Default, Inflation Expectations, and the Currency Denomination of Sovereign Bonds*

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Abstract

This paper studies optimal debt management by currency in inflation-targeting emerging countries. First, I document new evidence that these countries tilt their borrowing towards foreign currency when sovereign risk rises. Second, I develop a New Keynesian model with sovereign default, and show how the currency denomination of debt is shaped by sovereign risk contingent on fiscal-monetary interactions in default crises, which involve optimal deviations from the inflation target. Local currency debt hedges consumption fluctuations, while foreign currency debt reduces governments' incentive to raise (expected) inflation that generates distortions. Quantitatively, these tradeoffs capture the new evidence and explain up to 35 percentage points of the foreign currency debt share. Optimal debt management reduces inflation, default frequency, and spreads.

Key words: Sovereign Default, Inflation, Currency Denomination, New Keynesian Theory

JEL classification: E32, E52, E63, F34, H63

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1 Introduction

Over the past few decades, many emerging countries have improved their monetary credibility with the adoption of inflation targeting. A well-known fact is that default risk—a prominent feature of these countries—is highly associated with expected inflation and, through the Phillips curve, raises current inflation. Despite extensive research on this relationship, sovereign debt management—particularly by currency denomination—and its interaction with monetary policy is largely underexplored. What factors determine sovereign debt management? How can governments optimally manage debt denomination by currency? What are the benefits from optimally managing the currency denomination of sovereign debt?

In this paper, I first bring forward new stylized facts on the correlation between sovereign risk and expected inflation, on the one hand, and spreads and the currency denomination of sovereign debt, on the other, for a number of inflation-targeting emerging economies. Second, I develop a small open economy New Keynesian model with sovereign default, where the government optimally manages the currency denomination of debt issuance with discretion. The model highlights the joint role of *default risk* and *fiscal-monetary interactions in default crises* as the main driver of the currency denomination of sovereign debt observed in the data. When default occurs, the central bank optimally deviates from the inflation target, trading off inflation stability with reductions in fiscal distortions. This regime of fiscal-monetary interactions results in a finite inflation surge, which is anticipated and, via the Phillips Curve, raises current inflation in countries with default risk.

In this setting, my analysis sheds light on a novel policy tradeoff that shapes debt management in emerging economies. On the one hand, local currency debt offers *hedging benefits*, as higher inflation in bad times reduces the real debt burden—it offers much better state-contingency than foreign currency debt. On the other hand, high levels of debt in local currency tempt the government to debase its obligations by manipulating inflation through the *expected inflation* channel highlighted by the model. Namely, conditional on the fiscal-monetary interactions discussed above, the government can, by issuing additional debt, raise expected inflation through the amplified default risk. In a New Keynesian setting, higher expected inflation, in turn, results in higher current inflation, eroding the real value of local currency debt. This is distortionary in two respects: foreign lenders anticipate debt debasement and consequently offer lower prices (higher interest rates) for local currency debt; in addition, the central bank responds by raising the interest rate which in turn depresses aggregate output.[1] Foreign currency debt is appealing, as it provides *discipline benefits*—tilting debt issuance towards foreign currency reduces the

[1]Anticipations of debasement lead to higher expected inflation, which elevates contemporaneous inflation. This prompts the central bank to raise the nominal interest rate, which, in equilibrium, dampens aggregate consumption demand and reduces aggregate output.

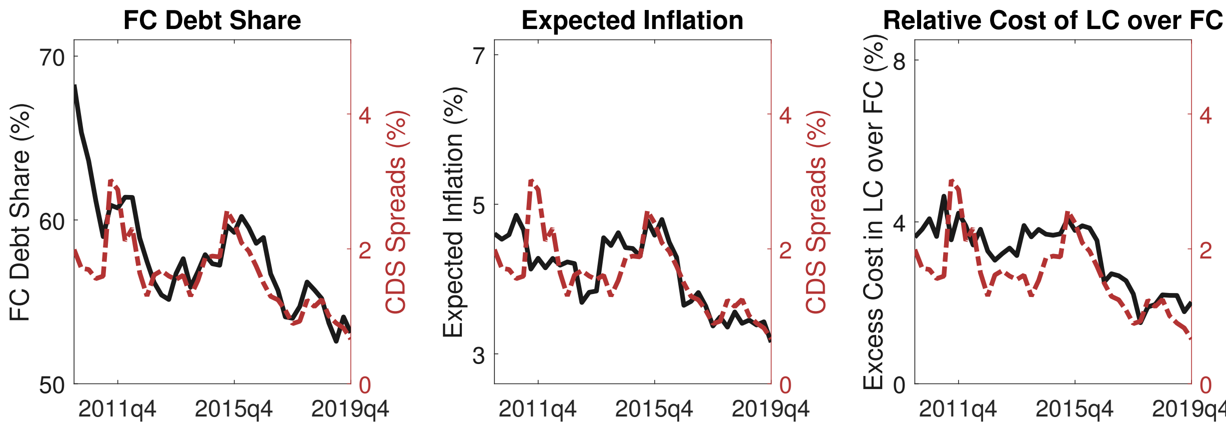

Figure 1: Co-movements between CDS spreads (red dashed lines, right Y-axis) and (i) FC debt share (left panel), (ii) expected inflation (mid panel), (iii) the relative cost of borrowing in LC over FC (right panel).

incentive for debasement, helping to avoid these two distortions. In equilibrium, optimal debt denomination by currency balances the discipline benefits of foreign currency debt, with the hedging benefits of local currency debt.

The contribution of this paper is twofold. First, empirically, I establish three stylized facts concerning the currency denomination of sovereign bonds and the spread of Credit Default Swaps (CDS), used as an indicator of default risk. These facts are illustrated in Figure 1, where, for a sample of inflation targeters, I present the cross-sectional mean of CDS spreads (red dashed lines, right Y-axis) with three variables (black solid lines, left Y-axis).[2] In the left panel, I show a positive association between CDS spreads and (i) the proportion of foreign currency (FC) borrowing in total external borrowing. Inflation-targeting emerging economies tilt their borrowing towards foreign currency when default risk rises. In the middle panel, I show a positive association between CDS spreads and (ii) inflation expectations. The second fact provides empirical support for default (risk) heightening inflationary pressure. In the right panel, I present a positive association between CDS spreads and (iii) the relative cost of borrowing in local currency (LC) over foreign currency (FC). The third fact illustrates that borrowing in local currency becomes more costly with higher default risk. The first and third facts are new to the literature, and the second fact is consistent with findings from related work (see, for instance, Arellano, Bai, and Mihalache (2023) and Galli (2020)).

The second contribution of the paper is the specification of a small open economy New Keynesian model with sovereign default and optimal debt denomination by currency. The government, borrowing internationally from risk-neutral lenders, cannot commit to debt repayment

[2]The figure specifically focuses on those with foreign currency debt shares within the interquartile range from my sample of 15 inflation-targeting emerging economies, including Brazil, Chile, Colombia, Hungary, India, Indonesia, Peru, Poland, Philippines, Russia, South Africa, Thailand, and Turkey. The data from 2009 and beyond 2020 is omitted in the figure, due to the impacts of the Great Recession and the COVID-19 pandemic.

and future debt choices. Each period, it decides whether to repay the outstanding debt stock or to default. If it repays, the government then chooses the amount of debt to issue in both foreign and local currency. If it defaults, it suffers permanent tax losses. The central bank follows a rule-based inflation-targeting policy upon repayment, but when default occurs, it optimally deviates from this rule-based policy—reflecting fiscal-monetary interactions in default crises—and balances inflation stability with support for government tax revenues.

In my quantitative analysis, the baseline, calibrated to Colombia from 2009 to 2021, performs well in capturing both targeted and untargeted moments in the Colombian economy.[3] Namely, the average share of foreign currency borrowing in total external borrowing predicted by the baseline (76.80%) mirrors the observed data (78.75%). Moreover, the baseline closely reproduces the correlations documented by my empirical analysis. Specifically, CDS spreads are correlated with (i) the share of foreign currency borrowing (.141 in the data versus .137 in the baseline), (ii) expected inflation (.621 versus .804) and (iii) the relative cost of borrowing in local currency over foreign currency (.476 versus .332).

To assess the macroeconomic and welfare implications of the model, I run two policy experiments, one constraining monetary responses in default events and the other constraining fiscal choices of debt denomination by currency. In my first experiment, I assume that the central bank strictly adheres to a rule-based inflation-targeting policy, even during default. Under this specification, default no longer triggers a surge in inflation—debasement through the expected inflation channel is ruled out.[4] The average share of foreign currency borrowing drops sharply from 76.80% (the baseline) to 41.86%, suggesting that around 35 percentage points of foreign currency debt share in the baseline is attributed to its discipline benefits. Additionally, the government counterfactually borrows less in foreign currency during periods of higher default risk (0.141 in the data versus -0.658 in the first experiment), and the correlation between default risk and expected inflation drops to 0.07 (.621 in the data). These results suggest that without fiscal-monetary interactions in default crises, default risk alone is insufficient to reproduce the dynamic patterns identified in my empirical studies.

In my second experiment, I conduct a counterfactual exercise where the government is constrained to exclusively borrow in local currency. In this setting, the government lacks a tool, foreign currency debt, to contain distortionary debasement. This leads to a rise in inflation (from 3.59% to 3.98%), in the cost of borrowing in local currency (from 5.01% to 6.38%), and in default frequency (from 1.37% to 2.15%). From a policy perspective, this exercise shows that the gains from debt management by currency can be substantial, in terms of higher macroeconomic

[3] Colombia is chosen as the reference, because it is an emerging economy that relies heavily on external borrowing and exhibits business cycle characteristics similar to those of other emerging economies.

[4] In the absence of a surge in inflation during default, an increase in debt issuance—resulting in higher default risk—does not raise (expected) inflation, making the debasement mechanism in the model no longer effective.

resilience. It also highlights the significant disciplining role that foreign-currency denominated debt plays in efficient debt management of emerging market governments.

The literature. This paper builds on the literature on sovereign debt and the New Keynesian monetary policy. The government's problem in the model follows the standard sovereign default framework developed by Eaton and Gersovitz (1981), as in Aguiar and Gopinath (2006) and Arellano (2008). Various studies have expanded upon this framework to explore different aspects of debt management.[5] Closely related to this paper, Arellano and Ramanarayanan (2012) study the optimal maturity structure of sovereign debt, addressing tradeoffs in debt maturity choices. Whereas short-term debt reduces the incentive to engage in (long-term) debt dilution, long-term debt offers consumption insurance. The optimal currency denomination of sovereign debt in this paper also involves analogous tradeoffs—local currency debt functions as a hedge, whereas foreign currency debt reduces the incentive for distortionary debasement.[6]

This paper is linked to sovereign default literature with nominal rigidities. Many studies have investigated the interaction between defaultable sovereign debt and the downward rigidity of nominal wages.[7] Na, Schmitt-Grohé, Uribe, and Yue (2018) assert that exchange rate depreciation associated with sovereign default is optimal, as it adjusts real wages to their efficient level. Bianchi, Ottonello, and Presno (2023) highlight a tradeoff in fiscal policy between boosting aggregate demand but potentially elevating default risk, accommodating pro-cyclical fiscal policy observed in countries with high default risk. This paper also captures the interaction between sovereign risk and nominal rigidities, but it differs from these studies in the monetary policy setting. In my framework, monetary policy mirrors the practices of central banks in many emerging markets, which set nominal interest rates to target inflation when there is no

[5] For instance, Cole and Kehoe (2000) investigate self-fulfilling rollover crises, recently revisited by Aguiar, Chatterjee, Cole, and Stangebye (2022) and Corsetti and Maeng (2023). Bocola and Dovis (2019) and Bocola, Bornstein, and Dovis (2019) employ a quantitative model to analyze European sovereign debt crises. Chatterjee and Eyigungor (2012) and Hatchondo, Martinez, and Sosa-Padilla (2016) study the sovereign default model with long-term bonds. Ayres, Navarro, Nicolini, and Teles (2018) and Ayres and Paluszynski (2022) examine the role of expectations in sovereign default models. Samano (2022) shows that central bank independence increases the sovereign's incentive to repay. Hernández (2018) and Barbosa-Alves, Bianchi, and Sosa-Padilla (2024) study the optimal reserve policy in the context of self-fulfilling rollover crises. Broner, Lorenzoni, and Schmukler (2013) explore the impact of lenders' risk aversion on the maturity choice of sovereign bonds. Park (2014), Morelli, Ottonello, and Perez (2022), and Maeng and Park (2025) highlight the role of global investors in driving borrowing costs in emerging economies.

[6] Similarly, Bianchi, Hatchondo, and Martinez (2018) study the optimal choice of international reserves, navigating the tradeoff between insurance benefits and a rise in borrowing costs. Aguiar, Amador, Hopenhayn, and Werning (2019) propose that the optimal debt management is conducted using only short-term bonds. Wicht (2023) delves into the optimal seniority structure of sovereign bonds in the presence of the *de facto* seniority of the multilateral debt.

[7] Bianchi and Mondragon (2022) show that self-fulfilling debt crises are more likely to take place in countries lacking monetary independence. Bianchi and Sosa-Padilla (2023) emphasize a macroeconomic-stabilization hedging role of reserves in the presence of sovereign risk and downward rigidity of nominal wages.

fiscal crisis.[8] In this regard, this paper is closely related to Arellano et al. (2023), who develop a framework reflecting the practices in many emerging economies. While Arellano et al. (2023) explore the interaction between sovereign risk and monetary policy, this paper investigates debt denomination by currency and its interactions with monetary policy and sovereign risk. I elaborate on the distinction from their work in Section 3.4.

This paper is also related to the literature following Calvo (1988) that investigates the incentives of governments to default on debt in local currency.[9] Aguiar, Amador, Farhi, and Gopinath (2013) explore the role of discretionary inflation in preventing self-fulfilling rollover crises. Galli (2020) shows that inflation and default risk co-move, as seigniorage becomes a crucial source of the government's revenue when default takes place. Related, Sunder-Plassmann (2020) studies how debt ownership affects inflation with local currency borrowing.[10]

The existing literature has extensively examined the high levels of foreign currency debt in emerging countries—referred to as the "original sin"[11]—and its relation to the optimal choice between foreign and local currency bonds.[12] Du, Pflueger, and Schreger (2020) address the time-inconsistency issue associated with monetary discretion, illustrating that countries with discretionary inflation tilt their borrowing towards foreign currency to avoid costly inflation ex post. Engel and Park (2022) employ an optimal contract model to emphasize monetary credibility as the primary factor shaping the currency composition of sovereign debt. Ottonello and Perez (2019) focus on the real exchange rate manipulation channel that drives the time-inconsistency problem of local currency obligations.[13] These studies, including mine, highlight that foreign currency borrowing contains distortionary devaluation of local currency liabilities. My work, in contrast to theirs, focuses on how default risk—in the context of fiscal and monetary interactions

[8]Also, pricing frictions in my model generate a standard New Keynesian Phillips Curve, which links current inflation and output with expected inflation.

[9]Another strand of self-fulfilling debt crises literature, following Calvo (1988), is explored in Corsetti and Dedola (2016), Ayres, Navarro, Nicolini, and Teles (2019) and Lorenzoni and Werning (2019). See Corsetti and Maeng (2024) for a reappraisal.

[10]Other related work that focuses on the relationship between local currency debt and inflation includes Hurtado, Nuño, and Thomas (2023) and Hur, Kondo, and Perri (2018), who study the interaction between discretionary inflation and defaultable local currency debt. Du and Schreger (2022) show that inflation can negatively affect the balance sheets of firms.

[11]The term "original sin" was first introduced by Eichengreen, Hausmann, and Panizza (2005). Aizenman, Jinjarak, Park, and Zheng (2021), Eichengreen, Hausmann, and Panizza (2023), Onen, Shin, and Peter (2023), Zheng (2023) and Bertaut, Bruno, and Shin (2024) use the new dataset to revisit the "original sin" of emerging economies.

[12]Devereux and Wu (2022) show that foreign reserves mitigate the destabilizing effects of global shocks on the domestic economy, reducing the currency risk premia in debt denominated in domestic local currency. Hofmann, Patel, and Wu (2022) investigate how the balance sheet mismatch of international lenders resulting from local currency lending contributes to the fragility of emerging economies' external borrowing. Lee (2022) illustrates that emerging economies borrow more in foreign currency when exchange rate volatility is higher, as risk-averse lenders demand much larger compensation for bearing higher volatility of currency-mismatch risk. Schmid, Valaitis, and Villa (2023) compare the real and nominal debt denomination under committed and discretionary taxation.

[13]Ottonello and Perez (2019) also study debt denomination by currency under monetary discretion.

in a default crisis—affects the currency denomination of sovereign debt, particularly in scenarios where the central bank is fully restrained from debasing local currency debt through discretionary inflation. I defer a full discussion of the differences between my work and theirs in Section 3.4.

The paper is organized as follows. Section 2 presents stylized facts that motivate the analysis. Section 3 describes the model and characterizes the main tradeoffs involved in the choice of the currency denomination of sovereign bonds. Section 4 presents quantitative results of the model, compares them to data counterparts, and conducts two policy experiments. Section 5 concludes.

2 Empirical Findings

In this section, I document three empirical regularities linking default risk and the sovereign's external borrowing among inflation-targeting emerging economies. I present the robust positive associations between the spreads of Credit Default Swaps (CDS)—as a proxy for default risk—and (i) the share of foreign currency borrowing in total external borrowing of the sovereign, (ii) inflation expectations, and (iii) the cost of borrowing in domestic local currency (LC) over that in foreign currency (FC). All empirical analyses are conducted at a quarterly frequency, due to data availability.

2.1 Data Description

The main variable of interest is the share of foreign currency debt in total external sovereign debt. The data for this variable are sourced from the dataset constructed by Arslanalp and Tsuda (2014), which provides information on foreign holdings of government debt issued for the period spanning from 2004Q1 to 2021Q4.[14] The dataset encompasses all major and extensively studied emerging countries. The debt stock is recorded at book value, implying that it is immune to the changes in the market prices of bonds. The sample under consideration consists of 15 inflation-targeting emerging countries, a subset of the 24 countries in Arslanalp and Tsuda (2014). Among these 24 countries, I exclude all six non-targeters, namely Argentina, Bulgaria, China, Egypt, Latvia, and Lithuania. Romania, Ukraine, and Uruguay are excluded due to the unavailability of data on local currency sovereign debt spreads. To summarize, the 15 countries included in my analysis are: Brazil, Chile, Colombia, Hungary, India, Indonesia, Malaysia, Mexico, Peru,

[14] Arslanalp and Tsuda (2014) have constructed and upheld a panel dataset documenting the currency denomination in sovereign bonds across emerging economies. This dataset, compiled from diverse data sources, has been employed in previous studies, including the work of Ottonello and Perez (2019), Du et al. (2020), Sunder-Plassmann (2020), Engel and Park (2022), Devereux and Wu (2022), and Lee (2022).

Philippines, Poland, Russia, South Africa, Thailand, and Turkey.[15]

To assess default risk, I collect data on five-year sovereign US dollar-denominated Credit Default Swap ($CDS_{\$,it}$) from Bloomberg, ranging from 2009Q1 to 2021Q4. These Over-the-Counter derivatives quote the premium, commonly referred to as the spread, that holders of sovereign debt can pay to fully insure themselves against credit events such as sovereign default. This measure has been extensively adopted in other studies as an indicator of sovereign default risk.[16]

Data on inflation expectations for each emerging economy come from Bloomberg. The median values of survey data (institutional forecasts) are used to measure the expected inflation one year ahead, from 2009Q1 to 2021Q4.[17]

To measure the cost of borrowing in local currency, I employ the five-year local currency bond spread ($spread_{DS,it}$) from Du and Schreger (2016) and add the US five-year treasury rates (y_{it}^{US}) back to the spreads to recover five-year zero-coupon local currency bond yields y_{it}^{LC}, in accordance with the approach outlined in Lee (2022). For the cost of borrowing in foreign currency, following Du et al. (2020), I use five-year sovereign US dollar-denominated CDS spreads ($CDS_{\$,it}$) along with the US five-year treasury rates (y_{it}^{US}) to formulate five-year zero-coupon foreign currency bond yields y_{it}^{FC}. The costs of borrowing in foreign and local currency, respectively, are measured as follows:

$$
\begin{aligned}
y_{it}^{FC} &= CDS_{\$,it} + y_{it}^{US} \\
y_{it}^{LC} &= spread_{DS,it} + y_{it}^{US}
\end{aligned}
$$

I incorporate macro controls in my regressions: year-over-year inflation, year-over-year real exchange rate depreciation, year-over-year real GDP growth, external sovereign debt to GDP ratio, capital openness index, and private credit to GDP ratio. The data are collected from FRED, CEIC, the IMF IFS dataset, World Bank WDI dataset, and Chinn and Ito (2006). I argue that the positive correlations between CDS spreads and (i) the share of foreign currency debt in total external sovereign debt, (ii) expected inflation, and (iii) the cost of borrowing in domestic local currency (LC) over that in foreign currency (FC), are not driven by a spurious correlation between macro controls and CDS spreads.

