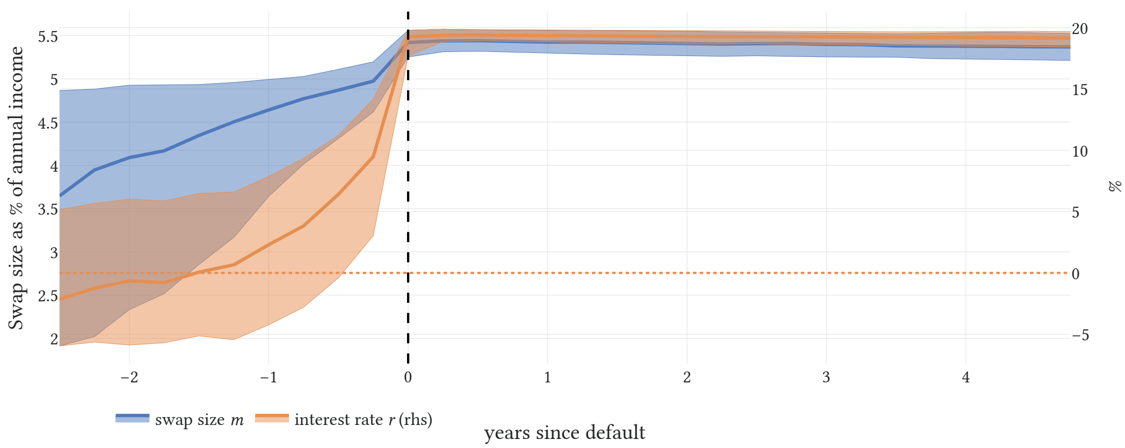

FIGURE 6: LOANS AROUND DEFAULT EVENTS

debt is increasing, to then raise them as default grows closer. In this case, the gamble for debt overhang has a twist: when the economy recovers market access, it immediately issues market debt to pay off the loan (see Figure 14 in the Appendix). The large lender is then gambling that income will not revert and that the exclusion period will be long.

While most of the use of the bilateral loan m occurs during default, Figure 6 shows that default episodes are preceded by bilateral issuance in an effort to avoid or postpone default (Figure 6 does not show the defaults that were avoided as a consequence of the large lender's presence).

Bilateral loans affect the economy in two ways: on the one hand, they provide extra financing when default risk makes borrowing in private markets costly. But they also provide funds in default, which raises the value of being excluded from private markets and consequently spreads. To disentangle these effects, we consider a variant of the model in which the large creditor is only willing to lend while the economy is in good standing with private debt markets, in other words, a variant with the extra constraint that $m'_D(m, z) = 0$. This implies in particular that whenever the government default, it must at the same time repay all of its bilateral loans.

Table 3 presents some statistics from simulating the model with and without bilateral loans (now marked 'Unrestricted'), as well as the variant in which bilateral loans are 'Limited.'

Table 3: Business cycle statistics with bilateral loans

	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
Swap to GDP (%)	0	3.32	1.05
Corr. swap & spreads (%)	–	62.2	69.4
Default frequency (%)	6.53	14.7	9.34
Welfare gains (rep)	–	-0.41%	-0.084%

In the version with Limited loans in default, the usage of bilateral loans declines by more than two-thirds on average, as repaying the large creditor after defaulting becomes even more costly (and can even act as an extra cost of default). However, bilateral loans are still mostly used when spreads are high, as shown by the high correlation between spreads and loans. The Limited version still creates welfare losses for the economy, but these are much lower than in the Unrestricted case.

5.1 *Default probabilities and debt prices*

Figure 7 shows ex-post default probabilities as a function of the debt level in private markets b, when the bilateral loan $m = 0$, for the three economies. Solid lines always represent the case without bilateral loans, while dotted and dashed lines correspond to the versions with Unrestricted and Limited bilateral loans. Bilateral loans increase the ex-post default probability for given (b, z) when they are Unrestricted, but decrease it in the Limited version.

