Sovereign Risk, Currency Risk, and Corporate Balance Sheets

Wenxin Du and Jesse Schreger[1]

June 2021

Abstract

We provide a comprehensive account of the evolution of the currency composition of sovereign and corporate external borrowing by emerging markets over the past fifteen years. We show that a higher reliance on foreign currency debt by the corporate sector is associated with higher sovereign default risk. We introduce local currency sovereign debt and private sector currency mismatch into a standard sovereign debt model to examine how the currency composition of corporate borrowing affects the sovereign's incentive to inflate or default. A calibration of the model generates the empirical patterns of sovereign credit risk over the last decade.

[1]Du: University of Chicago Booth School of Business, NBER, and CEPR, 5807 South Woodlawn Avenue, Chicago, IL 60601. Email: wenxin.du@chicagobooth.edu. Schreger: Columbia Business School, NBER, and CEPR, Uris Hall, 3022 Broadway, New York, NY 10027. Email jesse.schreger@columbia.edu.

We thank David Baqaee, Luigi Bocola, Carol Bertaut, Laura Blattner, John Campbell, Max Eber, Charles Engel, Emmanuel Farhi, Jeff Frankel, Jeff Frieden, Marcio Garcia, Gita Gopinath, Pierre-Olivier Gourinchas, Galina Hale, Herman Kamil, Ricardo Hausmann, Sebnem Kalemli-Ozcan, Illenin Kondo, Hanno Lustig, Matteo Maggiori, Andrea Raffo, Romain Raniciere, Carmen Reinhart, John Rogers, Ken Rogoff, Jeremy Stein, Alexandra Tabova, Adrien Verdelhan, Steve Pak Wu, Vivian Yue, and various seminar and conference participants for helpful comments. We thank Lina Beatriz Gomez Castillo, Joao Henrique Freitas, Emmanuel Kohlscheen, and Renzo Jimenez Sotelo for assistance in acquiring and interpreting various data sources. Angus Lewis, Conor Howells, and Christine Rivera provided excellent research assistance.

1 Introduction

During the 1980s, 1990s, and early 2000s, a number of sovereign debt crises engulfed emerging markets. While the details of each sovereign debt crisis were different, the broader story remained similar: the government borrowed from foreign investors in foreign currency (FC) during good times only to later default on their external debt as economic conditions deteriorated. Following these crises, emerging market governments curtailed their FC borrowing and moved toward borrowing in their local currency (LC). Using a newly constructed comprehensive dataset on the currency composition of sovereign and corporate external debt, we find that over the last decade major emerging market sovereigns went from having around 80% of their external debt in FC to having more than half of their external sovereign debt in their own currency. By contrast, even as governments were dramatically changing the way they finance themselves, the private sector continued to borrow from foreigners almost entirely in FC.

Despite their shift toward LC debt, emerging market governments continue to compensate investors for sovereign default risk, paying positive *credit* spreads on their LC and FC debt. In this paper, we argue that the private sector's reliance on external FC debt raises the cost of inflating away sovereign debt, leading to elevated sovereign credit spreads even in the presence of a shift towards LC sovereign debt. We find that heterogeneity in the private sector's FC exposure helps explain sovereign default risk across countries and over time, above and beyond the debt structure of the government.

We argue that corporate borrowing helps understand sovereign risk because private sector currency mismatch constrains the government from using inflation to reduce its real fiscal burden. When the government faces fiscal difficulties, corporate mismatch therefore raises the risk of outright sovereign default by making the alternative means of reducing real repayment, inflation, less appealing. The idea that corporate balance sheet mismatch could make depreciations contractionary was studied extensively following the Asian Financial

Crisis.[2] One key contribution of this paper is to demonstrate that currency mismatch on corporate balance sheets can be a source of *sovereign* default risk.

We begin by constructing a new dataset on the sectoral composition of cross-border borrowing and use it to provide a systematic account of the currency composition of external debt issued by the sovereign and corporate sector in 14 major emerging markets between 2003 to 2017, where "external" debt is defined as borrowing from foreign investors.[3] We find that emerging market sovereigns increasingly borrow in LC from foreign investors, while corporate external liabilities still remain largely in FC. From 2003 to 2017, the average LC share in external sovereign debt increased from around 21.7% to almost 59.1%. However, during this same period, the LC share in external corporate sector debt increased relatively little from 8.5% to 13.0%.

The composition of corporate balance sheets has significant implications for sovereign credit risk. We use our aggregate cross-country dataset on the currency composition of external liabilities to show that a higher reliance on external FC corporate financing is associated with a higher default risk on sovereign debt. In a panel regression, we demonstrate that increases in the LC share in the external corporate debt are robustly associated with reductions in sovereign credit risk. In addition, an increase in the LC corporate debt share also reduces the sensitivity of EM sovereign credit spreads to exchange rate fluctuations. Furthermore, we present micro-evidence showing that firms' FC corporate bond issuance is associated with a relatively larger increase in sovereign CDS spreads than LC corporate bond issuance about one week after the issuance date.

A high reliance on FC debt leads to currency mismatch on corporate balance sheets. While firms may borrow in FC debt to hedge their FC revenues (known as "operating hedges") or to reduce their funding costs on the currency-hedged basis using foreign exchange derivatives (known as "financial hedges"), we show that neither operating hedges nor

[2]See, for instance, Krugman (1999), Céspedes et al. (2004), Gertler et al. (2007), and Aghion et al. (2000, 2001, 2004). Korinek (2010) explores the effects of the private sector borrowing in foreign currency.

[3]The focus on "external" debt is important as defaulting or inflating away these debt represent a wealth transfer from foreign investors to domestic residents.

financial hedges can explain the full extent of FC corporate borrowing in emerging markets. Instead, we observe significant FC borrowing by firms with and without operational hedging motives. In particular, the distribution of the FC debt shares across firms is quite similar for firms with high and low export revenues, after controlling for country fixed effects and firm size. Furthermore, using data on cross-currency derivatives outstanding, we show that the ability for emerging market firms to hedge their FC debt using derivatives is generally quite limited due to the small size of the currency swap markets relative to the size of FC debt outstanding.

Motivated by these dramatic changes in emerging market borrowing and the empirical evidence on the importance of private FC debt for sovereign risk, we introduce LC sovereign debt and a corporate sector with FC external liabilities and LC revenues into the canonical quantitative sovereign debt model (Aguiar and Gopinath (2006) and Arellano (2008)). The model demonstrates quantitatively that the borrowing patterns of the private sector can have large effects on the nature of sovereign risk by affecting a government's optimal inflation policy. When the private sector is highly mismatched, meaning private debt is overwhelmingly in FC but revenues are in LC, the sovereign is reluctant to allow an exchange rate depreciation to reduce the real value of its debt, generating a "fear of floating" as in Calvo and Reinhart (2002). In this case, when the government considers whether to default or use inflation to reduce the fiscal burden of sovereign debt repayments, it is relatively more inclined to explicitly default than to inflate away the debt because of the effect of depreciation on the private sector. A calibration of the dynamic model produces simulated moments of currency and credit risk very similar to the cross-country mean empirical moments. Further, it demonstrates that moving towards local currency sovereign debt reduces default risk much more if it is accompanied by an increase in the local currency corporate debt share.

The paper contributes to a number of literatures in international finance and macroeconomics. Our measurement of currency mismatch at the sectoral level provides a contribution to the literature on the causes and consequences of the currency composition of external debt

(Eichengreen and Hausmann (1999), Lane and Shambaugh (2010)). By measuring the external currency composition of emerging market borrowing at a more disaggregated sectoral level and distinguishing between types of borrowing, we are able to pinpoint the sources of change in the currency composition of external debt. Our empirical contribution is to demonstrate that the currency composition of corporate debt is a powerful explanatory variable for pricing sovereign default risk. This contributes to the literature documenting a range of determinants of sovereign risk, such as US interest rates (Uribe and Yue (2006)), global financial conditions (Longstaff et al. (2011), Borri and Verdelhan (2011)), macroeconomic fundamentals (Tomz and Wright (2007)), debt maturity (Arellano and Ramanarayanan (2012), Broner et al. (2013)), or the existence of CDS markets (Salomao (2017)). Our modeling of local currency bonds as defaultable builds on the insights of Reinhart and Rogoff (2008) and Reinhart and Rogoff (2011), who emphasize the long history of default on domestic debt. Wu (2021) explores the role of risk premia in driving this connection between corporate FC borrowing and sovereign credit spreads. Finally, we contribute to theoretical sovereign debt literature by introducing local currency debt, corporate balance sheet mismatch, and the choice of inflation into the canonical sovereign debt model. These additional features allow us to perform counterfactuals on the effect of changes in the currency composition of government and corporate debt on the probability of sovereign default.

Our paper is organized as follows. In Section 2 we describe how we measure currency composition of external debt by sector and introduce stylized facts on the currency composition of private and sovereign external debt. In Section 3 we examine the drivers of corporate foreign currency debt issuance and its connection to sovereign default risk. In Section 4 we introduce LC sovereign debt and corporate mismatch into the benchmark sovereign debt model and explore how heterogeneity in currency composition can help explain sovereign default risk. Section 5 concludes.

2 The Changing Composition of External Portfolios

In this section, we combine various national and international data sources to construct measures of the currency composition of the external liabilities of the sovereign and corporate sectors in 14 major emerging markets. We document that emerging market sovereigns have shifted away from borrowing externally in FC to borrowing primarily in LC. However, we show that the external liabilities of the corporate sector remain largely denominated in FC.[4]

2.1 Measuring Currency Composition of External Debt by Sector

2.1.1 Overview

Our goal is to measure the currency composition of external debt (debt held by foreign investors) by sector across countries and over time. In particular, we measure:

$$D_{i,s,c,t} = IB_{i,s,c,t} + DB_{i,s,c,t} + CBL_{i,s,c,t}, \tag{1}$$

where D denotes total external debt, IB are bonds issued in international markets,[5] DB are bonds issued in domestic markets and owned by foreigners, and CBL denotes cross-border loans. For the subscripts, i denotes the nationality of the issuer, s denotes the sector, c denotes the currency, and t denotes time. We consider 14 major emerging markets: Brazil, Colombia, Hungary, Indonesia, Israel, Mexico, Malaysia, Peru, Poland, Russia, Thailand, Turkey, South Africa, and South Korea. All these countries have developed a sizable LC sovereign bond markets and attracted a significant amount of foreign participation. For currency c, we classify instruments according to whether they are in the LC of country i or in FC. For sector s, our primary focus is on the comparison between the government and corporate sector. However, we also estimate various disaggregations of the corporate

[4] Burger and Warnock (2006) and Burger and Warnock (2007) were early contributions demonstrating a shift in the rise of foreign investment in emerging market bond indices. Hale et al. (2020) examines the connection between the global financial crisis and local currency sovereign issuance.