[15]It is noteworthy that both India and Russia started to adopt inflation targeting in 2015. In my empirical analysis, I exclude periods in these two countries when inflation targeting was not adopted. The complete exclusion of India and Russia from the analysis does not qualitatively alter any of the obtained results. The details of the years of inflation targeting in my sample, along with a comprehensive graphical depiction of the data, are provided in Appendix A.

[16]See, for instance, Du and Schreger (2016), Galli (2020) and Du and Schreger (2022).

[17]The inflation expectations data in quarterly frequency is limited to a maximum horizon of one year. Note that inflation swaps, commonly used to gauge inflation expectations, are not traded in all 15 emerging countries of my sample. The survey data are the only available source for inflation expectations.

Table 1: FC Debt Share and CDS Spreads

	FC debt share $FCshare$ (%)		Adjusted FC debt share $FCshare^{ADJ}$ (%)	
	(1)	(2)	(3)	(4)
$CDS_{\$,it}$ (%)	3.196***	5.150***	1.127**	4.619***
	(0.525)	(0.596)	(0.469)	(0.579)
Inflation (%)		0.118		-0.181
		(0.145)		(0.133)
Real Exchange Rate Depreciation (%)		0.00548		0.0606*
		(0.0368)		(0.0343)
Real GDP Growth Rates (%)		0.137		0.00427
		(0.102)		(0.0944)
External Sovereign Debt to GDP (%)		-0.676***		-0.776***
		(0.0689)		(0.0723)
Capital Openness		-1.213*		2.795***
		(0.653)		(0.593)
Private Credit to GDP (%)		-0.0482		0.00646
		(0.0391)		(0.0354)
Observations	706	706	706	706
R-squared	0.934	0.948	0.939	0.954

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. In column (1) and (2), the dependent variable is the share of FC debt in total public external debt; in column (3) and (4), the dependent variable is the share of nominal exchange rate adjusted FC debt in total public external debt.

2.2 Currency Denomination

I first examine the correlation between the share of external sovereign borrowing in foreign currency and CDS spreads. The foreign currency debt share of country i at time t is denoted as $FCshare_{it}$:

$$FCshare_{it} = \frac{\text{Foreign held foreign currency sovereign debt}_{it}}{\text{Foreign held total sovereign debt}_{it}}$$

I run the country and time fixed effect panel regression, which takes the following form:

$$FCshare_{it} = \alpha_i + T_t + \beta CDS_{\$,it} + \Gamma' X_{it} + \epsilon_{it}$$

where $CDS_{\$,it}$ denotes five-year sovereign US dollar-denominated CDS spread. The country-specific macro controls X_{it} include year-over-year inflation, year-over-year real exchange rate depreciation, year-over-year real GDP growth, external sovereign debt to GDP ratio, capital openness index, and private credit to GDP ratio.

The regression estimates are reported in column (1) and (2) of Table 1. Column (1) displays estimates of the regression without any macro controls. These estimates reveal a positive association between the share of debt in foreign currency and CDS spreads—an increase in US dollar-denominated CDS spreads by one percentage point is associated with 3.196-5.150 percentage points higher foreign currency share of external debt.[18]

As the data on debt stocks are measured at their book values, any changes in valuation arise only from movements in nominal exchange rates. Specifically, when the domestic currency depreciates, the book value of local currency debt falls relative to that of foreign currency debt, resulting in a mechanical increase in the share of foreign currency borrowing. To account for the nominal exchange rate valuation effect, I adopt the approach proposed by Lee (2022), using the exchange rate against the US dollar in 2011Q1 throughout the sample periods.[19] The corresponding exchange-rate-adjusted share of foreign currency borrowing is denoted as $FCshare_{it}^{ADJ}$:

$$FCshare_{it}^{ADJ} = \frac{\text{Foreign held foreign currency sovereign debt, using 2011Q1 exchange rate}_{it}}{\text{Foreign held total sovereign debt, using 2011Q1 exchange rate}_{it}}$$

Column (3) and (4) of Table 1 report the estimates using $FCshare^{ADJ}$ as a dependent variable. The coefficient estimates, while quantitatively smaller after accounting for mechanical fluctuations, remain substantial, ranging from 1.13 to 4.62.[20]

The positive correlation between the share of foreign currency debt and CDS spreads remains robust across various specifications in Appendix B. Table B1 provides a summary of regression results, taking the first difference of each variable to investigate how the net stock of debt changes in response to changes in CDS spreads. The estimates indicate that the net stock of foreign currency debt increases more than that of local currency debt when CDS spreads are higher. Table B2 reports results using sample periods excluding the Covid-19 pandemic (2009-2019), indicating that the positive correlation is not driven by the Covid-19 pandemic in 2020-2021. I replace time fixed effects with global control variables in Table B3, and the estimates do not change qualitatively. To summarize, inflation-targeting emerging economies tilt their borrowing towards foreign currency when CDS spreads rise.

[18]By contrast, inflation itself has no explanatory power on foreign currency debt share, which aligns with the existing literature that finds a zero correlation between inflation and the share of foreign currency borrowing, referred to as 'the mystery of original sin'. See, for instance, Hausmann and Panizza (2003), Eichengreen et al. (2005) and Engel and Park (2022) for details.

[19]This approach implicitly posits that all foreign currency borrowing is denominated in the US dollar.

[20]The positive correlation between the exchange-rate-adjusted FC debt share and CDS spreads remains robust regardless of the specific quarterly date chosen as the base date for the nominal exchange rate.

Table 2: Inflation Expectations and Default Risk

	Expected Inflation $\mathbb{E}_t[\pi_{i,t+4}]$ (%)	
	(1)	(2)
$CDS_{\$,it}$ (%)	0.913***	0.489***
	(0.152)	(0.0929)
Inflation (%)		0.302***
		(0.0308)
Real Exchange Rate Depreciation (%)		-0.00375
		(0.00530)
Real GDP Growth Rates (%)		0.0118
		(0.0119)
External Sovereign Debt to GDP (%)		-0.0320***
		(0.00796)
Capital Openness		-0.0220
		(0.0880)
Private Credit to GDP (%)		-0.00595
		(0.00595)
Observations	643	643
R-squared	0.807	0.890

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. The dependent variable is expected inflation.

2.3 Expected Inflation

In this subsection, I investigate how expected inflation responds to default risk. I set expected inflation one year ahead $\mathbb{E}_t[\pi_{i,t+4}]$ as a dependent variable, and run regressions on five-year sovereign US dollar-denominated CDS spreads ($CDS_{\$,it}$) and the macro controls X_{it}, which take the following form:

$$\mathbb{E}_t[\pi_{i,t+4}] = \alpha_i + T_t + \beta CDS_{\$,it} + \Gamma' X_{it} + \epsilon_{it}$$

The corresponding estimates are reported in Table 2. A one percentage point increase in CDS spreads is associated with a 0.489-0.913 percentage point increase in inflation expectations. This result suggests that default risk is positively associated with high expected inflation, providing empirical support for default (risk) increasing inflationary pressure in inflation-targeting emerging economies.

The positive association between expected inflation and CDS spreads remains robust to

Table 3: Relative Cost of Borrowing in LC over FC and Inflation Expectations

	LC Yield over FC Yield $y_{it}^{LC} - y_{it}^{FC}$ (%) (1)	(2)
$CDS_{\$,it}$ (%)	0.723***	0.293***
	(0.110)	(0.103)
Inflation (%)		0.221***
		(0.0361)
Real Exchange Rate Depreciation (%)		0.0114
		(0.00750)
Real GDP Growth Rates (%)		-0.0427
		(0.0271)
External Sovereign Debt to GDP (%)		0.00470
		(0.0109)
Capital Openness		0.253*
		(0.135)
Private Credit to GDP (%)		0.0303***
		(0.00806)
Observations	660	660
R-squared	0.825	0.862

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. The dependent variable is the relative cost of borrowing in LC over FC.

an alternative specification that excludes pandemic periods, as illustrated in Table B4 in Appendix B. Incorporating the global factors into the regression does not qualitatively alter the results, as shown in Table B5. Table B6 presents the first-difference regression results regarding expected inflation and CDS spreads, showing that expected inflation rises with an increase in CDS spreads.[21]

2.4 Relative Costs of Borrowing

Now I shift the focus to the relationship between the relative cost of borrowing in local currency over foreign currency and CDS spreads. I initiate the analysis with the country and time fixed

[21] In Appendix C, I offer supplementary evidence regarding the correlation between inflation and default. I present inflation rates before and after eight recent and historical sovereign default events, illustrating that inflation tends to surge when default occurs.

effect panel regression, regarding the relative cost of borrowing in LC over FC:

$$y_{it}^{LC} - y_{it}^{FC} = \alpha_i + T_t + \beta CDS_{\$,it} + \Gamma' X_{it} + \epsilon_{it}$$

where y_{it}^{LC} and y_{it}^{FC}, respectively, are the five-year zero-coupon local and foreign currency bond yield.

Table 3 presents the results of the regression outlined above. A one percentage point increase in CDS spreads is positively associated with a 0.293-0.723 percentage point increase in the relative cost of borrowing in local currency over foreign currency. The relationship stays robust across various specifications. Excluding the Covid-19 pandemic (2020-2021) does not alter results qualitatively, shown in Table B7 in Appendix B. Substituting time fixed effects with global control variables in Table B8 also maintains the qualitative consistency of the results. These findings suggest that, when CDS spreads get higher, foreign lenders require more compensation when lending in local currency relative to foreign currency.

2.5 Summary

The key takeaway from this section is that, when CDS spreads rise, (i) inflation-targeting emerging economies tilt their borrowing towards foreign currency, (ii) expected inflation increases, and (iii) the relative cost of borrowing in local currency relative to foreign currency increases. The first and third facts are new to the literature. The second fact is consistent with related work by Arellano et al. (2023) and Galli (2020).

3 Model

In this section, I develop a small open economy New Keynesian model with sovereign default and optimal debt denomination by currency. The central bank in the model optimally deviates from the inflation target when default occurs, capturing fiscal-monetary interactions in sovereign default.

3.1 Environment

The model includes households, final goods firms, intermediate goods firms, the central bank, a benevolent government conducting fiscal policy, and a continuum of risk-neutral competitive foreign lenders with measure one. Time is discrete and indexed by $t = 0, 1, 2, \cdots$. The government has the discretion to decide whether to default or repay. When choosing repayment, it issues defaultable debt in two currencies: foreign currency (FC) and local currency (LC).

Notably, the model includes only one type of final goods, which is either produced using all varieties of intermediate goods or imported from abroad.[22] Throughout the paper, the primary distinction between FC and LC debt lies in their susceptibility to debasement risk.

3.1.1 Households

Households get utility from the consumption of private goods C_t and public spending G_t, while incurring disutility by supplying labor N_t to intermediate goods firms. Their preferences are given by:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t u(C_t, G_t, N_t)$$

where the utility function exhibits full separability and is given by

$$u(C_t, G_t, N_t) = \frac{C_t^{1-\gamma} - 1}{1-\gamma} + \alpha_G \frac{G_t^{1-\gamma} - 1}{1-\gamma} - \frac{N_t^{1+\frac{1}{\zeta}}}{1+\frac{1}{\zeta}} \tag{1}$$

Households take prices and policies as given and choose their private consumption, labor supply, and holdings of domestic bonds B_t^d. Domestic bonds, denominated in local currency, are risk-free and can only be traded among domestic households. In equilibrium, the net supply of domestic bonds is zero.[23]

Households earn labor income $W_t N_t$ and receive profits Ψ_t—I posit that these profits are independent of, and unaffected by the individual decisions of atomistic households. The government levies taxes T_t^τ on households for public expenditure, deducting a fraction τ of aggregate output.[24] T_t^N is the transfer the government provides from households to intermediate goods firms in order to correct inefficiencies induced by monopolistic competition—the full characterization is in Section 3.1.3. The budget constraint of households is given by

$$P_t C_t + Q_t^d B_{t+1}^d = W_t N_t + \Psi_t - T_t^\tau - T_t^N + B_t^d$$

where Q_t^d is the price of domestic bonds. Combining the first-order conditions for the private consumption, labor supply and domestic bonds, households' problem is characterized by the

[22]This design eliminates the possibility of the government manipulating the real exchange rate to reduce the local currency debt burden.

[23]Domestic bonds, zero in net supply, are exclusively traded among households to generate the Euler equation of households—these domestic bonds are not issued by the government. As the primary focus of the paper is on the external borrowing of the government, I posit that the government issues bonds to foreign lenders only, regardless of the currency denomination of these bonds. Domestic households are unable to hold sovereign bonds.

[24]In this setting, taxes do not create distortions in the labor market because the amount each household pays to the government—a τ share of aggregate output—is not influenced by their individual decisions.

intratemporal labor-consumption margin and the Euler equation:

$$
\begin{aligned}
-\frac{u_{N,t}}{u_{C,t}} &= w_t \\
u_{C,t} &= \beta i_t \mathbb{E}_t\left[\frac{u_{C,t+1}}{\pi_{t+1}}\right]
\end{aligned}
$$

$u_{x,t}$ denotes marginal utility with respect to variable x in period t; the real wage is $w_t \equiv W_t/P_t$; inflation is $\pi_t \equiv P_t/P_{t-1}$; the nominal domestic interest rate is the yield of domestic bonds $i_t \equiv 1/Q_t^d$.

3.1.2 Final Goods Firms

The representative final goods firm produces with technology

$$
Y_t = \left[\int_0^1 y_{jt}^{\frac{\eta-1}{\eta}}\, dj\right]^{\frac{\eta}{\eta-1}}
$$

where y_{jt} is the use of differentiated intermediate goods of type $j \in [0,1]$, and η captures the degree of substitutability of intermediate goods in the production of final goods. The optimization problem of final goods firms yields the demand function for intermediate goods j:

$$
y_{jt} = \left(\frac{p_{jt}}{P_t}\right)^{-\eta} Y_t \tag{2}
$$

where p_{jt} is the price of intermediate good j at time t. The price of final goods P_t is the price index $P_t = \left(\int_0^1 p_{jt}^{1-\eta} dj\right)^{1/(1-\eta)}$.

3.1.3 Intermediate Goods Firms

Each intermediate goods firm j employs labor as an input, taking productivity z_t as given. The production function of intermediate good j is then characterized by:

$$
y_{jt} = z_t n_{jt} \tag{3}
$$

where n_{jt} is the amount of labor used by the firm j.

Intermediate goods firms set prices subject to a price-setting friction, in the form of a convex quadratic adjustment cost when their price growth does not align with the inflation target $\bar{\pi}$ set by the central bank, as in Rotemberg (1982). A firm j's profit in period t is given by:

$$\widetilde{\Psi}_{jt} = p_{jt}y_{jt} - (1-\tau^N)W_t n_{jt} - \frac{\varphi}{2}\Big(\frac{p_{jt}}{p_{jt-1}} - \bar{\pi}\Big)^2 P_t Y_t \tag{4}$$

Firms receive constant labor subsidies $1-\tau^N = (\eta-1)/\eta$, designed to correct the markup in intermediate goods markets.[25]

Additionally, I assume that the aggregate resources dedicated to price changes—the last term in equation (4)—are passed back to households.[26] The total profit rebated back to households—as owners of both intermediate goods firms and the "agency" collecting the price adjustment costs from firms—can then be represented as follows:

$$\Psi_t = \int_0^1 \widetilde{\Psi}_{jt}dj + \int_0^1 \frac{\varphi}{2}\Big(\frac{p_{jt}}{p_{jt-1}} - \bar{\pi}\Big)^2 P_t Y_t dj$$

Now I characterize the intermediate goods firm's optimization problem. Each period, a firm j, taking the nominal wage W_t and the final goods price P_t as given, chooses n_{jt} and p_{jt} dynamically to maximize expected discounted profits subject to the demand schedule (2), the technology (3) and the profit (4):

$$\max_{n_{jt},p_{jt}} \mathbb{E}_0 \sum_{t=0}^{\infty} M_{0,t}\widetilde{\Psi}_{jt} \text{ where } M_{0,t} \equiv \beta^t \frac{u_{C,t}P_0}{u_{C,0}P_t}$$

Note that the profits are discounted using the stochastic discount factor of households, denoted as $M_{0,t}$, the owners of the firms. The optimality condition for each intermediate goods firm, after imposing symmetry across all firms ($p_{jt} = P_t$) and a labor subsidy $1-\tau^N = (\eta-1)/\eta$, is:

$$\big(\pi_t - \bar{\pi}\big)\pi_t = \frac{\eta-1}{\varphi}\Big(\frac{w_t}{z_t} - 1\Big) + \beta\mathbb{E}_t\Bigg[\frac{u_{C,t+1}}{u_{C,t}}\big(\pi_{t+1} - \bar{\pi}\big)\pi_{t+1}\frac{Y_{t+1}}{Y_t}\Bigg] \tag{5}$$

This equation features a New Keynesian Phillips Curve (NKPC) that links inflation to contemporaneous marginal cost (w_t/z_t), and inflation expectations.

[25] In line with the standard practice in the New Keynesian literature, I introduce a labor subsidy aimed to eliminate average inefficiencies induced by monopolistic competition.

[26] Alternatively, if one posits that inflation incurs a real resource cost (negligible at the first-order but not for higher orders), this would significantly impact the equilibrium allocation due to the pronounced non-linearity of inflation costs. Namely, elevated inflation during default periods would impose a substantial resource-draining quadratic cost, reducing the attractiveness of default. With reasonable parameter values, I find that the resource-draining cost either renders default always suboptimal for the government, or much less attractive, as the country would suffer much larger loss when default takes place. The role of resource-draining inflation in models with high non-linearity is explored in Freund, Lee, and Rendahl (2023).

3.1.4 Government

A benevolent government makes default/repayment (and currency denomination) decisions to maximize the expected utility of households. For illustration purposes, I posit that the maturity of debt is one period, and in the event of sovereign default, the economy stays at financial autarky indefinitely.[27] The government has a discount factor β_G that is different from that of households, β. Preferences of the government over private and public consumption, along with household labor supply, are given by:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta_G^t u(C_t, G_t, N_t)$$

At the beginning of each period, given that the fiscal government has fully met its debt obligations in the past, it can choose whether to default or to repay maturing debt. If the decision is to repay, the government proceeds to issue one-period bonds to foreign lenders and determines the currency composition of these bonds. The government's real budget constraint, given full debt repayment, is

$$G_t + B_{FC,t} + \frac{B_{LC,t}}{\pi_t} = Q_{FC,t} B_{FC,t+1} + Q_{LC,t} B_{LC,t+1} + t_t^\tau + t_t^N - \tau_N w_t N_t$$

where $B_{x,t}$ and $Q_{x,t}$ ($x \in \{FC, LC\}$) denote, respectively, the maturing debt obligations and the bond price denominated in currency x at time t. t_t^τ corresponds to the real tax raised from households, equal to a τ fraction of aggregate output. Labor subsidies $\tau_N w_t N_t$ are imposed to reduce the average markup to zero among intermediate goods firms, and these subsidies are funded through the lump-sum transfer t_t^N. The equilibrium budget constraint therefore becomes:

$$G_t + B_{FC,t} + \frac{B_{LC,t}}{\pi_t} = Q_{FC,t} B_{FC,t+1} + Q_{LC,t} B_{LC,t+1} + \tau z_t N_t \tag{6}$$

The term $z_t N_t$ represents the country's output. The fiscal government collects a τ share of the economy's output as tax, borrows from foreign lenders, and repays the outstanding stock of debt. Note that, the only difference between foreign and local currency debt in this environment is whether debt repayment is subject to debasement risk or not.

If the government either decides to default today, or has a history of defaulting in the past, it loses access to borrowing from foreign lenders and suffers a permanent tax loss $L^D(z_t)$, which is increasing in aggregate productivity z_t. The real budget constraint in equilibrium therefore becomes:

$$G_t = \tau z_t N_t - L^D \tag{7}$$

[27] In Section 4, I relax these assumptions and extend the framework into a richer, quantitative version of the model, introducing long debt maturity and stochastic re-entry to international financial markets after default.

Note that, the government, if it defaults, defaults on the entire outstanding stock of debt, irrespective of the currency denomination.

3.1.5 Foreign Lenders

Foreign lenders are risk-neutral, with deep pockets that rule out corner solutions in each lender's problem. Hence, the bond price satisfies the break-even condition, equating the expected return on sovereign debt to the world risk-free return $1 + r^*$—lenders receive compensation for any expected losses from either default or debasement:

$$Q_{FC,t} = \frac{1}{1+r^*}\mathbb{E}_t[1 - D_{t+1}]$$
$$Q_{LC,t} = \frac{1}{1+r^*}\mathbb{E}_t\left[\frac{1 - D_{t+1}}{\pi_{t+1}}\right]$$

where D_{t+1} denotes the government's decision to default ($D_{t+1} = 1$) or to repay ($D_{t+1} = 0$) in period $t + 1$. The foreign currency bond price $Q_{FC,t}$ captures default risk, whereas the local currency one $Q_{LC,t}$ encompasses both default and debasement risk.

