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Reference Details

CWPE	2438
Published	2 July 2024
Key Words	Sovereign Default, Inflation, Currency Denomination, New Keynesian Theory
JEL Codes	E32, E52, E63, F34, H63
Website	www.econ.cam.ac.uk/cwpe

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Job Market Paper
This version: June 26, 2024

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*I am indebted to my advisors, Giancarlo Corsetti and Meredith Crowley, for invaluable discussions, guidance and support throughout this project. I am grateful to Vasco Carvalho, Florin Bilbiie, Charles Brendon, Margit Reischer, Adrien Wicht, Deniz Atalar, Sarur Chaudhary, Lukas Freund, Charles Parry, Jungjae Park, Carlo Galli, Javier Bianchi, and Almuth Scholl for their helpful advice and comments. I thank the participants in the Cambridge Macro Workshop, the Cambridge Empirical Micro Seminar, and the EUI Macro Workshop, for helpful comments and feedback. I gratefully acknowledge support by the Janeway Institute and Keynes Fund in Cambridge (2024 KF project "Monetary Policy and Original Sin").

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1 Introduction

The issuance of external sovereign debt in foreign currency, referred to as "original sin" in the international finance literature, has been viewed as a source of financial fragility in emerging economies.[1] Starting from the early 2000s, many central banks in emerging economies have adopted inflation targeting, which significantly improved their ability to borrow abroad in their own national (hereafter, local) currency. Nonetheless, local currency borrowing only partially replaced foreign currency borrowing, and these emerging economies tilt their debt issuance towards foreign currency when inflation expectations rise. Why do inflation-targeting emerging economies tilt their borrowing towards foreign currency when inflation expectations are higher? The puzzle is that issuing a higher proportion of foreign currency debt during periods of elevated inflation expectations—a time when local currency is likely to devalue—exacerbates the financial fragility of these economies.

This paper develops a small open economy New Keynesian model with sovereign default to study the optimal currency denomination of sovereign bonds. The model highlights *default risk* as the primary factor driving the observed pattern of evolving debt compositions by currency among inflation-targeting emerging economies. The framework embodies two key features of policy in these emerging economies: (i) the central bank targets inflation as monetary policy during non-crisis (non-default) periods; (ii) sovereign default, however, increases inflationary pressure by incentivizing the central bank to deviate from inflation targeting when default occurs. While the inflation-targeting monetary stance in non-crisis times deters *the central bank* from deliberately debasing local currency debt, *the fiscal government* can debase the value of outstanding local currency debt by manipulating inflation expectations—through debt issuance and default policies.

The novel insight of my analysis is to recognise that a government, which has discretion over debt issuance and repayment, encounters a tradeoff in pursuing an expectation-driven inflationary debt policy. High levels of debt in local currency prompt the government to debase the value of local currency obligations—this is accomplished by issuing additional debt, which raises inflation (expectations) due to amplified default risk. Generating inflation for debasement, however, is costly, as it entails a surge in default risk and, due to price stickiness, distorts equilibrium allocations in the economy. To avoid engaging in costly debasement, governments resort to foreign currency borrowing; this strikes a balance between the benefit of foreign currency debt in curbing costly inflation (also default risk), and the cost of giving up consumption insurance associated with movements in inflation—a typical insurance offered by local currency debt.

[1] 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 Von Peter (2023), Zheng (2023) and Bertaut, Bruno, and Shin (2024) use the new dataset to revisit "original sin" of emerging economies.

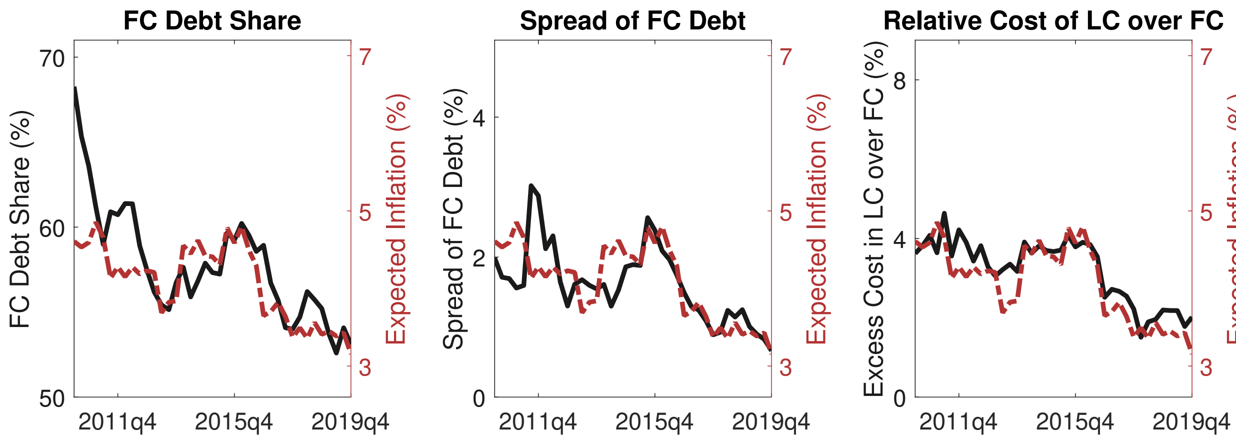

Figure 1: Co-movements between expected inflation (red dashed lines, right Y-axis) and (i) FC debt share (left panel), (ii) FC debt spreads (mid panel), (iii) the relative cost of borrowing in LC over FC (right panel). There are 15 inflation-targeting emerging economies in my sample.

The quantitative analysis of the model indicates that foreign currency borrowing in Colombia is largely attributed to the benefits of foreign currency debt in containing costly debasement. Specifically, around 37 percentage points of the share of borrowing denominated in foreign currency is directly associated with deterring the fiscal government from debasement. The model further highlights that the benefits of foreign currency borrowing in containing debasement are the key factor driving governments to tilt their borrowing towards foreign currency when expected inflation gets higher, as observed among inflation-targeting emerging economies. Additionally, the model is employed to assess the welfare gain originating from the optimal currency denomination of sovereign bonds. It reveals that inflation, spreads and default frequency are lower with the optimal debt denomination, relative to a counter-factual scenario where all borrowing is conducted solely in local currency.

The paper begins with empirical analyses on three stylized facts concerning the currency denomination of sovereign bonds and inflation expectations. These facts are briefly illustrated in Figure 1, where I present the cross-sectional mean of relevant variables and expected inflation across inflation targeters whose shares of foreign currency debt in total external borrowing lie in the interquartile range of my sample of 15 inflation-targeting emerging countries.[2] All panels include expected inflation (red dashed lines, right Y-axis), to visualize the comovements between associated variables and expected inflation. In the left panel, I show a positive association between expected inflation and (i) the proportion of foreign currency (FC) borrowing in total external borrowing. Inflation-targeting emerging economies tilt their borrowing towards foreign currency when expected inflation rises. In the middle panel, I show a positive association

[2]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.

between inflation expectations and (ii) spreads of foreign currency (FC) debt (default risk). The second fact provides empirical support for default (risk) heightening inflationary pressure. In the right panel, I present a positive association between inflation expectations 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 expected inflation.

To accommodate these stylized facts, I propose a small open economy New Keynesian model with sovereign default and the endogenous choice of currency denomination of sovereign bonds. As in standard New Keynesian models, inflation is shaped by forward-looking pricing decisions of firms, linking current-period inflation to both marginal costs and expected future inflation. The monetary authority conducts inflation-targeting monetary policy in non-crisis (repayment) times, thereby refraining from strategically debasing local currency debt. However, it deviates from strict inflation targeting by pursuing loose monetary policy in states of default, increasing inflationary pressure when sovereign default takes place. The government, borrowing internationally from risk-neutral lenders, cannot commit to debt repayment and future debt choices. Each period, it decides whether to default on the outstanding debt stock or not; when repayment takes place, the government chooses debt issuance in foreign and local currency.

Local currency debt provides *hedging benefits* via two channels. On the one hand, debt denominated in local currency offers a hedge against productivity fluctuations. A decline in aggregate productivity leads to an increase in marginal costs, resulting in a rise in contemporaneous inflation and a decrease in the real value of local currency debt. On the other hand, debt in local currency functions as a hedge against default risk, embodying another less obvious role played by local currency borrowing. A country with high risk of default experiences a surge in inflation, providing partial relief to the associated real debt burden in local currency. The second channel, however, enables governments to escalate inflation expectations for the purpose of debasement, creating a perverse incentive problem of debt in local currency. By issuing additional debt, the government triggers an escalation in (expected) inflation due to heightened default risk, which diminishes the value of local currency debt. Escalating inflation is distortionary from an ex-ante point of view—foreign lenders anticipate debt debasement and consequently offer lower bond prices, and the central bank responds by raising the nominal interest rate which in turn depresses aggregate output.

Foreign currency debt, by contrast, provides *discipline benefits*. By virtue of its immunity to inflation, foreign currency borrowing can enforce discipline on debt debasement, effectively containing a rise in distortionary inflation. This discipline effect is beneficial in two respects. First, tilting the currency composition of debt towards foreign currency lowers the ex-ante cost of borrowing, as foreign lenders anticipate that the government would be less inclined to raise debt issuance for debasement. Second, foreign currency borrowing alleviates the decline in aggregate output stemming from anticipations of escalating inflation. When debt issuance is largely conducted in local currency, future governments are more inclined to escalate inflation for debasement. Anticipations of escalating inflation then elevate contemporaneous inflation, prompting the central bank to raise the nominal interest rate in the current period. This, in turn, dampens aggregate consumption demand and reduces aggregate output in equilibrium. Shifting the currency denomination of debt towards foreign currency therefore mitigates the fall in aggregate output, as it disciplines debt debasement and contains expectations of escalating inflation. This provides an additional form of discipline benefits alongside lowering the ex-ante borrowing costs.

The optimal currency denomination of sovereign bonds is an equilibrium outcome characterized by the relative significance between the discipline benefits of foreign currency debt and the hedging benefits of local currency debt. When the economy exhibits low debt stocks and/or economic booms, governments lack strong incentives for debt debasement—discipline benefits are thus relatively less valuable. These are good times, also periods with *low expected inflation*, in which the government issues more local currency debt to benefit from its hedging properties. When the economy faces high debt stocks and/or downturns, the desire for debt debasement by governments gets much stronger. Consequently, the discipline benefits of foreign currency borrowing become much more valuable. These are bad times, also periods with *high expected inflation*, in which the government tilts its borrowing towards foreign currency to avoid generating distortionary inflation for debasement.

In my quantitative analysis, I calibrate the model by targeting six key moments in Colombia from 2009 to 2021, an emerging economy relying heavily on external borrowing and whose business cycle characteristics are similar to those of other emerging economies. The model performs well in capturing both targeted and untargeted moments in Colombian economy. For instance, the share of foreign currency borrowing in total external borrowing predicted by the model (78.92%) mirrors the observed data (78.75%). Moreover, the model closely reproduces three relevant correlations identified in my empirical studies regarding expected inflation. Specifically, inflation expectations show positive associations with (i) the share of foreign currency borrowing (.198 in the data versus .190 in the model), (ii) default risk (.621 versus .840) and (iii) the relative cost of borrowing in local currency over foreign currency (.779 versus .776).

After the moment matching exercise, I proceed to the main quantitative experiment of the paper, which involves quantifying the proportion of foreign currency borrowing driven by discipline benefits of foreign currency debt. Specifically, I construct an alternative New Keynesian model specification in which the government loses the ability to engage in debt debasement—the government hence no longer requires foreign currency debt for disciplining purposes. To achieve this, I make inflation orthogonal to default, i.e., default does not impact inflation at all, rendering manipulating inflation expectations via debt issuance (in turn related to default risk) infeasible. Under this specification, the share of foreign currency borrowing drops sharply from 78.92% to 42.18%, suggesting that around 37 percentage points of the share of foreign currency borrowing is attributed to discipline benefits of foreign currency debt. Additionally, under orthogonality, the government counterfactually borrows more in local currency during periods of higher expected inflation—precisely when local currency borrowing provides greater hedging benefits. This indicates that a perverse incentive problem associated to local currency borrowing deters issuing debt in local currency, especially during times when the government highly values the hedging benefits provided by local currency debt.

I finally delve into the assessment of welfare gains from the optimal currency denomination of sovereign bonds. I conduct a counterfactual exercise where the government exclusively borrows in local currency. In this setting, the government lacks the option to borrow in foreign currency, which otherwise would serve as a key mechanism to contain distortionary inflation. The constraint of borrowing in foreign currency leads to a rise in inflation (from 3.63% to 4.19%), the cost of borrowing in local currency (4.98% to 6.49%), and default frequency (1.36% to 2.25%). The analysis reveals that the optimal debt denomination improves the welfare and reduces the country's vulnerability, highlighting the significant disciplining role of foreign-currency denominated debt in the optimal debt management of emerging market governments.

From a policy perspective, this paper sheds light on the importance of establishing fiscal discipline to facilitate local currency borrowing from abroad—a lack of fiscal solvency would trigger an upsurge in foreign currency borrowing. While, as emphasized in Du, Pflueger, and Schreger (2020), a commitment by the monetary authority to refrain from debt debasement enables countries to predominantly borrow in local currency given that fiscal governments do not feature any limited commitment, this paper highlights that a deficiency of fiscal solvency can still create opportunities for debt debasement which, in equilibrium, heightens the share of foreign currency borrowing for disciplining purposes.

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.[3] Closely related to this paper, Arellano and Ramanarayanan (2012) study

[3]For instance, Cole and Kehoe (2000) investigate self-fulfilling rollover crises, recently revisited by Aguiar, Chatterjee, Cole, and Stangebye (2022) and Corsetti and Maeng (2023b). Bocola 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), Ayres, Navarro, Nicolini, and Teles (2019) and Ayres and Paluszynski (2022) examine the role of expectations

the optimal maturity structure of sovereign debt, addressing tradeoffs in debt maturity choices. Whereas short-term debt proves valuable for providing incentives to repay, long-term debt offers a hedge against consumption fluctuations. The optimal currency denomination of sovereign debt in this paper also involves analogous tradeoffs—debt in local currency functions as a hedge, whereas debt in foreign currency prevents perverse incentive problems of local currency borrowing.[4]

This paper is also 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.[5] 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. These papers, however, abstract from the role of inflation expectations in shaping current inflation and output, as they directly impose downward rigidity on nominal wages.

To address this issue, this paper integrates sovereign default into the New Keynesian framework, where pricing frictions stem from forward-looking price-setting by firms, thereby generating a standard New Keynesian Philips Curve that bridges expected inflation with contemporaneous inflation and output. I contribute to the literature by developing a framework that mirrors the salient features of policy in many emerging economies—the central bank targets inflation during non-crisis times and sovereign default increases inflationary pressure. In this regard, the goal of this paper is very similar to the goal pursued by Arellano, Bai, and Mihalache (2023), who also acknowledge the need to develop a framework reflecting the practices in many emerging economies. My work is complementary to theirs, as the primary mechanism generating inflationary pressure upon default differs. 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 incen-

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.

[4] 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. Broner, Lorenzoni, and Schmukler (2013) explore the impact of lenders' risk aversion on the maturity choice of sovereign bonds. 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.