[5] We assume that bonds issued in international markets by emerging market issuers are held by foreign investors.

sector into financial sector vs. non-financial corporate, and then further disaggregate the non-financial corporate sector into the tradable and non-tradable sector based on various industry classification schemes. We do this quarterly from 2003Q1 to 2017Q4. For the rest of this section, we suppress the country i and time t subscript for readability. Finally, we scale all series by quarterly GDP.[6]

There are a number of empirical challenges one faces when characterizing the currency composition of a country's external liabilities. First, foreign-owned debt may not be issued in international markets and so one needs to measure foreign ownership of debt issued in the domestic markets. Second, because a large amount of lending to emerging market corporates are intermediated through offshore subsidiaries, nationality based data provides a more economically meaningful measure of emerging market external borrowing.[7] Third, many aggregated datasets do not provide a clean distinction between the sector of borrowing (i.e. non-financial corporate, financial corporate, or sovereign).

To overcome these challenges, we use a host of data sources from international organizations, national authorities, and commercial vendors, including International Debt Statistics (IDS) and Locational Banking Statistics (LBS) from the Bank of International Settlements (BIS); data on foreign ownership of domestic government debt and total government debt outstanding from national sources, Haver Analytics, Asian Bonds Online (ABO); individual bond and loan-level issuance level from Refinitiv SDC Platinum and FactSet Debt Capital Structure; and mutual fund holdings data from Morningstar.

2.1.2 Debt Securities

We begin our dataset construction with bonds. We use the BIS IDS data to directly measure bonds issued in international capital markets ($I^{IDS}_{s,c}$). There are three currency categories in

[6] For our GDP series, where available we used IMF International Financial Statistics quarterly, nominal series (Gross Domestic Product, Expenditure Approach, Nominal, Domestic Currency) which we then seasonally adjust with X12-Arima. The coverage of Colombia and Mexico is incomplete in that series, so for Colombia we use World bank, annual, nominal and for Mexico we use OECD, quarterly.

[7] See Coppola et al. (2020) for a detailed treatment of this issue.

the IDS data. The euro (EUR) and the U.S. dollar (USD) are identified separately and all other currencies are in a single category. We approximate local currency debt by subtracting bond issued in USD and EUR from total issuance:

$$\widehat{IB}_{s,FC} = IB^{IDS}_{s,USD} + IB^{IDS}_{s,EUR} \tag{2}$$

$$\widehat{IB}_{s,LC} = IB^{IDS}_{s,total} - (IB^{IDS}_{s,USD} + IB^{IDS}_{s,EUR}). \tag{3}$$

This method will underestimate FC debt if countries borrow in foreign currencies other than the USD or EUR, such as the British pound (GBP), Swiss franc (CHF), or the Japanese yen (JPY).

We now proceed to discuss how to construct foreign holdings of debt securities issued in the domestic market. For governments, we collect data on nonresident holdings of domestically issued government debt from Haver, ABO, and the Colombian Ministry of Finance.[8] We label all of these series as $D^{Non-Res}_{govt,total}$. All foreign-owned government debt is denominated in the LC, and so therefore have

$$\widehat{DB}_{govt,LC} = DB^{Non-Res}_{govt,total} \tag{4}$$

There are no comparable national data available on foreign holdings of domestic corporate debt. Our estimation is based on our data on nonresident holdings of domestic LC sovereign debt and global mutual fund holdings data from Morningstar based on Maggiori et al. (2020) and Coppola et al. (2020). To approximate foreign holdings of domestic LC corporate debt, we assume that global mutual fund investors compose an equal share of foreign investors in domestic corporate and domestic sovereign debt.[9] In particular, our estimate for foreign

[8]See Section A.1 for details on our data on nonresident holdings of domestically issued government debt. Documenting the rise in foreign ownership of domestically issued government bonds is the focus of Arslanalp and Tsuda (2014). The sources used here largely overlap with their sources. Arslanalp and Tsuda (2014) do not consider corporate debt or loans.

[9]For example, if mutual fund investors account for 5% of total nonresident holdings of domestic LC sovereign debt for a given country, and hold \$50 million of domestic LC corporate debt, we estimate that total foreign holdings of domestic LC corporate debt are equal to \$1 billion (= \$50 million/5%).

holdings of domestic corporate debt in LC is given by

$$\widehat{DB}_{corp,LC} = \widehat{DB}_{govt,LC} \times \frac{DB^{MF}_{corp,LC}}{DB^{MF}_{govt,LC}}$$

Besides providing estimates for all domestically corporate bonds, we also follow the same methodology and provide separate estimates for the financial sector and the non-financial corporate sector.

2.1.3 Cross-Border Bank Loans

The final component of Equation 1 we need to measure is cross-border loans. We start with the BIS LBS data ($L^{LBS}_{s,c}$) as our source of aggregate data, and we will use SDC Platinum syndicated loan data ($L^{SDC}_{s,c}$) to further separate sectors within the LBS data.[10].

The BIS LBS provides quarterly data on cross-border financial claims and liabilities of banks resident in the BIS reporting countries. The level of external loans for country i is given by the total claims of all BIS reporting countries against counterparty country i. Since most developed, large developing countries, and offshore financial centers are BIS reporting countries, the aggregate lending of BIS reporting countries to country i represents the majority of private sector cross-border loans from the rest of the world to country i.

The BIS LBS breaks down cross-border loans into claims denominated in the USD, EUR, JPY, GBP, CHF, and residual currencies. From an emerging market country i's perspective, the amount of loans and deposits denominated in the residual currencies gives a very good proxy of the level of loans and deposits denominated in the LC of country i.

The LBS reports a separate series for financial (*bank*) and non-financial borrowers (*non-fin*), but it only separates governments from the non-financial corporate sector beginning in 2013. To estimate this sectoral split prior to 2013, we use micro-data from SDC Platinum.

[10]For more details on our treatment of the SDC Platinum loan data see Section A.3. Because the LBS data is only provided on a residency basis, we use the SDC Platinum data to estimate nationality versions of all the loan series we estimate. Until that final step, all the loan calculations are done using residency versions of the data.

We assume that the ratio of government loans ($CBL^{SDC}_{govt,c}$) to non-bank loans ($L^{SDC}_{nfc,c}$) in SDC is representative of the aggregate, and we use this ratio to estimate these levels. Since the bank series is already separate for all years in the LBS data, we use the LBS series directly for loans to banks. We can then define all our residency loan series as follows:

$$\begin{aligned}
\widehat{CBL}_{s,c,res} &= CBL^{LBS}_{non-fin,c,res} \times \frac{CBL^{SDC}_{s,c,res}}{CBL^{SDC}_{govt,c,res} + CBL^{SDC}_{nfc,c,res}}, s \in \{govt, nfc\} \\
\widehat{CBL}_{bank,c,res} &= CBL^{LBS}_{bank,c,res}
\end{aligned}$$

We find support for this approximation by comparing our values for $\widehat{CBL}_{govt,c,res}$ and $\widehat{CBL}_{nfc,c,res}$ to $CBL^{LBS}_{govt,c,res}$ and $CBL^{LBS}_{nfc,c,res}$ where both are available from 2013, finding they closely align.

The final challenge to overcome with cross-border loans arises because LBS is only reported on a residency basis.[11] To generate an estimate of cross-border loan debt on a nationality basis, we again assume that SDC Platinum is representative of the universe of cross-border bank lending and take the ratio of bank (non-bank) loans assigned to a country by nationality and residency for a given currency use it to scale the residency-based series:

$$\widehat{L}_{s,c,nat} = \widehat{L}_{s,c,res} \times \frac{L^{SDC}_{s,c,nat}}{L^{SDC}_{s,c,res}} \tag{5}$$

for s equal to $bank$ and nfc and c equal to LC and FC.[12]

To estimate the tradable and non-tradable sector external debt series, we combine our bond and loan series for non-banks with the tradable and non-tradable sector shares of non-bank bond and loan debt in the SDC Platinum data.[13] We scale our non-financial corporate series by the ratio of tradable and non-tradable sector debt to estimate the amount of external loans and bonds for each sector by currency. The procedures is described in more detail in

[11] The Consolidated Banking Statistics reports cross-border flows according to the nationality of the borrower but does not adjust the nationality of the lender.

[12] We use quarterly calculated values of the ratio unless the largest loan for a given country, sector, and currency–local or foreign–accounts for more than 60% of the total in any quarter from 2005-2017.

[13] We provide details of our treatment of the bond data in Section A.2.

Appendix A.6.

2.2 Stylized Facts on the Currency Composition of External Debt

Using our dataset on the currency composition of external debt by sector, we document a major shift in the currency composition of sovereign external borrowing alongside a relatively limited change in the composition of corporate borrowing. In particular, we find that the share of external sovereign debt in LC increased from 20% to 60% but the LC share of corporate debt stayed relatively unchanged at 10%. Figure 1 plots the cross-country mean of the share of sovereign, corporate, and total debt in LC from 2003 to 2017, with the shift in the aggregate share of debt in LC sovereign debt accounting for the bulk of the increase the LC share in the aggregate external debt. Figure 2 plots the mean external LC and FC debt by sector as a percentage of GDP. Externally held LC debt is primarily issued by the sovereign, whereas the bulk of external FC debt comes from the corporate sector. Appendix Figure A.5 presents country-level versions of Figures 1 and 2.

Figure 3 plots the share of external sovereign debt in LC and external corporate debt in local currency for 2005 (panel a) and 2017 (panel b). The difference is stark. While the share of external sovereign debt increased significantly nearly across the board during that period, the external foreign currency corporate debt composition was nearly unchanged. Remarkably, we see little correlation between the change in a government's reliance on LC debt externally and changes in the corporate sector's external borrowing.[14]

Despite this major shift of government external borrowing towards LC, emerging market sovereigns are not issuing debt in their own currency in international markets. Instead, foreign investors are buying LC sovereign debt issued under domestic law. The rise of foreign ownership of domestically-issued LC sovereign debt can be seen in Figure 4, where we plot the share of all domestic sovereign debt owned by foreign investors. In the early 2000s, we

[14] Appendix Table A1 reports the share of external debt in LC by sector as well as the debt/GDP ratio for the government, financial sector, non-financial corporate sector, and the aggregated corporate sector for 2005, 2012, and 2017.

see that, on average, less than 10% of all domestically issued sovereign debt was owned by foreigners. By the 2010s, that picture had changed and the mean foreign ownership share of domestic sovereign debt was around 25%, with a significant dispersion across countries.

In Figure 5, we decompose external debt into each of the components of external borrowing, international debt, foreign-owned domestic debt, and cross-border loans in FC and LC, respectively. We see clearly that the increasing external reliance of governments on LC comes almost entirely from foreign purchases of domestic debt, with the share of external debt accounted for by internationally issued LC debt actually slightly declining. For the emerging market corporate sector, the only significant change in the composition of external borrowing is the shift from FC bank loans to FC international bonds. This shift leaves the currency composition unaffected but represents a significant change in the nature of cross-border lending.

Taken together, these stylized facts on the heterogeneous behavior of corporate and sovereign sectors provide a changed picture on the nature of international currency exposures for emerging markets.