3.1.6 Central Bank

I assume that, upon repayment of sovereign debt, the central adheres to a rule-based inflation-targeting monetary policy characterized by the standard Taylor rule below:[28]

$$i_t = \bar{i}\left(\frac{\pi_t}{\bar{\pi}}\right)^{\alpha_P} \text{ with } \alpha_P > 1 \tag{8}$$

During default, the central bank deviates from (8) and conducts optimal monetary policy, which leads to a surge in equilibrium inflation—reflecting *fiscal-monetary interactions in default crises*. Default periods are marked by a decline in government tax revenues (due to tax losses L^D in (7)) and exclusion from international financial markets. Therefore, optimal monetary policy is to increase inflationary pressure, widening the positive output gap in order to boost government tax revenues (and its spending)—trading off inflation stability with fiscal support.[29]

[28]This indicates that the central bank never engages in strategic debasement of local currency liabilities through discretionary inflation.

[29]Differently from this paper, Galli (2020) provides a rationale for high inflation during default by focusing on the support from the central bank to the government through monetary financing (seigniorage). In Appendix C, I provide empirical evidence of a surge in inflation following default occurrences in emerging economies, encompassing eight default events, including both recent and older occurrences.

3.2 Government Recursive Problem

I focus on recursive Markov equilibria and describe the decision problem of the government over infinite horizons. The model features one exogenous state, aggregate productivity z, which follows a Markov process with support Z and a transition function $f(z,z')$. Three endogenous states are, respectively, the stocks of debt with different currency denomination, $\vec{\mathcal{B}} \equiv [B_{FC}, B_{LC}]'$, and the history of defaulting $\mathbf{D}_{-1}$ that is equal to one if default has already occurred in the past. The state of the government is given by $(z, \vec{\mathcal{B}}, \mathbf{D}_{-1})$.

In the absence of a history of default ($\mathbf{D}_{-1} = 0$), the value to the government $V(z, \vec{\mathcal{B}}, \mathbf{D}_{-1})$, considering the option to default, is

$$V(z, \vec{\mathcal{B}}, 0) = \max_{D \in \{0,1\}} \left\{ (1-D) \times V^R(z, \vec{\mathcal{B}}) + D \times V^D(z) \right\}$$

where $V^R(z, \vec{\mathcal{B}})$ is the value of repaying debt and $V^D(z)$ is the value of defaulting. The value of repaying is

$$V^R(z, \vec{\mathcal{B}}) = \max_{\vec{\mathcal{B}}'} u(C, G, N) + \beta_G \mathbb{E}[V(z', \vec{\mathcal{B}}', 0)] \tag{9}$$

subject to the government's budget constraint (6), the private equilibrium schedules and bond price schedules. I fully characterize the value of defaulting V^D, the private equilibrium and the bond price (schedules) later in Section 3.2.1-3.2.3.

The default policy of a government can be characterized by repayment and default sets. I define the repayment set $\mathcal{R}(\vec{\mathcal{B}})$ as the set of aggregate productivity for which the repayment is optimal for initial debt levels $\vec{\mathcal{B}} = [B_{FC}, B_{LC}]'$:

$$\mathcal{R}(\vec{\mathcal{B}}) = \{z \in Z : V^R(z, \vec{\mathcal{B}}) \geq V^D(z)\}$$

and the complement—the default set $\mathcal{D}(\vec{\mathcal{B}})$—is the set of aggregate productivity for which default is optimal for the outstanding obligation $\vec{\mathcal{B}}$:

$$\mathcal{D}(\vec{\mathcal{B}}) = \{z \in Z : V^R(z, \vec{\mathcal{B}}) < V^D(z)\}$$

Given that the government fulfills its debt obligations, the optimal debt choice is characterized by two policy functions that map today's state into tomorrow's debt levels:

$$\vec{\widetilde{\mathbb{B}}}(z, \vec{\mathcal{B}}) \equiv \begin{pmatrix} \widetilde{\mathbb{B}}_{FC}(z, \vec{\mathcal{B}}) \\ \widetilde{\mathbb{B}}_{LC}(z, \vec{\mathcal{B}}) \end{pmatrix}$$

3.2.1 Default with the Optimal Monetary Policy

During default, the central bank deviates from the rule-based monetary policy (8) and conducts optimal monetary policy. It solves the following optimization problem:

$$V^D(z) = \max_i u(C, G, N) + \beta_G \int_Z V^D(z')dz', \text{ subject to} \tag{10}$$

$$\text{Domestic Euler:} \qquad u_C = \beta i \int_Z \frac{u_{C'}}{\pi'} dz' \tag{11}$$

$$\text{Real Wage:} \qquad w = -\frac{u_N}{u_C} \tag{12}$$

$$\text{Household Budget:} \qquad C = (1-\tau)zN \tag{13}$$

$$\text{NKPC:} \qquad (\pi - \bar{\pi})\pi = \frac{\eta - 1}{\varphi}\left(\frac{w}{z} - 1\right) + \beta \int_Z \frac{u_{C'} z' N'}{u_C z N}(\pi' - \bar{\pi})\pi' dz' \tag{14}$$

$$\text{Government Budget:} \qquad G = \tau z N - L^D \tag{15}$$

The conditions (11)-(13) come from households' optimization problem in Section 3.1.1; equation (14) is from 3.1.3, intermediate goods firms' problem that produces the New Keynesian Philips Curve (NKPC); (15) is the budget constraint of the government upon default. By solving (10), equilibrium allocations when default occurs can be expressed as a function of z, specifically $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$, $w^D(z)$ and $G^D(z)$. Note that, equilibrium variables upon default are now superscribed by the capital D.

When the central bank sets nominal rates, it takes into account the impact on both the private equilibrium and government tax revenue. The following proposition outlines the relationship between equilibrium inflation under the optimal monetary policy and the default-induced tax losses L^D:

Proposition 1. *The optimal monetary policy upon default features higher equilibrium inflation with larger default-induced tax losses* L^D.

With larger tax losses, the marginal benefit of raising government spending increases. This incentivizes the central bank to raise inflationary pressure, which boosts equilibrium output as well as government tax revenue. Without loss of generality, in what follows I posit that tax losses L^D are sufficiently large to result in higher inflation under the optimal monetary policy in default events, relative to an alternative scenario where the central bank strictly follows the Taylor rule, even during default.[30]

[30] This assumption holds in the quantitative version of the model in Section 4. In Appendix F, I compare the inflation differences upon default between the model and the alternative that strictly adheres to the Taylor rule, showing that the former exhibits higher inflation in my quantitative exercise.

3.2.2 Private Equilibrium (Schedules) upon Repayment

I establish the private equilibrium given that the government has fully repaid obligations in the past ($\mathbf{D}_{-1} = 0$) and decides to repay in the current period ($D = 0$):

$$\text{Domestic Euler:} \qquad u_C = \beta i \left[\int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z, z') \frac{u_{C'}}{\pi'} dz' + \int_{\mathcal{D}(\vec{\mathcal{B}}')} f(z, z') \frac{u_{C^{D'}}}{\pi^{D'}} dz' \right] \tag{16}$$

$$\text{Real Wage:} \qquad w = -\frac{u_N}{u_C} \tag{17}$$

$$\text{Household Budget:} \qquad C = (1 - \tau) z N \tag{18}$$

$$\text{NKPC:} \qquad (\pi - \bar{\pi})\pi = \frac{\eta - 1}{\varphi}\left(\frac{w}{z} - 1\right) + \beta \left[\int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z, z') \frac{u_{C'} z' N'}{u_C z N} (\pi' - \bar{\pi})\pi' dz' + \int_{\mathcal{D}(\vec{\mathcal{B}}')} f(z, z') \frac{u_{C^{D'}} z' N^{D'}}{u_C z N} (\pi^{D'} - \bar{\pi})\pi^{D'} dz' \right] \tag{19}$$

$$\text{Interest Rate Rule:} \qquad i = \bar{i} \left(\frac{\pi}{\bar{\pi}}\right)^{\alpha_p} \tag{20}$$

Private equilibrium conditions (16)-(18) are derived from households' optimization problem in Section 3.1.1; equation (19), the New Keynesian Philips Curve (NKPC), is from Section 3.1.3; the inflation-targeting monetary rule (20) is from Section 3.1.6.[31]

Due to the full separability among C, G and N in the utility function (1), changes in government expenditure G alone does not directly affect the private allocation. G does not affect u_C and u_N, and none of private equilibrium variables in (16)-(20) are directly related to G—the private allocation stays invariant with the changes in G.

However, the government can influence private allocations through *the expectation channel*.[32] For instance, an increase in sovereign debt issuance, which elevates default risk, expands the set $\mathcal{D}(\vec{\mathcal{B}}')$. This expansion leads to higher expected inflation, prompting an increase in the right-hand-side of the NKPC equation (19), which calls for an increase in current inflation. The central bank conducts the inflation-targeting monetary policy when repayment takes place—it reacts to higher inflation by raising nominal domestic interest rates, depressing aggregate private consumption and output in equilibrium. As the amount of newly issued debt governs default risk, the private allocation given repayment can be expressed as a *schedule* of $\vec{\mathcal{B}}'$. Namely, $C(z, \vec{\mathcal{B}}')$, $N(z, \vec{\mathcal{B}}')$, $\pi(z, \vec{\mathcal{B}}')$, $i(z, \vec{\mathcal{B}}')$ and $w(z, \vec{\mathcal{B}}')$.

[31] There are 5 unknowns (C, N, π, i, w) and 5 equations, which fully solves the private equilibrium for each possible $\vec{\mathcal{B}}' = [B'_{FC}, B'_{LC}]'$.

[32] It is useful to highlight that income tax rate τ remains constant in my model—the government is unable to adjust tax rate to influence private equilibrium. The only way available for the government to impact private equilibrium is through affecting expectation terms in private equilibrium formulas.

3.2.3 Bond Price Schedules

Now I present bond price schedules for both foreign and local currency debt:

$$Q_{FC}(z, \vec{\mathcal{B}}') = \frac{1}{1+r^*} \int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z, z') dz' \tag{21}$$

$$Q_{LC}(z, \vec{\mathcal{B}}') = \frac{1}{1+r^*} \int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z, z') \frac{1}{\pi'\Big(z', \vec{\vec{\mathbb{B}}}(z', \vec{\mathcal{B}}')\Big)} dz' \tag{22}$$

Both bond prices reflect the default risk. The local currency bond price depends on an additional term—next-period inflation π' for $z' \in \mathcal{R}(\vec{\mathcal{B}}')$—which is determined by the next-period government's debt issuance policy $\vec{\vec{\mathbb{B}}}(z', \vec{\mathcal{B}}')$.[33] It reveals a perverse incentive problem associated to local currency borrowing: as the levels of B'_{LC} increase, local currency bond spreads experience a significant rise attributed to the inability to commit future debt flows—lenders anticipate that the next-period government would increase debt issuance (i.e. $\vec{\mathcal{B}}'' \uparrow$), which raises inflation π' (due to heightened default risk) and reduces the real value of B'_{LC} ex post.

3.2.4 Equilibrium

I consider a Markov Perfect Equilibrium, where the government takes into account that its default and borrowing policies affect the private equilibrium and bond prices.

Definition 1. *Equilibrium. Given the aggregate state* $(z, \vec{\mathcal{B}}, \mathbf{D}_{-1})$, *a recursive equilibrium consists of (i) government policies for debt issuance* $\vec{\vec{\mathbb{B}}}(z, \vec{\mathcal{B}})$, *government value functions* $V(z, \vec{\mathcal{B}}, \mathbf{D}_{-1})$, *the value of defaulting* $V^D(z)$, *repayment sets* $\mathcal{R}(\vec{\mathcal{B}})$ *and default sets* $\mathcal{D}(\vec{\mathcal{B}})$, *(ii) equilibrium allocations upon default* $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$, $w^D(z)$ *and* $G^D(z)$, *(iii) private equilibrium schedules upon repayment* $C(z, \vec{\mathcal{B}}')$, $N(z, \vec{\mathcal{B}}')$, $\pi(z, \vec{\mathcal{B}}')$, $i(z, \vec{\mathcal{B}}')$ *and* $w(z, \vec{\mathcal{B}}')$, *(iv) bond price schedules* $Q_{FC}(z, \vec{\mathcal{B}}')$ *and* $Q_{LC}(z, \vec{\mathcal{B}}')$, *such that following conditions hold*

- *Taking private equilibrium schedules upon repayment* $C(z, \vec{\mathcal{B}}')$, $N(z, \vec{\mathcal{B}}')$, $\pi(z, \vec{\mathcal{B}}')$, $i(z, \vec{\mathcal{B}}')$, $w(z, \vec{\mathcal{B}}')$, *equilibrium allocations upon default* $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$, $w^D(z)$, $G^D(z)$, *bond price schedules* $Q_{FC}(z, \vec{\mathcal{B}})$, $Q_{LC}(z, \vec{\mathcal{B}})$, *the policy functions* $\vec{\vec{\mathbb{B}}}(z, \vec{\mathcal{B}})$ *as given, repayment sets* $\mathcal{R}(\vec{\mathcal{B}})$ *and default sets* $\mathcal{D}(\vec{\mathcal{B}})$ *satisfy the government's optimization problem, and government policies and values are consistent with future policies and values.*

- *Taking equilibrium allocations upon default* $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$, $w^D(z)$, $G^D(z)$ *as given, the central bank solves (10), and equilibrium allocations and the value of defaulting*

[33] π' is contingent on the next-period productivity z' and the default risk two periods ahead (i.e. $\vec{\mathcal{B}}''$).

under the optimal monetary policy are consistent with future equilibrium allocations and values.

- *The private equilibrium upon repayment* $C(z,\vec{\mathcal{B}}')$, $N(z,\vec{\mathcal{B}}')$, $\pi(z,\vec{\mathcal{B}}')$, $i(z,\vec{\mathcal{B}}')$, $w(z,\vec{\mathcal{B}}')$ *satisfy equations (16)-(20). The bond price functions* $Q_{FC}(z,\vec{\mathcal{B}}')$ *and* $Q_{LC}(z,\vec{\mathcal{B}}')$ *satisfy equations (21) and (22).*

3.3 Optimal Currency Denomination

I analyze the optimal currency denomination of sovereign debt by characterizing the tradeoff faced by the government. I solve the problem (9) based on four key assumptions. First, I posit that the distribution function $f(z,z')$ is continuous. Second, I assume the differentiability of private equilibrium schedules $C(z,\vec{\mathcal{B}}')$, $N(z,\vec{\mathcal{B}}')$, $\pi(z,\vec{\mathcal{B}}')$, $i(z,\vec{\mathcal{B}}')$ and $w(z,\vec{\mathcal{B}}')$, bond price schedules $Q_{FC}(z,\vec{\mathcal{B}}')$ and $Q_{LC}(z,\vec{\mathcal{B}}')$, and the value of repaying $V^R(\cdot)$. Third, for illustration purposes, I set the weight of the utility on government spending $\alpha_G \longrightarrow \infty$ in the utility function (1), simplifying it to a function of G only, for repayment states.[34] Fourth, the loss in tax revenue L^D is large enough to lead to inflationary pressure under optimal monetary policy in sovereign default. I start with the following proposition, which establishes the relationship between inflation and default risk:

Proposition 2. *Larger default risk induces higher expected inflation, resulting in higher contemporaneous inflation.*

Proof. See Appendix D. □

Proposition 2 illustrates that the government can pursue debasement through the expectation channel—issuing additional debt increases (expected) inflation due to heightened default risk, which in turn reduces the value of debt in local currency. To elaborate on the associated tradeoffs, I derive the first-order necessary conditions of the sovereign's problem with respect to $\vec{\mathcal{B}}' = [B'_{FC}, B'_{LC}]'$:

$$u_G\left[Q_{FC} + \frac{\partial Q_{FC}}{\partial B'_{FC}}B'_{FC} + \frac{\partial Q_{LC}}{\partial B'_{FC}}B'_{LC} + \frac{B_{LC}}{\pi^2}\frac{\partial \pi}{\partial B'_{FC}} + \tau z\frac{\partial N}{\partial B'_{FC}}\right] = \beta_G \int_{\mathcal{R}'} u_{G'} f(z,z')dz' \tag{23}$$

$$u_G\left[Q_{LC} + \frac{\partial Q_{FC}}{\partial B'_{LC}}B'_{FC} + \frac{\partial Q_{LC}}{\partial B'_{LC}}B'_{LC} + \frac{B_{LC}}{\pi^2}\frac{\partial \pi}{\partial B'_{LC}} + \tau z\frac{\partial N}{\partial B'_{LC}}\right] = \beta_G \int_{\mathcal{R}'} \frac{u_{G'}}{\pi'} f(z,z')dz' \tag{24}$$

[34] I do not set $\alpha_G \longrightarrow \infty$ in default states, because doing so would result in supporting tax revenues always welfare-dominating stabilizing inflation for the central bank—inflation would reach infinity under optimal monetary policy. To ensure a stationary equilibrium upon default, I keep α_G bounded for default states in the analysis.

where $\mathcal{R}'$ represents the repayment set in the subsequent period. The left-hand side of each first-order condition represents the marginal gain from issuing one additional unit of debt concerned, whereas the right-hand side of the first-order condition reflects the marginal cost of the additional issuance. Next, I divide Q_{FC} in (23) and Q_{LC} in (24), yielding the following equations:

$$u_G\Bigg[1+\overbrace{\frac{\partial Q_{FC}}{\partial B'_{FC}}\frac{B'_{FC}}{Q_{FC}}+\frac{\partial Q_{LC}}{\partial B'_{FC}}\frac{B'_{LC}}{Q_{FC}}+\frac{B_{LC}}{Q_{FC}\pi^2}\frac{\partial \pi}{\partial B'_{FC}}}^{\text{① Bond prices}}+\overbrace{\frac{\tau z}{Q_{FC}}\frac{\partial N}{\partial B'_{FC}}}^{\text{② Output}}\Bigg]=\beta_G(1+r^*)\mathbb{E}[u'_G|\mathcal{R}'] \tag{25}$$

$$\begin{aligned}u_G\Bigg[1+\overbrace{\frac{\partial Q_{FC}}{\partial B'_{LC}}\frac{B'_{FC}}{Q_{LC}}+\frac{\partial Q_{LC}}{\partial B'_{LC}}\frac{B'_{LC}}{Q_{LC}}+\frac{B_{LC}}{Q_{LC}\pi^2}\frac{\partial \pi}{\partial B'_{LC}}}^{\text{① Bond prices}}+\overbrace{\frac{\tau z}{Q_{LC}}\frac{\partial N}{\partial B'_{LC}}}^{\text{② Output}}\Bigg]\\ =\beta_G(1+r^*)\mathbb{E}[u_{G'}|\mathcal{R}']\left(1+\frac{\mathrm{Cov}(u_{G'},\frac{1}{\pi'}|\mathcal{R}')}{\mathbb{E}[\frac{1}{\pi'}|\mathcal{R}']\mathbb{E}[u_{G'}|\mathcal{R}']}\right)\end{aligned} \tag{26}$$

where $\mathbb{E}[\cdot|\mathcal{R}']$ and $\mathrm{Cov}[\cdot|\mathcal{R}']$ denote, respectively, the conditional expectations and covariance across the repayment states in the next period.

These two equations clarify how the currency denomination of sovereign bonds is determined by the hedging benefit of local currency debt and the discipline benefit of foreign currency debt. The right-hand-side of (26) captures the hedging benefit of local currency debt. If inflation π' tends to increase in a bad state (i.e., when G' is low)—either when the productivity z (and hence tax revenue) is low, or when the level of debt is large, or both—, then local currency debt is a good hedge as debt obligations fall in bad times, indicated by the covariance term $\mathrm{Cov}(u_{G'}, 1/\pi'|\mathcal{R}') < 0$. Note that foreign currency debt does not have this hedging property as future debt repayment does not depend on inflation (see the right-hand-side of (25)).