[5] 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 for reserves in the presence of sovereign risk and downward rigidity of nominal wages.

tives of governments to default on debt in local currency.[6] 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.[7]

The existing literature on the optimal choice between foreign and local currency bonds is limited.[8] Du et al. (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) emphasize a defaultable monetary rule as the main factor shaping the currency composition of sovereign debt. Ottonello and Perez (2019) focus on the real exchange manipulation channel that drives the time-inconsistency problem of local currency obligations.[9] These studies, including mine, highlight that foreign currency borrowing serves as a mechanism to discipline the government against the distortionary devaluation of local currency liabilities. My work, however, in contrast to theirs, focuses on how default risk affects the currency denomination of sovereign debt, particularly in scenarios where monetary policy is fully refrained 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 and compares them to data counterparts. Section 5 concludes.

2 Empirical Findings

In this section, I document three novel empirical regularities linking inflation expectations and the sovereign's external borrowing among inflation-targeting emerging economies. I present

[6] Another strand of self-fulfilling debt crises literature, following Calvo (1988), is explored in Corsetti and Dedola (2016), Ayres et al. (2019) and Lorenzoni and Werning (2019). See Corsetti and Maeng (2023a) for a reappraisal.

[7] 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.

[8] 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.

[9] Ottonello and Perez (2019) also study debt denomination in the context of discretionary inflation.

the robust positive associations between inflation expectations and (i) the share of foreign currency borrowing in total external borrowing of the sovereign, (ii) default risk, 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.[10] 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, Philippines, Poland, Russia, South Africa, Thailand, and Turkey.[11]

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.[12]

To assess default risk, I collect data on five-year sovereign US dollar-denominated Credit Default Swap (CDS) from Bloomberg. 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.[13]

[10] 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).

[11] 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.

[12] The inflation expectations data in quarterly frequency is limited to a maximum horizon of one year. In Appendix B, a robustness check is conducted using expected inflation with shorter time horizons. 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.

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

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:

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

I incorporate macro controls in my regressions: year-over-year real exchange rate depreciation, year-over-year inflation, 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 expected inflation and (i) the share of foreign currency debt in total external sovereign debt, (ii) default risk, 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 inflation expectations.

2.2 Currency Denomination

I first examine the correlation between the share of external sovereign borrowing in foreign currency and inflation expectations. 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:

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

where $\mathbb{E}_t[\pi_{i,t+4}]$ denotes inflation expectations one year ahead. 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.

Table 1: FC Debt Share and Inflation Expectations

	FC debt share $FCshare$ (%)		Adjusted FC debt share $FCshare^{ADJ}$ (%)	
	(1)	(2)	(3)	(4)
$\mathbb{E}_t[\pi_{i,t+4}]$ (%)	2.003***	1.739***	1.350***	1.341***
	(0.371)	(0.365)	(0.315)	(0.310)
Inflation (%)	0.168	0.270	0.0230	0.0562
	(0.188)	(0.184)	(0.171)	(0.164)
Real Exchange Rate Depreciation (%)		-0.0907**		-0.0334
		(0.0386)		(0.0358)
Real GDP Growth Rates (%)		0.0319		-0.0404
		(0.119)		(0.114)
External Sovereign Debt to GDP (%)		-0.299***		-0.465***
		(0.0675)		(0.0703)
Capital Openness		-1.007		2.707***
		(0.711)		(0.633)
Private Credit to GDP (%)		-0.0976**		-0.0391
		(0.0411)		(0.0387)
Observations	639	639	639	639
R-squared	0.942	0.947	0.944	0.953

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.

The regression estimates are reported in column (1) and (2) of Table 1. Column (1) displays estimates of the regression that only includes inflation as a macro control. These estimates reveal a positive association between the share of debt in foreign currency and inflation expectations—an increase in expected inflation by one percentage point is associated with 1.7-2.0 percentage points higher foreign currency share of external debt.[14]

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),

[14] 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.

using the exchange rate against the US dollar in 2010Q1 throughout the sample periods.[15] The corresponding exchange-rate-adjusted share of foreign currency borrowing is denoted as $FCshare_{it}^{ADJ}$:

$$FCshare_{it}^{ADJ} = \frac{\text{Foreign held foreign currency sovereign debt, using 2010Q1 exchange rate}_{it}}{\text{Foreign held total sovereign debt, using 2010Q1 exchange rate}_{it}}$$

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 1.34 to 1.35.[16]

The positive correlation between the share of foreign currency debt and inflation expectations 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 inflation expectations. The estimates indicate that the net stock of foreign currency debt increases more than that of local currency debt when inflation expectations 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. Table B4 compares the results using inflation expectations for different time horizons, spanning one quarter, six months, and one year.[17] Inflation expectations for the longest time horizon (one-year expectations in my sample) show the greatest explanatory power regarding the share of foreign currency debt.

To summarize, inflation-targeting emerging economies tilt their borrowing towards foreign currency when inflation expectations rise. In other words, these countries borrow relatively more in foreign currency when local currency is likely to devalue (as expected inflation is higher), i.e., when foreign currency debt is more likely to exacerbate the financial fragility of these countries.

2.3 Default Risk

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-denomiated CDS spread ($CDS_{\$,it}$) and the macro controls X_{it}, which takes the following form:

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

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

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

[17] Expected inflation longer than one year is not available in quarterly frequency.

Table 2: Inflation Expectations and Default Risk

	Expected Inflation $\mathbb{E}_t[\pi_{i,t+4}]$ (%)	
	(1)	(2)
$CDS_{\$,it}$ (%)	0.345***	0.489***
	(0.0756)	(0.0929)
Inflation (%)	0.321***	0.302***
	(0.0312)	(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	0.885	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.

The corresponding estimates are reported in Table 2. A one percentage point increase in CDS spreads is associated with a 0.345-0.489 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 default risk remains robust to an alternative specification that excludes pandemic periods, as illustrated in Table B5 in Appendix B. Incorporating the global factors into the regression does not qualitatively alter the results, as shown in Table B6. Table B7 presents the first-difference regression results regarding expected inflation and CDS spreads, showing that expected inflation rises with an increase in CDS spreads.[18]

[18] 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.

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)
$\mathbb{E}_t[\pi_{i,t+4}]$ (%)	0.489***	0.531***
	(0.0761)	(0.0733)
Inflation (%)	0.120***	0.0885***
	(0.0276)	(0.0259)
Real Exchange Rate Depreciation (%)		0.0145**
		(0.00715)
Real GDP Growth Rates (%)		-0.0174
		(0.0210)
External Sovereign Debt to GDP (%)		0.0296***
		(0.00994)
Capital Openness		0.252*
		(0.133)
Private Credit to GDP (%)		0.0350***
		(0.00875)
Observations	583	583
R-squared	0.867	0.883

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.

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 expected inflation. I initiate the analysis with the country and time fixed effect panel regression, regarding the relative cost of borrowing in LC over FC:

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

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 inflation expectations is positively associated with a 0.489-0.531 percentage point increase in the excess 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 B8 in Appendix B. Substituting time fixed effects with global control variables in Table B9 also maintains the qualitative consistency of the results. These findings suggest that, when inflation expectations are 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 expected inflation rises, (i) inflation-targeting emerging economies tilt their borrowing towards foreign currency, (ii) default risk escalates, and (iii) the excess cost of borrowing in local currency relative to foreign currency increases. The first fact indicates that the government borrow a higher proportion in foreign currency when foreign currency debt exacerbates the financial fragility of inflation-targeting emerging economies (i.e., when expected inflation is high); the second fact provides empirical evidence of default (risk) heightening inflationary pressure; the third fact suggests that borrowing in local currency is more costly relative to foreign currency when expected inflation is higher. To reconcile these three empirical findings, in the subsequent section, I construct a New Keynesian model with sovereign default, to illustrate that default risk plays a pivotal role in shaping the currency denomination in sovereign bonds and the relative cost of borrowing in local currency over foreign currency.

3 Model

In this section, I develop a small open economy New Keynesian model that integrates sovereign default and an endogenous choice of currency denomination in sovereign bonds. The model encompasses two key aspects of policy in inflation-targeting emerging economies: (i) the central bank conducts inflation targeting as monetary policy in non-crisis (repayment) periods; (ii) sovereign default increases inflationary pressure by incentivizing the central bank to deviate from inflation targeting when default takes place.

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 non-state-contingent 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.[19] 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.[20]

Households are hired and earn labor income $W_t N_t$. In addition, they accrue profits from several other sources, and these profits are independent of and unaffected by the individual decisions of atomistic households. I summarize their total profits with the variable Ψ_t. The government levies taxes on households in a lump-sum manner, deducting a fraction τ from their total revenue. The budget constraint of households is given by

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

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

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

[20] 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 in emerging economies, 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.

intratemporal labor-consumption margin and the Euler equation:

$$-\frac{u_{N,t}}{u_{C,t}} = w_t \tag{2}$$

$$u_{C,t} = \beta i_t \mathbb{E}_t\left[\frac{u_{C,t+1}}{\pi_{t+1}}\right] \tag{3}$$

$u_{x,t}$ 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:

$$y_{jt} = \left(\frac{p_{jt}}{P_t}\right)^{-\eta} Y_t \tag{4}$$

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 produces using the labor as an input, taking aggregate productivity as given. The production function of intermediate good j is then characterized by:

$$y_{jt} = z_t n_{jt} \tag{5}$$

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

Intermediate goods firms encounter the price-setting friction, involving a convex quadratic adjustment cost if they do not raise their prices to meet 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:

$$\widetilde{\Psi}_{jt} = p_{jt}y_{jt} - (1-\tau^N)W_t n_{jt} - \frac{\varphi}{2}\left(\frac{p_{jt}}{p_{jt-1}} - \bar{\pi}\right)^2 P_t Y_t \tag{6}$$

Firms receive constant labor subsidies $1-\tau^N = (\eta-1)/\eta$, which are designed to correct the markup in intermediate goods markets.[21] Additionally, I assume that the aggregate resources dedicated to price changes—the last term in equation (6)—are rebated back to households.[22] In other words, households are presumed to own the "price-adjusting agency". The total profit rebated back to households—the owner of both intermediate goods firms and "pricing-adjusting agency"—can then be represented as follows:

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

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 (4), the technology (5) and the profit (6):

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

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:

$$\left(\pi_t - \bar{\pi}\right)\pi_t = \frac{\eta-1}{\varphi}\left(\frac{w_t}{z_t} - 1\right) + \beta\mathbb{E}_t\left[\frac{u_{C,t+1}}{u_{C,t}}\left(\pi_{t+1} - \bar{\pi}\right)\pi_{t+1}\frac{Y_{t+1}}{Y_t}\right] \tag{7}$$

This equation features a New Keynesian Phillips Curve (NKPC) that links inflation to contempo-

[21] 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.

[22] 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 sovereign default models. For instance, elevated inflation during default periods would impose a substantial resource-draining quadratic cost, mechanically 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 leads to a larger degree of resource losses when default takes place in a recession (as inflation is higher) relative to defaulting in booms—default then occurs during booms rather than busts. Since the primary focus of the paper does not revolve around how the resource-draining cost shapes the government's incentive for repayment, I abstract from delving into this aspect by rebating back price-adjustment costs to households. The role of resource-draining inflation in models with high non-linearity is explored in Freund, Lee, and Rendahl (2023).

raneous marginal cost (w_t/z_t), and inflation expectations.

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.[23] 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

$$G_t + B_{FC,t} + \frac{B_{LC,t}}{\pi_t} = Q_{FC,t}B_{FC,t+1} + Q_{LC,t}B_{LC,t+1} + \tau(w_t N_t + \psi_t) - \tau_N w_t N_t$$

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. $\tau(w_t N_t + \psi_t)$ corresponds to the real revenue tax raised from households, encompassing both the real labor income $w_t N_t$ and total profit ψ_t. Labor subsidies $\tau_N w_t N_t$ are imposed to reduce the average markup to zero among intermediate goods firms. After incorporating labor subsidies, the equilibrium budget constraint becomes:

$$G_t + B_{FC,t} + \frac{B_{LC,t}}{\pi_t} = Q_{FC,t}B_{FC,t+1} + Q_{LC,t}B_{LC,t+1} + \tau z_t N_t \tag{8}$$

The term $z_t N_t$ represents the country's output. The fiscal government collects tax revenue in a lump-sum manner, equivalent to τ of the economy's output, borrows from foreign lenders, and repays the outstanding stock of debt. Note that, the only difference between FC and LC 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. The real budget constraint in equilibrium

[23] 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.

therefore becomes:

$$G_t = \tau z_t N_t \tag{9}$$

Note that, the government, if it defaults, defaults on the entire outstanding stock of debt, irrespective of the currency denomination. When default takes place, following Bianchi et al. (2018), the government suffers a one-time utility loss $U^D(z_t)$, which is increasing in aggregate productivity z_t.[24] This utility loss encompasses various costs associated with default, including but not limited to reputation losses, sanctions, and misallocation of resources.[25]

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 full repayment of sovereign debt (during non-crisis times), the central bank aims to achieve an inflation target $\bar{\pi}$ by determining the nominal interest rate through an interest rate rule—it commits not to strategically debase local currency borrowing:

$$i_t = \bar{i}\left(\frac{\pi_t}{\bar{\pi}}\right)^{\alpha_P} \text{ with } \alpha_P > 1 \tag{10}$$

Sovereign default escalates inflationary pressure as monetary policy deviates from inflation

[24]The utility cost of defaulting has been adopted in other studies. See, for instance, Arellano, Bai, and Bocola (2017), Aguiar et al. (2019), Lee (2022) and Arellano et al. (2023).

[25]An alternative approach in the literature is to model the cost of defaulting as a loss of aggregate productivity. In Appendix H, I show that introducing a reasonable productivity loss upon default does not alter the key results.

targeting, characterized by the loose monetary rule below:

$$i_t = \frac{\bar{i} - \Delta}{\bar{i}} \times \bar{i}\left(\frac{\pi_t}{\bar{\pi}}\right)^{\alpha_P} = (\bar{i} - \Delta)\left(\frac{\pi_t}{\bar{\pi}}\right)^{\alpha_P} \text{ with } \alpha_P > 1 \text{ and } \Delta > 0 \tag{11}$$

Note that this loose interest rate rule (11) is crucial to generate *inflationary* pressure when default occurs. If, instead, the interest rate rule follows (10) upon default, default would be *orthogonal* to inflation,[26] contradicting the empirical evidence of a positive co-movement between inflation expectations and default risk presented in Section 2.

Moreover, the loose monetary rule (11) can be rationalized by the empirical observation that default is associated with a period of fiscal distress. Following a default and periods of exclusion from the international financial market, the central bank experiences pressure to implement a relatively loose monetary policy for other objectives beyond bringing down inflation to the target.[27] The reduced-form loose monetary rule (11) reflects the notion that, these additional objectives (not explicitly modelled in my environment), captured by the term $\frac{\bar{i}-\Delta}{\bar{i}}$, prompts the central bank to adopt the loose monetary stance, ultimately exerting inflationary pressure upon default.

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 $V(z, \vec{\mathcal{B}}, \mathbf{D}_{-1})$,

[26]If the monetary rule consistently follows (10), default leads to a direct utility loss only and does not affect the decisions of households and firms in the economy. As a result, inflation is not affected by the government's decision to repay or default. In Appendix F, I complement my analysis by adopting an alternative approach where default penalty takes the form of convex productivity loss instead of the utility loss. In this scenario, sovereign default generates *deflationary* rather than *inflationary* pressure, provided the monetary rule consistently follows (10). In other words, the loose monetary policy (11) is essential for rendering default inflationary, regardless of the form of default penalty in my model.