3 Corporate Borrowing and Sovereign Risk

Having documented a striking dichotomy between sovereigns and corporates, we now turn to its implications. First, we demonstrate that FC corporate borrowing is strongly associated with elevated levels of *sovereign* default risk. We then provide evidence for the mechanism behind this relationship, demonstrating that a higher reliance on FC debt is associated with a higher sensitivity of CDS spreads to fluctuations in exchange rate movements. We then provide high-frequency micro-evidence that increased foreign currency corporate borrowing causes increases in sovereign credit spreads, illustrating a direct pass-through of corporate currency mismatch to sovereign default risk. We conclude the section by providing micro-evidence that corporate foreign currency borrowing is evidence of balance sheet mismatch.

3.1 From Corporate Mismatch to Sovereign Default Risk

3.1.1 Aggregate Evidence

We now turn to examining the connection between FC borrowing and sovereign default risk across countries and time. We run regressions of the form

$$CDS_{i,t+1} = \alpha_i + \gamma_{t+1} + \sum_k \beta_k LC\,Share_{i,k,t} + \sum_k \omega_k \left(Debt/GDP\right)_{i,k,t} + \epsilon_{i,t} \tag{6}$$

where $LC\,Share_{i,k,t}$ denotes country i's LC share debt share of sector k at t, and $Debt/GDP_{i,k,t}$ refers to the debt-to-GDP ratio of sector k. $CDS_{i,t+1}$ denotes the sovereign CDS spread, which we use as our measure of sovereign credit risk. We will discuss the alternative sovereign default risk measure based on LC sovereign debt in Section 3.1.3. Depending on the specifications, we may also include country fixed effects α_i and/or time fixed effects γ_t.

Table 1 presents regression results. In columns 1-2, we include time fixed effects without country fixed effects to examine between country variation. In columns 3-4, we include country fixed effects to only examine within country variation. In column 1, we see that a higher sovereign and corporate LC share are both associated with a reduction in sovereign CDS spreads, after controlling for government and corporate debt/GDP ratios. In column 2, we see that the result is robust to excluding the peak of the Global Financial Crisis. In columns 3 and 4, we see the same qualitative patterns with country fixed effects. The effect of the corporate LC debt share remains largely similar to that in Column 1, albeit with slightly reduced significance. By contrast, we see reductions in the estimates on the sovereign LC share with country fixed effects. In summary, across all specifications, we find that while holding the debt levels constant, a 10% increase in the corporate LC debt share is associated with about 17 basis point reduction in the sovereign CDS spread.

In Table 2, we ask which type of FC debt helps explain sovereign CDS spreads. We include FC sovereign debt in all columns and different types of FC corporate debt across different columns. In line with previous findings, such as Edwards (1984) and Hilscher and Nosbusch

(2010), the amount of FC sovereign debt is significantly positively correlated with sovereign CDS spreads in all specifications. For the FC corporate debt to GDP ratio, Columns 1 shows that the total FC corporate debt is associated with higher sovereign CDS spreads. Column 2 splits the FC corporate debt into the FC debt of the financial sector and the non-financial sector. We see that positive effects of the FC corporate debt on sovereign CDS spreads are similar for the financial and non-financial sector. In columns 3 and 4, we further split the FC debt of the non-financial corporate sector into the debt of the tradable and non-tradable sectors. We consider two different definitions of the non-tradable sector based on Jensen and Kletzer (2010) and Sachs and Larrain (1993) in Columns 3 and 4, respectively. The effect of FC debt of the non-tradable sector on sovereign CDS spreads is larger that of the tradable sector. Given that firms in the non-tradable sector have less FC revenue to hedge their FC borrowing, the larger coefficient on the non-tradable sector is suggestive evidence that balance sheet that FC corporate debt increases FC debt due to corporate balance mismatch. That said, firms from tradable sector are not insulated from FX fluctuations if they over borrow in FC relative to their FC revenue. In addition, a large share of the pricing of tradable goods relying on essentially non-tradable service inputs (Burstein et al. (2005)).

3.1.2 Sovereign Default Risk and Exchange Rate Movements

The previous subsection provides evidence of a strong correlation between the currency composition of sovereign and corporate debt and sovereign default risk. Yet, it leaves the mechanism unspecified. Here, we present evidence that currency mismatch leaves sovereigns relatively more vulnerable to exchange rate fluctuations. To do so, we run regressions of the following form

$$\Delta CDS_{i,t} = \alpha + \beta_1 \Delta\mathcal{E}_{i,t} + \beta_2 LC\ Share_{i,t} + \beta_3 \Delta\mathcal{E}_{i,t} \times LC\ Share_{i,t} + \epsilon_{i,t} \tag{7}$$

$\Delta\mathcal{E}_{i,t}$ is the log change country i's bilateral exchange rate against the USD, with an increase corresponding to a depreciation of the LC against the US dollar.

In Table 3, we consider three different versions of the LC share: sovereign, corporate, and total. The coefficient of interest is β_3, and a negative $\beta_3 > 0$ coefficient indicates that the sovereign credit risk of countries with more LC debt increase less when the LC depreciates. Unsurprisingly, given that the dollar tends to appreciate in bad times (Avdjiev et al. (2019), Kekre and Lenel (2020)) we see that $\beta_1 > 0$, and so emerging market sovereign CDS spreads tend to widen when the local currency depreciates against the US dollar. More importantly, we see that β_3 is indeed negative, with us once again observing the weakest effect for the sovereign LC debt share, followed by the corporate LC debt share, and finally the total LC debt share. The magnitudes of β_3 for corporate and total debt are also larger in absolute value than β_1, indicating that countries with all of their corporate and sovereign debt in LC would be expected to see their default risk decline when the LC depreciates. Columns 4-6 rerun the same specification, but with additional time fixed effects, and find similar results quantitatively.[15]

3.1.3 Local Currency Credit Spreads

To this point, we have used sovereign CDS spreads as our primary measure of sovereign default risk. In this subsection, we use the methodology developed in Du and Schreger (2016) to measure the credit risk on LC sovereign debt in emerging markets as an alternative default measure to CDS spreads which directly measure credit risk on FC debt. We define the LC credit spread (s_t^{LCCS}) as the gap between an emerging market sovereign bond yield $\left(y_t^{LC}\right)$ and the LC risk-free rate implied by the U.S. Treasury bond yield (y_t^*) and the fixed-for-fixed

[15] Appendix Figure A.4 plots the results from a two-step procedure, where we first estimate the beta of CDS changes on FX changes for each country, and then regress these estimate betas on the local currency share. Once again, we find a stronger relationship for corporate and total debt than for sovereign debt.

LC/USD cross-currency swap rate (ρ_t):

$$s_t^{LCCS} = y_t^{LC} - (y_t^* + \rho_t) \quad (8)$$

One way to understand the LC risk-free rate ($y_t^* + \rho_t$) is to think of it as the hypothetical nominal interest rate that the U.S. government (assumed to be default-free) would pay if it issued a bond in an emerging market currency in the absence of market frictions. By using cross-currency swaps to convert the fixed dollar cash flows from a U.S. Treasury into fixed LC cash flows, we construct a synthetic LC instrument that is free from sovereign default risk. The LC credit spread measures how much an emerging market sovereign pays to borrow relative to this default-free benchmark in its own currency.

Figure 7 plots the mean CDS spreads and the LC credit spread between 2005-2021. If sovereigns are expected to simultaneously default on their LC and FC debt (as will be the case in the model)[16] and financial markets are frictionless, we would would expect CDS spreads and LC credit spreads to track each other closely. We see strong co-movements between the two spreads in early part of the sample between 2005-2013 and, more recently, during the Covid pandemic-induced market panic of March 2020. During the period 2005-2020, the average LC credit spread was very subdued and did not track CDS spreads closely. However, as discussed in Du and Schreger (2016) and Du and Schreger (2021), besides sovereign default risk, a number of financial market frictions can affect the LC credit spreads. These frictions include capital controls, market segmentation, illiquidity in the FX swap markets for emerging markets, and balance sheet costs for financial intermediaries to arbitrage between LC and FC debt markets.

In Table 4, we repeat the specifications in Table 2 using the LC credit spread as the dependent variable to complement our baseline regressions using CDS. We can see that the LC credit spread is increasing with the corporate FC debt to GDP ratio, and in particular with the FC borrowing of the non-financial sector. In contrast to the results in Table 2, FC

[16] This assumption is largely consistent with the data, as documented by Jeanneret and Souissi (2014).

sovereign debt/GDP does not significantly affect the LC credit spread, and the impact of FC debt of non-tradable sector is also weaker.[17] The more muted effects likely reflect the impact of financial frictions, which tend reduce the LC credit spread.

3.1.4 Sovereign CDS Spreads Around Corporate Bond Issuance

In this section, we provide additional support for our argument by demonstrating that sovereign CDS spreads increase following corporate FC bond issuances. We take an event study approach and examine daily changes in the sovereign CDS around corporate bond issuance dates. We include all dollar-denominated and LC-denominated corporate bonds of issuers in our sample emerging markets with par value greater than $100 million. We calculate the changes in the sovereign CDS spread 20 business days before and after the issuance date relative to the level of the spread on the day prior to the issuance[18] and examine the pattern of changes in the CDS spreads around individual FC and LC corporate bond issuance.

In particular, we run the following regressions with date fixed effects:

$$\Delta CDS^{j}_{i,k} = \alpha_{iss,t} + \sum_{-20 \leq k \leq 20} \gamma_k D^{j}_{k} + \epsilon_{j,k,t}, \tag{9}$$

where $\Delta CDS^{j}_{i,k} = CDS^{j}_{i,k} - CDS^{j}_{i,-1}$ denotes the change CDS spread of country i between the k-th day from the issuance date and the day prior to the issuance for bond j, D^{j}_{k} is the date fixed effect indicating the number of days from the issuance date, and $\alpha_{iss,t}$ denotes the issuer-quarter fixed effect. We cluster standard errors at the issuer level.

Figure 8 reports the results. We plot the point estimate and the 95% confidence interval for the coefficient on the date fixed effect, γ_k (with $\gamma_{-1} = 0$ by construction). The top panel shows changes in CDS spreads around FC corporate bond issuance. We see that the sovereign

[17] In Appendix Tables A6, we re-run the analyses in for Table 1 using the LC credit spread instead of CDS spreads. We see that elevated Corporate LC shares are associated with lower LC credit spreads between countries but no longer within countries (i.e. with country fixed effects).

[18] Bond-level issuance data is from SDC Platinum.

CDS spread declines prior to the FC bond issuance, which reflects the fact that issuers time debt issuance when the overall funding condition becomes more favorable. However, as soon as the FC corporate bond issuance occurs, the declining trend in the sovereign CDS spread reverses. Instead, sovereign CDS becomes more elevated and increases on average about 1 basis point one week following the issuance. The middle panel shows changes in the sovereign CDS spread around LC corporate bond issuance. While the spread also declines prior to the LC bond issuance, and the downward trend in the sovereign CDS spread continues after the issuance.