Comparing the left-hand-side of (25) and (26) reveals discipline benefits of foreign currency debt. First, I focus on the discipline benefit in terms of bond pricing, which is labeled as ① on the left-hand-side of (25) and (26). The price of both types of debt concerned is contingent on default risk—larger debt issuance shrinks the future repayment set $\mathcal{R}'$, thereby lowering bond prices. Differently from foreign currency debt, however, the price of local currency debt hinges on an additional term—expected inflation, i.e., debasement risk. The government cannot commit to future debt flow, opening the door to opportunistic debasement. If the government today issued a large amount of local currency debt B'_{LC}, the next-period government would deliberately issue additional debt (i.e. $\vec{\mathcal{B}}'' \uparrow$) aimed at increasing in π' ex post. An increase in π' then reduces the value of maturing B'_{LC} next period, yet this comes at a cost—default risk surges and aggregate output declines as the central bank raises nominal interest rates in response to rising inflation.[35] Debt debasement is distortionary from an ex-ante point of view. This is because, in equilibrium, foreign lenders anticipate debasement and offer lower bond prices,[36] which offset the benefits of debasement, resulting in debasement only entailing welfare costs from an ex-ante perspective.[37]

In contrast, foreign currency debt disciplines the opportunistic behaviours of governments. As foreign currency debt cannot be debased, opting for foreign currency borrowing today deters future governments from pursuing debasement ex post. This discipline benefit of foreign currency debt is reflected in bond prices—Q_{LC} is more sensitive to changes in debt issuance than Q_{FC}, especially in scenarios where there is a strong incentive to engage in debt debasement. Such situations arise when there is a large outstanding stock of debt and/or the economy is in a downturn.

Thus far, the main focus has been on the relationship between debt issuance by currency and bond prices. Now I shift the primary focus to how the government's debt policy affects aggregate output (in turn related to tax revenue of the sovereign), indicated by the terms labeled ② on the left-hand-side of (25) and (26). Larger debt issuance heightens future default risk, leading to higher expected inflation and, consequently, contemporaneous inflation. Following the inflation-targeting monetary rule (8), the nominal domestic interest rate rises in response to an increase in inflation, depressing aggregate private consumption demand. This, in turn, reduces labor demand by intermediate goods firms, leading to a decline in equilibrium labor supply and, consequently, a contraction in output.[38]

To rigorously establish that larger debt issuance results in a decline in aggregate output, I start with the following lemma, which characterizes the sufficient condition for a larger increase in inflation relative to other equilibrium variables during sovereign default—a condition that holds in the quantitative version of the model in Section 4:

Lemma 1. *An increase in inflation induced by default is much more pronounced relative to the changes in aggregate output, private consumption, and labor supply when default takes place, if*

[35]The central bank conducts inflation targeting as monetary policy as long as default does not occur. See Section 3.1.6 for details.

[36]This is observed in (22)—the price of debt in local currency depends on future inflation $\pi'(z', \vec{\mathscr{B}}'')$, which is determined by the policy choice of the next-period government $\vec{\widetilde{\mathbb{B}}}(z', \vec{\mathscr{B}}') \equiv [\widetilde{\mathbb{B}}_{FC}(z', \vec{\mathscr{B}}'), \widetilde{\mathbb{B}}_{LC}(z', \vec{\mathscr{B}}')]'$.

[37]Note that, although both terms $\frac{B_{LC}}{Q_{LC}\pi^2}\frac{\partial \pi}{\partial B'_{LC}}$ and $\frac{B_{LC}}{Q_{FC}\pi^2}\frac{\partial \pi}{\partial B'_{FC}}$ indicate the marginal benefit from engaging in debasement, it has already been offset by the (lower) previous-period local currency bond price. Hence, I categorize these terms under the discipline benefit in terms of bond pricing.

[38]Arellano et al. (2023) show that default risk amplifies distortions originating from price stickiness, referred to as the *default amplification* channel. In this paper, the *default amplification* channel manifests through a reduction in aggregate output driven by a rise in default-risk-induced inflation. This channel is analogous to a cost-push shock, where aggregate output declines while inflation increases.

the following condition holds

$$\left(\frac{1-\beta}{(\eta-1)/\varphi}\right)\left(\frac{1}{1+1/\zeta}\right) < 1$$

Proof. See Appendix D. □

The optimal monetary policy upon default generates inflation, which in turn raises equilibrium labor supply and aggregate output. Each one percentage point increase in inflation is associated with an increase in current and future marginal costs by $\frac{1-\beta}{(\eta-1)/\varphi}$ percentage points, as indicated by the New Keynesian Philips Curve (NKPC) in (14). An increase in marginal costs, which corresponds to a rise in real wages, leads to larger equilibrium labor supply by $\frac{1}{1+1/\zeta}$. Hence, one percentage point of increase in inflation would imply an increase in labor supply by $\frac{1-\beta}{(\eta-1)/\varphi}\frac{1}{1+1/\zeta}$. As long as this value is lower than one,[39] the optimal monetary policy generates much more inflation relative to equilibrium labor supply, aggregate output and private consumption.

The subsequent proposition, given that the sufficient condition in Lemma 1 holds, summarizes the impact of a rise in default-risk-induced (expected) inflation on aggregate output.

Proposition 3. *An increase in default-risk-induced (expected) inflation depresses aggregate private consumption demand if the central bank responds strongly enough to a rise in inflation (i.e., α_P in (8) is sufficiently large). In equilibrium, this reduces the equilibrium labor supply and aggregate output.*

Proof. See Appendix D. □

Proposition 3 illustrates that, with a monetary rule that responds strongly to inflation, higher default-risk-induced (expected) inflation leads to lower aggregate output.[40] This implies that, if expected inflation responds more strongly to debt issuance in local currency than that in foreign currency, an additional unit of local currency borrowing results in a more substantial decline in output.

Corollary 1. *When expected inflation rises more significantly with an additional issuance of local currency debt than with foreign currency debt, a marginal increase in B'_{LC} leads to a more significant fall in equilibrium labor supply (and also aggregate output) than that in B'_{FC}.*

[39] This requires patient households (high β), a relatively high elasticity of substitutions among intermediate goods (high η), large price adjustment costs (high φ), and a relatively low Frisch elasticity of labor (low ζ).

[40] In my quantitative analysis, the value of α_P is large enough that default-risk-induced inflation lowers aggregate output. Details on how private equilibrium allocations vary with default risk (debt issuance) are provided in Appendix H.

This occurs when the government has a strong incentive to engage in debt debasement. Specifically, with a large amount of local currency debt issuance today, future governments are more inclined to engage in debasement ex post, raising inflation π'. In such a case, foreign currency debt, by disciplining ex-post debasement, contains a rise in π' and, consequently, π, which mitigates a fall in the current-period output in equilibrium.

I take the ratio of two first-order conditions (26) and (25). The optimal currency denomination of sovereign bonds is then determined by equating the hedging benefits of local currency bonds

$$\text{Hedging Benefit} = \left(1 + \frac{\text{Cov}(u_{G'}, \frac{1}{\pi'}|\mathcal{R}')}{\mathbb{E}[\frac{1}{\pi'}|\mathcal{R}']\mathbb{E}[u_{G'}|\mathcal{R}']}\right)$$

and the discipline benefits of foreign currency bonds:

$$\text{Discipline Benefit} = \frac{1 + \frac{\partial Q_{FC}}{\partial B'_{LC}}\frac{B'_{FC}}{Q_{LC}} + \frac{\partial Q_{LC}}{\partial B'_{LC}}\frac{B'_{LC}}{Q_{LC}} + \frac{B_{LC}}{Q_{LC}\pi^2}\frac{\partial \pi}{\partial B'_{LC}} + \frac{\tau z}{Q_{LC}}\frac{\partial N}{\partial B'_{LC}}}{1 + \frac{\partial Q_{FC}}{\partial B'_{FC}}\frac{B'_{FC}}{Q_{FC}} + \frac{\partial Q_{LC}}{\partial B'_{FC}}\frac{B'_{LC}}{Q_{FC}} + \frac{B_{LC}}{Q_{FC}\pi^2}\frac{\partial \pi}{\partial B'_{FC}} + \frac{\tau z}{Q_{FC}}\frac{\partial N}{\partial B'_{FC}}}$$

To illustrate the tradeoff, on the one hand, foreign currency debt, due to its immunity to inflation, enforces discipline on distortionary debt debasement, thereby reducing borrowing costs and mitigating the decline in aggregate output. On the other hand, local currency debt serves as a good hedge as inflation increases and debt repayment falls in bad times. This tradeoff is closely related to the work by Arellano and Ramanarayanan (2012), in which the government endogenously chooses the maturity structure of sovereign debt. In their seminal work, long-term debt offers a hedge, as its value falls in bad times, whereas short-term debt provides incentives to repay, as it is immune to debt dilution. My model features a similar tradeoff, where foreign currency debt serves as a discipline tool, providing incentives to avoid debt debasement, whereas local currency debt acts akin to long-term debt, whose real value (maturing obligation) falls in bad times.

3.4 Discussion

In the analysis so far, the currency denomination of sovereign debt is jointly determined by default risk and the interaction between fiscal and monetary policy in default events. I show that, to avoid the distortions originating from debt debasement, the fiscal government tilts its borrowing towards foreign currency, at the cost of forgoing hedging benefits offered by local currency debt. In equilibrium, the currency composition of sovereign debt reflects a time-varying balance between discipline benefits of foreign currency debt and hedging benefits of local currency debt. In this subsection, I delve into the relationship of my analysis to other relevant work on the currency denomination of sovereign debt and monetary policy in emerging economies.

The role of discretionary inflation in shaping the currency denomination of sovereign debt has been investigated in Du et al. (2020). These authors show that when monetary policy operates under full discretion, the central bank resorts to discretionary inflation ex post in order to debase local currency debt—henceforth, I refer to this form of debasement as "monetary debasement", since it is the monetary authority that debases local currency obligations. As foreign lenders anticipate the ex-post optimal inflation choices by the central bank, the cost of local currency borrowing rises. This makes monetary debasement distortionary from an ex-ante perspective, since a rise in borrowing costs offsets the ex-post benefits of debasement—inflation only entails the direct welfare costs. Hence, to avoid distortions from monetary debasement, the government resorts to foreign currency debt.

Ottonello and Perez (2019) explore how discretionary inflation and the real exchange rate affect the currency composition of sovereign debt. Similar to the findings in Du et al. (2020), the government increases the proportion of its borrowing in foreign currency to avoid monetary debasement ex post. Additionally, they highlight an additional channel that drives foreign currency borrowing—a lack of commitment to the real exchange rate.[41] The government's inability to commit to future real exchange rates (in turn related to future consumption flows that affect the relative price between tradable and non-tradable goods) gives rise to opportunistic real exchange rate manipulation aimed at local currency debt devaluation.

Ottonello and Perez (2019) show that, analogous to my model, foreign currency debt carries a discipline benefit, which deters the government from engaging in distortionary devaluation ex post, whereas local currency debt offers a hedge. However, a key distinction arises in the source of this discipline benefit. Unlike my work, where the discipline benefit originates from *sovereign default risk* contingent on fiscal-monetary interactions during default, Ottonello and Perez (2019) attribute it to *discretionary inflation* and *discretionary real exchange rates*. Moreover, there are differences in the policy choices for the government to strategically devalue local currency debt between these two models. Specifically, Ottonello and Perez (2019) suggest that, for a government to devalue local currency debt via real exchange rate manipulation, it should consume *less* tradable goods (i.e. deleverage) to lower the relative price of non-tradable goods, inducing real exchange rate depreciation. In contrast, in my model, the government should consume *more* (to increase debt issuance) to elevate default risk and thus (expected) inflation for devaluation.

Engel and Park (2022) use an optimal contract model to study the dynamics of currency

[41] In Du et al. (2020), the real exchange rate follows an exogenous process that eliminates the possibility of the real exchange rate manipulation for devaluation.

denomination. They find that the temptation for monetary debasement places endogenous constraints on local currency borrowing—if the government borrowed more than this constraint, monetary debasement would take place. In countries with low monetary credibility, these constraints are too tight to satisfy their financing needs, prompting governments to borrow mostly in foreign currency to avoid engaging in monetary debasement. In essence, Engel and Park (2022) delve into the interaction between *monetary credibility* and the currency denomination of sovereign debt. In contrast, this paper focuses on how *fiscal insolvency*, contingent on fiscal-monetary interactions in sovereign default, affects debt denomination, given that the central bank is fully restrained from monetary debasement.

Lastly, my work is closely related to the seminal work by Arellano et al. (2023), who first introduced sovereign default into a New Keynesian framework.[42] Arellano et al. (2023) examine the interaction between monetary policy and sovereign risk, showing that high (expected) inflation associated with high default risk prompts the central bank to raise nominal interest rates. This amplifies the distortion originating from pricing frictions, a channel termed *default amplification* in Arellano et al. (2023).[43] When the government issues only foreign currency debt, default amplification reduces government's incentives to borrow, which in turn lowers the equilibrium levels of sovereign debt relative to a scenario without pricing frictions. The government internalizes the economic costs of default amplification and mitigates these distortions by curbing its borrowing (hence default risk).

Differently from Arellano et al. (2023), I study the optimal debt denomination by currency, allowing the government to issue both foreign and local currency debt. My model, in contrast to Arellano et al. (2023), features higher equilibrium levels of sovereign debt relative to a scenario without pricing frictions. This is because, the state-contingency (the hedging benefits) offered by local currency debt—lower debt repayments in bad states—increases the sustainable levels of sovereign debt. While default amplification highlighted in Arellano et al. (2023) is present and exerts downward pressure on equilibrium debt levels in my model, the state-contingency (hedging) benefits of local currency debt more than offset this effect—the government sustains higher equilibrium levels of debt through the optimal currency denomination. By contrast, the government is not allowed to actively manage debt denomination by currency in Arellano et al. (2023), making default amplification as the primary factor that drives the government's borrowing decisions. In equilibrium, this leads to lower levels of sovereign debt.

[42] Arellano et al. (2023) investigate the optimal monetary rule, suggesting that the central bank should target not only inflation, but also default risk.

[43] In my model, default amplification á la Arellano et al. (2023) leads to a reduction in both output and private consumption. See footnote 38 for details.

4 Quantitative Analysis

I solve the model numerically to assess its quantitative performance on the dynamic patterns of debt compositions by currency and default risk in emerging economies. The baseline is calibrated to Colombia, chosen as a relevant reference due to its business cycle characteristics, which are comparable to those of other emerging economies. Additionally, the Colombian government relies heavily on external borrowing, accounting for more than 40% of total sovereign borrowing over the sample periods—one of the highest among my sample of 15 inflation-targeting emerging economies.[44] First, I solve the baseline and compare its performance against the data. Second, to understand the macroeconomic implication of the model, I conduct two experiments: one constraining monetary responses in default crises and the other constraining fiscal choices of debt denomination by currency.

4.1 Calibration

The model period is a quarter. I choose parameter values by drawing from existing studies and conducting a moment-matching exercise, to align the baseline with key characteristics of Colombian data. The mean and standard deviation moments of data in Table 5 are estimated using Colombian data from 2009Q4 to 2021Q4. Correlations of data are estimated using data from all countries in my dataset from 2009Q1 to 2021Q4, owing to the lack of extensive time series data available for each individual country.[45]

Assuming the relative risk aversion equal to one, the utility function is given by:

$$u(C, G, N) = \log(C) + \alpha_G \log(G) - \frac{N^{1+\frac{1}{\zeta}}}{1+\frac{1}{\zeta}}$$

Aggregate productivity follows an AR(1) process, characterized by:

$$\log z_t = \rho_z \log z_{t-1} + \sigma_z \epsilon_t, \text{ where } \epsilon_t \sim N(0,1).$$

Default involves tax losses as well as exclusion from international financial markets. Following Chatterjee and Eyigungor (2012), tax losses upon default $L^D(z)$ are characterized by:

$$L^D(z) = d_0 z + d_1 z^2$$

[44] Also, Colombia has been used as a reference in other studies examining the currency composition of sovereign bonds. See, for instance, Lee (2022).

[45] For instance, one outlier in each individual country could significantly alter the correlation due to short time horizons of data. To mitigate this limitation, I look at the average correlation across all sample countries.

Table 4: Parameter Values

Parameters	Description	Values	Notes
Parameters selected directly			
γ	Relative risk aversion	1.0	Conventional value
ζ	Frisch elasticity	0.33	Gali and Monacelli (2005)
η	Intermediate goods elasticity	5.0	25% markup
φ	Price adjustment costs	30	Price adjustment twice a year
$\bar{\pi}$	Inflation target	1.0075	Annual inflation target 3%
$\bar{i}$	Interest rate rule intercept	$\bar{\pi}/\beta$	The steady state condition
α_P	Interest rate rule coefficient	1.6	Klau and Mohanty (2004)
ρ_z	Persistence of aggregate productivity shock	0.83	International real business cycle studies
σ_z	Std of aggregate productivity shock	0.012	International real business cycle studies
τ	Tax rate	0.30	Tax revenues over GDP
λ	Inverse of debt maturity	0.05	5-year debt duration in Colombia
κ	Coupon payment	0.02	8% annual coupon rate
ι	Market re-entry probability	0.0625	4-year exclusion, Benjamin and Wright (2009)
r^*	International risk-free rate	0.5%	Quarterly 5-year US Treasury yield
$\sigma_{\mathbf{v}}$	Taste shock variance	0.008	Set for numerical convergence
$\rho_{\mathbf{v}}$	Taste shock correlation	0.25	Dvorkin, Sánchez, Sapriza, and Yurdagul (2021)
$\sigma_{\mathbf{i}}$	Taste shock for nominal rates choice	0.0018	Set for numerical convergence
Parameters from moment matching			
β	Private discount factor	0.9994	Average nominal domestic interest rate
β_G	Government discount factor	0.9628	Average external debt to GDP ratio
α_G	Weight G in the utility function	0.6	Average G to GDP ratio
d_0	Default tax losses	-0.1076	Average 5-year FC debt spread
d_1	Default tax losses	0.1656	Average inflation

In the quantitative exercise, I account for the possibility of reentering financial markets after default—exclusion ends with a constant probability ι. Upon reentry, the government transitions from a bad credit standing (a state under financial autarky) to a state of good credit standing with zero debt.

I integrate long-term bonds to match the average maturity of Colombian government debt. Following Chatterjee and Eyigungor (2012), I introduce bonds that mature probabilistically. In each period, a bond pays a coupon κ and carries a probability λ of maturing. The flow of debt payments is therefore $(\kappa + \lambda)$, where λ represents the inverse of maturity. This feature makes the maturing debt "memoryless", eliminating the need to track the entire distribution of maturities over time.

The first set of parameters, directly assigned and outlined in Table 4, includes the relative risk aversion γ, Frisch elasticity ζ, intermediate goods elasticity η, the Rotemberg price adjustment cost φ, inflation target $\bar{\pi}$, interest rate rule intercept $\bar{i}$, interest rate rule coefficient α_P, persistence of aggregate productivity shock ρ_z, volatility of productivity shock σ_z, tax rate τ, inverse of debt maturity λ, quarterly coupon rate κ, reentry probability ι, international risk-free rate r^*, and taste shock parameters $\sigma_{\mathbf{v}}$, $\rho_{\mathbf{v}}$ and $\sigma_{\mathbf{i}}$.

Specifically, the Frisch elasticity is set to 0.33 following Gali and Monacelli (2005); intermediate goods elasticity η is set equal to 5, corresponding to 25% markup in accordance with estimates in Edmond, Midrigan, and Xu (2023) and Díez, Fan, and Villegas-Sánchez (2021); the Rotemberg adjustment cost φ is determined using the first-order equivalence between Calvo and Rotemberg pricing frictions—a Calvo frequency of price changes of roughly twice per year would imply the value for φ at 30; the inflation target $\bar{\pi}$ aligns with the Colombian central bank's 3% annual inflation target; the interest rate rule intercept $\bar{i}$ is set to the steady-state condition $\bar{\pi}/\beta$; the value of α_P is well within the range of estimates in Klau and Mohanty (2004). Given the limited time span of the data, determining the precise persistence of the productivity process is challenging. Therefore, the persistence parameter ρ_z is set to a reference value of 0.83, and the volatility of productivity innovations σ_z is set at 0.012, that are comparable to values employed in many international real business cycle studies.

The tax rate τ is calibrated to 0.3 to align with the tax revenue of GDP ratio in Colombia. To achieve a debt maturity of 20 quarters (5 years) and an annual coupon rate of 8%, I set $\lambda = 0.05$ and $\kappa = 0.02$. The quarterly reentry probability in default state is established at $\iota = 6.25\%$, corresponding to an expected exclusion period of about 4 years, in accordance with Benjamin and Wright (2009). The risk-free interest rate r^* is set at 0.5%, roughly equivalent to the real quarterly return on 5-year US treasury yield. I introduce taste shocks $\mathbf{v}$ that influence the government's default decisions and debt issuance choices. These shocks are integrated into the computational technique following Dvorkin et al. (2021) and Gordon (2019), which generate subtle perturbations to the portfolio and default-repayment choices, enhancing convergence. Additionally, taste shocks $\mathbf{i}$ are introduced to perturb the central bank's choice of nominal domestic interest rates in sovereign default, further contributing to convergence. I choose low enough values of $\sigma_{\mathbf{v}}$ and $\sigma_{\mathbf{i}}$ that guarantee convergence, and $\rho_{\mathbf{v}}$ is well within the range of values adopted in Dvorkin et al. (2021). The full specification of long-term debt model with taste shocks is provided in Appendix I, including the algorithm for the computation and simulation. In Appendix E, I carry out a sensitivity analysis with respect to taste shocks $\mathbf{v}$ and $\mathbf{i}$ and show that variations in $\mathbf{v}$ and $\mathbf{i}$ have negligible effects on the primary moments in the baseline.