[27]Galli (2020) presents evidences of a positive co-movement between default and inflation, suggesting that during times of default, the central bank adopts a loose monetary policy stance to support the fiscal 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.

considering the option to default, is

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

where $V^R(z,\vec{\mathscr{B}})$ is the value of repaying debt and $V^D(z) - U^D(z)$ is the value of defaulting, inclusive of the one-time default utility loss $U^D(z)$. The value of repaying is

$$V^R(z,\vec{\mathscr{B}}) = \max_{\vec{\mathscr{B}}'} u(C,G,N) + \beta_G\mathbb{E}[V(z',\vec{\mathscr{B}}',0)] \tag{12}$$

subject to the government's budget constraint (8), the private equilibrium schedules and bond price schedules. I fully characterize the private equilibrium and bond price (schedules) later in Section 3.2.1 and 3.2.2.

The value of defaulting $V^D(z)$ net of the one-time utility loss is given by:

$$V^D(z) = u(C^D, G^D, N^D) + \beta_G\mathbb{E}[V^D(z')]$$

subject to the budget constraint (9) and the private equilibrium upon default. Note that, private equilibrium variables upon default are now superscribed by the capital D.

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

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

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

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

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:

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

With this characterization of debt and default decisions, I can now define private equilibrium and equilibrium bond prices, which the sovereign takes into account when making fiscal decisions.

3.2.1 Private Equilibrium (Schedules)

First, 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 ($D = 0$):

$$\text{Domestic Euler:} \quad u_C = \beta i \left[\int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z,z') \frac{u_{C'}}{\pi'} dz' + \int_{\mathcal{D}(\vec{\mathcal{B}}')} f(z,z') \frac{u_{C^{D'}}}{\pi^{D'}} dz' \right] \tag{13}$$

$$\text{Real Wage:} \quad w = -\frac{u_N}{u_C} \tag{14}$$

$$\text{Household Budget:} \quad C = (1-\tau) z N \tag{15}$$

$$\text{NKPC:} \quad (\pi - \bar{\pi})\pi = \frac{\eta - 1}{\varphi}\left(\frac{w}{z} - 1\right) + \beta \left[\int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z,z') \frac{u_{C'} z' N'}{u_C z N} (\pi' - \bar{\pi})\pi' dz' + \int_{\mathcal{D}(\vec{\mathcal{B}}')} f(z,z') \frac{u_{C^{D'}} z' N^{D'}}{u_C z N} (\pi^{D'} - \bar{\pi})\pi^{D'} dz' \right] \tag{16}$$

$$\text{Interest Rate Rule:} \quad i = \bar{i}\left(\frac{\pi}{\bar{\pi}}\right)^{\alpha_p} \tag{17}$$

Private equilibrium conditions (13)-(15) come from households' optimization problem in Section 3.1.1; equation (16) is from Section 3.1.3, intermediate goods firms' problem that produces the New Keynesian Philips Curve (NKPC); the interest rate rule conducted by the central bank upon repayment (17) is from Section 3.1.6.[28]

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 (13)-(17) are directly related to G—the private allocation stays invariant with the changes in G.

Instead, the private allocation hinges on the default risk.[29] For instance, an increase in sovereign debt issuance, which elevates default risk, expands the set $\mathcal{D}(\vec{\mathcal{B}}')$. Since sovereign default increases inflationary pressure, this expansion leads to higher expected inflation, prompting an increase in the right-hand-side of the NKPC equation (16), which calls for an increase in current inflation. The central bank targets inflation in non-crisis (repayment) periods—it reacts to higher inflation by raising nominal domestic interest rates, depressing aggregate private consumption and output in equilibrium.

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

[29]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 sole channel available for the government to impact private equilibrium is through default risk.

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 $w(z,\vec{\mathcal{B}}')$. The private equilibrium upon default is analogous to (13)-(17)—except that the monetary policy is loose ($\bar{i}$ replaced with $\bar{i}-\Delta$). To save space, I leave the full characterization of the private equilibrium upon default in Appendix D, which is a function of aggregate productivity (as the government cannot issue bonds to lenders), characterized by $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$ and $w^D(z)$.

3.2.2 Bond Price Schedules

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

$$Q_{FC}(z,\vec{\mathcal{B}}') = \frac{1}{1+r^*}\int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z,z')dz' \tag{18}$$

$$Q_{LC}(z,\vec{\mathcal{B}}') = \frac{1}{1+r^*}\int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z,z')\frac{1}{\pi'\Big(z',\vec{\mathbb{B}}(z',\vec{\mathcal{B}}')\Big)}dz' \tag{19}$$

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 $\vec{\mathbb{B}}(z',\vec{\mathcal{B}}')$.[30] 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 escalates inflation π' (due to heightened default risk) and reduces the real value of B'_{LC} ex post.

3.2.3 Equilibrium

I consider a Markov Perfect Equilibrium, where a 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* $\vec{\mathbb{B}}(z,\vec{\mathcal{B}})$, *government value functions* $V(z,\vec{\mathcal{B}},\mathbf{D}_{-1})$, *repayment sets* $\mathcal{R}(\vec{\mathcal{B}})$ *and default sets* $\mathcal{D}(\vec{\mathcal{B}})$, *(ii) 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* $w(z,\vec{\mathcal{B}}')$ *(iii) private equilibrium upon default* $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$ *and* $w^D(z)$ *(iv) bond price schedules* $Q_{FC}(z,\vec{\mathcal{B}}')$ *and* $Q_{LC}(z,\vec{\mathcal{B}}')$, *such that following conditions hold*

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

- *Taking private equilibrium schedules upon repayment* $C(z,\vec{\mathcal{B}}')$, $N(z,\vec{\mathcal{B}}')$, $\pi(z,\vec{\mathcal{B}}')$, $i(z,\vec{\mathcal{B}}')$, $w(z,\vec{\mathcal{B}}')$, *the private equilibrium upon default* $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$, $w^D(z)$, *bond price schedules* $Q_{FC}(z,\vec{\mathcal{B}})$, $Q_{LC}(z,\vec{\mathcal{B}})$, *the policy functions* $\vec{\mathbb{B}}(z,\vec{\mathcal{B}})$ *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.*

- *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 (13)-(17). The private equilibrium upon default* $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$, $w^D(z)$ *satisfy equations (D1)-(D5) in Appendix D. The bond price functions* $Q_{FC}(z,\vec{\mathcal{B}}')$ *and* $Q_{LC}(z,\vec{\mathcal{B}}')$ *satisfy equations (18) and (19).*

3.3 Optimal Currency Denomination

I analyze the optimal currency denomination of sovereign debt by characterizing the tradeoff faced by the government, solving its problem (12) based on three 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 $\alpha_G \to \infty$ in the utility function (1), simplifying it to a function of G only. I start with the following proposition, which establishes the relationship between inflation and default risk:

Proposition 1. *Larger default risk induces higher expected inflation, resulting in higher contemporaneous inflation.*

Proof. See Appendix E. ☐

Proposition 1 illustrates that the government can pursue debasement by manipulating inflation expectations—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 $\vec{\mathcal{B}}' = [B'_{FC}, B'_{LC}]'$:

$$u_G\left[Q_{FC} + \frac{\partial Q_{FC}}{\partial B'_{FC}}B'_{FC} + \frac{\partial Q_{LC}}{\partial B'_{FC}}B'_{LC} + \frac{B_{LC}}{\pi^2}\frac{\partial \pi}{\partial B'_{FC}} + \tau z\frac{\partial N}{\partial B'_{FC}}\right] = \beta_G \int_{\mathcal{R}'} u_{G'} f(z,z')dz' \tag{20}$$

$$u_G\left[Q_{LC} + \frac{\partial Q_{FC}}{\partial B'_{LC}}B'_{FC} + \frac{\partial Q_{LC}}{\partial B'_{LC}}B'_{LC} + \frac{B_{LC}}{\pi^2}\frac{\partial \pi}{\partial B'_{LC}} + \tau z\frac{\partial N}{\partial B'_{LC}}\right] = \beta_G \int_{\mathcal{R}'} \frac{u_{G'}}{\pi'} f(z,z')dz' \tag{21}$$

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 (20) and Q_{LC} in (21), yielding the following equations:

$$u_G\Bigg[1+\overbrace{\frac{\partial Q_{FC}}{\partial B'_{FC}}\frac{B'_{FC}}{Q_{FC}}+\frac{\partial Q_{LC}}{\partial B'_{FC}}\frac{B'_{LC}}{Q_{FC}}+\frac{B_{LC}}{Q_{FC}\pi^2}\frac{\partial \pi}{\partial B'_{FC}}}^{\text{① Bond prices}}+\overbrace{\frac{\tau z}{Q_{FC}}\frac{\partial N}{\partial B'_{FC}}}^{\text{② Output}}\Bigg]=\beta_G(1+r^*)\mathbb{E}[u'_G|\mathcal{R}'] \tag{22}$$

$$u_G\Bigg[1+\overbrace{\frac{\partial Q_{FC}}{\partial B'_{LC}}\frac{B'_{FC}}{Q_{LC}}+\frac{\partial Q_{LC}}{\partial B'_{LC}}\frac{B'_{LC}}{Q_{LC}}+\frac{B_{LC}}{Q_{LC}\pi^2}\frac{\partial \pi}{\partial B'_{LC}}}^{\text{① Bond prices}}+\overbrace{\frac{\tau z}{Q_{LC}}\frac{\partial N}{\partial B'_{LC}}}^{\text{② Output}}\Bigg]$$
$$=\beta_G(1+r^*)\mathbb{E}[u_{G'}|\mathcal{R}']\left(1+\frac{\mathrm{Cov}(u_{G'},\frac{1}{\pi'}|\mathcal{R}')}{\mathbb{E}[\frac{1}{\pi'}|\mathcal{R}']\mathbb{E}[u_{G'}|\mathcal{R}']}\right) \tag{23}$$

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 (23) captures the hedging benefit of local currency debt. If inflation π' tends to increase in a bad state (i.e., high $u_{G'}$ state)—either when the productivity (and hence tax revenue) is low, or when the level of debt (and thus future default risk) is so large that the government cuts its spending, 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 (22)).

Comparing the left-hand-side of (22) and (23) 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 (22) and (23). 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. Escalating 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 escalating inflation.[31]

[31]The central bank conducts inflation targeting as monetary policy as long as default does not occur. See Section

Excessive inflation for debasement is distortionary from an ex-ante point of view. This is because, in equilibrium, foreign lenders anticipate debasement and offer lower bond prices,[32] which offset the benefits of debasement, resulting in excessive inflation only entailing welfare costs from an ex-ante perspective.[33]

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 elevating distortionary inflation to debase debt obligations 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 (22) and (23). Larger debt issuance heightens future default risk, leading to higher expected inflation and, consequently, contemporaneous inflation. Following the inflation-targeting monetary rule upon repayment (10), 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.[34]

To rigorously establish that larger debt issuance results in a decline in aggregate output, I introduce the following assumption, which holds in my quantitative version of the model:[35]

Assumption 1. *An increase in inflation induced by default is much more pronounced relative to the changes in aggregate output, private consumption, and labor supply upon default.*

Assumption 1 implies that, upon default, the loose monetary rule (11) leads to a substantial rise in inflation, whereas other equilibrium variables (private consumption, labor supply and output) exhibit modest responses to default relative to inflation. The subsequent proposition,

3.1.6 for details.

[32]This is observed in (19)—the price of debt in local currency depends on future inflation $\pi'(z', \vec{\mathcal{B}}'')$, which is determined by the policy choice of the next-period government $\vec{\widetilde{\mathbb{B}}}(z', \vec{\mathcal{B}}') \equiv [\widetilde{\mathbb{B}}_{FC}(z', \vec{\mathcal{B}}'), \widetilde{\mathbb{B}}_{LC}(z', \vec{\mathcal{B}}')]'$.

[33]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.

[34]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 induced by default risk. This channel is analogous to a cost-push shock, where aggregate output declines while inflation increases.

[35]In Appendix G, I present the validity of Assumption 1 through the quantitative exercise conducted in Section 4.

under Assumption 1, summarizes the impact of a rise in default-risk-induced (expected) inflation on aggregate output.

Proposition 2. *An escalation of default-risk-induced (expected) inflation depresses aggregate private consumption demand, thereby reducing the equilibrium labor supply and aggregate output.*

Proof. See Appendix E. □

Proposition 2 illustrates that higher default-risk-induced (expected) inflation leads to lower aggregate output. 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}.*

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 and/or low aggregate productivity next period, future governments are more inclined to engage in debasement ex post, escalating inflation π'. In such a case, foreign currency debt, by disciplining ex-post debasement, contains a rise in expectations of distortionary inflation, thereby mitigating a fall in the current-period output.

I take the ratio of two first-order conditions (23) and (22). 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:

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

A relative significance of these two benefits are determined by the shapes of private equilibrium and bond price schedules as functions of foreign and local currency debt as well as aggregate productivity. 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

The core driving force behind debasement in my model is sovereign default risk. I show that, even when the monetary authority commits not to engage in local currency debt debasement—it adheres to the inflation-targeting monetary rule in repayment states—, the fiscal government can still debase local currency debt by manipulating inflation expectations. As sovereign default increases inflationary pressure, a government facing a large stock of local currency liabilities would elevate debt issuance in order to increase (expected) inflation through heightened default risk. Hence, foreign currency debt, immune to debt debasement, offers discipline benefits by containing distortionary debasement. In this context, 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 the monetary authority lacks the ability to commit to refrain from strategic monetary debasement, it resorts to discretionary inflation ex post in order to devalue local currency debt. This leads to an escalation in the cost of local currency borrowing, as foreign lenders anticipate the ex-post optimal inflation choices by the central bank. Debasement is distortionary from an ex-ante point of view, since a rise in borrowing costs offsets the ex-post benefits of monetary debasement—inflation only entails the direct welfare costs. Hence, to mitigate distortions from discretionary inflation, the government opts to borrow relatively more in foreign currency.[36]

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 seeking discretionary inflation for monetary debasement ex post. Additionally, they highlight an

[36] Du et al. (2020) assume a high level of risk aversion among lenders, making borrowing much more expensive in local currency and thus exacerbating distortions originating from discretionary inflation.

additional channel that drives foreign currency borrowing—a lack of commitment to the real exchange rate.[37] 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* through an expectation channel, 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) examine the dynamics of currency denomination under a defaultable committed monetary policy. They find that the existence of an outside option (discretionary inflation) to deviate from the committed monetary rule places constraints on the local currency borrowing. Again, foreign currency borrowing is associated with a discipline benefit, but in this case it originates from a lack of commitment to entirely refrain from discretionary inflation. The key insight is that a larger local currency borrowing makes deviating from the previously committed monetary rule towards discretionary inflation more appealing. Hence, to prevent ex-post deviation—an opportunistic behaviour that is distortionary ex ante—the government tilts its borrowing towards foreign currency. In essence, Engel and Park (2022) delve into the interaction between a *defaultable monetary rule* and the currency denomination of sovereign debt. In contrast, this paper focuses on how *fiscal insolvency* affects debt denomination given that monetary debasement (via discretionary inflation) is fully restrained.