To estimate the difference between the behavior of the sovereign CDS spreads around the FC and LC corporate bond issuance. We run the following additional regression:

$$\Delta CDS_{i,k}^{j} = \alpha_{iss,t} + FC_j + \sum_{-20 \leq k \leq 20} \gamma_k D_k^j + \sum_{-20 \leq k \leq 20} \delta_k D_k^j \times FC_j + \epsilon_{j,k,t}, \tag{10}$$

where FC_j is a dummy variable indicating whether bond j is denominated in FC. The bottom figure of Figure 8 plots the point estimate and the confidence interval on the interaction term δ_k, which estimates the difference in the behavior of sovereign CDS spread around the FC and LC corporate bond issuance. We note that the difference in the sovereign CDS spread response to the FC and LC difference peaks at about 2 basis points one week after the issuance. We view these results as evidence consistent with our argument that FC corporate bond increases perceived default risk.

3.2 Firm-Level Corporate Balance Sheet Mismatch

The previous results demonstrated a strong relationship between corporate FC borrowing and sovereign risk. This connection between corporate borrowing and sovereign risk makes economic sense if FC borrowing is evidence of corporate vulnerability to exchange rate fluctuations (a balance sheet mismatch). We now present firm-level evidence that this is indeed case. In particular, we ask whether FC use can be explained by operating hedging or financial hedging motives, or whether it is more likely to indicate a mismatch.

We examine this question using Factset Debt Capital Structure, a commercial dataset built from firm financial reporting such as financial statements and credit agreements. The data is intended to not only cover foreign bonds and syndicated loans, but all of a firm's debt financing. In addition, the data is aggregated to the level of the ultimate parent, consistent with our nationality-based treatment of the aggregate data in Section 2.[19] We restrict our attention to any bonds and loans reported on the firms balance sheet. The set of firms included in Factset are those with public reporting and therefore are overwhelmingly likely to be among the large, publicly traded firms. For each firm-year, we measure the share of the firm's FC debt share in total debt. A table with summary statistics by country and year is reported as Appendix Table A2.

First, we show that FC borrowing remains sizable even in firms without operating hedging motives, such as the ones in the non-tradable sector, or without foreign sales or foreign assets. In Table 5, we run regressions of the form

$$FC\ Debt_{f,i} = \alpha_i + \beta \cdot X_f + \epsilon_f \tag{11}$$

where α_i is a country fixed effect, and X_f is a firm-level characteristic we might expect to explain the FC debt share, including the firm size, proxied by the de-meaned log total sales, the share of sales from foreign countries, and the foreign asset share in total assets. The regression constant reports the average country fixed effects. In Column 1 of Table 5, we run a regression with country fixed effects alone and already observe an R^2 of 14%. This should be unsurprising as our previous aggregate analysis documented large differences across countries in the FC debt share. The constant indicates that average FC share in total debt is 19% in our sample. In the second column, based on Maggiori et al. (2020) and Salomao and Varela (2021), we include the log of total sales and find that this proxy

[19] Because the Factset Debt Capital Structure data comes from firm balance sheets, it includes all debt, not only external debt as is the focus of the rest of the paper.

for firm size adds additional explanatory power. We de-mean the log total sales. So the constant shows the average FC debt share for an average sized firm. In column 3, we use the Worldscope Geographic Segment data and include a firm's foreign sales share and find that, a 1% increase in the share of sales firms coming from export is associated with a 0.29% increase in the share of a firm's debt in foreign currency. In column 4 we see a similar effect for firm's foreign asset share, but with significantly lower explanatory power. In column 5, we find that firms in the tradable sector borrow 7.9% more of their debt in foreign currency than do firms in the non-tradable sector.[20] While these results suggest that firms borrow in FC in part for operating hedge motives, we note that the constants of the regressions remain about 15-20, which indicates that firms in the non-tradable sector that do not have foreign sales nor assets still borrow 15-20 perfect of their debt in FC.

Furthermore, Figure 6 visualizes the overlap between the distribution of FC shares between tradable and non-tradable sector firms and exporters and non-exporters. We residualize the FC share by running the regression in column 2 and plot the resulting distribution. Panel (a) reports the residuals for firms in the tradable sector versus firms in the non-tradable sector. While we do see a somewhat lower residualized FC share for firms in the non-tradable sector (as indicated by the statistically significant coefficient on Tradability in Column 4), the overall distribution of the FC debt share in the tradable and non-tradable sector remains very similar. Panel (b) reports a similar finding for firms above and below the sample median in terms of foreign sales shares.[21]

While the previous analysis demonstrates that the pattern of firm level FC borrowing is not fully explained by operating hedge motives, Appendix Table A5 presents evidence that the FC liabilities are unlikely to be financially hedged. In particular, we show that the outstanding amounts of FC liabilities are generally much larger than the notional outstanding

[20] We use a definition of tradable based on geographic concentration that we take from Jensen and Kletzer (2010)

[21] Appendix Table A4 replaces the tradability measure with industry fixed effects using four-digit NAICS. We find that the industry fixed effects increase the R^2 more than tradability. In the final three columns, we reintroduce introduce total sales, foreign sales, and foreign assets. While all three retain their statistical significance, the increase in R^2 is fairly minor relative to country and industry fixed effects.

of cross-currency swaps for most sample countries, the derivatives that firms would use to financially hedge their foreign currency liability exposure.

Putting this together leads us to conclude that while firms with an operating hedging motive are more likely to borrow in FC, there are many firms with no operational hedging motives still borrowing significant amounts in FC. In addition, the relative explanatory power of country fixed effects motivates our decision to focus on between country heterogeneity rather than within-country differences in our theoretical framework. Furthermore, the use of financial derivatives to hedge FC debt exposure is likely to be quite limited. These evidence of corporate balance sheet FX mismatch is consistent with finding in the recent work on Peru (Gutierrez et al. (2020)), Chile (Alfaro et al. (2020)), Hungary (Salomao and Varela (2021)), and Turkey (Di Giovanni et al. (2017)).

4 Model

Having documented this relationship between the currency composition of external debt and sovereign risk, we now interpret these patterns through the lens of the canonical sovereign debt model (Arellano (2008) and Aguiar and Gopinath (2006)). The key friction in the model is that the government cannot commit, and instead decides each period whether or not to repay and how much to borrow. Relative to this literature, we introduce LC sovereign debt alongside FC sovereign debt and give the sovereign another policy tool, the inflation rate, with which to reduce real repayments on the debt. In addition, we introduce a simple firm balance sheet where the firm's debt composition generates an endogenous cost of inflation.

4.1 Setup

The sovereign's objective is to maximize the discounted utility stream of consumption for the representative agent:

$$\max_{B',\zeta,D} E\left[\sum_{t=0}^{\infty}\beta^t u\left(C_t\right)\right]. \tag{12}$$

The sovereign maximizes this objective function by choosing how much to borrow (B'), whether to default on the outstanding debt (D), and, now, how much of the existing debt to inflate away ζ. An exogenous fraction α_G of the face value of the borrowing the government is in LC and the remainder $(1-\alpha_G)$ will be in foreign currency.

In order to tractably introduce long-term debt, we assume that the sovereign borrows with exponentially decaying nominal LC perpetuities with promised LC cash flows:

$$P_t \kappa \left[1,\ \delta,\ \delta^2, ...\right]. \tag{13}$$

In this expression, P_t indicates today's price level and $\delta \leq 1$ controls the speed with which promised coupon payments decline, and thereby the duration of the bond. If $\delta = 0$, this is equivalent to one-period debt.[22] We assume that purchasing power parity holds, $\frac{P_{t+1}}{P_t} = \frac{\mathcal{E}_{t+1}}{\mathcal{E}_t}$, so that the inflation rate is equal to the depreciation rate (where we have normalized foreign inflation to 0). A foreign lender values this stream of coupons in FC. Defining $\frac{P_{t+1}}{P_t} = 1 + \pi_{t+1}$, with π being the net inflation rate, we can define the inflation tax as $\zeta_{t+1} = \frac{\pi_{t+1}}{1+\pi_{t+1}} \in [0,1]$. The real (FC) value of the coupons can then be written compactly as

$$\kappa \left[\left(1-\zeta_{t+1}\right),\ \delta \prod_{s=1}^{2} \left(1-\zeta_{t+s}\right),\ \delta^2 \prod_{s=1}^{3} \left(1-\zeta_{t+s}\right), ... \right]. \tag{14}$$

The bond price is equal to the discounted expected value of all future cash flows. The decaying perpetuity structure allows us to write the bond price schedule as a function of today's exogenous state A and amount of debt issued:

$$q^{LC}\left(A, B'\right) = \int_{A'} M\left(A'\right)\left(1 - D\left(A', B'\right)\right)\left(1 - \zeta\left(A', B'\right)\left(\kappa + \delta q^{LC}\left(A', B''\right)\right)\right) f\left(A, A'\right) dA' \tag{15}$$

[22]We use the modeling device of Lorenzoni and Werning (2019) and normalize the coupon payments by $\kappa = 1 + r^* - \delta$, where r^* is the risk-free rate. Multiplying the coupon payments by κ guarantees that one unit of risk-free debt sells for a price of 1, regardless of the bond's duration.

This expectation is taken after the state A and borrowing B' have been realized, but tomorrow's state A' and tomorrow's borrowing level B'' are not yet known. Given the lack of commitment, the government today has to treat tomorrow's borrowing policy function $B''(A', B')$ as given. $D(A', B')$ is an indicator variable for default that depends on aggregate productivity and the amount of debt outstanding. In the event of default, $D = 1$, and the lender receives nothing.[23] In repayment states, $D = 0$, and the expectation is taken over losses from inflation (ζ), which are a function of tomorrow's state A' and the debt level B'. If the bonds were only one period ($\delta = 0$), then this would be sufficient. However, because these are long-term bonds, lenders must account for future inflation and default risk reducing the value of future repayments. Finally, $M(A')$ is the lender's stochastic discount factor, which we assume to be a function of the aggregate state.[24] This will allow us to parsimoniously generate risk premia that vary with the state of the domestic economy.[25] Pricing FC debt is done equivalently, but inflation no longer affects the foreign currency value of the repayment:

$$q^{FC}(A, B') = \int_{A'} M(A')(1 - D(A', B'))\left(\kappa + \delta q^{FC}(A', B'')\right) f(A, A')\, dA' \tag{16}$$

For now, we assume that output in repayment is a function of aggregate TFP A and the inflation rate ζ. We will introduce a specific functional form for output based on mismatched

[23] With full default, optimal inflation conditional on default is zero, but with partial default some inflation can still be optimal. Appendix B.1 considers an extension with partial default. Galli (2020) considers how the existence of money can also generate positive inflation upon default.

[24] Most of the sovereign debt literature assume a risk-neutral foreign lender, in which case $M(A') = \dfrac{1}{1+r^*}$.