The second set of parameters, outlined at the bottom of Table 4, is chosen to match specific moments observed in the Colombian economy. These five parameters comprise the discount factor of private households β and of the government β_G, the weight on the utility of government spending α_G, the parameters of the default cost function d_0 and d_1. The moments targeted for calibration encompass the average values of nominal domestic interest rates, external debt to GDP ratio, public spending to GDP ratio, 5-year foreign currency (FC) bond spread, and

Table 5: Cyclicality, Data, and Models

Targeted Moment (annualized)	Data	Baseline	NK-Ortho	NK-LC
Mean				
Nominal domestic interest rate (%)	4.26	4.26	3.26	5.10
External debt to GDP ratio (%)	18.4	18.6	26.0	17.8
G to GDP ratio (%)	29.8	29.3	29.2	29.3
5-year FC debt spread (%)	1.39	1.43	0.61	-
Inflation (%)	3.61	3.59	3.00	3.98
Untargeted Moment (annualized)				
Mean				
FC debt share in external borrowing (%)	78.75	76.80	41.86	-
Spread of 5-year LC debt (%)	4.66	5.01	3.61	6.38
Standard deviation				
Spread of FC debt σ_{FC} (%)	0.42	0.43	0.11	-
Spread of LC debt σ_{LC} (%)	0.91	0.73	0.45	3.48
σ_{FC}/σ_{LC}	0.46	0.59	0.24	-
Inflation (%)	1.81	2.07	1.67	3.58
Correlation with 5-year FC debt spreads (CDS spreads)				
FC debt share	0.141	0.137	-0.658	-
Inflation expectations	0.621	0.804	0.073	-
Relative cost of borrowing (LC over FC)	0.476	0.332	0.108	-

Notes: The correlation between FC debt share and 5-year FC debt spreads is computed assuming the government behaves as if the value of the taste shock is zero. To examine how discipline and hedging benefits shape the currency denomination, I focus on the correlation between FC debt share and the spreads abstracted from the taste shocks.

inflation.[46]

The results of the moment-matching exercise are illustrated in Table 5, with values of moments all annualized. The second column of the table reports values of moments in the baseline. Evidently, the matching exercise is highly successful. The targeted moments in the baseline closely match the data. Untargeted moments also match the data very well. The average share of FC borrowing accounts for 76.80% in the baseline, close to the mean FC debt share 78.75% in the data. Both mean and standard deviation of local currency (LC) debt spread closely approximate the corresponding data values. The baseline also produces inflation volatility that is close to empirical observations.

The performance of the correlation with FC debt spreads (CDS spreads) is notably strong in

[46]The values of d_0 and d_1 chosen for the targeted moments generate large enough of tax losses, leading to higher inflation upon default in the baseline relative to inflation under strict inflation targeting. In Appendix F, I compare the inflation differences upon default—year-over-year inflation in the baseline is around 30% higher than in the alternative with strict inflation targeting.

the baseline. The baseline overestimates the correlation between CDS spreads and (ii) expected inflation in comparison to data, as default risk is the main driver of inflation.[47] The correlations between CDS spreads and (i) FC debt share, as well as (iii) relative cost of borrowing in LC over FC in the baseline are close to the data.

4.2 Spreads, Output, and Policy Functions

In this subsection, I illustrate the key factors that drive the currency denomination of sovereign bonds in the baseline. First, I highlight the dynamics of bond spreads, expected inflation and default risk varying debt issuance. Then, I examine how aggregate output responds to different debt denominations. Lastly, I explore the optimal currency denomination of sovereign bonds and its association with CDS spreads. All policy functions, aggregate output, and spreads are evaluated at the mean of aggregate productivity.

Figure 2 plots the spread of external borrowing, expected inflation as well as the probability of defaulting, while keeping $B'_{LC} = 0$ and varying B'_{FC}. The left panel of the figure displays, respectively, the spread of FC debt (a green solid line, left Y-axis) and LC debt (a orange dashed line, right Y-axis). Notably, neither type of debt is at the risk-free level (zero spread), a well-known feature of long-term debt due to the fact that, the price of long-term debt incorporates an additional premium embedded in the price tomorrow, which is contingent on the choice of debt tomorrow. Both spreads increase with higher levels of debt issuance. To facilitate a visual comparison of how both spreads increase with larger issuances of B'_{FC}, I adjust left and right Y-axes such that when $B'_{FC} = 0$, FC and LC debt spreads are located at the same point on the panel. Then, the distance between the orange dashed and green solid lines indicates the extent to which the spread of LC debt increases relative to FC debt spreads as levels of B'_{FC} rise. Clearly, the spread of LC borrowing exhibits a more substantial increase than that of FC borrowing, for elevated levels of FC debt issuance. A high stock of debt implies fewer resources available for government public spending, thereby marginally increasing the attractiveness of local currency debt debasement, if any. This inclination towards debasement is reflected in the spread of local currency—an increase in LC debt spread hence is more pronounced than that in FC for larger levels of B'_{FC}, as shown in the panel.

The right panel of Figure 2 depicts expected inflation (a red solid line, left Y-axis) and the probability of defaulting next period (a dashed black line, right Y-axis) varying B'_{FC}. FC debt deters the next-period government from engaging in debt debasement. Hence, if the borrowing is exclusively conducted in foreign currency, the probability of defaulting next period, rather than expectations of debt debasement, becomes the primary driver of expected inflation. This

[47] In practice, inflation expectations are also affected by global shocks and monetary shocks, which may lower the correlation between expected inflation and CDS spreads. These factors are not considered in the baseline.

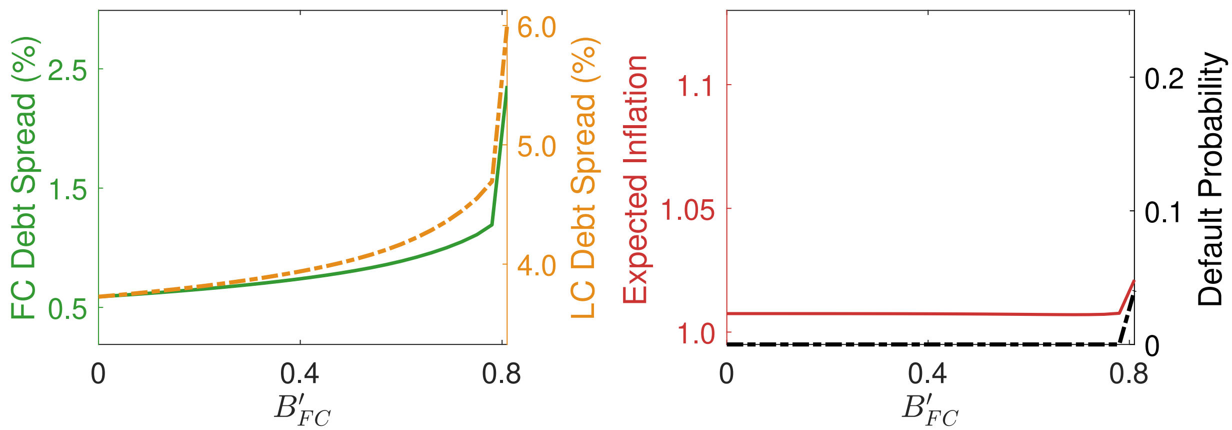

Figure 2: Bond spreads, default probability, and expected inflation varying B'_{FC}, given $B'_{LC} = 0$

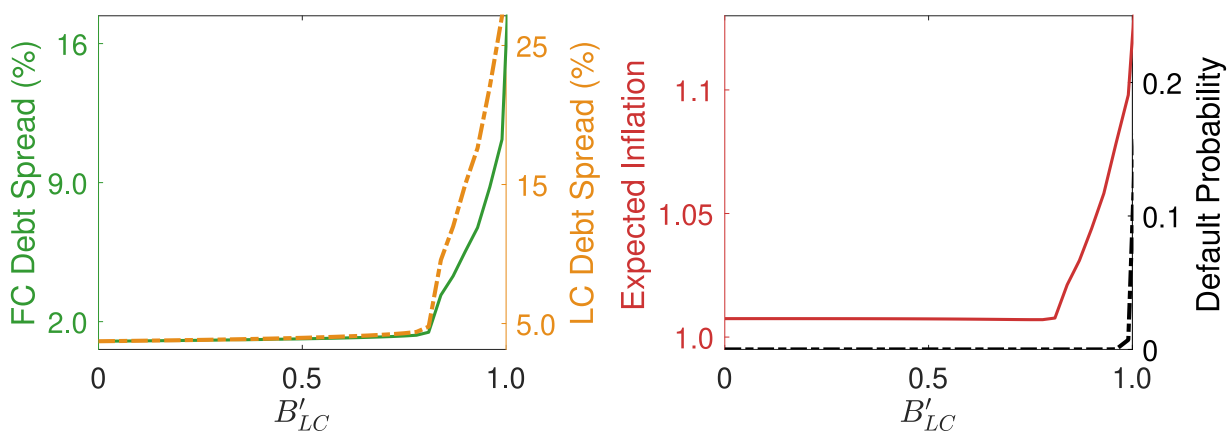

Figure 3: Bond spreads, default probability, and expected inflation varying B'_{LC}, given $B'_{FC} = 0$

leads to a co-movement between expected inflation and default probability on the right panel of Figure 2—for B'_{FC} larger than 0.78, both the next-period default risk and expected inflation start to surge, and below 0.78, expected inflation remains mostly constant as the probability of defaulting is either zero or close to zero.

Differently from debt denominated in foreign currency, local currency borrowing provides hedging benefits as debt repayment depends on inflation—with larger outstanding debt stock, local currency borrowing is attractive as inflation is positively associated with the amount of liabilities. Now I shift the focus to the impact on spreads varying LC debt issuance. Figure 3 is analogous to Figure 2, except that it takes $B'_{FC} = 0$ as given and varies B'_{LC}. The left panel of Figure 3 displays that, similar to the left panel of Figure 2, the spread of LC debt exhibits a more substantial increase relative to that of FC debt with larger debt issuance—the gap between the orange dashed and green solid lines, an indicator of the degree of the relative borrowing cost in LC over FC, enlarges with larger B'_{LC}. However, in this case, expectations of debt debasement get more pronounced and emerge as the primary driver of the increase in spreads of both FC and LC debt, making a sharp contrast with foreign currency borrowing in Figure 2 where debasement is fully contained.

The right panel of Figure 3 displays an increase in expectations of debt debasement when debt issuance is exclusively conducted in local currency. Differently from the right panel of Figure 2, there seems a disconnect between the probability of defaulting next period and expected inflation. With a larger issuance of B'_{LC}, it becomes more appealing for the next-period government to issue additional debt (i.e. $\vec{\mathcal{B}}'' \uparrow$) aimed at generating inflation for debasement. In other words, a rise in B'_{LC} leads to an increase in default risk two periods ahead (not shown in the figure), ultimately leading to a rise in inflation π' in the expectation term. This occurs even when the probability of defaulting next period remains close to or equal to zero, as illustrated in the right panel of Figure 3. Expected inflation in this scenario is then largely driven by expectations of debt debasement, rather than by the probability of defaulting next period.

The left panel of Figure 3 depicts the effect of expectations of debt debasement on bond prices—both FC and LC debt spreads increase sharply along with an increase in expected inflation (starting from $B'_{LC} = 0.8$). The rise in spreads is largely driven by the anticipated increase in inflation next period and default risk two periods ahead—the former diminishes only the value of LC debt, whereas the latter reduces the value of both FC and LC debt.[48]

Comparing bond spreads in Figure 2 and 3 highlights the discipline benefits of foreign currency borrowing in terms of bond pricing. The left panel of Figure 2 shows that, as debt debasement, which is distortionary from an ex-ante perspective, is fully contained with foreign currency borrowing, the spreads of FC and LC debt remain relatively low as long as the next-period default probability is moderate—this is the case where B'_{FC} lies below 0.78, in which spreads of FC and LC stay, respectively, below 1.5% and 5.0%. By contrast, the left panel of Figure 3 displays much higher spreads of FC and LC debt, even when the next-period default probability is close to zero. For instance, spreads of FC and LC debt, respectively, exceed 10% and 25% as B'_{LC} increases to 0.99 in the left panel of Figure 3. This is because foreign lenders anticipate that the next-period government would engage in debt debasement, which is associated with an increase in inflation next period and default risk two periods ahead. Foreign currency debt, therefore, offers a discipline benefit in terms of reducing the cost of borrowing by containing distortionary debasement.

Debt issuance, as discussed in Section 3.3, not only affects bond prices, but also has implications for aggregate output. In Appendix H, I present the impact of debt issuance on aggregate output considering distinct currency denominations. I find that substantial issuance of debt,

[48]The maturity of debt is long in the quantitative analysis. Hence, anticipations of an increase in default risk two periods ahead reduce the value of both foreign and local currency bonds today.

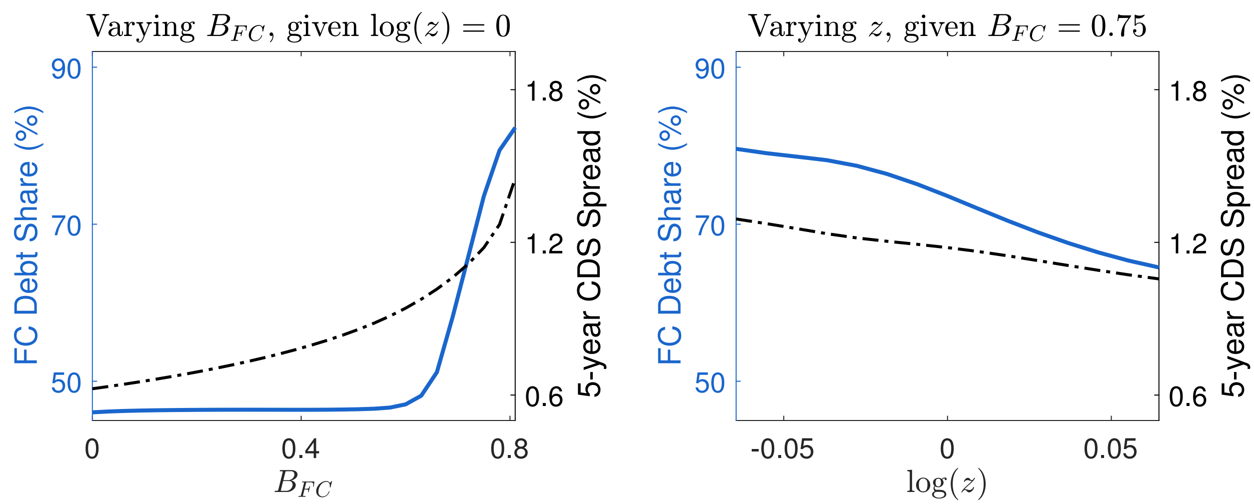

Figure 4: The share of FC borrowing and FC debt spreads

Notes: As FC and LC debt choices become a distribution with the presence of the taste shock, I plot the mean value of FC debt share and 5-year CDS spreads for each value of B_{FC} in the left panel, and for each value of $\log(z)$ in the right panel.

regardless of its currency denomination, results in a decline in aggregate output due to a rise in expected inflation. However, local currency borrowing tends to elevate expected inflation to a greater extent due to anticipations of debt debasement, which leads to a more substantial decline in aggregate output, as outlined in Corollary 1.[49] This makes borrowing in foreign currency even more appealing, as foreign currency debt mitigates the degree of output fall by containing debt debasement.

Now, I delve into the optimal currency denomination of sovereign debt. In Figure 4, I assume the outstanding stock of LC debt equal to zero ($B_{LC} = 0$), and study how outstanding liabilities and economic conditions—varying B_{FC} and aggregate productivity z—affect the equilibrium share of FC debt (the blue solid lines, left Y-axis) and 5-year CDS spreads (the black dashed lines, right Y-axis).[50] In the left panel, I set the aggregate productivity at its mean value and vary B_{FC}; in the right panel, I vary aggregate productivity z given $B_{FC} = 0.75$, a debt level that corresponds to the mean value of external debt in the baseline simulation. Both panels illustrate that the baseline captures the positive co-movement between 5-year CDS spreads and FC debt share observed in the data. In bad times—when the government faces large outstanding stock of debt (large B_{FC} in the left panel) and/or economic downturns (low $\log(z)$ in the right panel)—, 5-year CDS spreads rise due to heightened future default risk. At the same time, the government tilts debt issuance towards foreign currency, despite forfeiting the hedge benefits offered by local

[49]For instance, when comparing the issuance of debt in foreign and local currency that leads to the same levels of probability of defaulting next period, local currency borrowing triggers a more significant rise in expected inflation, consequently resulting in a more pronounced fall in aggregate output.

[50]In Appendix G, I complement the analysis by presenting the government's FC and LC debt choices, varying outstanding FC liabilities B_{FC} and aggregate productivity z.

currency debt—it values disciplining properties of foreign currency debt much more, as future governments are more likely to engage in distortionary debasement.

4.3 Strictly Following the Taylor Rule

In this subsection, I run my first experiment constraining monetary responses in default events, where the central bank strictly adheres to the Taylor rule, even during default. I apply the identical parameterization as in the baseline, to compare its performance with both the data and the baseline.

Under strict adherence to the Taylor rule, a surge in inflation no longer occurs upon default—default becomes *orthogonal* to inflation.[51] I refer to this specification as the *NK-Ortho* model. In the NK-Ortho model, the government can no longer manipulate inflation through the expected inflation channel—debasement is ruled out. The third column of Table 5 reports the corresponding simulation results.

First, bond spreads in the NK-Ortho specification are lower than those in the baseline. Notably, the spread of LC debt falls more than that of FC debt, as equilibrium bond spreads incorporate the complete elimination of debasement—an equilibrium outcome that particularly reduces the spread of LC debt. Also, default becomes much more costly since, in the NK-Ortho model, the central bank does not increase inflation to support the government. The combination of these two—lower borrowing costs and the reduced attractiveness of default—improves debt sustainability. The external debt-to-GDP ratio on the second row increases from 18.6% (baseline) to 26.0% (NK-Ortho). Moreover, the average inflation and its standard deviation are markedly lower than the baseline, as inflation in the NK-Ortho model depends only on aggregate productivity rather than default risk thanks to strict adherence to the Taylor rule.

Remarkably, the average proportion of FC debt is significantly lower under the NK-Ortho specification relative to the baseline. The disparity in the mean values of the share of FC borrowing amounts to $76.80 - 41.86 \approx 35$ percentage points! This drastic change is attributed to the fact that the government no longer needs to borrow in foreign currency for disciplining purposes. Approximately 35 percentage points of the average FC borrowing share in the baseline is directly attributed to the discipline benefits of FC debt.

Now, I turn to the model's correlation properties. First, the NK-Ortho model features a negative correlation between the share of FC borrowing and CDS spreads, which makes a sharp contrast with the baseline, where a positive correlation exists. In the baseline, the positive

[51] The private equilibrium allocations, absent optimal deviations from the inflation target, are characterized by equations (16)-(20) regardless of default. The lower government spending resulting from default would not have any impact on the private equilibrium allocations due to the full separability among C, G and N—none of private equilibrium allocations are directly associated with changes in government expenditure G.

correlation emerges because foreign currency debt provides discipline benefits—tilting debt issuance towards foreign currency helps to avoid distortionary debasement. Discipline benefits are highly valuable in bad times when CDS spreads are high, leading to co-movements between FC debt share and CDS spreads. By contrast, under the NK-Ortho specification, the government loses the ability to engage in debt debasement, and therefore foreign currency debt no longer offers discipline benefits. The government, as a result, seeks larger amounts of borrowing in local currency, especially in bad times (i.e., high CDS spreads) due to its hedging properties.

Second, the other two correlations—between CDS spreads and, expected inflation and the relative cost of borrowing, are much lower in the NK-Ortho model compared to the data. For instance, the correlation between expected inflation and CDS spreads is close to zero, which does not align with high correlation observed in the data (0.621). These results highlight that without fiscal-monetary interactions in default events, default risk alone cannot explain the three stylized facts documented in my empirical studies.

4.4 Gains from the Optimal Debt Denomination

The paper has shown that, contingent on fiscal-monetary interactions during sovereign default, debt in foreign currency functions as a mechanism to discipline distortionary debasement. Here, I quantify the gains from the optimal currency denomination, by conducting the last experiment that constrains the government's debt issuance exclusively to local currency. The last column of Table 5 reports the relevant moments under this specification, referred to as the *NK-LC* model.