Lastly, my work is closely related to the seminal work by Arellano et al. (2023), who first introduced sovereign default into the New Keynesian framework.[38] The main distinction between this paper and Arellano et al. (2023) lies in the source of inflationary pressure when default occurs. In Arellano et al. (2023), default induces inflationary pressure due to aggregate productivity loss

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

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

upon default, coupled with high substitutability among multiple final goods consumption.[39] Default in Arellano et al. (2023) triggers a decline in aggregate productivity, subsequently resulting in a fall in both home and foreign final goods consumption in equilibrium. This leads to a substantial increase in the marginal utility of both consumption goods, especially when they exhibit strong *substitutability*.[40] The notable rise in marginal utility of consumption indicates that households highly value consumption, implying that aggregate demand for consumption goods remains strong despite a default-induced contraction in aggregate supply resulting from a fall in aggregate productivity. In response to this strong aggregate demand, intermediate goods firms charge higher prices (relative to the economy with low substitutability), exerting inflationary pressure on the economy.[41]

Differently from Arellano et al. (2023), I adopt the loose monetary rule to induce inflationary pressure when default takes place, for the following reasons. On the one hand, default is associated with fiscal distress, making it challenging to assert that the country strictly adheres to inflation-targeting monetary rule during times of fiscal strain.[42] On the other hand, inflation driven by high substitutability between multiple final goods is not the central focus of this paper.[43] Substitutability influences inflation not only during default but also during periods of full debt repayment—regardless of whether debt is fully repaid or not, multiple goods consumption paths determine households' marginal utility of consumption, shaping equilibrium inflation. As this paper primarily concentrates on how default risk, rather than goods substitutability, shapes the currency denomination of sovereign bonds, I simplify the utility function to feature full separability.

4 Quantitative Analysis

I solve the model numerically to assess its quantitative performance on the dynamic patterns of debt compositions by currency and inflation expectations in emerging economies. The model 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

[39]By contrast, my model features only one single final goods, which is either produced using all varieties of domestic intermediate inputs, or imported from abroad.

[40]Absent high substitutability, default-induced aggregate productivity loss generally leads to deflation. See Appendix F for details.

[41]In the main quantitative exercise in Arellano et al. (2023), the elasticity of substitution between home and foreign goods is set to 5 to amplify a rise in marginal utility in consumption upon default, making default inflationary.

[42]Many empirical evidences support this claim—during a crisis, both the monetary authority and the fiscal government typically utilize all available tools to boost/stabilize the economy, diverging from strict adherence to a specific policy rule. See Section 3.1.6 for details.

[43]Also, with multiple final goods, the government can manipulate real exchange rates to engage in debt devaluation, a plausible way to devalue local currency borrowing which however would not be the one I focus this paper on.

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] I evaluate the model's performance against the data and compare implications with alternative model specifications.

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 model with key characteristics of Colombian data. The mean and standard deviation moments of data in Table 5 are esimated 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 one-time utility loss as well as exclusion from international financial markets. Following Bianchi et al. (2018), one-time utility loss $U^D(z)$ is characterized by:

$$U^D(z) = d_0 + d_1 \log(z)$$

In my quantitative model, 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 extend my model to 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.

[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	0.85	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	0.0417	6-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)
Parameters from moment matching			
β	Private discount factor	0.9994	Average nominal domestic interest rate
β_G	Government discount factor	0.9618	Average external debt to GDP ratio
α_G	Weight G in the utility function	0.58	Average G to GDP ratio
Δ	Loose monetary policy upon default	0.17	Average inflation
d_0	Default utility loss	0.9535	Average 5-year FC debt spread
d_1	Default utility loss	1.5	Standard deviation of 5-year FC debt spread

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 $\sigma_{\mathbf{v}}$ and $\rho_{\mathbf{v}}$.

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 0.85, 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 $\iota = 4.16\%$, corresponding to an expected exclusion period of about 6 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. Finally, the model incorporates taste shocks $\mathbf{v}$ that influence the relative values of repayment and default. These shocks are integrated into the computational technique following Dvorkin et al. (2021) and Gordon (2019). These taste shocks introduce subtle perturbations to the portfolio and default-repayment choices, enhancing model convergence, especially in models featuring two distinct long-term defaultable bonds. Characterized by two parameters, $\rho_{\mathbf{v}}$ and $\sigma_{\mathbf{v}}$, I choose a low enough value of $\sigma_{\mathbf{v}}$ that guarantees the convergence of the model, 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 K, including the algorithm for the computation and simulation of the model. In Appendix I, I carry out a sensitivity analysis with respect to the taste shock $\mathbf{v}$ and show that variations in $\mathbf{v}$ have negligible effects on the primary moments in the model.

The second set of parameters, outlined at the bottom of Table 4, is chosen to match specific moments observed in the Colombian economy. These six 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, and the degree of loose monetary rule upon default Δ. The moments targeted for calibration encompass the average values of nominal domestic interest rates, external debt to GDP ratio, public spending to GDP ratio, inflation, 5-year foreign currency (FC) bond spread, and the standard deviation of 5-year foreign currency debt spread.

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 my baseline specification.[46] Evidently, the matching exercise is highly successful. The targeted moments

[46] The results remain robust to different specifications of the cost of default. In Appendix H, I report the simulated moments adopting aggregate productivity loss instead of one-time utility loss as the default penalty. With a

Table 5: Cyclicality, Data, and Models

Targeted Moment (annualized)	Data	Baseline	NK-Ortho	NK-LC
Mean				
Nominal domestic interest rate (%)	4.26	4.27	3.24	5.27
External debt to GDP ratio (%)	18.4	18.4	21.8	18.0
G to GDP ratio (%)	29.8	29.3	29.3	29.2
5-year FC debt spread (%)	1.39	1.39	0.78	-
Inflation (%)	3.61	3.63	3.00	4.19
Standard deviation				
Spread of FC debt σ_{FC} (%)	0.42	0.42	0.15	-
Untargeted Moment (annualized)				
Mean				
FC debt share in external borrowing (%)	78.75	78.92	42.18	-
Spread of 5-year LC debt (%)	4.66	4.98	3.77	6.49
Standard deviation				
Spread of LC debt σ_{LC} (%)	0.91	0.76	0.50	3.91
σ_{FC}/σ_{LC}	0.46	0.55	0.31	-
Inflation (%)	1.81	2.78	1.82	5.45
Correlation with expected inflation				
FC debt share	0.198	0.190	-0.471	-
5-year FC debt spread (CDS spread)	0.621	0.840	0.095	-
Relative cost of borrowing (LC over FC)	0.779	0.776	0.999	-

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 examine how discipline and hedging benefits shape the currency denomination, I focus on the correlation between FC debt share and inflation expectations abstracted from the taste shocks.

in my baseline closely match the data. Untargeted moments also match the data very well. The share of FC borrowing accounts for 78.92% in the model, 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. However, the model overestimates the volatility of inflation.

The performance of the correlation with expected inflation is notably strong in my baseline. The model overestimates the correlation between expected inflation and (ii) CDS spread in comparison to data, as default risk is the main driver of inflation in the model.[47] The correlations between inflation expectations and (i) FC debt share, as well as (iii) relative cost of borrowing in

reasonable parameterization, this alternative specification generates moments that are close to the baseline.

[47] In practice, inflation expectations are also affected by global shocks and monetary shocks, thereby lowering the correlation between expected inflation and default risk, factors which are not considered in the model.

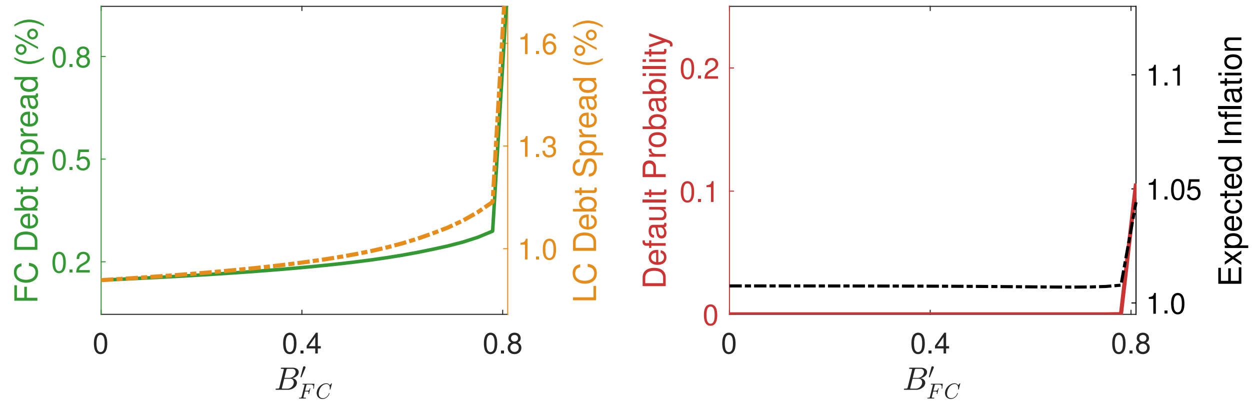

Figure 2: Bond spreads, default probability, and expected inflation varying B'_{FC}, given $B'_{LC} = 0$

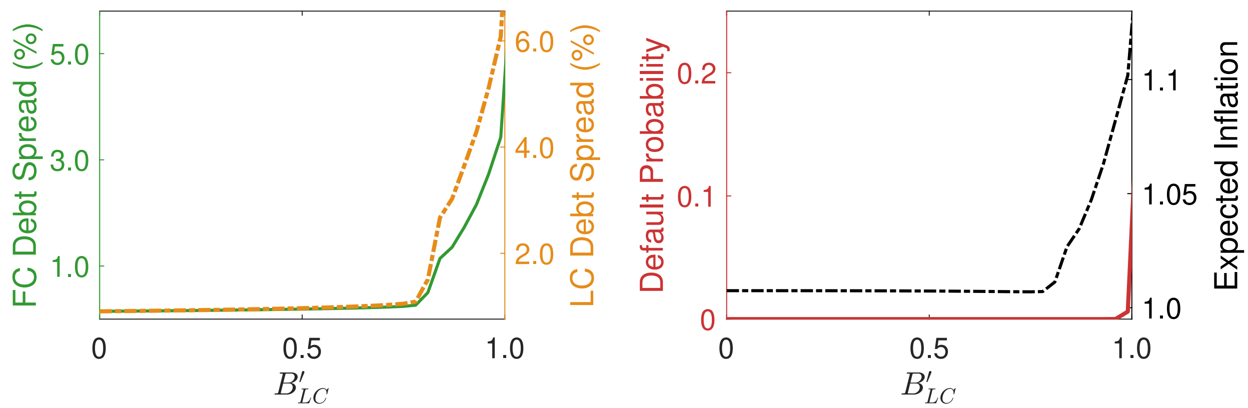

Figure 3: Bond spreads, default probability, and expected inflation varying B'_{LC}, given $B'_{FC} = 0$

LC over FC in baseline are very 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. First, I highlight the dynamics of bond spreads, default risk, and expected inflation 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 expected inflation. 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 wellknown 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 both 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 spread 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 dahsed black line, right Y-axis) and the probability of defaulting next period (a red solid line, left Y-axis) varying B'_{FC}. The immunity to debasement, a characteristic of FC debt, deters the next-period government from inducing distortionary inflation, a strategic move typically employed for local currency 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 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, 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 a hedge against default risk—default risk lowers local currency debt burden, as inflation is positively associated with default (risk).[48] 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.

[48]Local currency debt also provides an insurance against negative aggregate productivity shock, which leads to an increase in marginal costs, thereby a rise in inflation.

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 $B'_{LC} = 0.75$). The rise in spreads is largely driven by the anticipated escalation of 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.[49]

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 0.3% and 1.2%. 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 3% and 6% 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 escalation of 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 J, I present the impact of debt issuance on aggregate output considering distinct currency denominations. I find that substantial issuance of debt, regardless of its currency denomination, results in a decline in aggregate output due to a rise in expected inflation induced by future default risk.[50] However, when comparing the issuance

[49]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.

[50]An increase in inflation expectations due to default risk leads to a rise in inflation, which calls for a rise in nominal domestic interest rates, leading to a fall in private consumption and aggregate output. See Proposition 2

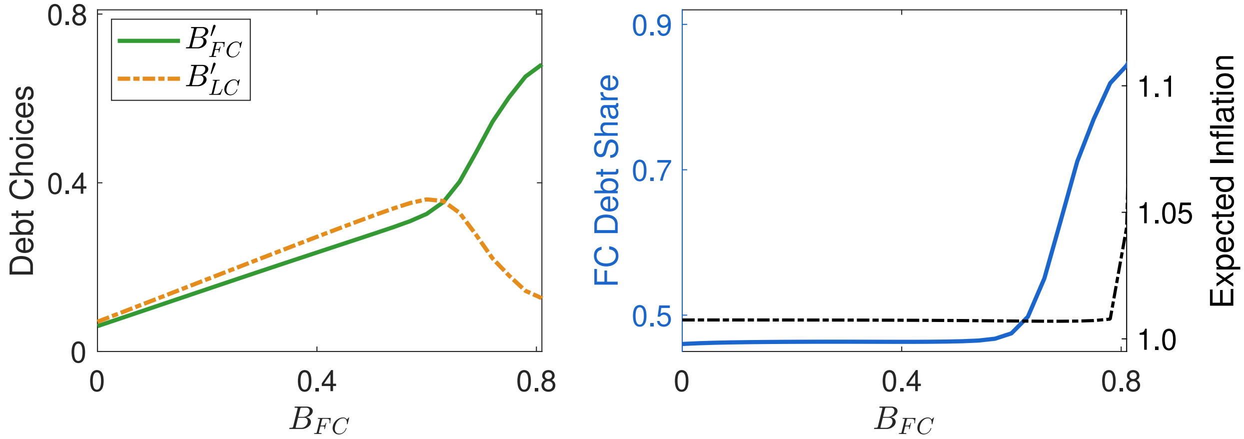

Figure 4: Choice of debt issuance, the share of FC borrowing, and expected inflation

Notes: The left panel of the figure illustrates the optimal FC and LC borrowing for different levels of B_{FC}, taking $B_{LC} = 0$ as given. As FC and LC debt choices become a distribution with the presence of the taste shock, on the left panel I plot the mean of FC and LC debt choices, for each value of B_{FC}. The FC debt share on the right panel is computed by dividing the mean of FC borrowing by the mean of total external borrowing.

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. In essence, local currency borrowing tends to elevate expected inflation to a greater extent (due to anticipations of debt debasement), leading to a more substantial decline in aggregate output, as outlined in Corollary 1. 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 vary B_{FC}. As before, the aggregate productivity remains at its mean value. In the left panel, the green solid and orange dashed lines represent, respectively, the sovereign's FC and LC debt choices for different levels of B_{FC}. Notably, with a larger outstanding debt stock, the government tilts its borrowing towards foreign currency. This trend is further highlighted in the right panel of Figure 4 by the blue solid line (left Y-axis)—the share of FC borrowing increases with larger B_{FC}. The government values discipline benefits much more with higher levels of inherited liabilities, as future governments are more likely to engage in debt debasement and thus generate the associated distortions. Hence, the government tilts its borrowing towards foreign currency to avoid these distortions, albeit at the cost of forfeiting the hedge against consumption fluctuations offered by local currency debt.