Figure 7 highlights the negative impact of the bilateral loans. In the Unrestricted version, loans are available during default, which makes market debt repayment less attractive. The higher default probability translates into lower prices for debt, as shown in Figure 8. This effect is muted

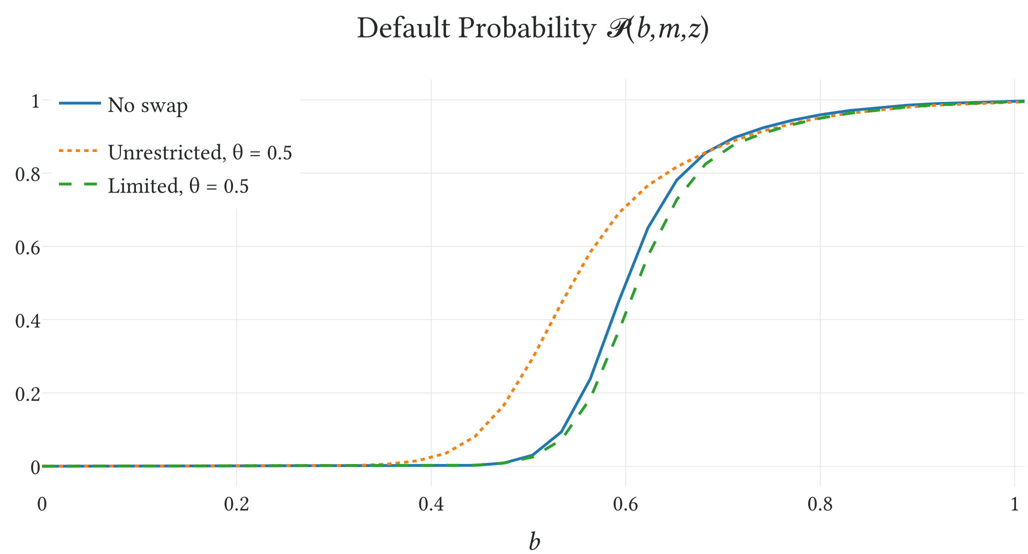

FIGURE 7: DEFAULT PROBABILITY

in the Limited variant, when bilateral loans are not available in default. However, as shown in Figure 8, prices remain lower in the Limited variant relative to the model without the large creditor. This means that even though the one-period-ahead default probability may not increase when bilateral loans are introduced in the Limited variant, policies are altered in a way that still creates more default risk later on. In other words, the option of bilateral loans, even in the Limited variant, induces the government to take on more default risk.

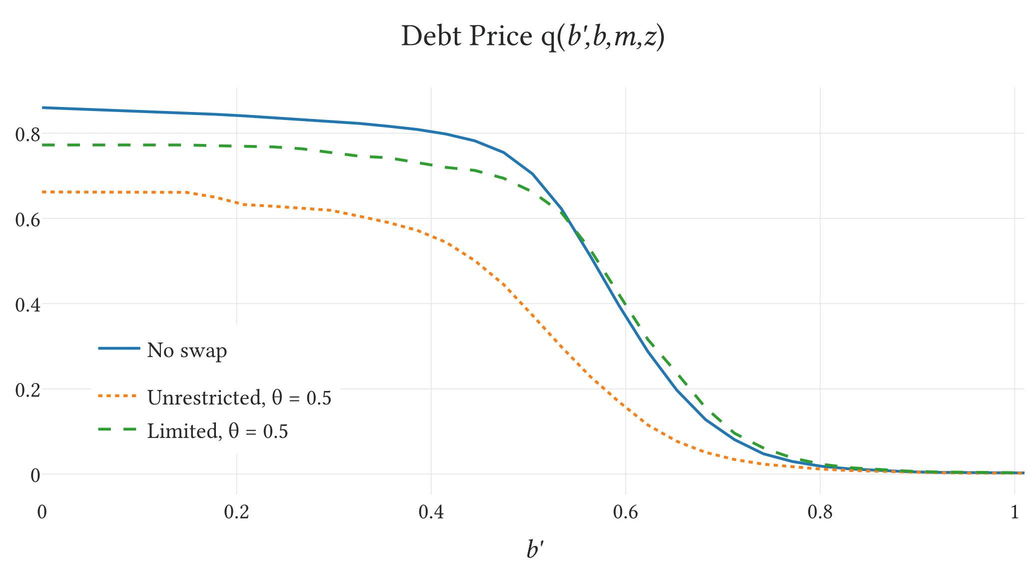

FIGURE 8: DEBT PRICES

Figure 9 presents the ergodic distribution of the debt/GDP ratio in simulations of the three models, conditional on repayment. When bilateral loans are available, in both variants, the economy spends longer in the region of the state space where default risk is large.