The first observation is that the average inflation is higher in the NK-LC specification compared to the baseline. This is attributed to the government's consistent pursuit of debt debasement. This opportunistic behaviour is ex ante reflected in LC bond price—the average spread of LC debt is the highest among all specifications in Table 5. High borrowing costs in turn lower the sustainable levels of debt (18.6% in the baseline vs. 17.8% in the NK-LC)—among all model specifications, the average debt-to-GDP ratio is the lowest in the NK-LC. Inflation volatility is also at its peak, as governments actively generate inflation for debasement. I find that, if the government is constrained from issuing foreign currency debt, the default frequency rises from 1.37% in the baseline to 2.15% in the NK-LC model. The last experiment shows that the gains from including foreign currency debt for its discipline benefits are huge, highlighting the importance of optimal debt management by currency in emerging economies.

5 Conclusion

This paper examines three stylized facts regarding the currency denomination of sovereign bonds and CDS spreads in inflation-targeting emerging economies. First, when CDS spreads rise, the government tilts its borrowing towards foreign currency. Second, an increase in expected inflation is positively associated with a rise in CDS spreads. Lastly, rising CDS spreads are associated with an increase in the relative cost of borrowing in local currency over foreign currency.

I develop a small open economy New Keynesian model with sovereign default, where the government optimally chooses debt denomination by currency. Using the model, I highlight the joint role of default risk and fiscal-monetary interactions in default crises in shaping the currency denomination of sovereign debt. The central bank optimally deviates from inflation targeting in default events, trading off inflation stability with fiscal support.

In this context, my analysis reveals that foreign currency debt enforces discipline on distortionary debasement, whereas local currency debt offers hedging benefits due to its state-contingency associated with inflation movements. In equilibrium, the government optimally balances the discipline benefits of foreign currency debt with the hedging benefits of local currency debt. Calibration results indicate that these trade-offs effectively capture three stylized facts identified in my empirical studies. Two experiments in the paper highlight that, first, without fiscal-monetary interactions in default crises, default risk alone cannot explain three stylized facts identified in my empirical studies, and second, there are substantial gains in terms of higher macroeconomic resilience from optimally managing the currency denomination of sovereign debt.

Finally, this paper introduces a framework that integrates sovereign risk and pricing frictions in emerging economies. It offers a structured approach to study the trade-offs that a government with the limited commitment faces under the fiscal-monetary interactions. This framework can be further extended to explore the optimal monetary rule, and the welfare implications of monetary cooperation, as studied in Corsetti and Pesenti (2001), but in the context of default risk. I leave these for future research.

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A Expected Inflation and Inflation Targeting Year

Table A1 shows the inflation targeting year for the countries in my sample. Malaysia was viewed as an inflation targeter, but it did not adopt inflation targeting officially. Figure A1, A2 and A3, respectively, plot the share of foreign currency borrowing in total external borrowing, expected inflation, and relative costs of borrowing in LC over FC, both along with CDS spreads over the periods after inflation targeting was adopted as the monetary regime in each country of my sample.

Table A1: Inflation Targeting Year

Country	Inflation targeting year
Brazil	1999
Chile	1999
Colombia	1999
Hungary	2001
India	2015
Indonesia	2005
Peru	2002
Poland	2002
Philippines	2002
Russia	2015
South Africa	2000
Thailand	2000
Turkey	2006

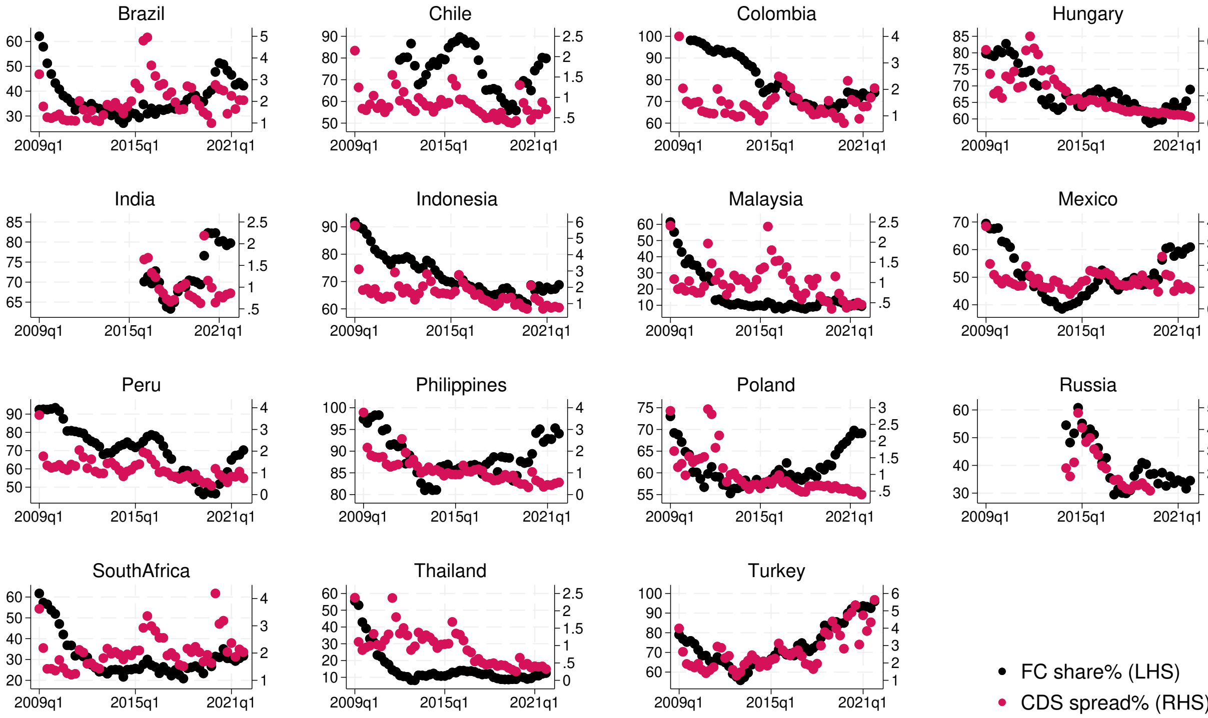

Figure A1: The Share of Foreign Currency Borrowing and CDS Spreads

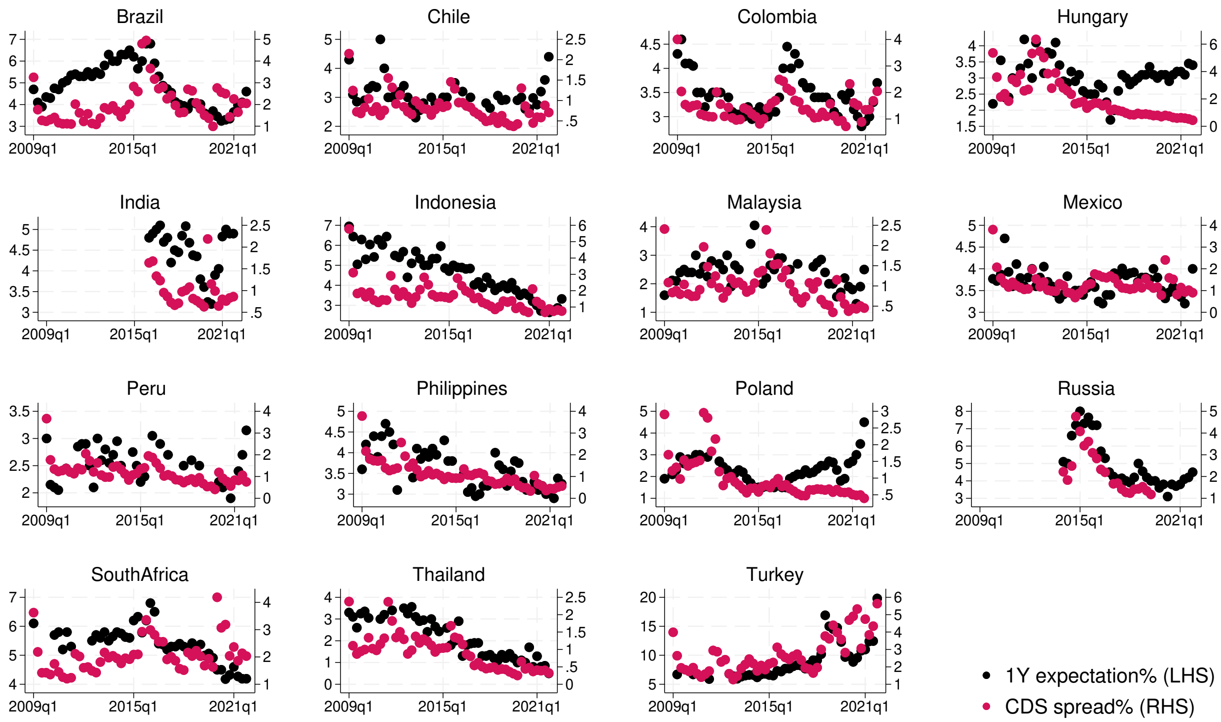

Figure A2: Expected Inflation and CDS Spreads

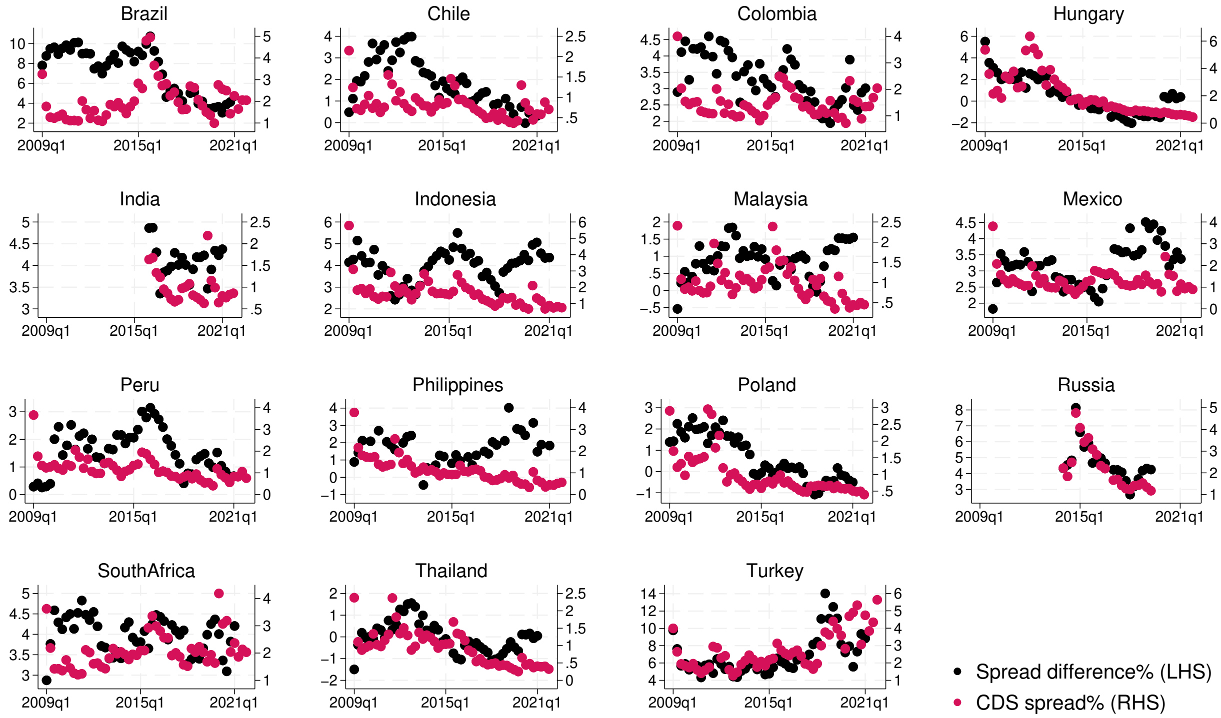

Figure A3: Relative Costs of Borrowing in LC over FC and CDS Spreads

B Additional Tables

Table B1: Changes in the Stock of Debt and CDS Spreads (First-Difference Regression)

	The Growth of FC Debt Stock over LC Debt Stock $\Delta F_{it}\% - \Delta D_{it}\%$	
	(1)	(2)
$\Delta CDS_{\$,it}$ (%)	5.551***	5.292***
	(0.961)	(0.880)
ΔInflation (%)		0.391
		(0.319)
ΔReal Exchange Rate Depreciation (%)		0.00983
		(0.0383)
ΔReal GDP Growth Rates (%)		0.0704
		(0.0912)
External Sovereign Debt to GDP (%)		0.0564
		(0.0458)
Capital Openness		-0.589
		(0.562)
Private Credit to GDP (%)		0.0534
		(0.0337)
Observations	700	700
R-squared	0.424	0.434

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. The dependent variable is the difference between the growth rate of FC debt stock and that of LC debt stock.

Table B2: Excluding Covid-19 Pandemic Periods

	FC debt share $FCshare$ (%)		Adjusted FC debt share $FCshare^{ADJ}$ (%)	
	(1)	(2)	(3)	(4)
$CDS_{\$,it}$ (%)	1.818***	3.806***	-0.0644	3.054***
	(0.621)	(0.737)	(0.509)	(0.667)
Inflation (%)		0.174		-0.167
		(0.181)		(0.160)
Real Exchange Rate Depreciation (%)		-0.000494		0.0588
		(0.0398)		(0.0377)
Real GDP Growth Rates (%)		0.0156		-0.132
		(0.182)		(0.146)
External Sovereign Debt to GDP (%)		-0.610***		-0.681***
		(0.0848)		(0.0844)
Capital Openness		-0.687		2.713***
		(0.763)		(0.659)
Private Credit to GDP (%)		-0.0714		-0.0184
		(0.0567)		(0.0495)
Observations	594	594	594	594
R-squared	0.940	0.949	0.948	0.957

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. In column (1) and (2), the dependent variable is the share of FC debt in total public external debt; in column (3) and (4), the dependent variable is the share of nominal exchange rate adjusted FC debt in total public external debt.

Table B3: FC Debt Share and CDS Spreads, Controlling Global Factors

	FC Debt Share $FCshare$ (%)		
	(1)	(2)	(3)
$CDS_{\$,it}$ (%)	4.538***	5.840***	4.013***
	(0.484)	(0.556)	(0.576)
Inflation (%)		0.304**	0.579***
		(0.154)	(0.153)
Real Exchange Rate Depreciation (%)		0.113**	0.113***
		(0.0447)	(0.0387)
Real GDP Growth Rates (%)		-0.151*	0.194*
		(0.0795)	(0.103)
External Sovereign Debt to GDP (%)		-0.647***	-0.509***
		(0.0864)	(0.0794)
Capital Openness		0.968	-0.0199
		(0.773)	(0.730)
Private Credit to GDP (%)		-0.284***	-0.202***
		(0.0517)	(0.0480)
US GDP Growth Rates (%)			-0.650***
			(0.215)
log VIX			6.088***
			(1.067)
US 5-year treasury (%)			1.267**
			(0.491)
Observations	706	706	706
R-squared	0.880	0.911	0.918
Macro control	No	Yes	Yes
Global control	No	No	Yes

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country fixed effects. The dependent variable is the share of FC debt in total public external debt.

Table B4: Inflation Expectations and CDS Spreads, Excluding the Covid-19 Pandemic

	Expected Inflation $\mathbb{E}_t[\pi_{i,t+4}]$ (%)	
	(1)	(2)
$CDS_{\$,it}$ (%)	0.914***	0.523***
	(0.156)	(0.0981)
Inflation (%)		0.272***
		(0.0344)
Real Exchange Rate Depreciation (%)		-0.00270
		(0.00589)
Real GDP Growth Rates (%)		-0.00627
		(0.0185)
External Sovereign Debt to GDP (%)		-0.0281***
		(0.00839)
Capital Openness		-0.00133
		(0.101)
Private Credit to GDP (%)		-0.0187***
		(0.00700)
Observations	533	533
R-squared	0.817	0.887

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. The dependent variable is expected inflation.

Table B5: Inflation Expectations and CDS Spreads, Controlling Global Factors

	Expected Inflation $\mathbb{E}_t[\pi_{i,t+4}]$ (%)		
	(1)	(2)	(3)
$CDS_{\$,it}$ (%)	0.630***	0.274***	0.333***
	(0.103)	(0.0555)	(0.0556)
Inflation (%)		0.310***	0.308***
		(0.0350)	(0.0337)
Real Exchange Rate Depreciation (%)		0.00113	9.95e-05
		(0.00487)	(0.00485)
Real GDP Growth Rates (%)		0.00684	0.00559
		(0.00717)	(0.0106)
External Sovereign Debt to GDP (%)		-0.0237***	-0.0267***
		(0.00733)	(0.00717)
Capital Openness		-0.142	-0.117
		(0.0884)	(0.0867)
Private Credit to GDP (%)		-0.00763	-0.00619
		(0.00504)	(0.00498)
US GDP Growth Rates (%)			-0.0198
			(0.0188)
log VIX			-0.357***
			(0.0886)
US 5-year treasury (%)			0.125**
			(0.0495)
Observations	643	643	643
R-squared	0.771	0.873	0.879
Macro control	No	Yes	Yes
Global control	No	No	Yes

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country fixed effects. The dependent variable is expected inflation.

Table B6: Changes in Inflation Expectations and CDS Spreads (First-Difference Regression)

	The Difference of Expected Inflation $\Delta\mathbb{E}_t[\pi_{i,t+4}]$ (%)	
	(1)	(2)
$\Delta CDS_{\$,it}$ (%)	0.316*	0.267**
	(0.169)	(0.126)
ΔInflation (%)		0.162**
		(0.0677)
ΔReal Exchange Rate Depreciation (%)		0.0135**
		(0.00582)
ΔReal GDP Growth Rates (%)		-0.00169
		(0.0103)
External Sovereign Debt to GDP (%)		-0.000855
		(0.00475)
Capital Openness		-0.00666
		(0.0910)
Private Credit to GDP (%)		0.00393
		(0.00459)
Observations	580	580
R-squared	0.192	0.282

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. The dependent variable is the difference of expected inflation.

Table B7: Relative Cost of Borrowing in LC over FC, Excluding the Covid-19 Pandemic

	LC Yield over FC Yield $y_{it}^{LC} - y_{it}^{FC}$ (%)	
	(1)	(2)
$\mathbb{E}_t[\pi_{i,t+4}]$ (%)	0.932***	0.305**
	(0.130)	(0.119)
Inflation (%)		0.229***
		(0.0382)
Real Exchange Rate Depreciation (%)		0.00527
		(0.00753)
Real GDP Growth Rates (%)		-0.0319
		(0.0366)
External Sovereign Debt to GDP (%)		0.00808
		(0.0116)
Capital Openness		0.149
		(0.154)
Private Credit to GDP (%)		0.0368***
		(0.00983)
Observations	592	592
R-squared	0.844	0.876

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country and quarterly date fixed effects. The dependent variable is the relative cost of borrowing in LC over FC.

Table B8: Relative Cost of Borrowing in LC over FC and Inflation Expectations, Controlling Global Factors

	LC Yield Over FC Yield $y_{it}^{LC} - y_{it}^{FC}$ (%)		
	(1)	(2)	(3)
$CDS_{\$,it}$ (%)	0.520***	0.242***	0.246**
	(0.0837)	(0.0911)	(0.0968)
Inflation (%)		0.254***	0.251***
		(0.0343)	(0.0343)
Real Exchange Rate Depreciation (%)		0.0194***	0.0200***
		(0.00667)	(0.00674)
Real GDP Growth Rates (%)		0.00722	-0.00708
		(0.0121)	(0.0202)
External Sovereign Debt to GDP (%)		0.0170*	0.0163
		(0.0102)	(0.0111)
Capital Openness		0.206	0.225
		(0.144)	(0.145)
Private Credit to GDP (%)		0.00851	0.00648
		(0.00651)	(0.00724)
US GDP Growth Rates (%)			0.0492
			(0.0400)
log VIX			0.136
			(0.147)
US 5-year treasury (%)			-0.0262
			(0.0767)
Observations	660	660	660
R-squared	0.796	0.834	0.835
Macro control	No	Yes	Yes
Global control	No	No	Yes

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are reported in parentheses. All specifications include country fixed effects. The dependent variable is the relative cost of borrowing in LC over FC.

C Default Events and Inflation

Figure C1 depicts the associations between default occurrence dates and inflation, encompassing recent default events after 2020 (Lebanon, Sri Lanka, Ghana) as well as older default events before 2020 (Ecuador, Ukraine, Russia, Uruguay, Paraguay). The figure highlights a surge in inflation when default occurs.