Indeed, foreign currency debt provides discipline benefits due to the government's inability to commit to refrain from local currency debt debasement. The black dashed line in the right panel of Figure 3 (right Y-axis) shows that, expected inflation generally remains moderate for

for details.

B_{FC} in the region $[0.0, 0.78]$, as the government optimally resorts to foreign currency debt to contain debt debasement. For B_{FC} larger than 0.78, the expected inflation starts to increase, mainly due to default risk next period rather than expectations of debt debasement.

4.3 Decomposition and Experiments

In my baseline calibration, I use the New Keynesian framework with sovereign default to study the currency composition of sovereign debt in Colombia and the associated tradeoffs between foreign and local currency debt. In this subsection, I redirect the focus to the core experiment of the paper, where I decompose and extract a portion of the FC borrowing share attributed to the discipline benefits of foreign currency debt. Subsequently, I elaborate on how these discipline benefits contribute to shaping the correlation between the currency denomination of sovereign debt and expected inflation. Finally, I briefly illustrate welfare gains from the optimal debt denomination.

4.3.1 Orthogonality between Inflation and Default

To start, I employ an alternative model specification where the government loses the ability to induce distortionary inflation for debasement. In this setup, the government no longer needs to resort to foreign currency borrowing for disciplining purposes. To render debasement infeasible, I make default *orthogonal* to inflation by imposing $\Delta = 0$.[51] I denote this alternative specification as the *NK-Ortho* model—the third column of Table 5 reports the corresponding simulation results.

First, bond spreads in NK-Ortho specification are lower than those in baseline. Notably, the spread in LC debt falls more than that in FC debt, as the government is unable to engage in local currency debt debasement. Lower cost of borrowing improves debt sustainability—external debt-to-GDP ratio on the second row increases from 18.4% (baseline) to 21.8% (NK-Ortho). Moreover, the average inflation and its standard deviation are markedly lower than the baseline, as inflation depends only on aggregate productivity rather than default risk under the NK-Ortho specification.

Remarkably, the proportion of FC debt is significantly lower under the NK-Ortho specification relative to the baseline. The disparity in the share of FC borrowing amounts to $78.92 - 42.18 \approx 37$ 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 37 percentage points of FC borrowing share in baseline is directly attributed to the discipline benefits of foreign

[51] This corresponds to the case where default leads to the utility loss only—the monetary rule always follows (10). In this case, local currency debt hedges against aggregate productivity fluctuations, but not against default risk.

currency debt—benefits that no longer exist in the NK-Ortho specification.

Lastly, the NK-Ortho model features a negative correlation between the share of FC borrowing and inflation expectations: when LC debt provides a higher degree of hedging benefits (i.e., higher expected inflation), the government opts to borrow relatively more in LC. This stands in sharp contrast to the baseline, where a positive correlation exists between the proportion of FC borrowing and inflation expectations—the government tilts its borrowing towards FC when LC borrowing provides a greater degree of hedging.

In baseline, the positive correlation emerges due to a perverse incentive problem of debt in local currency—the government can debase local currency obligations by manipulating inflation expectations ex post. To discipline distortionary debasement, the government tilts its borrowing towards foreign currency, especially during periods when it highly values hedging benefits offered by local currency debt. By contrast, under the NK-Ortho specification, the government loses the ability to engage in debt debasement, and therefore it no longer demands foreign currency debt for disciplining purposes. The government, as a result, seeks larger amounts of borrowing in local currency, especially during economic downturns (i.e. high expected inflation) due to its hedging properties. This crucial distinction explains the opposite sign of the correlation between the baseline and the NK-Ortho model.

4.3.2 Welfare Gains from the Optimal Denomination

The paper has shown that debt in foreign currency functions as a mechanism to discipline distortionary debasement, reducing the ex-ante borrowing costs and mitigating the output loss caused by anticipations of debt debasement. Here, I quantify the welfare gain from the optimal currency denomination, by conducting the last experiment of the model specification wherein debt denomination is only in 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 (18.4% in baseline vs. 18.0% in NK-LC)—among all model specifications, the average debt-to-GDP ratio is the lowest in NK-LC. Inflation volatility is also at its peak, as governments actively generate distortionary inflation for debasement. I find that, if the government is constrained from issuing foreign currency debt, the default frequency rises from 1.36% in baseline to 2.25% in NK-LC model. Indeed, LC debt exhibits characteristics similar to *long-term* debt; its value can be diminished triggered by the issuance of new debt—issuing new debt reduces the value of existing LC debt because it elevates the probability of default, raising expected inflation and, consequently, contemporaneous inflation. By contrast, FC debt is analogous to *short-term* debt, as its value remains immune to inflation.

I compute the welfare gains of optimal currency denomination at the mean level of productivity and zero debt, relative to the NK-LC model. The gain in consumption equivalence terms in my baseline, relative to the NK-LC model, amounts to 0.05%.[52] As is customary in the business cycle literature, the welfare differences are small across models.

5 Conclusion

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

I develop a New Keynesian model with sovereign default to study how default risk shapes the currency denomination of sovereign debt. I show that, while the inflation-targeting monetary policy in repayment periods effectively eliminates local currency debt debasement by the central bank, the fiscal government can engage in debasement by manipulating expected inflation, through debt issuance and default policies. Foreign currency debt is therefore appealing, as it enforces discipline on distortionary debasement. In contrast, local currency debt offers hedges against aggregate productivity and default risk. The decision regarding the currency denomination of debt is determined by the relative significance of discipline benefits of foreign currency debt and hedging benefits of local currency debt. Calibration results indicate that the model effectively captures three key stylized facts highlighted at the beginning. My model also suggests that discipline benefits of foreign currency debt are the main factor driving (i) a substantial share of debt in foreign currency (around 37 percentage points) and (ii) a higher share of debt in foreign currency when expected inflation rises. The result highlights the importance of improving fiscal solvency to facilitate local currency borrowing from abroad.

Finally, this paper introduces a framework that integrates two crucial aspects of policy in emerging economies—the central bank pursues inflation stability during non-crisis periods and sovereign default increases inflationary pressure. It offers a structured approach to study the tradeoffs that a government with the limited commitment faces under an inflation-targeting monetary rule in non-crisis times. This framework can be further extended to explore optimal monetary policy, 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.

[52] I derive consumption equivalent C_E from household welfare V_E, as $V_E = \log(C_E)/(1-\beta)$.

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A Expected Inflation and Inflation Targeting Year

I take the medium institutional forecast values of expected inflation obtained from Bloomberg. 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 plots the share of foreign currency borrowing in total external borrowing and expected inflation over the periods when inflation targeting has been 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

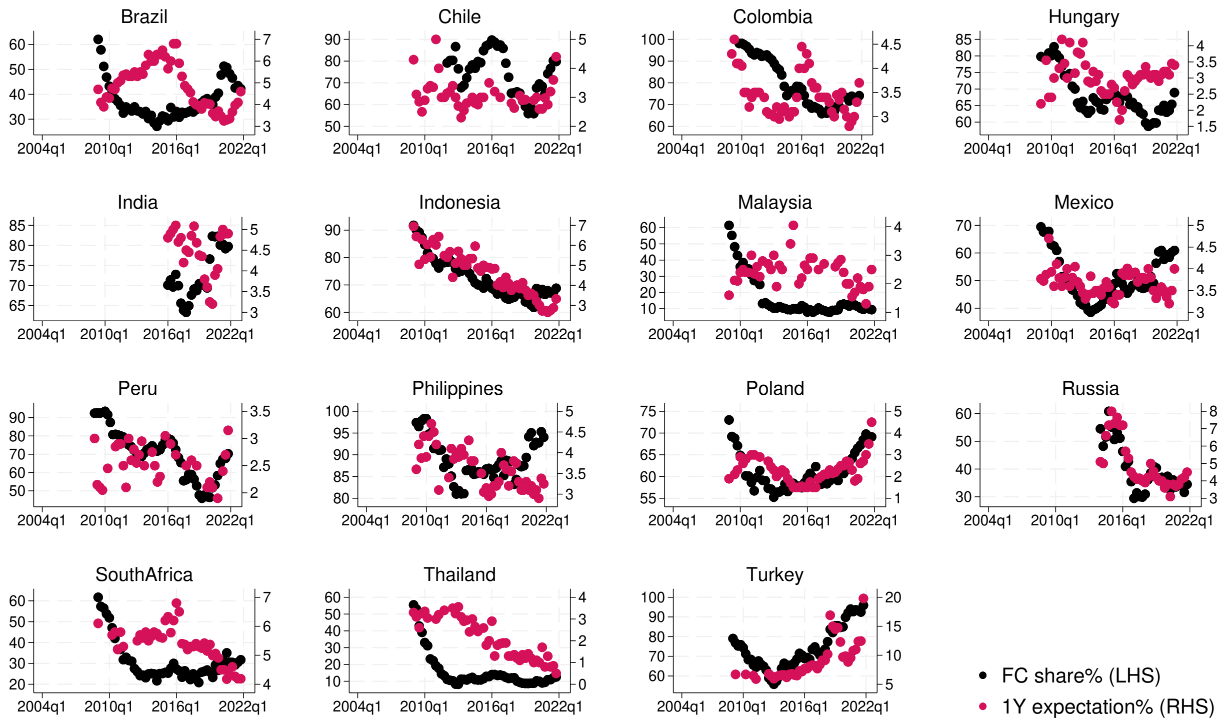

Figure A1: The Share of Foreign Currency Borrowing and Expected Inflation

B Additional Tables

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

	The Growth of FC Debt Stock over LC Debt Stock $\Delta F_{it}\% - \Delta D_{it}\%$	
	(1)	(2)
$\Delta \mathbb{E}_t[\pi_{i,t+4}]$ (%)	2.819***	2.852***
	(0.672)	(0.661)
ΔInflation (%)	0.0623	0.103
	(0.291)	(0.291)
ΔReal Exchange Rate Depreciation (%)		-0.0447
		(0.0380)
ΔReal GDP Growth Rates (%)		-0.00962
		(0.108)
External Sovereign Debt to GDP (%)		0.0556
		(0.0557)
Capital Openness		-0.736
		(0.556)
Private Credit to GDP (%)		0.0336
		(0.0372)
Observations	577	577
R-squared	0.434	0.440

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)
$\mathbb{E}_t[\pi_{i,t+4}]$ (%)	2.332***	2.040***	1.289***	1.227***
	(0.403)	(0.389)	(0.344)	(0.349)
Inflation (%)	-0.204	-0.0904	-0.299	-0.220
	(0.199)	(0.198)	(0.187)	(0.181)
Real Exchange Rate Depreciation (%)		-0.0714*		-0.0176
		(0.0371)		(0.0382)
Real GDP Growth Rates (%)		-0.173		-0.241
		(0.188)		(0.170)
External Sovereign Debt to GDP (%)		-0.358***		-0.506***
		(0.0810)		(0.0816)
Capital Openness		-0.725		2.645***
		(0.756)		(0.675)
Private Credit to GDP (%)		-0.0787		-0.0312
		(0.0576)		(0.0525)
Observations	521	521	521	521
R-squared	0.952	0.956	0.953	0.961

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 Inflation Expectations, Controlling Global Factors

	FC Debt Share $FCshare$ (%)		
	(1)	(2)	(3)
$\mathbb{E}_t[\pi_{i,t+4}]$ (%)	2.081***	1.487***	1.535***
	(0.575)	(0.475)	(0.417)
Inflation (%)	0.310	0.708***	0.551***
	(0.299)	(0.241)	(0.209)
Real Exchange Rate Depreciation (%)		-0.0253	0.0309
		(0.0420)	(0.0341)
Real GDP Growth Rates (%)		-0.270***	0.142
		(0.0879)	(0.109)
External Sovereign Debt to GDP (%)		-0.215**	-0.237***
		(0.0907)	(0.0641)
Capital Openness		0.602	-0.177
		(0.778)	(0.686)
Private Credit to GDP (%)		-0.410***	-0.183***
		(0.0606)	(0.0529)
US GDP Growth Rates (%)			-0.619***
			(0.206)
log VIX			8.394***
			(0.998)
US 10-year treasury (%)			2.468***
			(0.489)
Federal Fund Rate (%)			-2.343***
			(0.369)
Observations	639	639	639
R-squared	0.883	0.903	0.927
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: FC Debt Share and Inflation Expectations for Shorter Time Horizons

	FC Debt Share $FCshare$ (%)		
	(1)	(2)	(3)
$\mathbb{E}_t[\pi_{i,t+1}]$ (one quarter ahead, %)	1.141**		
	(0.460)		
$\mathbb{E}_t[\pi_{i,t+2}]$ (six months ahead, %)		1.053**	
		(0.416)	
$\mathbb{E}_t[\pi_{i,t+4}]$ (one year ahead, %)			1.739***
			(0.365)
Inflation (%)	0.0590	0.280	0.270
	(0.424)	(0.318)	(0.184)
Real Exchange Rate Depreciation (%)	-0.0490	-0.0542	-0.0907**
	(0.0397)	(0.0400)	(0.0386)
Real GDP Growth Rates (%)	0.0855	0.0619	0.0319
	(0.116)	(0.116)	(0.119)
External Sovereign Debt to GDP (%)	-0.344***	-0.342***	-0.299***
	(0.0656)	(0.0657)	(0.0675)
Capital Openness	-1.445**	-1.358*	-1.007
	(0.720)	(0.708)	(0.711)
Private Credit to GDP (%)	-0.0561	-0.0481	-0.0976**
	(0.0421)	(0.0412)	(0.0411)
Observations	702	697	639
R-squared	0.942	0.943	0.947

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 share of FC debt in total public external debt.

Table B5: Inflation Expectations and CDS Spreads, Excluding the Covid-19 Pandemic

	Expected Inflation $\mathbb{E}_t[\pi_{i,t+4}]$ (%)	
	(1)	(2)
$CDS_{\$,it}$ (%)	0.349***	0.523***
	(0.0814)	(0.0981)
Inflation (%)	0.284***	0.272***
	(0.0361)	(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	0.880	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 B6: Inflation Expectations and CDS Spreads, Controlling Global Factors

	Expected Inflation $\mathbb{E}_t[\pi_{i,t+4}]$ (%)		
	(1)	(2)	(3)
$CDS_{\$,it}$ (%)	0.221***	0.274***	0.330***
	(0.0504)	(0.0555)	(0.0589)
Inflation (%)	0.322***	0.310***	0.309***
	(0.0356)	(0.0350)	(0.0337)
Real Exchange Rate Depreciation (%)		0.00113	-0.000267
		(0.00487)	(0.00479)
Real GDP Growth Rates (%)		0.00684	0.00356
		(0.00717)	(0.0106)
External Sovereign Debt to GDP (%)		-0.0237***	-0.0263***
		(0.00733)	(0.00719)
Capital Openness		-0.142	-0.111
		(0.0884)	(0.0827)
Private Credit to GDP (%)		-0.00763	-0.00510
		(0.00504)	(0.00538)
US GDP Growth Rates (%)			-0.0163
			(0.0186)
log VIX			-0.342***
			(0.0899)
US 10-year treasury (%)			0.121***
			(0.0467)
Federal Fund Rate (%)			0.0552
			(0.0480)
Observations	643	643	643
R-squared	0.867	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 B7: 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)
$\Delta CDS_{\$,it}(\%)$ (%)	0.249*	0.267**
	(0.130)	(0.126)
ΔInflation (%)	0.168**	0.162**
	(0.0704)	(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	0.264	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 B8: 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)
$\mathbb{E}_t[\pi_{i,t+4}]$ (%)	0.462***	0.523***
	(0.0785)	(0.0748)
Inflation (%)	0.154***	0.101***
	(0.0287)	(0.0278)
Real Exchange Rate Depreciation (%)		0.00871
		(0.00716)
Real GDP Growth Rates (%)		0.00689
		(0.0250)
External Sovereign Debt to GDP (%)		0.0315***
		(0.0103)
Capital Openness		0.102
		(0.148)
Private Credit to GDP (%)		0.0504***
		(0.0104)
Observations	517	517
R-squared	0.881	0.898

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 B9: 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)
$\mathbb{E}_t[\pi_{i,t+4}]$ (%)	0.540***	0.578***	0.567***
	(0.0654)	(0.0641)	(0.0693)
Inflation (%)	0.103***	0.0981***	0.0819***
	(0.0268)	(0.0256)	(0.0255)
Real Exchange Rate Depreciation (%)		0.0180***	0.0212***
		(0.00650)	(0.00639)
Real GDP Growth Rates (%)		0.00640	-0.00439
		(0.0105)	(0.0168)
External Sovereign Debt to GDP (%)		0.0354***	0.0309***
		(0.0110)	(0.00998)
Capital Openness		0.288**	0.221*
		(0.138)	(0.132)
Private Credit to GDP (%)		0.0115*	0.0247***
		(0.00642)	(0.00772)
US GDP Growth Rates (%)			0.0490
			(0.0398)
log VIX			0.376***
			(0.135)
US 10-year treasury (%)			0.197***
			(0.0714)
Federal Fund Rate (%)			-0.297***
			(0.0625)
Observations	583	583	583
R-squared	0.849	0.858	0.869
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.