[25] Of course, assuming that the domestic economy and its lenders share a single aggregate state variable is a simplification, and a more complete model would begin with lenders consumption or net worth with the addition of a lender SDC.

entrepreneurs in the next subsection. Consumption in repayment is given by:

$$C^{R}(A,B,B') = \underbrace{Y(A,\zeta)}_{\text{Output}} - \underbrace{(1-\alpha_G\zeta)\,\kappa B}_{\text{Coupon payments}} + \underbrace{\alpha_G q^{LC}(a,B')\,(B'-(1-\zeta)\,\delta B)}_{\text{Net revenue from LC bond issuance}} + \underbrace{(1-\alpha_G)\,q^{FC}(a,B')\,(B'-\delta B)}_{\text{Net revenue from FC bond issuance}} \tag{17}$$

The term $(1-\alpha_G\zeta)\,\kappa B$ gives the real value of coupon payments this period, with $\alpha_G\kappa B\zeta$ capturing the reduction in real coupon value coming from inflation. The next term, $\alpha_G q^{LC}(a,B')\,(B'-(1-\zeta)\,\delta B)$, is the net revenue raised from local currency bond issuance bond issuance. The final term is the equivalent for net revenue raised from FC bond issuance.[26]

If the sovereign chooses to default, aggregate productivity is reduced to:

$$A_D = A - \phi(A), \tag{18}$$

where $\phi(A) \geq 0$ denotes how much aggregate productivity is reduced by a sovereign default.

4.2 The Optimal Inflation Rate

We begin by characterizing the optimal rate of inflation for a general production function before introducing a simple microfoundation that delivers a closed form expression. The key in our formulation is that, taking today's TFP A and today's debt stock B as given, we can characterize the optimal rate of inflation for any given choice of next period borrowing B'

[26] As the term for consumption makes clear, domestic holdings of local currency bonds do not affect consumption in our framework. This is because with a representative household and lump-sum taxation, Ricardian equivalence holds making domestic bond holdings irrelevant in our model. For models where the domestic ownership composition of sovereign debt affects the governments repayment incentives, seeAghion and Bolton (1990), Guembel and Sussman (2009), D'Erasmo and Mendoza (2016), and D'Erasmo and Mendoza (2021).

as the choice that maximizes static consumption

$$\zeta^* = \arg\max_{\zeta} C^R\left(A, B, B'\right) \tag{19}$$

Assuming an interior solution for inflation, this delivers the first order condition

$$\underbrace{-\frac{\partial Y\left(A,\zeta\right)}{\partial \zeta}}_{\text{Output Cost of Inflation}} = \underbrace{\alpha_G B\left(\kappa + \delta q^{LC}\left(A, B'\right)\right)}_{\text{Reduction in debt repayment}} \tag{20}$$

This says that the government will continue to increase inflation until it maximizes period consumption, the point where the marginal output loss from increased inflation offsets the consumption gain from reducing the real value of debt payments. The key idea of this paper is that one of the things that will determine the optimal choice of inflation is the degree of FX mismatch on corporate balance sheets. Essentially, if firms are more mismatched (with more LC revenue relative to FC liabilities), then output will fall increasingly quickly with inflation.

We do not actually need output to fall with inflation in order for this mechanism to be at play. The key for our mechanism is that output may simply increase relatively less for countries with a higher degree of mismatch than those of others, holding all else equal. Appendix B.2 demonstrates how changes in the degree of currency mismatch operate very similarly to changes in a reduced form deadweight cost of inflation.

4.2.1 Currency Mismatch and Inflation

We now introduce a simple production function with mismatched entrepreneurs that allows us to pin down the optimal cost of inflation in closed form. In particular, we assume that

$$Y\left(A,\zeta\right) = AX\left(\zeta\right)^{\gamma} \tag{21}$$

where A is aggregate TFP and X is intermediate good provision. Intermediate goods are produced by a continuum of entrepreneurs. At the beginning of the period entrepreneurs have access to projects that require a fixed investment to return a fixed amount ω of the tradable good. To finance the investment in the project, entrepreneurs borrow intra-period from foreign lenders. The key assumption is that conditional on producing, entrepreneurs are committed to sell a share of their output at a fixed LC per-unit price. Because they have set their prices in LC but have to repay a real amount, inflation (depreciation) reduces the real value of their profits.[27] While the entrepreneurs are constrained to sell a fraction of their output in fixed LC prices, the single consumption good is also traded internationally with flexible prices. This implies that PPP holds, and changes in the domestic price level are equal to changes in the nominal exchange rate. This PPP assumption will allow us to talk about inflation and depreciation interchangeably. Entrepreneurs' profits from the sale of the tradable good in the first stage of the period constitute their net worth when they want to invest in intermediate good production in the second stage. We assume that no external finance can be used for the production of intermediate goods, and so changes in net worth will determine the amount of intermediate goods entrepreneurs can produce. This in turn will determine aggregate production.[28]

At the beginning of the period, entrepreneurs borrow a fixed amount Z from foreign lenders with an exogenous share α_P in LC and $1 - \alpha_P$ in FC.[29] Entrepreneurs borrow signif-

[27] Our assumption of a mismatched corporate sector builds on the empirical literature that documents that non-financial corporate foreign currency borrowing is driving by real borrowing cost differentials, rather than hedging motives. Looking at heterogeneity in corporate cash holdings, Bruno and Shin (2017) argue that foreign currency bond issuance in emerging markets is driven by a carry-trade motive. Acharya and Vij (2020) demonstrate that non-financial corporate foreign currency borrowing in India is driven by a carry trade motive.

[28] The closest paper in the literature to our entrepreneurial sector is Céspedes et al. (2004), who study a Bernanke et al. (1999) financial accelerator in an open economy environment. Céspedes et al. (2004) demonstrate that depreciations are less expansionary, and potentially contractionary, when entrepreneurs are indebted in FC but earn revenues in sticky LC prices. In their model, informational frictions create an external finance premium that is falling in net worth. A lower net worth that leads to a higher premium on external borrowing thereby reduces aggregate investment. While we are after a similar channel, we make a starker assumption.

[29] We treat the currency composition of corporate debt to keep our focus on the determinants of sovereign default risk. For a model that endogenizes the choice of the currency composition of corporate debt, see Salomao and Varela (2021).

icantly less than they will produce ω, so we do not consider them defaulting on their debt.[30] However, their profit Π is a function of the inflation rate. We assume that entrepreneurs are committed to sell a share μ of their output at a fixed LC price P_{t-1} and may set the price of the remaining $(1-\mu)$ optimally. Using our earlier definition of the inflation tax ζ, we can write the real value of entrepreneurial profits as:

$$\Pi = \left((1-\zeta)\left(\mu\omega - \alpha_P Z\right) + (1-\mu)\,\omega - (1-\alpha_P)\,Z\right). \tag{22}$$

We assume that entrepreneurs have access to a linear production technology that allows them to invest to produce intermediate goods $X = \xi I$, where ξ is the productivity of the intermediate good production technology and I denotes the units of tradable goods invested. The key financial friction is that we assume entrepreneurs cannot access external finance to invest in intermediate good provision, so we must have that investment is less than net worth $(I \leq \Pi)$.

We will consider the case where this constraint binds in every state, and so entrepreneurs will invest the maximum amount possible and we have $I = \Pi$. We can therefore write the amount of intermediates produced in equilibrium as:

$$X(\zeta) = \xi\left((1-\zeta)\left(\mu\omega - \alpha_P Z\right) + (1-\mu)\,\omega - (1-\alpha_P)\,Z\right). \tag{23}$$

We can then define $\theta \equiv \mu\omega - \alpha_P Z$ as the currency mismatch of the corporate sector, with $\mu\omega$ capturing the amount of sales with sticky LC prices and $\alpha_P Z$ measuring local currency debt liabilities. The difference between these determines the effect of inflation on firm net worth. Heterogeneity in α_P will be the key source of corporate balance sheet mismatch in the model, as a higher α_p means firm net worth will decline less with inflation. $\eta \equiv \omega - Z$ measures firm net worth in the absence of inflation. We can rewrite output in terms of TFP,

[30] When we turn to the sovereign's problem, we will see that an optimizing sovereign would not choose a level of inflation in equilibrium that leaves entrepreneurs unable to repay their debt.

inflation, and these composite parameters:[31]

$$Y = A\left(\xi\left(\eta - \theta\zeta\right)\right)^{\gamma} \tag{24}$$

We can then solve for the optimal inflation rate as[32]

$$\zeta^{*}\left(A, B, B'\right) = \frac{\eta}{\theta} - \left(\frac{A}{\alpha_G B\left(\kappa + \delta q^{LC}\left(A, B'\right)\right)}\gamma\left(\xi\theta\right)^{\gamma}\right)^{1-\gamma} \tag{25}$$

This captures the trade-offs the sovereign faces in choosing the optimal inflation rate. First, inflation is countercyclical, as a lower aggregate productivity makes it more tempting to inflate away the debt. Second, the larger today's debt service, κB, the higher the optimal inflation rate. Third, the term $\delta B q^{LC}\left(A, B'\right)$ captures the present value of outstanding long-term debt that can be inflated away. Because the expression for inflation is for a fixed amount of debt to be issued, B', net revenue raised is increasing with the amount of debt inflated away. Therefore, the higher the price a sovereign will receive for new bond issuances, the more tempting it is to inflate away the existing debt. Of course, this temptation will be captured by the bond price schedule in equilibrium.

4.3 Sovereign Borrowing and Default

While the inflation choice can thus be reduced to a static optimization problem, the choice of the debt level is inherently dynamic, as this debt level is the endogenous state variable in the next period. Following the literature, we assume governments are locked out of credit markets in default, and so consumption in default is simply output in default:

$$C_D = \left(A - \phi\left(A\right)\right) X_D^{\gamma}, \tag{26}$$

[31] In default states, inflation $\zeta = 0$, and so if we have $X_D = \xi I_D$ and $I_D \leq \Pi_D$, equilibrium intermediate good provision in default states will be given by $X_D = \xi\left(\omega - Z\right)$.

[32] Returning the general first order condition, we can now solve explicitly for the optimal inflation rate $\frac{\partial Y}{\partial \zeta} = -\gamma\theta A\left(\xi\left(\eta - \theta\zeta\right)\right)^{\gamma-1}$. This can then be solved directly for ζ.

where X_D is given by Equation 23 with inflation set to zero and $\phi(A)$ is a non-negative function capturing how much aggregate productivity drops in default. Following Aguiar and Gopinath (2006) and Arellano (2008), we assume that once the government defaults, there is a constant probability λ each period that the government is redeemed, productivity losses cease, and the government can re-enter sovereign debt markets with zero outstanding debt. However, with probability $(1-\lambda)$ the government remains locked out of sovereign debt markets for another period. With this setup, we can write the government's problem recursively as:

$$\begin{aligned} V^R(A,B) &= \max_{B'} u\left(C_R(A,B,B')\right) + \beta E V(A',B') \\ V^D(A) &= u\left(C_D(A)\right) + \beta\left(\lambda E V^R(A',0) + (1-\lambda) E V^D(A')\right) \\ V(A,B) &= \max_{D\in\{0,1\}} (1-D)\,V^R(A,B) + D V^D(A), \end{aligned} \tag{27}$$

where the inflation policy is given by Equation 25, consumption in repayment and default by Equations 17 and 26, intermediate good provision in repayment and default by Equation 23, and the bond prices by Equations 15 and 16. The value function in repayment states V^R is today's flow utility and the expectation of tomorrow's value function. In the event a country defaults or remains in bad credit history, there are no choices to be made and the country's period utility is just $u(C_D(A))$. Finally, the value function today is the upper envelope of the two: the sovereign remains in V^R if it prefers to repay the debt rather than explicitly default, and if it prefers to default, the relevant value function is V^D.