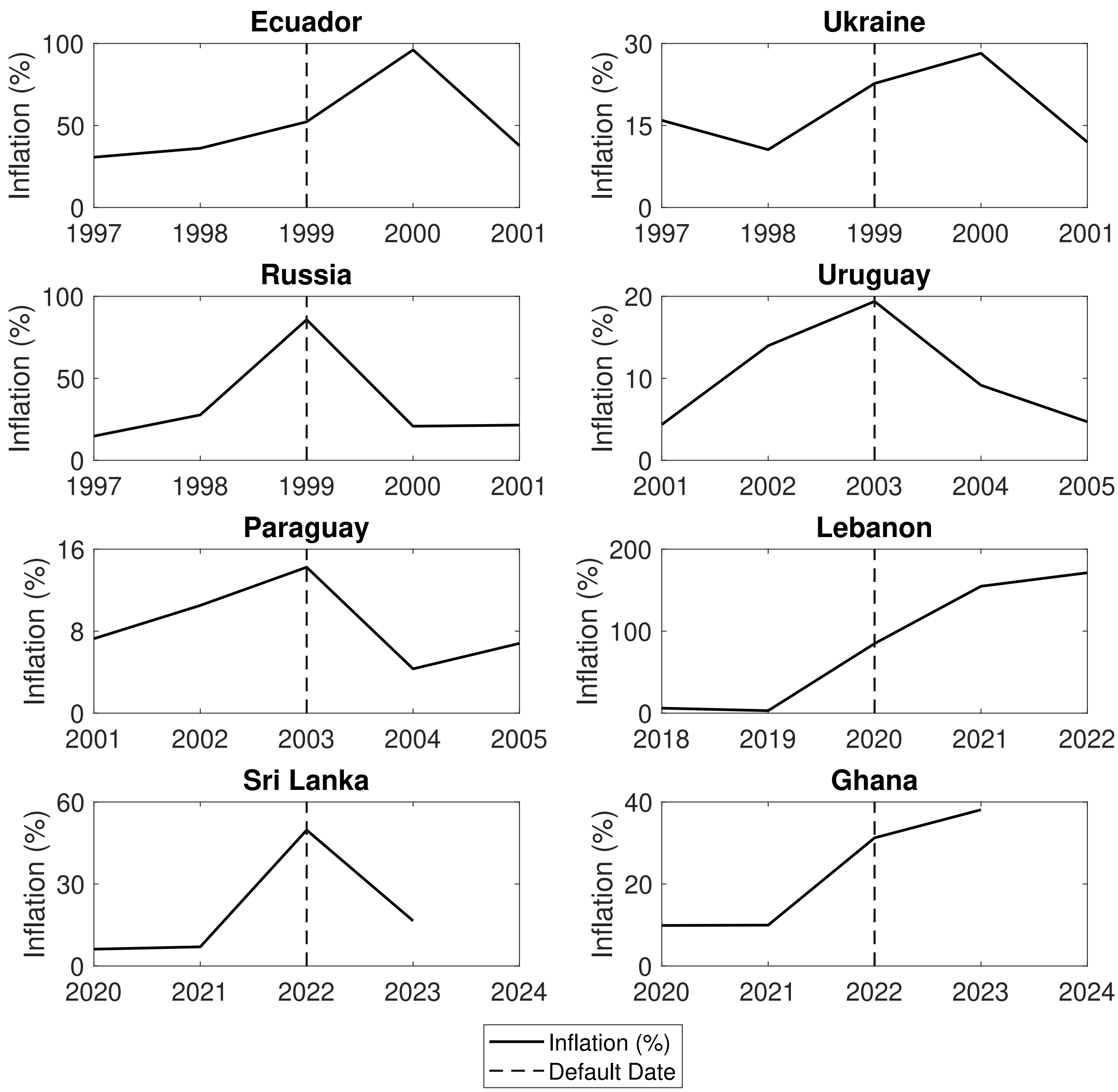

Figure C1: 8 sovereign default events and inflation

D Default, Inflation, and Output

In this section, I establish the sufficient condition for a larger increase in inflation relative to other private equilibrium variables when default occurs. I then outline a mechanism showing how default risk increases contemporaneous inflation and depresses output. Without loss of generality, I assume that the productivity remains at $\bar{z}$ throughout the periods, as depicted in Figure D1. I posit that, in period 1, default occurs with probability p^D, and if default happens, the economy remains in a state of default permanently from period 1 onward. Else, the economy stays at states with full repayment forever. While this example does not incorporate productivity uncertainty, it highlights how the change in the probability of defaulting p^D affects the equilibrium output and labor supply at time 0. The government in my model indeed "picks" p^D by choosing how much debt to issue.

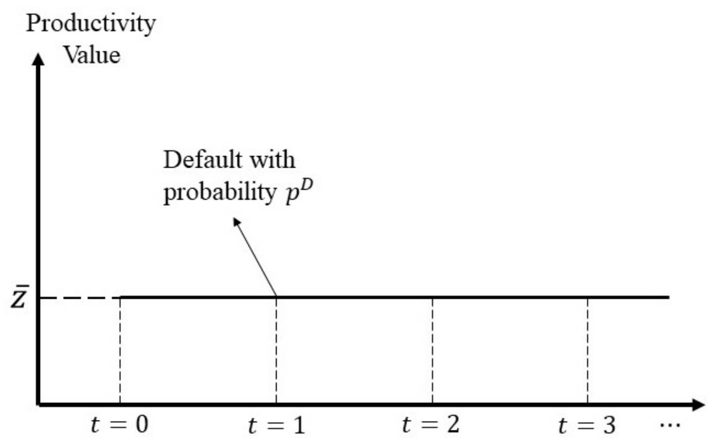

Figure D1: Aggregate productivity paths

I use $\bar{x}$ to denote the value of equilbrium variable x from period 2 when repayment takes place in period 1. I log-linearize relevant variables—$\hat{x}_0$ represents the log-linearized variable x around $\bar{x}$ in period 0; $\hat{x}_t^D$ denotes a percentage deviation from $\bar{x}$ when default occurs in period 1, for $t \geq 1$. From period 1, if default occurs, the economy remains in a state of default indefinitely, implying $\hat{x}_1^D = \hat{x}_2^D = \cdots$ for all equilibrium variables x. Without loss of generality, I assume that tax losses L^D upon default are large enough to make generating high inflation upon default optimal for the central bank (i.e., $\hat{\pi}_t^D > 0$ for $t \geq 1$), consistent with Proposition 1. The log-linearization results in default states in Appendix D.1 give the following formula

$$\left(\frac{1-\beta}{(\eta-1)/\varphi}\right)\left(\frac{1}{1+1/\zeta}\right)\hat{\pi}_1^D = \hat{N}_1^D = \hat{C}_1^D$$

Hence, the sufficient condition to have a response of inflation larger than other private equilibrium variables upon default is

$$\left(\frac{1-\beta}{(\eta-1)/\varphi}\right)\left(\frac{1}{1+1/\zeta}\right) < 1 \tag{D1}$$

Now, suppose that the sufficient condition (D1) holds. Following the period-0 log-linearization results in Appendix D.1, I can show that

$$\hat{\pi}_0 = p^D\left[\frac{\beta+\chi}{1+\alpha_P\chi}\hat{\pi}_1^D + \frac{\chi}{1+\alpha_P\chi}\hat{C}_1^D\right] \tag{D2}$$

$$\hat{C}_0 = -\frac{p^D}{1+\alpha_P\chi}\left[(\alpha_P\beta-1)\hat{\pi}_1^D - \hat{C}_1^D\right] \tag{D3}$$

$$\hat{N}_0 = \hat{C}_0$$

$$\text{with } \chi \equiv \frac{\eta-1}{\varphi}\left(1+\frac{1}{\zeta}\right)$$

Equation (D2) illustrates that more default risk (i.e., higher value of p^D) leads to a more substantial increase in period-0 inflation, thus completing the proof for Proposition 2.

Now I prove Proposition 3. Given that the condition (D1) holds, $\hat{\pi}_1^D > \hat{C}_1^D$. With a sufficiently large value of α_P, this would imply $(\alpha_P\beta-1)\hat{\pi}_1^D - \hat{C}_1^D > 0$. Equation (D3) then indicates that default-risk-induced inflation results in lower consumption in period 0, and the reduced demand for aggregate consumption leads to a lower equilibrium labor supply, ultimately causing a decline in aggregate output. Note that higher default risk (increased p^D) further diminishes equilibrium labor supply and output, as $\partial\hat{C}_0/\partial p^D < 0$ and $\partial\hat{N}_0/\partial p^D < 0$.

D.1 Log-linearization

I present the log-linearization results for Figure D1 in period t, for $t \geq 1$ in states of default:

$$\begin{aligned}
\hat{\pi}_t &= \hat{i}_t \\
\hat{w}_t &= \hat{C}_t + \frac{1}{\zeta}\hat{N}_t \\
\hat{C}_t &= \hat{N}_t \\
(1-\beta)\hat{\pi}_t &= \frac{\eta-1}{\varphi}\hat{w}_t \\
\hat{G}_t &= \hat{N}_t - \frac{L^D}{\bar{G}}
\end{aligned}$$

The period-0 log-linearization results for Figure D1 are characterized by the following equations:

$$
\begin{aligned}
-\hat{C}_0 &= \hat{i}_0 - p^D \hat{C}_1^D - p^D \hat{\pi}_1^D \\
\hat{w}_0 &= \hat{C}_0 + \frac{1}{\zeta} \hat{N}_0 \\
\hat{C}_0 &= \hat{N}_0 \\
\hat{\pi}_0 &= \frac{\eta - 1}{\varphi} \hat{w}_0 + \beta p^D \hat{\pi}_1^D \\
\hat{i}_0 &= \alpha_P \hat{\pi}_0
\end{aligned}
$$

E Sensitivity to the Taste Shock

The introduction of taste shocks plays a crucial role in achieving convergence in long-term debt models. It is well-documented in Chatterjee and Eyigungor (2012) that without such shocks, these models do not converge. However, it is important to note, as pointed out by Dvorkin et al. (2021), that these shocks are likely to impact the moments of the model. In Table E1, we observe that changes in $\rho_{\mathbf{v}}$, $\sigma_{\mathbf{v}}$ and $\sigma_{\mathbf{i}}$ barely alter the moments of the model.

Table E1: Moments varying $\rho_{\mathbf{v}}$, $\sigma_{\mathbf{v}}$ and $\sigma_{\mathbf{i}}$

Targeted Moment (annualized)	Baseline	$\rho_{\mathbf{v}} \times 0.9$	$\rho_{\mathbf{v}} \times 1.08$	$\sigma_{\mathbf{v}} \times 0.92$	$\sigma_{\mathbf{v}} \times 1.08$	$\sigma_{\mathbf{i}} \times 0.93$	$\sigma_{\mathbf{i}} \times 1.08$
Mean							
Nominal domestic interest rate (%)	4.26	4.19	4.23	4.21	4.29	4.24	4.24
External debt to GDP ratio (%)	18.6	18.6	18.8	18.6	18.7	18.7	18.6
G to GDP ratio (%)	29.3	29.3	29.3	29.3	29.3	29.3	29.3
5-year FC debt spread (%)	1.43	1.33	1.39	1.37	1.47	1.42	1.40
Inflation (%)	3.59	3.55	3.57	3.56	3.60	3.58	3.58
Untargeted Moment (annualized)							
Mean							
FC debt share in external borrowing (%)	76.80	78.33	75.99	76.09	75.90	76.60	77.12
Spread of 5-year LC debt (%)	5.01	4.88	4.95	4.93	5.07	4.99	4.97
Standard deviation							
Spread of FC debt σ_{FC} (%)	0.43	0.40	0.44	0.40	0.46	0.42	0.44
Spread of LC debt σ_{LC} (%)	0.73	0.67	0.77	0.69	0.77	0.74	0.73
σ_{FC}/σ_{LC}	0.59	0.60	0.57	0.58	0.60	0.57	0.60
Inflation (%)	2.07	2.00	2.10	2.02	2.10	2.08	2.05
Correlation with expected inflation							
FC debt share	0.137	0.112	0.200	0.139	0.160	0.177	0.101
5-year FC debt spread (CDS spread)	0.804	0.773	0.861	0.800	0.847	0.845	0.809
Relative cost of borrowing (LC over FC)	0.332	0.267	0.393	0.297	0.361	0.372	0.302

Notes: The correlation between FC debt share and expected inflation is computed assuming the government behaves as if the value of the taste shock is zero. To specifically examine how discipline and hedging benefits shape currency denomination, I focus on the correlation between FC debt share and inflation expectations abstracted from the taste shocks.

F Inflation in Default Events

In this section, I show that, default in the baseline leads to a substantial increase in inflation relative to the alternative strictly following the Taylor rule. Figure F1 visualizes this comparison, where π^D and π^{strict} represent, respectively, year-over-year inflation in the model and under strict adherence to the Taylor rule. The left panel of Figure F1 plots π^D (solid line) and π^{strict} (dashed line), while the right panel plots the difference, $\pi^D - \pi^{strict}$, both varying z.

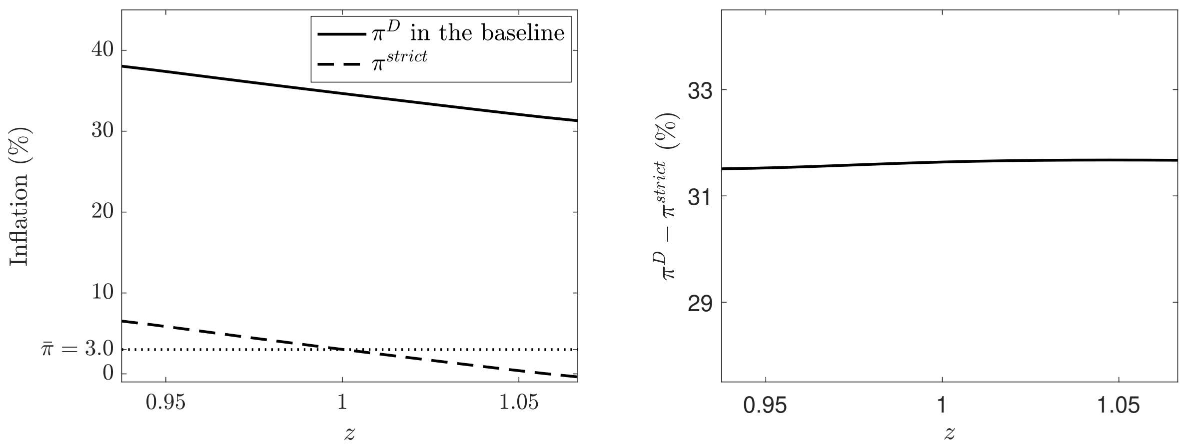

Figure F1: Inflation upon default in the baseline, relative to the alternative

G Debt Choices

In this section, I examine the government's debt choices, varying levels of outstanding debt and aggregate productivity. Figure G1 plots FC and LC debt choices by the government, varying outstanding FC liabilities (the left panel) and aggregate productivity (the right panel), assuming maturing LC debt equal to zero ($B_{LC} = 0$). Consistent with Figure 4, in the left panel, aggregate productivity is set at its mean value; in the right panel, the outstanding FC debt B_{FC} is set at 0.75, the mean value of external debt in the baseline. The green solid and orange dashed lines in the figure represent, respectively, the sovereign's FC and LC debt choices.

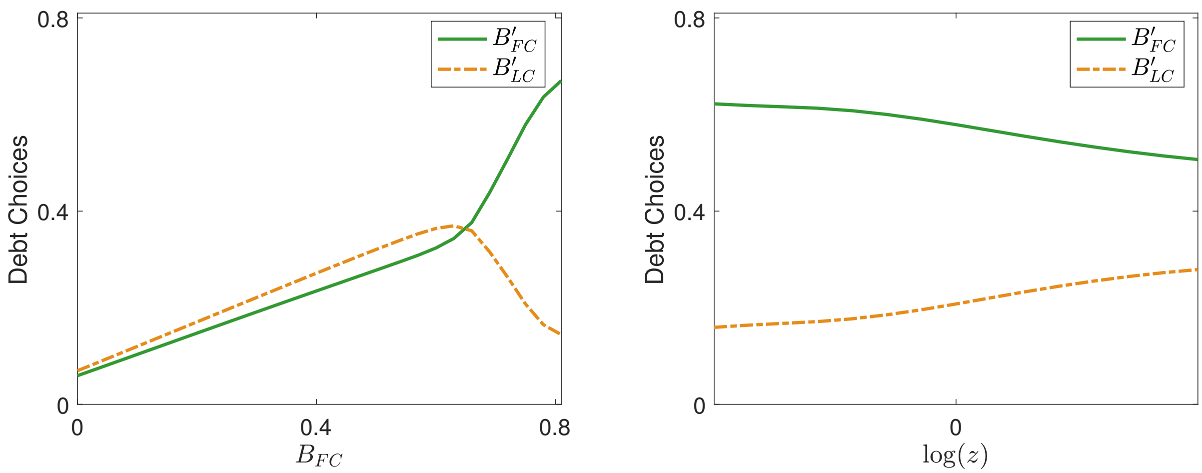

Figure G1: Choice of debt issuance

Notes: As FC and LC debt choices become a distribution with the presence of the taste shock, I plot the mean value of FC and LC debt choices, varying B_{FC} (the left panel) and z (the right panel).

The left panel reveals that when the government is facing a larger outstanding stock of debt, overall debt issuance rises, with a clear shift towards foreign currency borrowing. The right panel shows that when aggregate productivity is low, the government tilts its borrowing towards foreign currency.

H Changes in Output with Debt Issuance

In this section, I show how private equilibrium allocations vary with debt issuance. Figure H1 plots equilibrium labor supply, inflation, and expected inflation along with default probabilty, varying B'_{FC} (left three panels, with $B'_{LC} = 0$) and B'_{LC} (right three panels, with $B'_{FC} = 0$). The bottom two panels are identical to the right panel of Figure 2 and 3, and the top two panels and middle two panels depict, respectively, equilibrium labor supply and inflation.

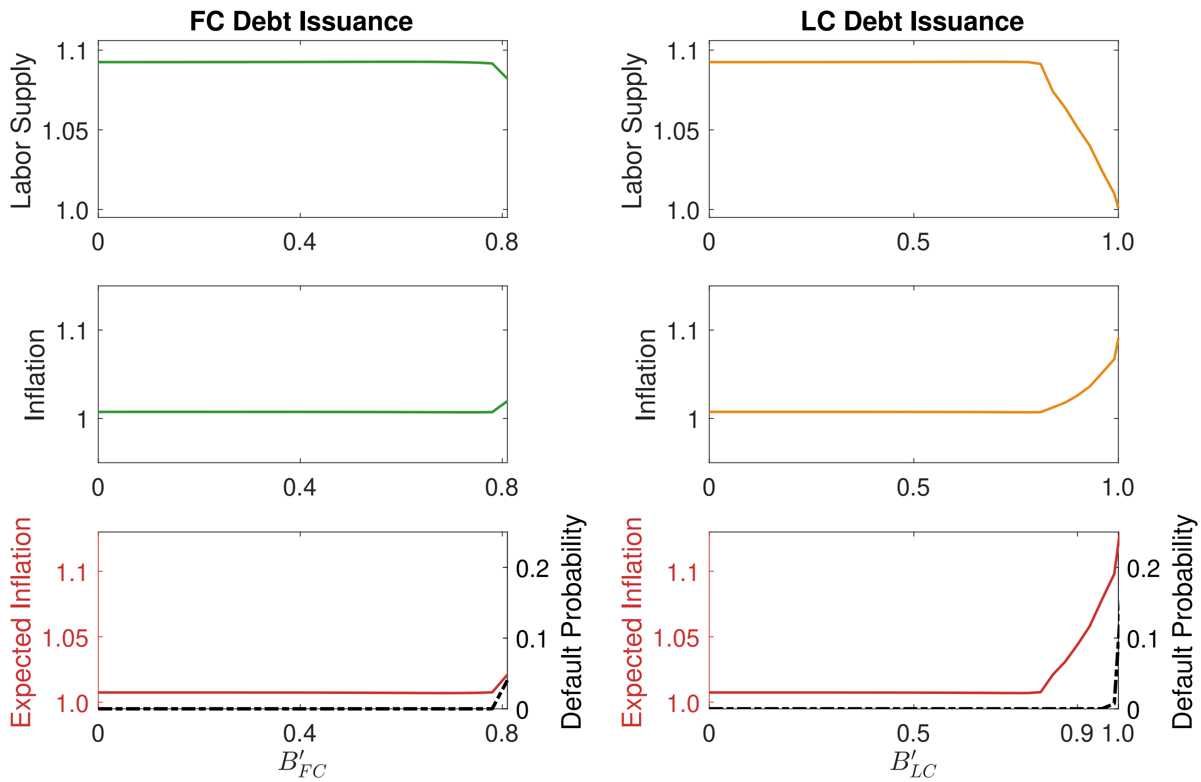

Figure H1: Changes in labor supply and inflation varying B'_{FC} (green) or B'_{LC} (orange)

For the same level of default risk, local currency borrowing tends to raise expected inflation much more than foreign currency borrowing, causing a sharp increase in contemporaneous inflation and a drastic fall in aggregate labor supply. For instance, when $B'_{LC} = 0.9$, the probability of defaulting is zero, but expected inflation is high due the anticipated debt debasement. Consequently, current inflation rises, while labor supply experiences a substantial decline. By contrast, expected inflation, labor supply, and inflation, barely change with foreign currency borrowing, given that the level of issuance entails either zero or negligible default risk (for B'_{FC} lower than 0.78 in the left three panels of the figure).