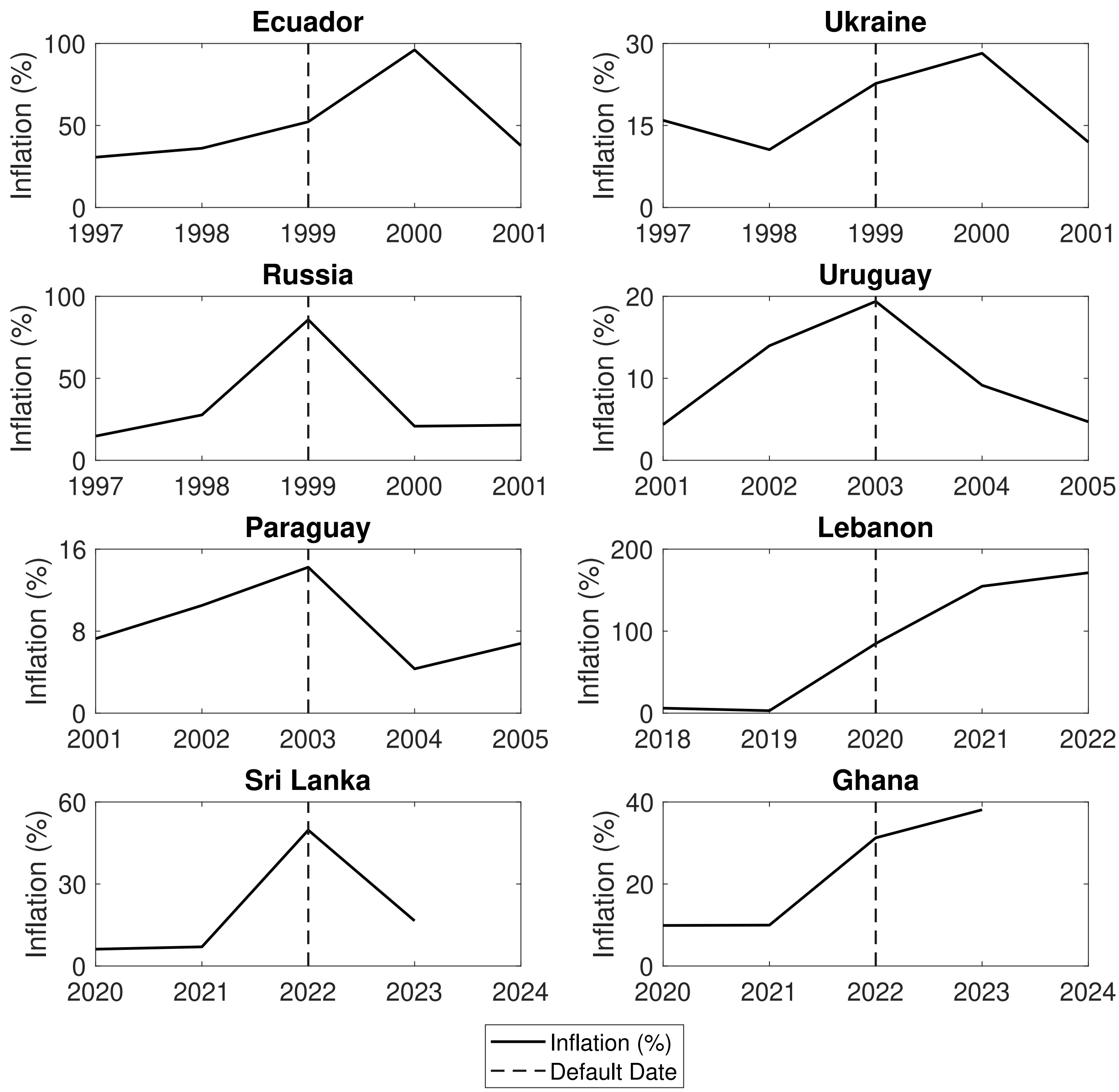

Figure C1: 8 sovereign default events and inflation

D Private Equilibrium upon Default

If the government either has already defaulted in the past ($\mathbf{D}_{-1} = 1$), or decides to default in the current period ($D = 1$), the private allocation is featured by the following equations. Similar to the full repayment case in Section 3.2.1, there are 5 unknowns and 5 equations.

$$\text{Domestic Euler:} \quad u_{C^D} = \beta i \int_{z'} f(z, z') \frac{u_{C^{D'}}}{\pi^{D'}} dz' \tag{D1}$$

$$\text{Real Wage:} \quad w^D = -\frac{u_{N^D}}{u_{C^D}} \tag{D2}$$

$$\text{Household BC:} \quad C^D = (1 - \tau) z N^D \tag{D3}$$

$$\text{NKPC:} \quad (\pi^D - \bar{\pi})\pi = \frac{\eta - 1}{\varphi}\left(\frac{w^D}{z} - 1\right) + \beta \int_{z'} f(z, z') \frac{u_{C^{D'}} z' N^{D'}}{u_{C^D} z N^D} (\pi^{D'} - \bar{\pi}) \pi^{D'} dz' \tag{D4}$$

$$\text{Interest rate rule:} \quad i^D = (\bar{i} - \Delta)\left(\frac{\pi^D}{\bar{\pi}}\right)^{\alpha_p} \tag{D5}$$

The main difference between private equilibrium in a state of repayment and default is colored in red in the preceding set of equations—the monetary policy is loose.

E Default, Inflation, and Output

In this section, I provide 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 E1. I posit that, in period 1, default occurs with probability p^D, followed by an economic recovery to the steady state with full repayment from period 2 onwards. 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.

I log-linearize relevant variables—$\hat{x}_0$ represents the log-linearized variable x around the steady state $\bar{x}$ in period 0; $\hat{x}_1^D$ denotes a percentage deviation from the steady state of variable x when default occurs in period 1. For all periods, the productivity remains at $\bar{z}$. Hence, $\hat{z}_t = 0$ for $t \geq 0$. Moreover, the economy enters the steady state from period 2, and therefore $\hat{\pi}_t = 0$ for $t \geq 2$. In period 1, default may occur, and it increases inflationary pressure due to the loose monetary rule specified in (11)—adopting the loose rule leads to higher aggregate consumption and inflation relative to a scenario following the rule (10), i.e., $\hat{C}_1^D > 0$ and $\hat{\pi}_1^D > 0$. Following

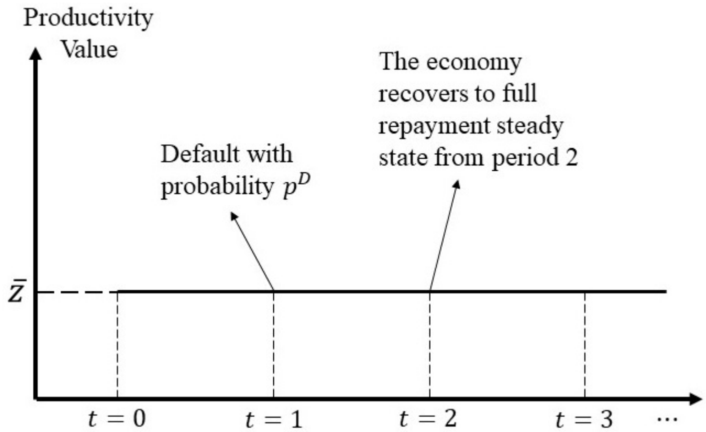

Figure E1: Aggregate productivity paths

the period-0 log-linearization results in Appendix E.1, I can show that

$$\hat{\pi}_0 = p^D \left[\frac{\beta + \chi}{1 + \alpha_P \chi} \hat{\pi}_1^D + \frac{\chi}{1 + \alpha_P \chi} \hat{C}_1^D \right] \tag{E1}$$

$$\hat{C}_0 = -\frac{p^D}{1 + \alpha_P \chi} \left[(\alpha_P \beta - 1) \hat{\pi}_1^D - \hat{C}_1^D \right] \tag{E2}$$

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

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

Equation (E1) 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 1.

Now I prove Proposition 2. To show that C_0 falls with higher default risk, consistent with Assumption 1, I introduce the condition $\hat{\pi}_1^D \gg \hat{C}_1^D$. Equation (E2) then indicates that, with $\alpha_P \beta - 1 > 0$, higher default risk 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 $\partial \hat{N}_0 / \partial p^D < 0$.

E.1 Log-linearization

I present the log-linearization results for Figure E1 in period 0:

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

F Default, Productivity Loss, and Inflation

In this section, I specify how default increases inflationary pressure in Arellano et al. (2023). There are three key differences between this paper and Arellano et al. (2023). First, default in Arellano et al. (2023) results in aggregate productivity loss, whereas in my model, it leads to a one-time direct utility loss. Second, the monetary authority consistently targets inflation in Arellano et al. (2023)—Δ is equal to zero in (11). Throughout this section, to illustrate the novel mechanism in Arellano et al. (2023), I assume that default leads to aggregate productivity loss (from z to z^D) instead of a one-time utility loss, and the interest rate rule always follows (10).

Lastly, differently from Arellano et al. (2023), my model features one single final good only but with two distinct types of consumption.[53] Nevertheless, extending my model by introducing non-separability between private and public consumption will be instructive enough to capture the key factor that drives inflation in their seminal work. The high substitutability between home and foreign goods consumption—the essential ingredient for generating inflationary pressure upon default in Arellano et al. (2023)—can be analogously represented in my model through a high elasticity of substitution between private and public consumption.[54] In Appendix F.1, I first conduct an analysis where default causes productivity loss and the utility function is fully separable. In Appendix F.2, I show that strong substitutability is necessary to generate inflationary default when default occurs, absent the loose monetary policy.

[53]This single-good setting eliminates the possibility of the sovereign manipulating the real exchange rate to reduce local currency debt obligation.

[54]Assuming multiple final goods does not alter the main analytical results.

F.1 Default with Full Separability

In this subsection, I conduct the analysis assuming that the utility function is fully separable—it follows (1). I begin with the following assumption.

Assumption F1. *Default takes place when z is low.*

This assumption, valid in quantitative sovereign default models, implies that it is sufficient to compare equilibrium inflation in repayment and default scenarios for low productivity z.

I compare inflation under two scenarios: full debt repayment over the periods, and default in period 0 by the government. For the sake of tractability, I employ a deterministic version of the model that excludes any uncertainty. The aggregate productivity upon repayment follows the path $\{z_t\}_{t=0}^{\infty}$, depicted with a solid line in Figure F1. At time 0, the economy faces low productivity, and gradually recovers to its steady state—from period 2 onward, productivity stays at the steady state $\bar{z}$ forever. Although this example does not account for any uncertainty or/and fluctuations in productivity beyond period 2, the path of z captures the primary characteristic of AR(1) process[55] during an economic downturn—over the periods, given that z follows AR(1) process, the economy gradually rebounds from a recession and fluctuates around the unconditional mean of the random variable z.

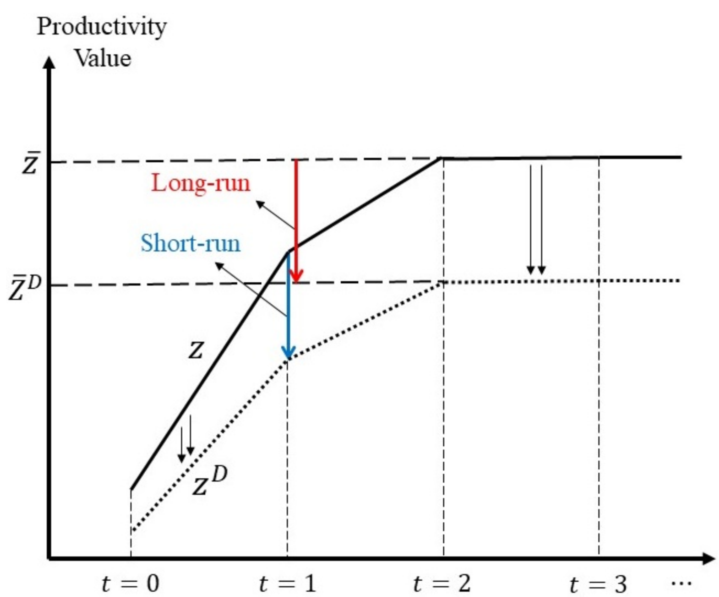

Figure F1: Aggregate productivity paths, and short-run and long-run components in (F5).

Default leads to productivity loss, that is analogous to negative permanent productivity shocks, as illustrated by the dotted line in Figure F1. The corresponding steady-state value of

[55] z in my quantitative model follows AR(1) process.

productivity declines from $\bar{z}$ to $\bar{z}^D$. For the sake of simplicity, I assume the relative risk aversion γ and inflation target $\bar{\pi}$ both equal to one in the following analysis. I log-linearize all relevant variables, under full repayment and default scenarios, respectively. A detailed log-linearization characterization is provided in Appendix F.3. Following the log-linearization, I can show that, upon repayment:

$$\hat{\pi}_1 = -\frac{\chi}{1+\alpha_P\chi}\hat{z}_1 \tag{F1}$$

$$\hat{\pi}_0 = -\frac{\chi}{1+\alpha_P\chi}\hat{z}_0 + \frac{\beta-(\alpha_P-1)\chi}{1+\alpha_P\chi}\hat{\pi}_1 \tag{F2}$$

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

If default took place in period 0, the log-linearization results are:

$$\hat{\pi}_1^D = -\frac{\chi}{1+\alpha_P\chi}\hat{z}_1^D \tag{F3}$$

$$\hat{\pi}_0^D = -\frac{\chi}{1+\alpha_P\chi}\hat{z}_0^D + \frac{\beta-(\alpha_P-1)\chi}{1+\alpha_P\chi}\hat{\pi}_1^D \tag{F4}$$

Here, $\hat{x}_t$ ($\hat{x}_t^D$) represents the log-linearized variable x (x^D) around the steady state $\bar{x}$ ($\bar{x}^D$) in period t (e.g., $\hat{z}_0 \equiv (z_0-\bar{z})/\bar{z}$ denotes the log-linearized productivity around steady state $\bar{z}$ in period 0). Note that, regardless of whether the government defaulted or not, from period 2, the economy stays at steady state indefinitely hence $\hat{\pi}_t = \hat{z}_t = 0$ and $\hat{\pi}_t^D = \hat{z}_t^D = 0$ for $t \geq 2$. In either scenario, period-1 inflation is higher than the steady state inflation, due to higher marginal costs driven by low productivity relative to steady-state productivity ($\hat{z}_1 < 0$ and $\hat{z}_1^D < 0$). Inflation in period 0 is the highest among all periods, which is jointly determined by the lowest period-0 productivity and period-1 inflation.