One of the primary benefits of the way in which we introduce LC debt and the entrepreneurial sector into the canonical model is that our model is a generalization of the benchmark model used for modeling FC debt. If we were to restrict inflation to always be zero, then this setup collapses exactly to a model with FC debt, particularly the version with long-term debt studied by Hatchondo and Martinez (2009) and Chatterjee and Eyigungor (2012). If we also restricted the sovereign to borrowing with one-period debt ($\delta = 0$), then this would be equivalent to the model studied by Arellano (2008) and Aguiar and Gopinath (2006).[33]

4.3.1 Equilibrium Definition

We study the Recursive Markov Equilibrium for this economy, where all decision rules are functions only of the state variables A and B. An equilibrium is a set of policy functions for consumption $\tilde{c}(A,B)$, debt issuance $\tilde{B}(A,B)$, default $\tilde{D}(A,B)$, and inflation $\tilde{\zeta}(A,B)$, and a price function for debt $q(A,B')$ such that (1) taking as given the government policy functions, household consumption satisfies the resource constraint; (2) taking the bond price function $q(A,B')$ as given, the government's policy functions satisfy the sovereign's optimization problem; (3) the bond price function satisfies the foreign lenders' pricing condition. The government's lack of commitment is captured by the fact that equilibrium policy functions are restricted to be functions of today's state variables A and B and cannot be history dependent. Instead, the government policy functions must satisfy the government's optimization problem period by period.

4.4 Quantitative Results

4.4.1 Calibration and Numerical Solution

In this section, we will outline the functional form assumptions, calibration strategy, and solution method used to solve the model numerically. We assume a CRRA utility function with a coefficient of relative risk aversion σ, and we assume that log productivity follows an

[33] A recent literature has also examined how monetary policy and inflation will affect the sovereign default decision, even in the absence of local currency debt and a direct ability to reduce real cost of servicing the debt. Bianchi and Mondragon (2018) examines the effect an independent monetary policy on the probability of a rollover crisis with foreign currency debt. Arellano et al. (2020) examines the interaction of monetary policy and sovereign default in an integrated New Keynesian model with defaultable sovereign debt.

AR(1) process:

$$u(c) = \frac{c^{1-\sigma} - 1}{1-\sigma} \tag{28}$$

$$\ln A_t = \mu_z (1-\rho_z) + \rho_z \ln A_{t-1} + \epsilon_t,\ 0 < \rho_z < 1 \ and\ \epsilon_t \sim N\left(0, \sigma_\epsilon^2\right).$$

We follow Chatterjee and Eyigungor (2012) and use the flexible form for default costs:[34]

$$\phi(A) = \max\left\{0, d_0 A + d_1 A^2\right\},\ d_1 \geq 0. \tag{29}$$

We assume the foreign lender has an exponentially affine stochastic discount factor:

$$M(A_{t+1}) = \exp\left(-r^* - \chi\varepsilon_{t+1}^a - \frac{1}{2}\chi^2\eta^2\right) \tag{30}$$

$$\varepsilon_{t+1}^a = \log(A_{t+1}) - \rho \log A_t$$

We calibrate the model to a quarterly frequency. The parameter values are documented in Table 6. We split the parameters between those we set using external data and those we estimate via simulated method of moments. For the parameters calibrated externally, we set the intermediate good share γ to 1/3 so that the labor share is 2/3. To calibrate the productivity process, set the autocorrelation $\rho_z = 0.8$ and $\sigma_z = 0.034$ (Aguiar and Gopinath (2006)). We follow Tauchen (1986) to discretize the productivity process. We let $\delta = 0.9595$ to set the risk-free duration of the LC bonds to 5 years when the quarterly risk-free rate is 1%.[35] For the probability of re-entry into credit markets, we follow Cruces and Trebesch (2013) and set the probability of re-entry λ to 4.9%. The share of sticky price goods μ is set to 0.75, a common calibration parameter for Calvo pricing. We set the amount of FC external

[34] The literature provides a number of potential micro-foundations of the costs of default, including Mendoza and Yue (2012), Bocola (2016) and Perez (2014). Hebert and Schreger (2017) provide empirical evidence for these default costs.

[35] The risk-free Macaulay duration of bond is given by $D = \sum_{n=1}^{\infty} n \frac{C_n (1+r^*)^{-n}}{q}$, where C_n is the coupon payment due in period n. In our framework with exponentially declining coupons, $D = \frac{1+r^*}{1+r^*-\delta}$.

corporate financing Z to 0.68, so that in the absence of inflation the mean debt/output ratio is equal to 17%. Our benchmark calibration sets the corporate LC debt share α_P to 10% to and the sovereign LC share α_G to 60% to match the evidence in Section 2. In the counterfactuals, we will vary both of these debt share parameters for our key comparative statics.

That leaves a number of parameters we need to estimate. To do so, we jointly target a number of empirical moments. In particular, we need to estimate the default cost parameters d_0 and d_1, investor risk aversion ψ, the government discount factor β, and entrepreneurial relative productivity ξ. To do so, we use the method of simulated moments, targeting the default rate, the external debt/GDP ratio, the share of the risk premia in the LC spread, the average inflation difference, and the standard deviation of LC spreads.[36] While we estimate all parameters jointly, default costs are roughly targeted with the default rate and standard deviation of the spread, investor risk aversion is targeted with the difference between historical spreads and default rates, the sovereign discount factor for the level of debt, and entrepreneurial productivity with mean inflation. We estimate moderately convex default costs, risk-averse investor $(\psi = 0.889)$, and impatient sovereign with a quarterly $\beta = 0.91$, and $\xi = 1.2195$.

To solve the model, we use value function iteration over a discretized state space. Because our recursive representation is identical to the model studied in Hatchondo and Martinez (2009) and Chatterjee and Eyigungor (2012), with one additional constraint on the policy-maker (Equation 25), we can simply follow the solution methods used in the FC sovereign debt literature. The state space for productivity shocks is discretized to a 31-state grid. The state space for bonds is discretized into 301 grid points. A finer grid is used for the

[36]The default rate is taken from Aguiar et al. (2016). The external Debt/GDP ratio is calculated as the average external government debt to GDP from the World Bank International Debt Statistics in current USD scaled by GDP in current USD since 2000. Average inflation is the difference in median inflation the 14 sample emerging markets relative relative to the United States since 2005 (3.6% for emerging markets, 2.1% for the United States). The standard deviation of the LC spreads is measured directly in our dataset. The risk premia share is the mean LC spread, net of the average inflation difference and mean default probability as a share of the spread.

endogenous state variable to keep the discretization from impacting the sovereign's choices. Following the recommendations in Hatchondo et al. (2010), we iterate backward from the solution of the final period of the finite-horizon model so that we select the equilibrium bond price of the finite-horizon model.[37] With our policy functions and bond price schedules in hand, we can calculate the model-implied moments by simulating the model 20 times for 3,000 quarters per simulation. We discard the first 500 periods of each simulation.

4.4.2 Quantitative Results and Key Mechanisms

In Table 7, we report the empirical and model-generated moments for five different calibrations of the corporate (α_P) and sovereign (α_G) local currency debt share. In the first column, we report the empirical moments. In our baseline calibration, we come quite close to matching the average cross-country empirical moments, with an average FC and LC spread of 1.06% and 2.95%, compared to 1.59% and 4.32% in the data. Countries have a default rate of 0.9% in the model as compared to 1.5% in the data.

In the bottom five rows of the table, we compare the business cycle moments between the data and the various model calibrations. We find that the baseline calibration come fairly close to matching the excess volatility of consumption to output ($\sigma(y)/\sigma(c)$) and the correlation between output and consumption (0.92 in model vs 0.72 in data). In addition, the model generates a countercyclical trade balance. More closely related to the innovation of the model, out baseline model generates strongly countercyclical inflation, with a correlation

[37] To improve the convergence properties of the solution, we follow Chatterjee and Eyigungor (2012) and introduce a small i.i.d. component to the productivity process. Chatterjee and Eyigungor (2012) show that in sovereign debt models with long-term bonds, large changes in the bond issuance policy function can achieve roughly the same welfare level, so that small changes in the bond price can lead the bond issuance policy function to change significantly. These discontinuities arise from the non-convexity of the budget set. The introduction of a small i.i.d. component to the productivity process acts to convexify the budget set and improve convergence without significantly affecting the business cycle properties of the model. In the event of default, we set this i.i.d. component to its lowest value, slightly raising the cost of default. As in Chatterjee and Eyigungor (2012), we set a bounded support of this i.i.d. shock at .006 and find it is sufficient to achieve faster convergence for our calibration. Rather than using the continuous formulation of this i.i.d. shock, we model it as a discrete uniform distribution with an 3-point grid. This method corresponds to column IV in Table C1 of their appendix.

between inflation and output of -0.65 as compared to -0.28 in the data.[38] In addition, the mean inflation differential of 1.73 is quite close to the data, where emerging markets have had an average inflation of around 1.5% - 2% higher than the United States since 2005.

We next perform counterfactual analyses by varying the sovereign and corporate local currency debt shares. In column (6), we see that by moving from our baseline of 60% local currency sovereign debt and 10% local currency corporate debt to 80% sovereign debt and 30% corporate debt, the probability of default is cut by 2/3. In columns (4) and (5), we see that when we vary only the corporate and sovereign LC shares individually, and we see smaller declines in default risk. For completeness, in column (3), we report the model-simulated moments for a model with only foreign currency debt.

In order to better understand how shifting the currency composition of debt generates this different default behavior, we will begin by looking at the sovereign's policy for different degrees of corporate and sovereign mismatch. In Figure 9, we plot the sovereign's inflation policy functions and default threshold for different currency compositions of external debt for a single productivity level. As the country shifts towards more local currency corporate and sovereign debt, the government finds it optimal to begin to engage in fiscal inflation at lower levels of debt. In addition, the government chooses higher levels of inflation to reduce the value of the debt before turning to explicit sovereign default.

Because lenders recognize the incentives facing the sovereign, these policy functions are mirrored in the bond price schedules ensuring that foreign lenders break even in expectation. In Figure 10, we plot the local currency and foreign currency bond price schedule the sovereign faces for 5 different combinations of corporate and sovereign local currency exposure. Panel 10a plots the local currency bond price schedule and Panel 10b plots the price schedule for foreign currency bonds. Turning to local currency bond prices first, we see a straightforward relationship: as the government moves from more foreign currency corporate and sovereign debt to more local currency debt, we see lower local currency bond

[38] This is the average correlation between inflation and GDP growth from 1990-2018 for our sample countries. Over the more recent period since 2003, this drops to -0.08.

prices for any level of borrowing. As seen in Figure 9, this is expected as sovereigns with more local currency debt are relatively more inclined to reduce the value of the debt using inflation. Turning to Panel 10b, however, we see a starkly different pattern. Here, we see for relatively low levels of debt, governments with relatively more local currency debt (solid red lines) actually receive the highest foreign currency bond prices. The reason for this is that the government's ability to partially reduce the value of their debt stock via inflation, and the incentive of the government when borrowing to avoid the inflation region to maintain a higher bond price, keeps the government away from the default threshold in equilibrium. Because the only risk faced by investors is foreign currency debt is that of outright default, this figure speaks to the main finding of the paper, that a larger reliance on local currency debt can reduce default. Importantly, however, as seen in the dashed pink line, increasing the sovereign local currency share is not sufficient to do this. It is the joint movement of sovereign and corporate debt towards local currency that reduces equilibrium default risk.