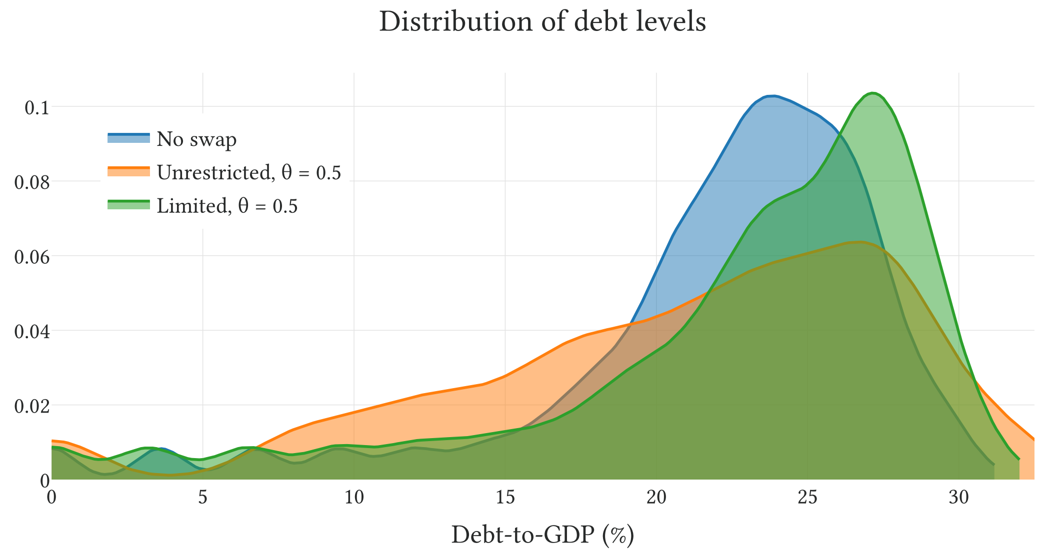

Figure 9: Distribution of debt levels

5.2 *Dynamics with bilateral loans*

In the model with bilateral loans, the government issues debt in a riskier manner and spends more time in the regions where default risk is likely. Figure 10 plots the monopolist's value (or profit) function (8) as a function of debt, as always at $m = 0$.

In both versions (both when loans are Unrestricted or Limited in default), the large lender's profit are increasing in market debt b, at least when debt is low enough that the one-period-ahead default probability remains contained. In this region, as spreads open up, the presence of the monopolist is more valuable to the government, which increases gains from trade. As debt continues to increase and default becomes likely, profits for the large lender decrease in the Limited version, as bilateral loans cannot be used in default, but increase sharply in the Unrestricted case, in which bilateral loans become very active both leading to and into the default spell.

When the government has a safe level of debt and pays low spreads, there is little for the monopolist to offer that private markets do not already provide at a competitive price. But when default risk drives up spreads, the monopolist can provide financing through the bilateral loan, which is undefaultable, and charge an interest rate between the risk-free rate and the rate that the government is paying on its market debt.

This creates a force towards issuing debt away from the 'safe' zone and to issue at positive