Default results in a permanent productivity loss, which may impact inflation in both period 0 and 1. The change in equilibrium inflation after default $\pi_t^D - \pi_t$ can be decomposed into two components—short-run and long-run. In what follows, I use period 1 as the reference time point. Note that default leads to a drop in both short-run (period-1) and long-run (period-2 onwards) productivity. Assuming the long-run productivity remains unchanged, default-induced productivity loss imposes inflationary pressure as the degree of deviation $|\frac{z_1^D-\bar{z}}{\bar{z}}|$ enlarges relative to $|\hat{z}_1| = |\frac{z_1-\bar{z}}{\bar{z}}|$. This is illustrated with the blue arrow in Figure F1, representing the positive short-run component in equation (F5) below:

$$\hat{\pi}_1^D - \hat{\pi}_1 = -\frac{\chi}{1+\alpha_P\chi}(\hat{z}_1^D - \hat{z}_1) = \frac{\chi}{1+\alpha_P\chi}\Bigg[\overbrace{\hat{z}_1 - \left(\frac{z_1^D-\bar{z}}{\bar{z}}\right)}^{\text{short-run, }>0} + \overbrace{\left(\frac{z_1^D-\bar{z}}{\bar{z}} - \hat{z}_1^D\right)}^{\text{long-run, }<0}\Bigg] \tag{F5}$$

However, default causes a productivity loss not only in period 1 but also in period 2 onwards—$\bar{z}$ decreases to $\bar{z}^D$, imposing deflationary pressure on the economy. A decline in steady-state productivity reduces deviation, as illustrated with the red arrow in Figure F1 and equation (F5). Whether default causes more inflation or not depends on the relative significance between these two components.

Proposition F1. *If default-induced productivity loss results in larger drop in the steady-state (long-run) value of productivity, relative to the fall in (short-run) productivity value during an economic downturn, default is deflationary.*

When long-run productivity falls more than short-run one, the degree of log-deviation decreases, causing deflation. For example, upon repayment, the steady state productivity can be 100 while the productivity in a downturn is 80. In such a case, a log-deviation is equal to $(80-100)/100 = -20\%$. If default leads to a more significant decline in steady-state productivity (from 100 to 80) relative to short-run one (from 80 to 75), the degree of log-deviation (in absolute terms) gets smaller, equal to $(75-80)/80 = -6.25\%$, resulting in *deflation*.

The sovereign debt literature imposes the convex cost of defaulting—larger loss in productivity for higher productivity levels—to ensure default takes place only during an economic downturn.[56] The following corollary asserts that, with the conventional convex cost of defaulting, default is *deflationary*.

Corollary F1. *Under the convex cost of defaulting, the long-run unconditional productivity undergoes a more pronounced decrease compared to the short-run productivity fall during recessions, leading to a deflationary default.*

Without high substituability between C and G, default-induced productivity loss induces deflation.

F.2 Non-separability and Inflation

In this section, I provide an insightful mechanism that sheds light on inflation driven by the non-separability of the utility function. For the sake of tractability, akin to the analysis in Appendix F.1, I focus on the economy following a deterministic path of productivity depicted in Figure F1. Without loss of generality, I posit that the economy enters the steady state from period 2.

I assume the following functional form of the utility function, where ϑ is the elasticity of substitution between C and G:

$$u(C,G,N) = \log\left(\left(\theta C^{\frac{\vartheta-1}{\vartheta}} + (1-\theta)G^{\frac{\vartheta-1}{\vartheta}}\right)^{\frac{\vartheta}{\vartheta-1}}\right) - \frac{N^{1+\frac{1}{\zeta}}}{1+\frac{1}{\zeta}} \tag{F6}$$

[56] This approach was first introduced in Arellano (2008), and was extended in Chatterjee and Eyigungor (2012).

Adopting the utility function (F6), the marginal utility $u_{C,t}$ in Euler equation (3) is equal to

$$u_{C,t} = \theta C_t^{-1/\vartheta}\left(\theta C_t^{\frac{\vartheta-1}{\vartheta}} + (1-\theta)G_t^{\frac{\vartheta-1}{\vartheta}}\right)^{-1}$$

Note that, when $\vartheta \to 1$, the utility function is fully separable between C_t and G_t, and $u_{C,t}$ no longer depends on G_t. Equations below show the period-1 log-linearization results upon repayment.

$$\begin{aligned}
\hat{w}_1 &= \frac{1}{\vartheta}\hat{C}_1 + \left(1-\frac{1}{\vartheta}\right)\left[w_{\bar{C}}\hat{C}_1 + (1-w_{\bar{C}})\hat{G}_1\right] - \frac{1}{\zeta}\hat{N}_1 \\
\hat{C}_1 &= \hat{z}_1 + \hat{N}_1 \\
\hat{\pi}_1 &= \frac{\eta-1}{\varphi}(\hat{w}_1 - \hat{z}_1) \\
\hat{i}_1 &= \alpha_P\hat{\pi}_1 \\
\hat{i}_1 &= -\frac{1}{\vartheta}\hat{C}_1 - \left(1-\frac{1}{\vartheta}\right)\left[w_{\bar{C}}\hat{C}_1 + (1-w_{\bar{C}})\hat{G}_1\right] \\
&\text{where } w_{\bar{C}} \equiv \frac{\theta(\bar{C})^{(\vartheta-1)/\vartheta}}{\theta(\bar{C})^{(\vartheta-1)/\vartheta} + (1-\theta)(\bar{G})^{(\vartheta-1)/\vartheta}} \in (0,1)
\end{aligned}$$

Analogous equations can be derived for period 0. These log-linearized equations generate

$$\begin{aligned}
\hat{\pi}_1 &= -\frac{\chi}{1+\alpha_P\chi+\alpha_P\Gamma_G}\hat{z}_1 - \frac{\Gamma_G}{1+\alpha_P\chi+\alpha_P\Gamma_G}\hat{G}_1 \\
\hat{\pi}_0 &= -\frac{\chi}{1+\alpha_P\chi+\alpha_P\Gamma_G}\hat{z}_0 - \frac{\Gamma_G}{1+\alpha_P\chi+\alpha_P\Gamma_G}\hat{G}_0 + \frac{\beta-(\alpha_P-1)(\chi+\Gamma_G)}{1+\alpha_P\chi+\alpha_P\Gamma_G}\hat{\pi}_1 \\
\text{with } \Gamma_G &\equiv \frac{\eta-1}{\varphi}\frac{1}{\zeta}\left[\frac{1}{\frac{1}{\vartheta}+(1-\frac{1}{\vartheta})w_{\bar{C}}} - 1\right] \gtreqless 0, \text{ when } \vartheta \gtreqless 1
\end{aligned} \tag{F7}$$

Γ_G represents a separability wedge, which emerges only when C and G are non-separable in the utility function.[57] When $\vartheta > 1$ ($\vartheta < 1$), C and G are substitutes (complements) and $\Gamma_G > 0$ ($\Gamma_G < 0$).

[57]When $\vartheta \to 1$, the utility exhibits full separability between C and G, resulting in $\Gamma_G = 0$. The log-linearized equations then revert to (F1)-(F4) in Appendix F.

Upon default, log-linearized equations generate

$$\hat{\pi}_1^D = -\frac{\chi}{1+\alpha_P\chi+\alpha_P\Gamma_G^D}\hat{z}_1^D - \frac{\Gamma_G^D}{1+\alpha_P\chi+\alpha_P\Gamma_G^D}\hat{G}_1^D \tag{F8}$$

$$\hat{\pi}_0^D = -\frac{\chi}{1+\alpha_P\chi+\alpha_P\Gamma_G^D}\hat{z}_0^D - \frac{\Gamma_G^D}{1+\alpha_P\chi+\alpha_P\Gamma_G^D}\hat{G}_0^D + \frac{\beta-(\alpha_P-1)(\chi+\Gamma_G^D)}{1+\alpha_P\chi+\alpha_P\Gamma_G^D}\hat{\pi}_1^D$$

with $\Gamma_G^D \equiv \frac{\eta-1}{\varphi}\frac{1}{\zeta}\left[\frac{1}{\frac{1}{\vartheta}+(1-\frac{1}{\vartheta})w_{\bar{C}^D}}-1\right]$ and $w_{\bar{C}^D} \equiv \frac{\theta(\bar{C}^D)^{(\vartheta-1)/\vartheta}}{\theta(\bar{C}^D)^{(\vartheta-1)/\vartheta}+(1-\theta)(\bar{G}^D)^{(\vartheta-1)/\vartheta}} \in (0,1)$

And $\Gamma_G^D \gtreqless 0$ when $\vartheta \gtreqless 1$

Γ_G^D is the separability wedge upon default. Clearly, owing to non-separability, inflation now depends not only on the productivity deviation ($\hat{z}$ and $\hat{z}^D$) but also on public spending deviation ($\hat{G}$ and $\hat{G}^D$). When the government fully repays debt, it can borrow from lenders to smooth public consumption G, resulting in much smaller fluctuation (and smaller log-deviation from the steady state) relative to default (i.e., $|\hat{G}_t| \ll |\hat{G}_t^D|$ for $t = 0, 1$). In addition, as the government cannot borrow to smooth consumption in a state of default, G_0^D and G_1^D is unambiguously smaller than the steady-state value $\bar{G}^D$, implying $\hat{G}_0^D < \hat{G}_1^D < 0$.

Consequently, depending on the sign of Γ_G and Γ_G^D, larger public spending deviation upon default leads to either inflation or deflation. I specifically focus on the equilibrium inflation in period 1, by subtracting equation (F7) using (F8).[58] This is illustrated in equation (F9) below:

$$\hat{\pi}_1^D - \hat{\pi}_1 = \overbrace{\frac{\chi}{1+\alpha_P\chi+\alpha_P\Gamma_G}\hat{z}_1 - \frac{\chi}{1+\alpha_P\chi+\alpha_P\Gamma_G^D}\hat{z}_1^D}^{\text{Productivity Component}} + \overbrace{\frac{\Gamma_G}{1+\alpha_P\chi+\alpha_P\Gamma_G}\hat{G}_1 - \frac{\Gamma_G^D}{1+\alpha_P\chi+\alpha_P\Gamma_G^D}\hat{G}_1^D}^{\text{Non-separability Component}} \tag{F9}$$

Default-induced inflation/deflation can be decomposed into two components—the productivity component and the non-separability component. When C and G are complements (i.e. $\vartheta < 1$), Γ_G^D is negative. In this case, as $\hat{G}_1^D$ is much more negative than $\hat{G}_1$ ($\hat{G}_1^D \ll \hat{G}_1 < 0$), the non-separability component imposes deflationary pressure on the economy. Conversely, when C and G are substitutes (i.e. $\vartheta > 1$), a wedge Γ_G^D becomes positive, and thus the non-separability component imposes inflationary pressure. If C and G exhibit strong substitutability, the inflationary non-separability component may overwhelm the productivity component, resulting in inflationary default.

[58] Focusing on period-0 inflation does not alter the key results shown below.

F.3 Log-linearization

I present the log-linearization results upon repayment for Figure F1 in period 0 and 1. Log-linearization results upon default can be derived analogously.

Period 1:

$$
\begin{aligned}
-\hat{C}_1 &= \hat{i}_1 \\
\hat{w}_1 &= \hat{C}_1 + \frac{1}{\zeta}\hat{N}_1 \\
\hat{C}_1 &= \hat{z}_1 + \hat{N}_1 \\
\hat{\pi}_1 &= \frac{\eta - 1}{\varphi}(\hat{w}_1 - \hat{z}_1) \\
\hat{i}_1 &= \alpha_P \hat{\pi}_1
\end{aligned}
$$

Period 0:

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

G Equilibrium Allocations Upon Default

Default leads to a surge in inflation, while also affecting other private equilibrium variables such as consumption, labor supply and output. In this section, I show, through my quantitative analysis in Section 4, that default leads to a substantial increase in inflation relative to consumption, labor supply and output. This confirms the validity of Assumption 1 in my main quantitative exercise.

I use $\hat{\pi}^D$, $\hat{C}^D$ and $\hat{N}^D$ to denote, respectively, percentage difference of changes in inflation, private consumption and labor supply upon default, relative to inflation, consumption and labor supply when debt issuance is set at zero:

$$\hat{\pi}^D \equiv \frac{\pi^D(z) - \pi(z, \vec{\mathbf{0}})}{\pi(z, \vec{\mathbf{0}})}$$
$$\hat{C}^D \equiv \frac{C^D(z) - C(z, \vec{\mathbf{0}})}{C(z, \vec{\mathbf{0}})}$$
$$\hat{N}^D \equiv \frac{N^D(z) - N(z, \vec{\mathbf{0}})}{N(z, \vec{\mathbf{0}})}$$

where $\vec{\mathbf{0}} \equiv (0, 0)$ is the zero-debt vector.

Figure G1 depicts $\hat{\pi}^D - \hat{C}^D$ and $\hat{\pi}^D - \hat{N}^D$, illustrating the difference between the increase in inflation relative to consumption and labor supply (in turn related to aggregate output) as the aggregate productivity z varies. It is evident that a surge in inflation significantly outweighs changes in consumption and labor supply upon default.