4.4.3 Model and Data

The results in Table 7 show that the model predicts that sovereign credit risk declines very sharply with the share of private LC debt. We now aim to direct connect the theory and data by running our benchmark regressions in the model to compare. In particular, in Table 8, using empirical and model-generated data we estimate a panel regression of the form:

$$CDS_{i,t} = \beta_0 + \beta_1 \cdot \alpha_G + \beta_2 \cdot \alpha_P + \epsilon_{i,t} \tag{31}$$

In the second column, we additionally control for the the debt/GDP ratio. The third column reports the model counterparts. We see that our model-generated estimates for the effect of an increase in the LC debt share on market-implied default risk is roughly in line with data. For corporate debt, while the model generates a significant effect of moving towards local currency, it is less so than in the data.[39]

5 Conclusion

This paper examines why FC corporate borrowing increases sovereign default risk, even when the sovereign external borrowing has been largely denominated in LC. We argue that a government is more inclined to default than inflate when the currency mismatch of the corporate sector implies large adverse balance sheet effects from a currency depreciation. In making this argument, we construct a new dataset on the currency composition of emerging market external borrowing by sector and show that the corporate sector remains reliant on external FC debt even as sovereigns have swiftly moved toward borrowing in their own currency. We show that a higher level of external FC corporate debt is associated with more sovereign credit risk.

Motivated by these empirical findings that a higher level of external FC corporate debt is associated with more sovereign credit risk. we present a model where currency-mismatched corporate balance sheets increase the cost of inflating away sovereign debt and make default relatively more appealing. We embed a corporate balance sheet channel in the canonical Eaton and Gersovitz (1981) sovereign debt model and demonstrate how higher shares of LC private debt can reduce the default risk on sovereign debt in equilibrium by affecting the cost of inflation relative to default.

More generally, this paper underscores the importance of integrating private sector vulnerabilities into analyses of government borrowing and default decisions. This paper demonstrates how aggregate corporate mismatch can tilt the balance between outright default and fiscal inflation. But, of course, there are many channels through which corporate exposures may affect the costs of default or other channels underlying government decisions.

[39] As shown in Table A9, the fit between model and data is worse for inflation. While the relation is consistent between model and data for the corporate debt share, empirically a higher LC sovereign debt share is associated with lower inflation. This can be rationalized in a model with endogenous sovereign currency choice, such as Ottonello and Perez (2019), Engel and Park (2016), and Du et al. (2020).

References

Acharya, Viral V and Siddharth Vij, "Foreign currency borrowing of corporations as carry trades: Evidence from india," 2020.

Aghion, Philippe and Patrick Bolton, "Government domestic debt and the risk of default: a political-economic model of the strategic role of debt," *Public debt management: theory and history*, 1990, *315.*

Aghion, Philippe, Philippe Bacchetta, and Abhijit Banerjee, "A Simple Model of Monetary Policy and Currency Crises," *European Economic Review*, 2000, *44* (4), 728–738.

Aghion, Philippe, Philippe Bacchetta, and Abhijit Banerjee, "Currency Crises and Monetary Policy in an Economy with Credit Constraints," *European Economic Review*, 2001, *45* (7), 1121–1150.

Aghion, Philippe, Philippe Bacchetta, and Abhijit Banerjee, "A Corporate Balance-Sheet Approach to Currency Crises," *Journal of Economic Theory*, 2004, *119* (1), 6–30.

Aguiar, Mark and Gita Gopinath, "Defaultable Debt, Interest Rates and the Current Account," *Journal of International Economics*, 2006, *69* (1), 64–83.

Aguiar, Mark, Satyajit Chatterjee, Harold Cole, and Zachary Stangebye, "Quantitative models of sovereign debt crises," in "Handbook of Macroeconomics," Vol. 2, Elsevier, 2016, pp. 1697–1755.

Alfaro, Laura, Mauricio Calani, and Liliana Varela, "Currency hedging in emerging markets: Managing cash flow exposure," 2020.

Arellano, Cristina, "Default Risk and Income Fluctuations in Emerging Economies," *American Economic Review*, 2008, *98* (3), 690–712.

Arellano, Cristina and Ananth Ramanarayanan, "Default and the Maturity Structure in Sovereign Bonds," *Journal of Political Economy*, April 2012, *120* (2), 187–232.

Arellano, Cristina, Yan Bai, and Gabriel P Mihalache, "Monetary policy and sovereign risk in emerging economies (NK-default)," 2020.

Arslanalp, Serkan and Takahiro Tsuda, "Tracking Global Demand for Emerging Market Sovereign Debt," *IMF Working Paper*, March 2014, (14/39).

Avdjiev, Stefan, Valentina Bruno, Catherine Koch, and Hyun Song Shin, "The dollar exchange rate as a global risk factor: evidence from investment," *IMF Economic Review*, 2019, *67* (1), 151–173.

Bernanke, Ben S, Mark Gertler, and Simon Gilchrist, "The Financial Accelerator in a Quantitative Business Cycle Framework," *Handbook of Macroeconomics*, 1999, pp. 1341–1393.

Bianchi, Javier and Jorge Mondragon, "Monetary independence and rollover crises," Technical Report, National Bureau of Economic Research 2018.

Bocola, Luigi, "The Pass-Through of Sovereign Risk," *Journal of Political Economy*, August 2016, *124* (4), 879–926.

Borri, Nicola and Adrien Verdelhan, "Sovereign Risk Premia," *Working Paper*, 2011.

Broner, Fernando A., Guido Lorenzoni, and Sergio L. Schmuckler, "Why Do Emerging Economies Borrow Short Term?," *Journal of European Economic Association*, 2013, *11*, 67–100.

Bruno, Valentina and Hyun Song Shin, "Global dollar credit and carry trades: a firm-level analysis," *The Review of Financial Studies*, 2017, *30* (3), 703–749.

Burger, John D and Francis E Warnock, "Local currency bond markets," *IMF Staff papers*, 2006, *53* (1), 133–146.

Burger, John D and Francis E Warnock, "Foreign participation in local currency bond markets," *Review of Financial Economics*, 2007, *16* (3), 291–304.

Burstein, Ariel, Martin Eichenbaum, and Sergio Rebelo, "Large devaluations and the real exchange rate," *Journal of Political Economy*, 2005, *113* (4), 742–784.

Calvo, Guillermo A and Carmen M Reinhart, "Fear of Floating," *The Quarterly Journal of Economics*, 2002, *117* (2), 379–408.

Céspedes, Luis Felipe, Roberto Chang, and Andrés Velasco, "Balance Sheets and Exchange Rate Policy," *American Economic Review*, 2004, *94* (4), 1183–1193.

Chatterjee, Satyajit and Burcu Eyigungor, "Maturity, Indebtedness, and Default Risk," *American Economic Review*, 2012, *102* (6), 2674–2699.

Coppola, Antonio, Matteo Maggiori, Brent Neiman, and Jesse Schreger, "Redrawing the map of global capital flows: The role of cross-border financing and tax havens," 2020.

Cruces, Juan J and Christoph Trebesch, "Sovereign defaults: The price of haircuts," *American Economic Journal: Macroeconomics*, 2013, *5* (3), 85–117.

D'Erasmo, Pablo and Enrique G Mendoza, "Distributional incentives in an equilibrium model of domestic sovereign default," *Journal of the European Economic Association*, 2016, *14* (1), 7–44.

D'Erasmo, Pablo and Enrique G Mendoza, "History remembered: Optimal sovereign default on domestic and external debt," *Journal of Monetary Economics*, 2021, *117*, 969–989.

Di Giovanni, Julian, Sebnem Kalemli-Ozcan, Mehmet Fatih Ulu, and Yusuf Soner Baskaya, "International spillovers and local credit cycles," Technical Report, National Bureau of Economic Research 2017.

Driscoll, John C. and Aart Kraay, "Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data," *Review of Economics and Statistics*, 1998, *80* (4), 549–560.

Du, Wenxin and Jesse Schreger, "Local Currency Sovereign Risk," *Journal of Finance*, 2016, *71* (3), 1027–1070.

Du, Wenxin and Jesse Schreger, "CIP Deviations, the Dollar, and Frictions in International Capital Markets," *Handbook of International Economics*, 2021.

Du, Wenxin, Carolin E. Pflueger, and Jesse Schreger, "Sovereign Debt Portfolios, Bond Risks, and the Credibility of Monetary Policy," *Journal of Finance*, 2020, *75* (6), 3097–3138.

Eaton, Jonathan and Mark Gersovitz, "Debt with Potential Repudiation: Theoretical and Empirical Analysis," *Review of Economic Studies*, 1981, *48* (2), 289–309.

Edwards, Sebastian, "LDC Foreign Borrowing and Default Risk: An Empirical Investigation, 1976-80," *The American Economic Review*, 1984, pp. 726–734.

Eichengreen, Barry and Ricardo Hausmann, "Exchange rates and financial fragility," 1999.

Engel, Charles and JungJae Park, "Debauchery and Original Sin: The Currency Composition of Sovereign Debt," *Working Paper*, 2016.

Galli, Carlo, "Inflation, Default Risk and Nominal Debt," *UCL manusript*, 2020.

Gertler, Mark, Simon Gilchrist, and Fabio M. Natalucci, "External Constraints on Monetary Policy and the Financial Accelerator," *Journal of Money, Credit and Banking*, 2007, *39* (2-3), 295–330.

Guembel, Alexander and Oren Sussman, "Sovereign debt without default penalties," *The Review of Economic Studies*, 2009, *76* (4), 1297–1320.

Gutierrez, Bryan, Victoria Ivashina, and Juliana Salomao, "Why is Dollar Debt Cheaper? Evidence from Peru," *Evidence from Peru*, 2020.

Hale, Galina B, Peter C Jones, and Mark M Spiegel, "Home currency issuance in international bond markets," *Journal of International Economics*, 2020, *122*, 103256.

Hatchondo, Juan Carlos and Leonardo Martinez, "Long-Duration Bonds and Sovereign Defaults," *Journal of International Economics*, 2009, *79* (1), 117–125.

Hatchondo, Juan Carlos, Leonardo Martinez, and Horacio Sapriza, "Quantitative Properties of Sovereign Default Models: Solution Methods Matter," *Review of Economic Dynamics*, 2010, *13* (4), 919–933.

Hebert, Benjamin and Jesse Schreger, "The Costs of Sovereign Default: Evidence from Argentina," *American Economic Review*, October 2017, *107* (10), 3119–3145.

Hilscher, Jens and Yves Nosbusch, "Determinants of Sovereign Risk: Macroeconomic Fundamentals and the Pricing of Sovereign Debt," *Review of Finance*, 2010, pp. 235–262.