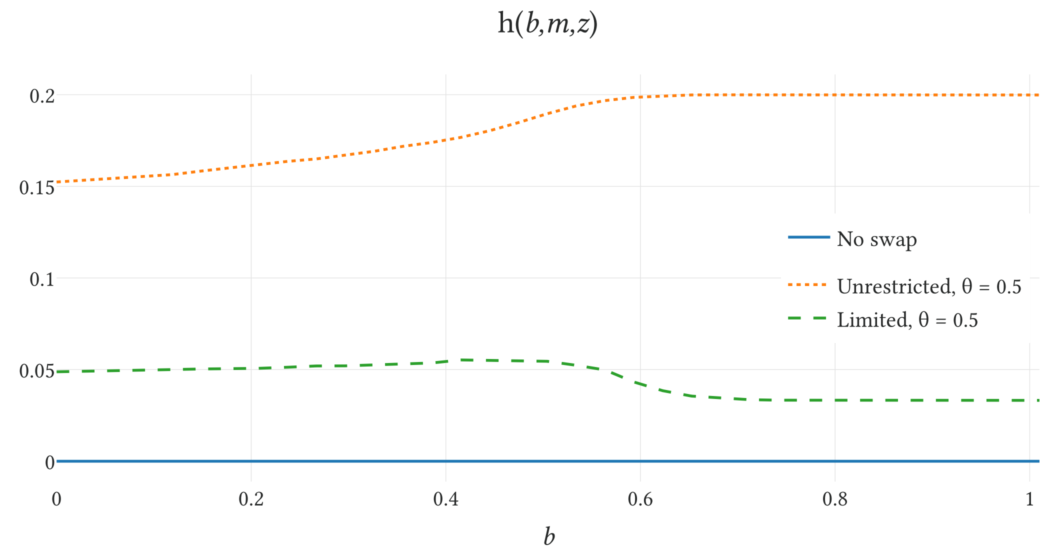

Figure 10: Monopolist's profits

spreads. Figure 11 shows the terms at which the monopolist offers transfers for given choices of debt issuance b'.

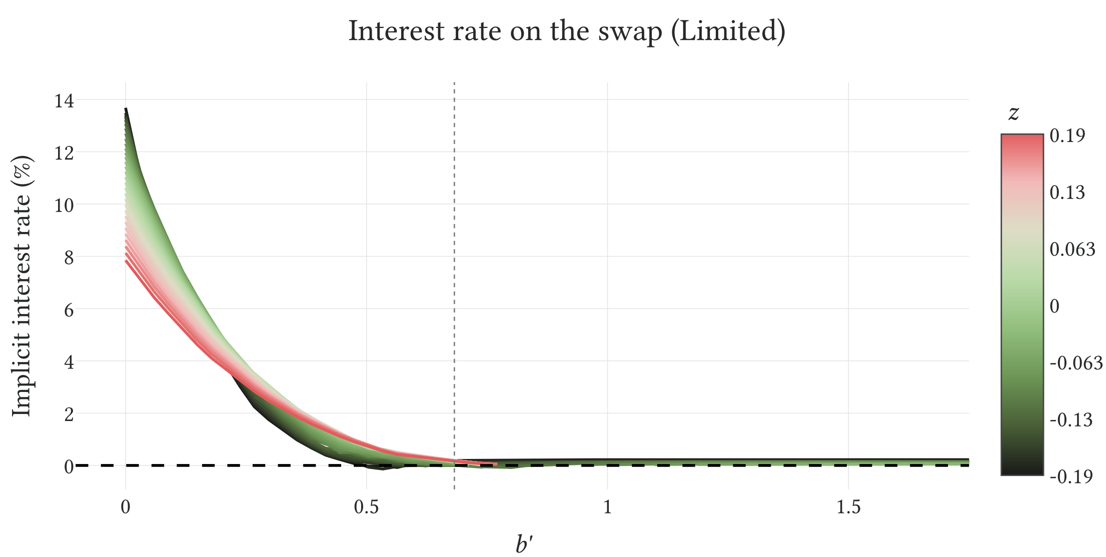

Figure 11: Interest rate on the swap

When the government has already chosen a safe debt level, there are little profits to be made in the following period. Moreover, choosing a low level of debt today means less consumption, which makes the government 'weak' in the bargaining stage. For both reasons, the monopolist charges a high rate when the government has chosen to delever its debt and a lower one when it is exposing itself to sovereign risk.

5.3 *Welfare effects of bilateral loans*

The forces discussed above combine to produce welfare effects of bilateral loans. Figure 12 shows the government's value function as a function of debt b when it owes $m = 0$ to the monopolist. The government prefers bilateral loans to be Unavailable during default, except of course when a default in the current period is very likely.