I Long-term Debt Model with the Taste Shock

In what follows, I present the value functions, policies, equilibrium allocations upon default, private equilibrium schedules, and bond price schedules, all contingent on taste shocks $\mathbf{v}$ and $\mathbf{i}$. I first characterize the optimization problem of the government. I assume that foreign currency debt takes values from a discretized space $\mathbf{B}_{FC} = \{B_{FC,1}, \cdots, B_{FC,\mathcal{F}}\}$ with $|\mathbf{B}_{FC}| = \mathcal{F}$, and local currency debt is selected from $\mathbf{B}_{LC} = \{B_{LC,1}, \cdots, B_{LC,\mathcal{L}}\}$ with $|\mathbf{B}_{LC}| = \mathcal{L}$. The available debt choices can be represented by $\mathcal{F} \times \mathcal{L}$ matrix as follows:

$$\begin{bmatrix} (B_{FC,1}, B_{LC,1}) & (B_{FC,1}, B_{LC,2}) & \dots & (B_{FC,1}, B_{LC,\mathcal{L}}) \\ (B_{FC,2}, B_{LC,1}) & (B_{FC,2}, B_{LC,2}) & \dots & (B_{FC,2}, B_{LC,\mathcal{L}}) \\ \vdots & \vdots & \ddots & \vdots \\ (B_{FC,\mathcal{F}}, B_{LC,1}) & (B_{FC,\mathcal{F}}, B_{LC,2}) & \dots & (B_{FC,\mathcal{F}}, B_{LC,\mathcal{L}}) \end{bmatrix}$$

Define the vector $\vec{\mathbf{B}}$ by vectorizing the above matrix, which contains $\mathcal{J} \equiv \mathcal{F} \times \mathcal{L}$ elements:

$$\begin{aligned} \vec{\mathbf{B}} \equiv & [\overbrace{(B_{FC,1}, B_{LC,1}), (B_{FC,2}, B_{LC,1}), \cdots, (B_{FC,\mathcal{F}}, B_{LC,1})}^{\mathcal{F} \text{ elements}}, \overbrace{(B_{FC,1}, B_{LC,2}), \cdots, (B_{FC,\mathcal{F}}, B_{LC,2})}^{\mathcal{F} \text{ elements}}, \cdots, \\ & (B_{FC,1}, B_{LC,\mathcal{L}}), \cdots, (B_{FC,\mathcal{F}}, B_{LC,\mathcal{L}})]' \end{aligned}$$

$\vec{\mathcal{B}}_k$ is then the kth elements of vector $\vec{\mathbf{B}}$.

A taste shock vector, denoted as $\mathbf{v}$, is of size $\mathcal{J} + 1$, corresponding to the number of all possible debt choices in the vector $\vec{\mathbf{B}}$, along with one additional element to account for the choice of default. The distribution of these shocks is assumed to follow a Generalized Extreme Value distribution. I further assume that the vector $\mathbf{v}$ is i.i.d. over time.

Following Dvorkin et al. (2021), the ex-ante value of the utility before the realization of the taste shock, when the aggregate productivity is z and the outstanding stock of debt is $\vec{\mathcal{B}}_i$, is expressed as:

$$V(z, \vec{\mathcal{B}}_i) = \sigma_{\mathbf{v}} \ln \left(\left[\sum_{k=1}^{\mathcal{J}} \exp\left(\frac{u(C_k, G_{i,k}, N_k) + \beta_G \mathbb{E}_{z'|z}\left[V(z', \vec{\mathcal{B}}_k)\right]}{\rho_{\mathbf{v}} \sigma_{\mathbf{v}}} \right) \right]^{\rho_{\mathbf{v}}} + \exp\left(\frac{V^D(z)}{\sigma_{\mathbf{v}}} \right) \right) \quad \text{(I1)}$$

where $C_k \equiv C(z, \vec{\mathcal{B}}_k)$, $N_k \equiv N(z, \vec{\mathcal{B}}_k)$, and $G_{i,k} \equiv G(z, \vec{\mathcal{B}}_i, \vec{\mathcal{B}}_k)$.

When default takes place, if the central bank optimally deviates from the rule-based monetary policy, it chooses domestic nominal interest rates that maximize welfare. Nominal rates are chosen from a discretized space $\mathbf{I} = \{\mathrm{i}_1, \cdots, \mathrm{i}_{\mathcal{G}}\}$, where the size of the space is $|\mathbf{I}| = \mathcal{G}$. A taste shock vector, denoted as $\mathbf{i}$ corresponds to the $\mathcal{G}$ possible choices in $\mathbf{I}$. Analogous to $\mathbf{v}$, the distribution of the taste shock $\mathbf{i}$ follows a Generalized Extreme Value distribution and is i.i.d. over time.

The ex-ante value of defaulting $V^D(z)$ before the realization of the taste shock $\mathbf{i}$ is

$$V^D(z) = \sigma_{\mathbf{i}}\left(\sum_{k=1}^{\mathcal{G}} \exp\left(\frac{u(C_k^D, G_k^D, N_k^D) + \beta_G \mathbb{E}_{z'|z}\left[\iota V(z', \vec{\mathbf{0}}) + (1-\iota)V^D(z')\right]}{\sigma_{\mathbf{i}}}\right)\right) \tag{I2}$$

where $C_k^D \equiv C^D(z, \mathrm{i}_k)$, $G_k^D \equiv G^D(z, \mathrm{i}_k)$, and $N_k^D \equiv N^D(z, \mathrm{i}_k)$—when the central bank chooses the nominal rate, it takes into account how nominal domestic interest rates affect equilibrium allocations. $\vec{\mathbf{0}} \equiv (0, 0)$ is the zero-debt vector, indicating that defaulted governments, if they reenter the financial market (happening with a probability ι), enter with zero debt.

The probability of choosing i_j by the central bank in the state of default, given the current-period productivity z, is expresses as:

$$p^{\mathrm{i}}(\mathrm{i}_j; z) = \frac{\exp\left(\frac{u(C_j^D, G_j^D, N_j^D) + \beta_G \mathbb{E}_{z'|z}\left[\iota V(z', \vec{\mathbf{0}}) + (1-\iota)V^D(z')\right]}{\sigma_{\mathbf{i}}}\right)}{\sum_{k=1}^{\mathcal{G}} \exp\left(\frac{u(C_k^D, G_k^D, N_k^D) + \beta_G \mathbb{E}_{z'|z}\left[\iota V(z', \vec{\mathbf{0}}) + (1-\iota)V^D(z')\right]}{\sigma_{\mathbf{i}}}\right)} \tag{I3}$$

Now I characterize the probability of the sovereign choosing the debt portfolio $\vec{\mathcal{B}}_j$. Given the outstanding debt stock $\vec{\mathcal{B}}_i$ and the current-period productivity z, the probability is expresses as:

$$p^B(\vec{\mathcal{B}}_j; z, \vec{\mathcal{B}}_i) = \frac{\exp\left(\frac{u(C_j, G_{i,j}, N_j) + \beta_G \mathbb{E}_{z'|z}\left[V(z', \vec{\mathcal{B}}_j)\right]}{\rho_{\mathbf{v}}\sigma_{\mathbf{v}}}\right)}{\sum_{k=1}^{\mathcal{J}} \exp\left(\frac{u(C_k, G_{i,k}, N_k) + \beta_G \mathbb{E}_{z'|z}\left[V(z', \vec{\mathcal{B}}_k)\right]}{\rho_{\mathbf{v}}\sigma_{\mathbf{v}}}\right)} \tag{I4}$$

The probability of defaulting is

$$p^D(z, \vec{\mathcal{B}}_i) = \frac{\exp\left(\frac{V^D(z)}{\sigma_{\mathbf{v}}}\right)}{\left[\sum_{k=1}^{\mathcal{J}} \exp\left(\frac{u(C_k, G_{i,k}, N_k) + \beta_G \mathbb{E}_{z'|z}\left[V(z', \vec{\mathcal{B}}_k)\right]}{\rho_{\mathbf{v}}\sigma_{\mathbf{v}}}\right)\right]^{\rho_{\mathbf{v}}} + \exp\left(\frac{V^D(z)}{\sigma_{\mathbf{v}}}\right)} \tag{I5}$$

The foreign currency long-term bond price, given that debt issuance is set at $\vec{\mathcal{B}}_j$, is:

$$Q_{FC}(z,\vec{\mathcal{B}}_j) = \frac{1}{1+r^*}\mathbb{E}_{z'|z}\left[\left(1-p^D(z',\vec{\mathcal{B}}_j)\right)\times\left(\kappa+\lambda+\sum_{k=1}^{\mathcal{J}}(1-\lambda)Q_{FC}(z',\vec{\mathcal{B}}_k)p^B(\vec{\mathcal{B}}_k;z,\vec{\mathcal{B}}_j)\right)\right] \tag{I6}$$

The local currency long-term bond price depends on an additional term—expected inflation:

$$Q_{LC}(z,\vec{\mathcal{B}}_j) = \frac{1}{1+r^*}\mathbb{E}_{z'|z}\left[\left(1-p^D(z',\vec{\mathcal{B}}_j)\right)\times\left(\sum_{k=1}^{\mathcal{J}}p^B(\vec{\mathcal{B}}_k;z,\vec{\mathcal{B}}_j)\times\frac{\kappa+\lambda+(1-\lambda)Q_{LC}(z',\vec{\mathcal{B}}_k)}{\pi(z',\vec{\mathcal{B}}_k)}\right)\right] \tag{I7}$$

I.1 Numerical Algorithm

First, I solve private equilibrium allocations for each possible value of the nominal domestic interest rate i in $\mathbf{I}$, taking the expectation terms $\mathcal{M}^D$ and $\mathcal{H}^D$ as given, shown below

$$\text{Domestic Euler:} \qquad u_{C^D} = \beta i \mathcal{M}^D(z) \tag{I8}$$

$$\text{Real Wage:} \qquad w^D = -\frac{u_{N^D}}{u_{C^D}} \tag{I9}$$

$$\text{Household Budget:} \qquad C^D = (1-\tau)zN^D \tag{I10}$$

$$\text{NKPC:} \qquad (\pi^D-\bar{\pi})\pi^D = \frac{\eta-1}{\varphi}\left(\frac{w^D}{z}-1\right)+\frac{\beta}{u_{C^D}zN^D}\mathcal{H}^D(z) \tag{I11}$$

$$\text{Government Budget:} \qquad G = \tau z N^D - L^D \tag{I12}$$

In the presence of taste shocks, $\mathcal{M}^D$ and $\mathcal{H}^D$ are characterized by the following formulas:

$$\mathcal{M}^D(z) = (1-\iota)\int_Z f(z,z')\sum_{k=1}^{\mathcal{G}}p^{\mathrm{i}}(\mathrm{i}_k;z')\frac{u_{C_k^D(z')}}{\pi_k^D(z')}dz' + \iota\int_Z f(z,z')\sum_{k=1}^{\mathcal{J}}p^B(\vec{\mathcal{B}}_k;z',\vec{\mathbf{0}})\frac{u_{C_k(z')}}{\pi_k(z')}dz' \tag{I13}$$

$$\begin{aligned}\mathcal{H}^D(z) = (1-\iota)\int_Z f(z,z')\sum_{k=1}^{\mathcal{G}}p^{\mathrm{i}}(\mathrm{i}_k;z')u_{C_k^D(z')}z'N_k^D(z')(\pi_k^D(z')-\bar{\pi})\pi_k^D(z')dz'+\\ \iota\int_Z f(z,z')\sum_{k=1}^{\mathcal{J}}p^B(\vec{\mathcal{B}}_k;z',\vec{\mathbf{0}})u_{C_k(z')}z'N_k(z')(\pi_k(z')-\bar{\pi})\pi_k(z')dz'\end{aligned} \tag{I14}$$

where $\pi_k^D(z) \equiv \pi^D(z,\mathrm{i}_k)$, $N_k^D(z) \equiv N^D(z,\mathrm{i}_k)$ and $C_k^D(z) \equiv C^D(z,\mathrm{i}_k)$, $\pi_k(z) \equiv \pi(z,\vec{\mathcal{B}}_k)$, $N_k(z) \equiv N(z,\vec{\mathcal{B}}_k)$ and $C_k(z) \equiv C(z,\vec{\mathcal{B}}_k)$.

Second, I solve private equilibrium upon repayment for each value of $\vec{\mathcal{B}}'$ in $\vec{\mathbf{B}}$, taking the expectation terms $\mathcal{M}$ and $\mathcal{H}$ as given, shown below

$$\text{Domestic Euler:} \qquad u_C = \beta i \mathcal{M}(z, \vec{\mathcal{B}}') \tag{I15}$$

$$\text{Real Wage:} \qquad w = -\frac{u_N}{u_C} \tag{I16}$$

$$\text{Household Budget:} \qquad C = (1-\tau)zN \tag{I17}$$

$$\text{NKPC:} \qquad (\pi - \bar{\pi})\pi = \frac{\eta - 1}{\varphi}\Big(\frac{w}{z} - 1\Big) + \frac{\beta}{u_C z N}\mathcal{H}(z, \vec{\mathcal{B}}') \tag{I18}$$

$$\text{Interest Rate Rule:} \qquad i = \bar{i}\Big(\frac{\pi}{\bar{\pi}}\Big)^{\alpha_p} \tag{I19}$$

where

$$\mathcal{M}(z, \vec{\mathcal{B}}_j) = \int_Z f(z, z')\Big(1 - p^D(z', \vec{\mathcal{B}}_j)\Big) \sum_{k=1}^{\mathcal{J}} p^B(\vec{\mathcal{B}}_k; z', \vec{\mathcal{B}}_j) \frac{u_{C_k(z')}}{\pi_k(z')} dz' + \int_Z f(z, z') p^D(z', \vec{\mathcal{B}}_j) \sum_{k=1}^{\mathcal{G}} p^{\mathrm{i}}(\mathrm{i}_k; z') \frac{u_{C_k^D(z')}}{\pi_k^D(z')} dz' \tag{I20}$$

$$\mathcal{H}(z, \vec{\mathcal{B}}_j) = \int_Z f(z, z')\Big(1 - p^D(z', \vec{\mathcal{B}}_j)\Big) \sum_{k=1}^{\mathcal{J}} p^B(\vec{\mathcal{B}}_k; z', \vec{\mathcal{B}}_j) u_{C_k(z')} z' N_k(z')(\pi_k(z') - \bar{\pi})\pi_k(z') dz' + \int_Z f(z, z') p^D(z', \vec{\mathcal{B}}_j) \sum_{k=1}^{\mathcal{G}} p^{\mathrm{i}}(\mathrm{i}_k; z') u_{C_k^D(z')} z' N_k^D(z')(\pi_k^D(z') - \bar{\pi})\pi_k^D(z') dz' \tag{I21}$$

1. Start with initial guesses for the value functions V and V^D, the expectation terms $\mathcal{M}^D$, $\mathcal{H}^D$, $\mathcal{M}$ and $\mathcal{H}$, as well as bond price schedules Q_{FC} and Q_{LC}.

2. For each possible choice of nominal domestic interest rates i_k ($\mathrm{i}_k \in \mathbf{I}$), solve equilibrium allocations upon default taking $\mathcal{M}^D$ and $\mathcal{H}^D$ as given.

   (a) Guess $C_k^D(z)$, $N_k^D(z)$ and $\pi_k^D(z)$. Using equation (I8) to derive a new value of consumption $\hat{C}_k^D$.

   (b) Use the current guess $C_k^D(z)$ and the budget constraint of households (I10) to derive a new value of labor supply $\hat{N}_k^D$.

   (c) Derive real wages $w_k^D(z)$ using the current guesses $C_k^D(z)$ and $N_k^D(z)$ and equation (I9).

   (d) Use the current guesses $C_k^D(z)$ and $N_k^D(z)$, along with newly derived $w_k^D(z)$, to derive a new value of inflation $\hat{\pi}_k^D(z)$ using the NKPC (I11).

   (e) Use equation (I12) to derive $G_k^D(z)$.

(f) Check whether $|C_k^D(z) - \hat{C}_k^D(z)| < 1e^{-7}$, $|N_k^D(z) - \hat{N}_k^D(z)| < 1e^{-7}$ and $|\pi_k^D(z) - \hat{\pi}_k^D(z)| < 1e^{-7}$. If not, update $C_k^D(z)$, $N_k^D(z)$ and $\pi_k^D(z)$ until they satisfy the convergence criterion.

These steps generate $C^D(z, \mathrm{i}_k)$, $G^D(z, \mathrm{i}_k)$, $N^D(z, \mathrm{i}_k)$, $\pi^D(z, \mathrm{i}_k)$ and $w^D(z, \mathrm{i}_k)$, where $\mathrm{i}_k \in \mathbf{I}$.

3. Using $C_k^D(z)$, $G_k^D(z)$ and $N_k^D(z)$ derived in step 2, solve the central bank's optimization problem and derive $V^D(z)$ and $p^{\mathrm{i}}(\mathrm{i}_j; z)$ using (I2) and (I3).

4. For each possible debt choice $\vec{\mathcal{B}}_j$ ($\vec{\mathcal{B}}_j \in \vec{\mathbf{B}}$), solve the corresponding private equilibrium schedules taking $\mathcal{M}$ and $\mathcal{H}$ as given.

   (a) Guess $C_j(z)$ and $N_j(z)$. Using equation (I15) to derive $i_j(z) \equiv i(z, \vec{\mathcal{B}}_j)$.

   (b) With $i_j(z)$ and equation (I19), derive the corresponding $\pi_j(z)$.

   (c) Derive real wages $w_j(z) \equiv w(z, \vec{\mathcal{B}}_j)$ using the guess of $C_j(z)$ and $N_j(z)$ and equation (I16).

   (d) Derive a new value of labor supply $\hat{N}_j(z)$ using the guess of $C_j(z)$ and (I17).

   (e) Use the current guess $N_j(z)$, newly derived $w_j(z)$ and $\pi_j(z)$, and the NKPC (I18) to derive a new value of private consumption $\hat{C}_j(z)$.

   (f) Check whether $|C_j(z) - \hat{C}_j(z)| < 1e^{-7}$ and $|N_j(z) - \hat{N}_j(z)| < 1e^{-7}$. If not, update $C_j(z)$ and $N_j(z)$ until they satisfy the private equilibrium convergence criterion.

   These steps generate private equilibrium schedules in repayment states: $C(z, \vec{\mathcal{B}}_j)$, $N(z, \vec{\mathcal{B}}_j)$, $\pi(z, \vec{\mathcal{B}}_j)$, $i(z, \vec{\mathcal{B}}_j)$, $w(z, \vec{\mathcal{B}}_j)$, where $\vec{\mathcal{B}}_j \in \vec{\mathbf{B}}$.

5. Solve the government's optimization problem, taking the private equilibrium schedules and bond price schedules as given. Using (I1), (I4) and (I5) to derive $V(z, \vec{\mathcal{B}}_i)$, $p^B(\vec{\mathcal{B}}_j; z, \vec{\mathcal{B}}_i)$ and $p^D(z, \vec{\mathcal{B}}_i)$.

6. Use $p^B(\vec{\mathcal{B}}_j; z, \vec{\mathcal{B}}_i)$, $p^D(z, \vec{\mathcal{B}}_i)$ and $p^{\mathrm{i}}(\mathrm{i}_k; z)$ to derive new expectation terms $\hat{\mathcal{M}}^D$ $\hat{\mathcal{H}}^D$, $\hat{\mathcal{M}}$ and $\hat{\mathcal{H}}$, using (I13), (I14), (I20) and (I21), and new bond price schedules $\hat{Q}_{FC}$ and $\hat{Q}_{LC}$ using (I6) and (I7).

7. Check the convergence for value function V and V^D, expectation terms $\mathcal{M}^D$, $\mathcal{H}^D$, $\mathcal{M}$, $\mathcal{H}$, and bond price schedules Q_{FC} and Q_{LC}. If the newly derived utility values are closer than $1e^{-6}$ and expectations and prices are closer than $1e^{-5}$ in the sup norm, stop iteration. Else, update and go back to step 1.

The model is subject to an AR(1) aggregate productivity shock z, discretized across 15 equally spaced grid points, covering ± 3 standard deviations of its unconditional distribution. For local currency debt, I employ 38 grid points spanning $[0, 1.11]$ equally spaced, and for foreign currency debt, 32 grid points spanning $[0, 0.93]$ equally spaced. All model moments are computed as sample averages obtained by simulating the economy over 10,000 periods for 300 times, while excluding default periods and the initial 20 periods (5 years) following each reentry after default.