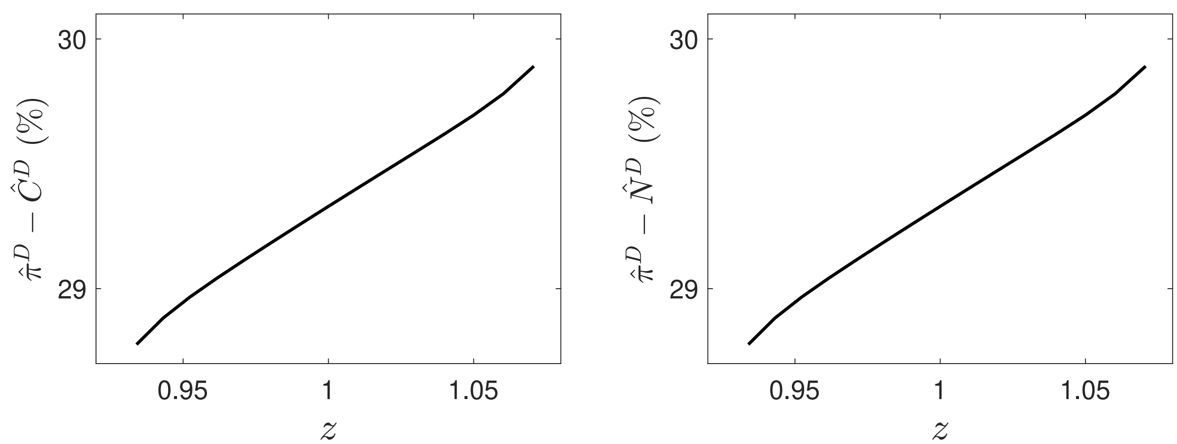

Figure G1: An increase in inflation relative to private consumption (left panel) and labor supply (right panel) upon default

H Productivity Loss as Default Penalty

In this section, I specify an alternative model specification where default leads to convex productivity loss rather than one-time utility loss. If the government defaults, following Chatterjee and Eyigungor (2012), I assume that the productivity experiences a convex loss, such that

$$z^D = z - \max\{0, a_0 z + a_1 z^2\}$$

In Appendix F, I show that the conventional productivity loss alone is not enough to increase inflationary pressure in the event of default. As in my main quantitative analysis in Section 4, I adopt the loose monetary policy to make default inflationary. I take parameters from Table 4, except that Δ is now set at 0.19 to generate the average inflation close to 3.61. I set $a_0 = -0.1955$, $a_1 = 0.2415$, and the third column of Table H1 reports moments using this alternative default penalty. The simulated moments are close to the baseline model specification with one-time utility loss.

Table H1: Cyclicality, Data, and Models

Targeted Moment (annualized)	Data	Baseline	Productivity Loss
Mean			
Nominal domestic interest rate (%)	4.26	4.27	4.31
External debt to GDP ratio (%)	18.4	18.4	1.82
G to GDP ratio (%)	29.8	29.3	29.3
5-year FC debt spread (%)	1.39	1.39	1.42
Inflation (%)	3.61	3.63	3.65
Standard deviation			
Spread of FC debt σ_{FC} (%)	0.42	0.42	0.40
Untargeted Moment (annualized)			
Mean			
FC debt share in external borrowing (%)	78.75	78.92	79.68
Spread of 5-year LC debt (%)	4.66	4.98	5.01
Standard deviation			
Spread of LC debt σ_{LC} (%)	0.91	0.76	0.77
σ_{FC}/σ_{LC}	0.46	0.55	0.52
Inflation (%)	1.81	2.78	2.96
Correlation with expected inflation			
FC debt share	0.198	0.190	0.227
5-year FC debt spread (CDS spread)	0.598	0.840	0.879
Relative cost of borrowing (LC over FC)	0.758	0.776	0.761

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.

I 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 I1, we observe that changes in $\rho_{\mathbf{v}}$ and $\sigma_{\mathbf{v}}$ barely alter the moments of the model.

Table I1: Moments varying $\rho_{\mathbf{v}}$ and $\sigma_{\mathbf{v}}$

Targeted Moment (annualized)	Baseline	$\rho_{\mathbf{v}} \times 0.8$	$\rho_{\mathbf{v}} \times 1.2$	$\sigma_{\mathbf{v}} \times 0.875$	$\sigma_{\mathbf{v}} \times 1.125$
Mean					
Nominal domestic interest rate (%)	4.27	4.25	4.40	4.20	4.36
External debt to GDP ratio (%)	18.4	18.2	18.6	18.4	18.4
G to GDP ratio (%)	29.3	29.3	29.3	29.3	29.3
5-year FC debt spread (%)	1.39	1.37	1.54	1.29	1.50
Inflation (%)	3.63	3.62	3.70	3.58	3.68
Standard deviation					
Spread of FC debt σ_{FC} (%)	0.42	0.36	0.51	0.38	0.48
Untargeted Moment (annualized)					
Mean					
FC debt share in external borrowing (%)	78.92	79.91	77.00	79.92	77.80
Spread of 5-year LC debt (%)	4.98	4.95	5.18	4.83	5.13
Standard deviation					
Spread of LC debt σ_{LC} (%)	0.76	0.76	0.85	0.73	0.81
σ_{FC}/σ_{LC}	0.55	0.47	0.60	0.52	0.59
Inflation (%)	2.78	2.66	3.02	2.67	2.91
Correlation with expected inflation					
FC debt share	0.190	0.256	0.206	0.153	0.211
5-year FC debt spread (CDS spread)	0.840	0.865	0.874	0.834	0.855
Relative cost of borrowing (LC over FC)	0.776	0.819	0.745	0.798	0.761

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.

J Changes in Output with Debt Issuance

In this section, I illustrate the impact of a rise in expected inflation and default risk on aggregate output. Figure J1 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.

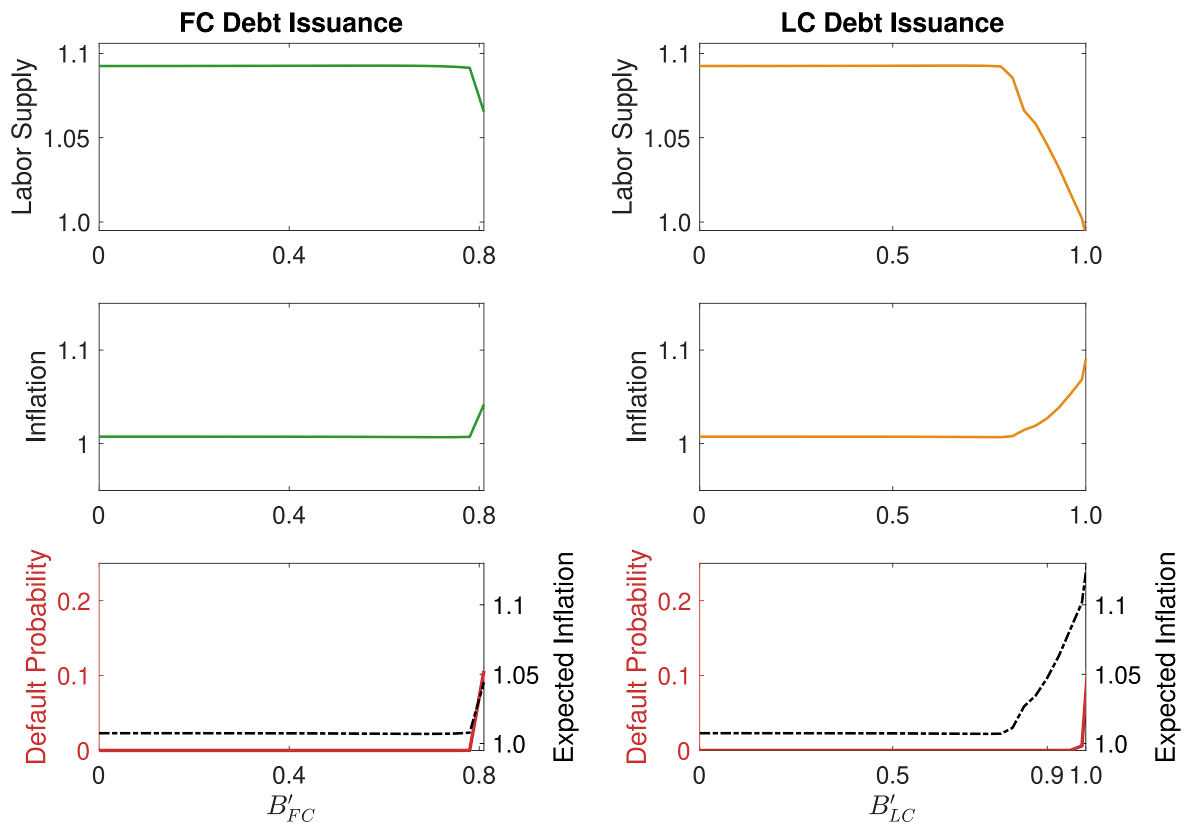

Figure J1: Changes in labor supply and inflation varying B'_{FC} (green) or B'_{LC} (orange)

As discussed in the main text, 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 by the next-period government. Consequently, contemporaneous 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).

Hence, as foreign currency debt contains distortionary inflation for debasement, it simultaneously mitigates the decline in aggregate output, rendering foreign currency borrowing appealing. See Corollary 1 for details.

K Long-term Debt Model with the Taste Shock

In what follows, I present the value functions, policies, private equilibrium schedules, and bond price schedules, all contingent on the taste shock $\mathbf{v}$. 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:

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

$\vec{\mathcal{B}}_k$ 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:

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

where $C_k(z) \equiv C(z, \vec{\mathcal{B}}_k)$, $N_k(z) \equiv N(z, \vec{\mathcal{B}}_k)$, and $G_{i,k}(z) \equiv G(z, \vec{\mathcal{B}}_i, \vec{\mathcal{B}}_k)$. $V^D - U^D$ is the utility of defaulting, and V^D is characterized by:

$$V^D(z) = u(C^D(z), G^D(z), N^D(z)) + \beta_G \mathbb{E}_{z'|z}\left[\iota V(z', \vec{\mathbf{0}}) + (1-\iota)V^D(z')\right]$$

$\vec{\mathbf{0}} \equiv (0,0)$ 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 $\vec{\mathcal{B}}_j$ by the sovereign, given the outstanding debt stock $\vec{\mathcal{B}}_i$ and the current-period productivity z, is expresses as:

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

The probability of defaulting is

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

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

$$Q_{FC}(z, \vec{\mathcal{B}}_j) = \frac{1}{1+r^*}\mathbb{E}_{z'|z}\left[\left(1 - p^D(z', \vec{\mathcal{B}}_j)\right) \times \left(\kappa + \lambda + \sum_{k=1}^{\mathcal{J}} (1-\lambda) Q_{FC}(z', \vec{\mathcal{B}}_k) p^B(\vec{\mathcal{B}}_k; z, \vec{\mathcal{B}}_j)\right)\right] \quad \text{(K1)}$$

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

$$Q_{LC}(z, \vec{\mathcal{B}}_j) = \frac{1}{1+r^*}\mathbb{E}_{z'|z}\left[\left(1 - p^D(z', \vec{\mathcal{B}}_j)\right) \times \left(\sum_{k=1}^{\mathcal{J}} p^B(\vec{\mathcal{B}}_k; z, \vec{\mathcal{B}}_j) \times \frac{\kappa + \lambda + (1-\lambda) Q_{LC}(z', \vec{\mathcal{B}}_k)}{\pi(z', \vec{\mathcal{B}}_k)}\right)\right] \quad \text{(K2)}$$

K.1 Numerical Algorithm

The numerical solution method outlined below is similar to Arellano et al. (2023), except that the utility function features full separability. First, I establish private equilibrium schedules taking the expectation terms $\mathcal{M}$ and $\mathcal{H}$ as given, shown below

$$\text{Domestic Euler:} \quad u_C = \beta i \mathcal{M}(z, \vec{\mathcal{B}}') \tag{K3}$$

$$\text{Real Wage:} \quad w = -\frac{u_N}{u_C} \tag{K4}$$

$$\text{Household Budget:} \quad C = (1-\tau)zN \tag{K5}$$

$$\text{NKPC:} \quad (\pi - \bar{\pi})\pi = \frac{\eta - 1}{\varphi}\left(\frac{w}{z} - 1\right) + \frac{\beta}{u_C z N}\mathcal{H}(z, \vec{\mathcal{B}}') \tag{K6}$$

$$\text{Interest Rate Rule:} \quad i = \bar{i}\left(\frac{\pi}{\bar{\pi}}\right)^{\alpha_p} \tag{K7}$$

where

$$\mathcal{M}(z, \vec{\mathcal{B}}') \equiv \int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z, z')\frac{u_{C'}}{\pi'}dz' + \int_{\mathcal{D}(\vec{\mathcal{B}}')} f(z, z')\frac{u_{C^{D'}}}{\pi^{D'}}dz'$$

$$\mathcal{H}(z, \vec{\mathcal{B}}') \equiv \int_{\mathcal{R}(\vec{\mathcal{B}}')} f(z, z')u_{C'}z'N'(\pi' - \bar{\pi})\pi' dz' + \int_{\mathcal{D}(\vec{\mathcal{B}}')} f(z, z')u_{C^{D'}}z'N^{D'}(\pi^{D'} - \bar{\pi})\pi^{D'} dz'$$

Hence, in the presence of taste shocks:

$$\mathcal{M}(z, \vec{\mathcal{B}}_j) = \int_Z f(z, z')\left(1 - p^D(z', \vec{\mathcal{B}}_j)\right)\sum_{k=1}^{\mathcal{J}} p^B(\vec{\mathcal{B}}_k; z, \vec{\mathcal{B}}_j)\frac{u_{C_k(z')}}{\pi_k(z')}dz' + \int_Z f(z, z')p^D(z', \vec{\mathcal{B}}_j)\frac{u_{C^D(z')}}{\pi^D(z')}dz' \tag{K8}$$

$$\mathcal{H}(z, \vec{\mathcal{B}}_j) = \int_Z f(z, z')\left(1 - p^D(z', \vec{\mathcal{B}}_j)\right)\sum_{k=1}^{\mathcal{J}} p^B(\vec{\mathcal{B}}_k; z, \vec{\mathcal{B}}_j)u_{C_k(z')}z'N_k(z')(\pi_k(z') - \bar{\pi})\pi_k(z')dz' + \int_Z f(z, z')p^D(z', \vec{\mathcal{B}}_j)u_{C^D(z')}z'N^D(z')(\pi^D(z') - \bar{\pi})\pi^D(z')dz' \tag{K9}$$

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

1. Start with initial guesses for the value functions V, the expectation terms $\mathcal{M}$ and $\mathcal{H}$, as well as bond price schedules Q_{FC} and Q_{LC}. For each possible debt choice $\vec{\mathcal{B}}_j$ ($j \in \mathcal{J}$), 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 (K3) to derive $i_j(z) \equiv i(z, \vec{\mathcal{B}}_j)$.

   (b) With $i_j(z)$ and equation (K7), 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 (K4).

(d) Derive a new value of labor supply $\hat{N}_j(z)$ using the guess of $C_j(z)$ and (K5).

(e) Use the current guess $N_j(z)$, newly derived $w_j(z)$ and $\pi_j(z)$, and the NKPC (K6) 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 $j \in \mathcal{J}$.

2. Solve the private equilibrium in a state of default analogously. The solution encompasses $C^D(z)$, $N^D(z)$, $\pi^D(z)$, $i^D(z)$, $w^D(z)$.

3. Solve the government's optimization problem in the absence of taste shocks, taking the private equilibrium schedules and bond price schedules as given. This generates a new value function $\bar{V}(z, \vec{\mathcal{B}})$, which would be realized under the assumption that all taste shocks are zero.

4. Derive the new ex-ante value of utility before the taste shock realization $\hat{V}$, and derive the probability p^B and p^D for each $i \in \mathcal{J}$ and $j \in \mathcal{J}$ using the following equations:

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

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

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

5. Use $p^B(\vec{\mathcal{B}}_j; z, \vec{\mathcal{B}}_i)$ and $p^D(z, \vec{\mathcal{B}}_i)$ $(i, j \in \mathcal{J})$ to derive new expectation terms $\hat{\mathcal{M}}$ and $\hat{\mathcal{H}}$ using (K8) and (K9), and new bond price schedules $\hat{Q}_{FC}$ and $\hat{Q}_{LC}$ using (K1) and (K2).

6. Check the convergence for value function V, expectation terms $\mathcal{M}$ and $\mathcal{H}$, 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.