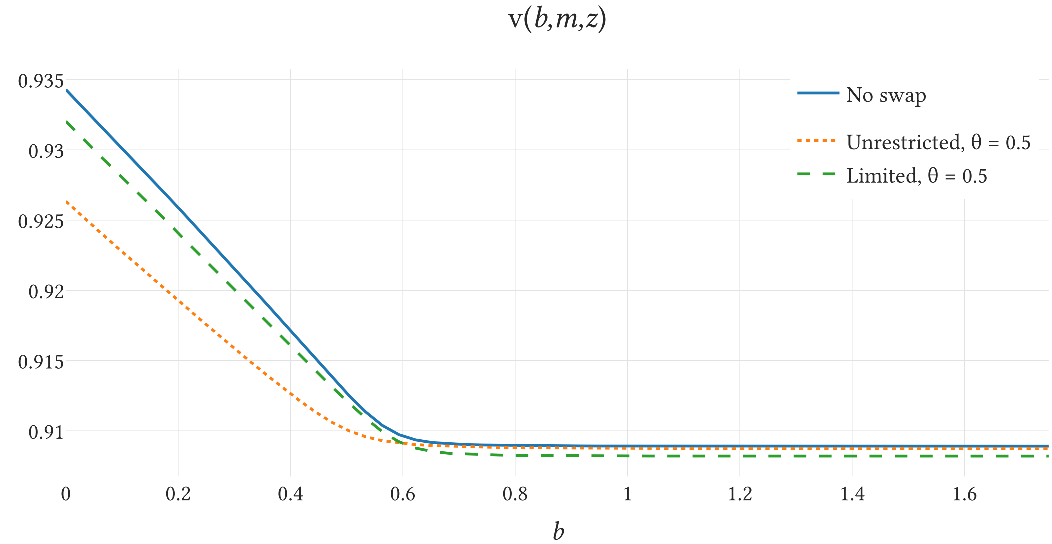

Figure 12: Value functions

Figure 15 in the Appendix confirms this intuition about debt dilution. In particular, it shows that with short-term debt there are welfare gains for the variant where swaps are Unavailable during default. The Unrestricted variant produces very small welfare losses in this case.

6. Programming the large lender

7. Concluding remarks

To investigate the interaction between marketable and bilateral debts, we develop a model of sovereign debt in which the government can borrow from a large lender (or monopolist) as well as from a competitive fringe of creditors. We find that both sources of funds are linked by strong interactions, even when quantitatively the amounts borrowed from the large lender remain an order of magnitude smaller than market debts.

The model describes a 'relational overborrowing' effect which arises in the presence of the large lender, subject to three sufficient conditions. Relative to markets, loans from the large lender must be of shorter maturity, more costly to default, and with terms subject to negotiation. With these conditions, the interest rate on bilateral loans results endogenously increasing in indebtedness in markets, which incentivizes the government to overborrow and face more sovereign default risk.

Our results suggest that having more sources of indebtedness can be detrimental for the borrowing government. The price of bilateral debt can include large premia as a consequence of market power. Furthermore, while bilateral loans could in some cases help a government fend off default, they can also make it more likely: either through reducing the effective costs of default (when it is possible to borrow from the large lender while excluded from markets) or through the relational overborrowing effect.

The welfare impacts of the large lender's presence raise important policy questions and challenges. Limiting the use of bilateral debt during defaults is a clear welfare-enhancing policy in this model. Extending the maturity of bilateral loans would mute the incentivizing effect of their borrowing terms and could also disarm relational overborrowing. Because the relational overborrowing effect operates through increased default risk, the gains of fiscal rules that constrain market borrowing should be larger for countries with access to bilateral debts.

The model implies a simple test to gauge the likely effects of a new bilateral creditor or instrument. Bilateral loans whose interest rate is expected to be strongly decreasing in the amount (or spreads) of marketable debt will induce relational overborrowing and are thus likely to hurt welfare. More generally, it highlights the benefits of transparent rules for the terms of bilateral debts.

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A. More results

Figure 13 shows that when the borrower holds all the bargaining power, the swap interest rate is constant at β_L^{-1}.

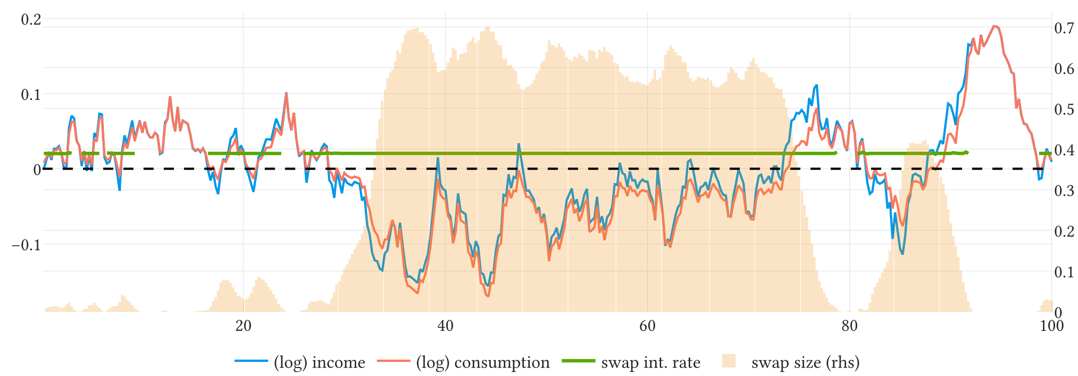

Figure 13: Simulated path, $\theta = 0$

Figure 14 shows that, further conditioning on an exclusion period of 2 years, the economy issues debt in the market in order to pay off the swap as soon as it recovers market access.

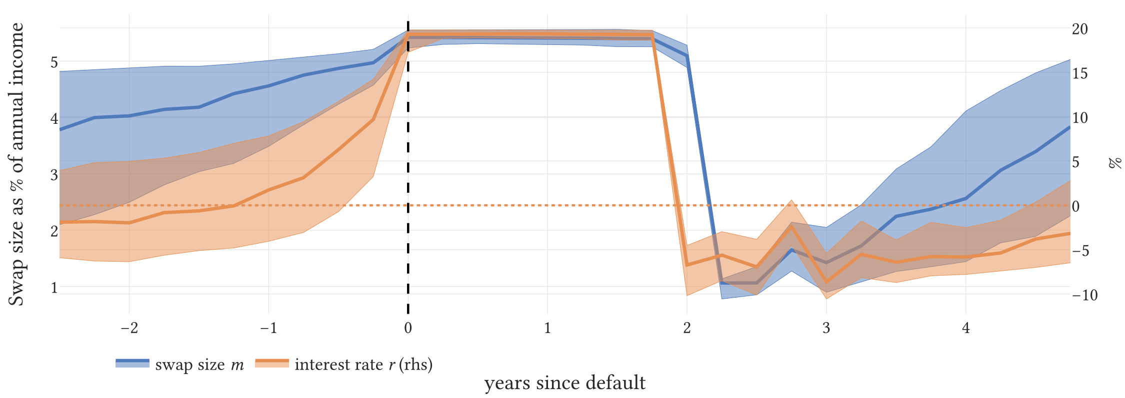

Figure 14: Swaps around default events

Figure 15 shows that, (*i*) with short-term debt, allowing the swap to be drawn while in default provides welfare gains and (*ii*) there are welfare gains from the swap for a larger range of values of the bargaining weight, in particular for $\theta \leq 0.3$.

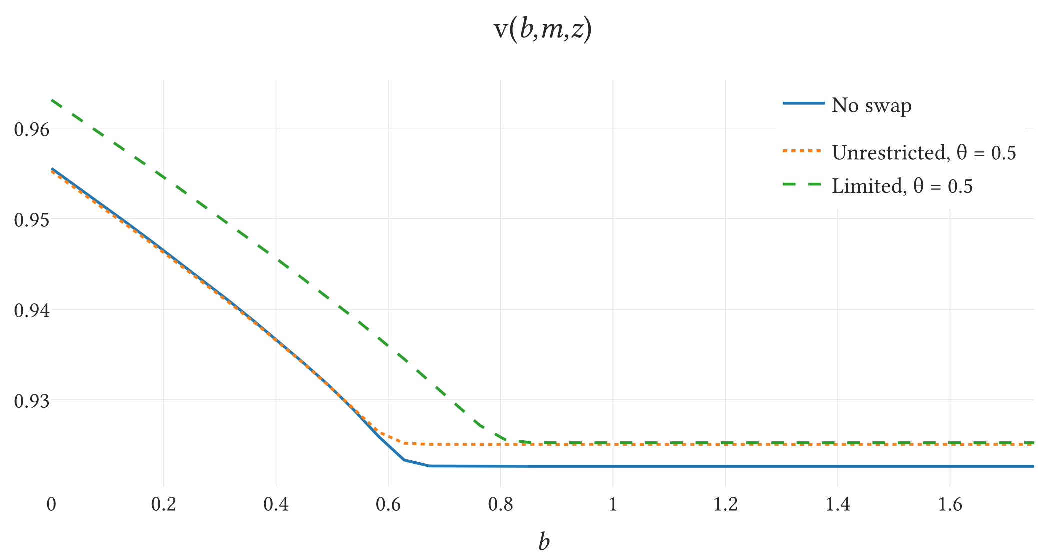

Figure 15: Value functions, short-term debt