Jeanneret, Alexandre and Slim Souissi, "Sovereign Defaults by Currency Denomination," *Working Paper*, May 2014.

Jensen, J Bradford and Lori G Kletzer, "Measuring tradable services and the task content of offshorable services jobs," in "Labor in the new economy," University of Chicago Press, 2010, pp. 309–335.

Kekre, Rohan and Moritz Lenel, "The dollar and the global price of risk," *University of Chicago Booth School of Business, working paper*, 2020.

Korinek, Anton, "Excessive Dollar Borrowing in Emerging Markets: Balance Sheet Effects and Macroeconomic Externalities," *Working Paper*, 2010.

Krugman, Paul, "Balance Sheets, the Transfer Problem, and Financial Crises," *International Tax and Public Finance*, 1999, *6*, 459–472.

Lane, Philip R and Jay C Shambaugh, "Financial Exchange Rates and International Currency Exposures," *The American Economic Review*, 2010, pp. 518–540.

Longstaff, Francis A, Jun Pan, Lasse H Pedersen, and Kenneth J Singleton, "How sovereign is sovereign credit risk?," *American Economic Journal: Macroeconomics*, 2011, *3* (2), 75–103.

Lorenzoni, Guido and Ivan Werning, "Slow Moving Debt Crises," *American Economic Review'*, 2019, *109* (9), 3229–63.

Maggiori, Matteo, Brent Neiman, and Jesse Schreger, "International currencies and capital allocation," *Journal of Political Economy*, 2020, *128* (6), 2019–2066.

Mendoza, Enrique G and Vivian Z Yue, "A General Equilibrium Model of Sovereign Default and Business Cycles," *The Quarterly Journal of Economics*, 2012, *127* (2), 889–946.

Ottonello, Pablo and Diego Perez, "The Currency Composition of Sovereign Debt," *American Economic Journal: Macroeconomics*, 2019, *11* (3), 174–208.

Perez, Diego J, "Sovereign Debt, Domestic Banks and the Provision Of Public Liquidity," *Manuscript, Stanford University*, 2014.

Reinhart, Carmen M. and Kenneth S. Rogoff, *This Time is Different: Eight Centuries of Financial Folly*, Princeton University Press, 2008.

Reinhart, Carmen M. and Kenneth S. Rogoff, "The Forgotten History of Domestic Debt," *The Economic Journal*, May 2011, *121*, 319–350.

Sachs, Jeffrey D and B Felipe Larrain, *Macroeconomics in the global economy*, Prentice Hall, 1993.

Salomao, Juliana, "Sovereign debt renegotiation and credit default swaps," *Journal of Monetary Economics*, 2017, *90*, 50–63.

Salomao, Juliana and Liliana Varela, "Exchange rate exposure and firm dynamics," *Review of Economic Studies*, 2021.

Tauchen, George, "Finite State Markov-Chain Approximations to Univariate and Vector Autoregressions," *Economics Letters*, 1986, *20* (2), 177–181.

Tomz, Michael and Mark LJ Wright, "Do countries default in "bad times"?," *Journal of the European Economic Association*, 2007, *5* (2-3), 352–360.

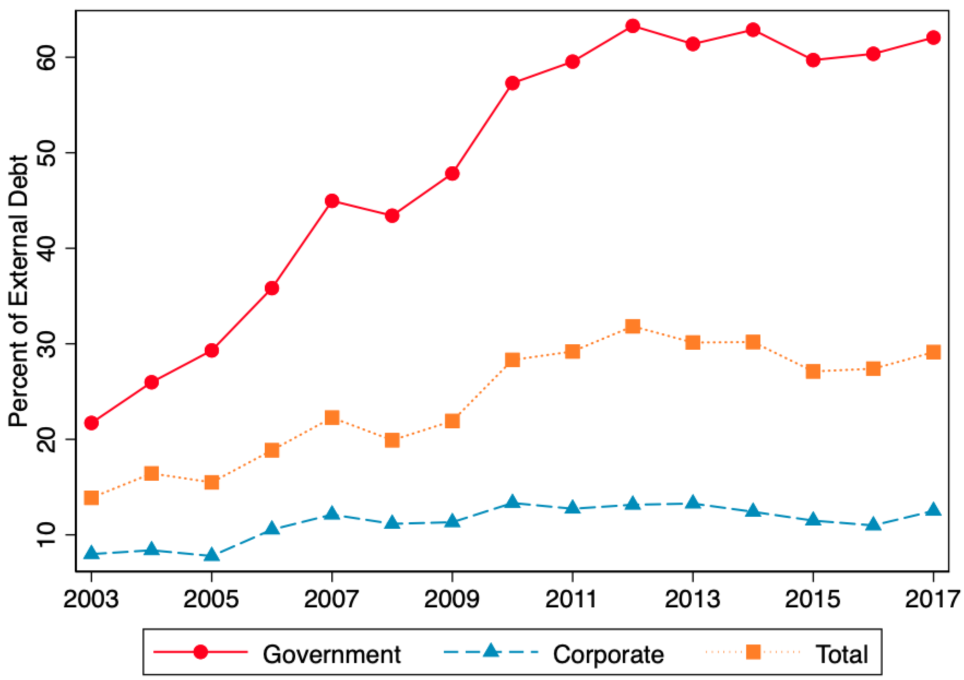
Uribe, Martin and Vivian Z Yue, "Country Spreads and Emerging Countries: Who Drives Whom?," *Journal of International Economics*, 2006, *69* (1), 6–36.

Wu, Steve Pak Yeung, "Corporate Balance Sheets and Sovereign Risk Premia," *Available at SSRN 3685278*, 2021.

Yue, Vivian Z, "Sovereign Default and Debt Renegotiation," *Journal of International Economics*, 2010, *80* (2), 176–187.

6 Figures

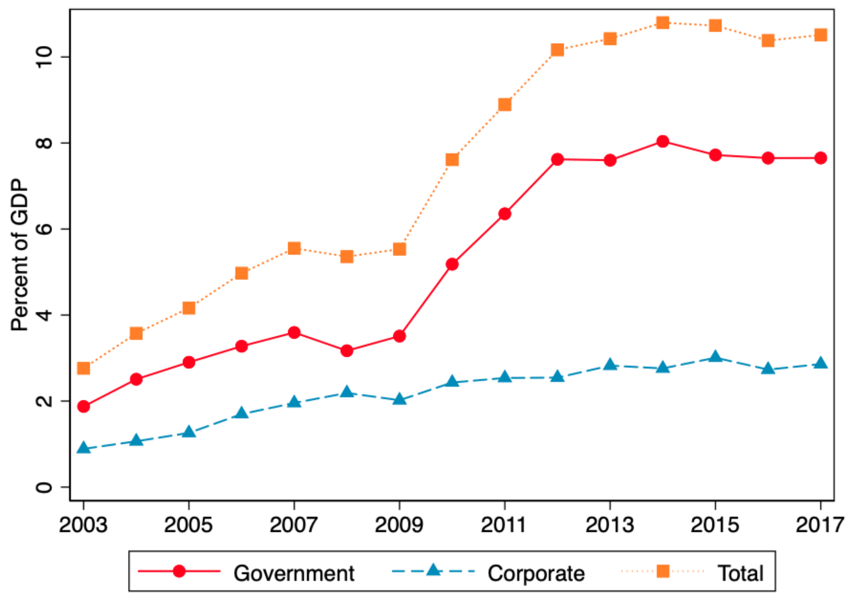
Figure 1: Average Share of External Debt in Local Currency



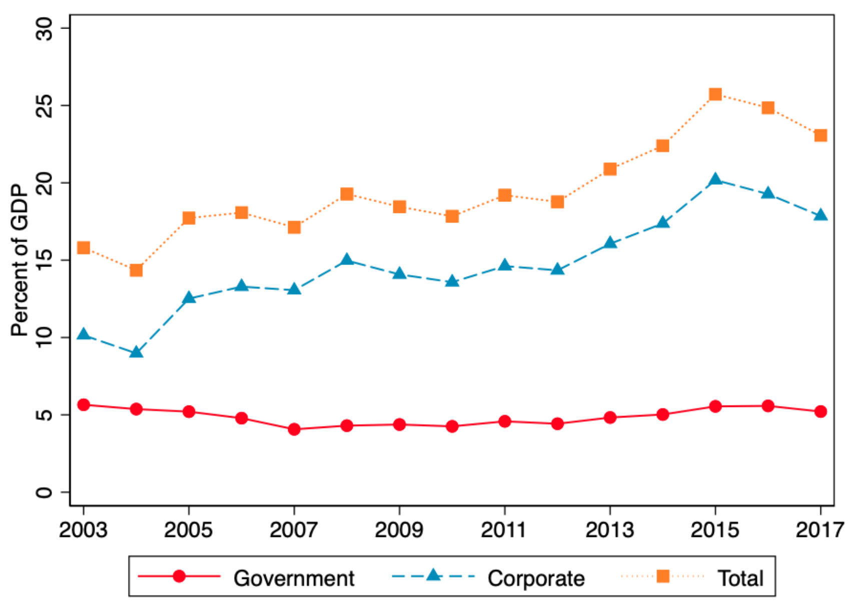
Notes: This figure plots the cross-country average of the share of external debt in local currency by sector. Each country is equally weighted. All data is by nationality.

Figure 2: Debt to GDP Ratios by Currency and Sector

(a) Local Currency External Debt/GDP



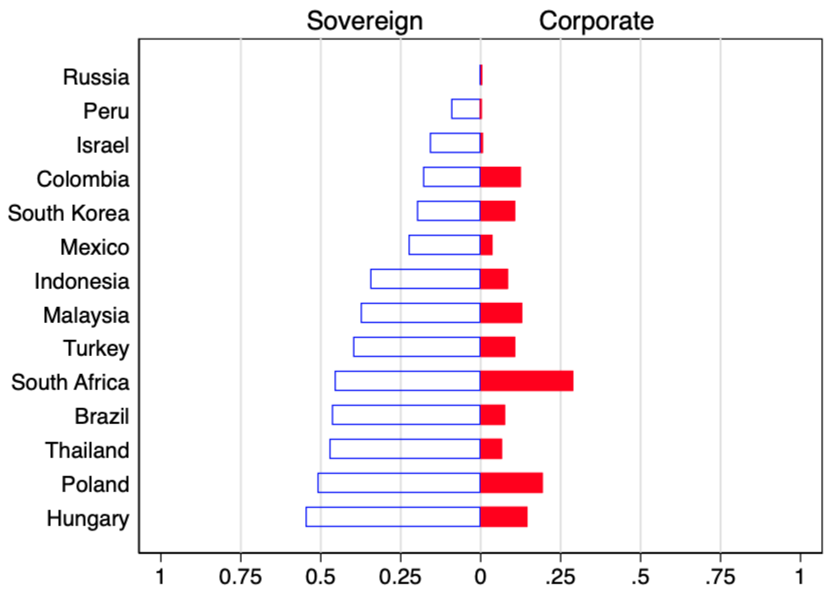
(b) Foreign Currency External Debt/GDP



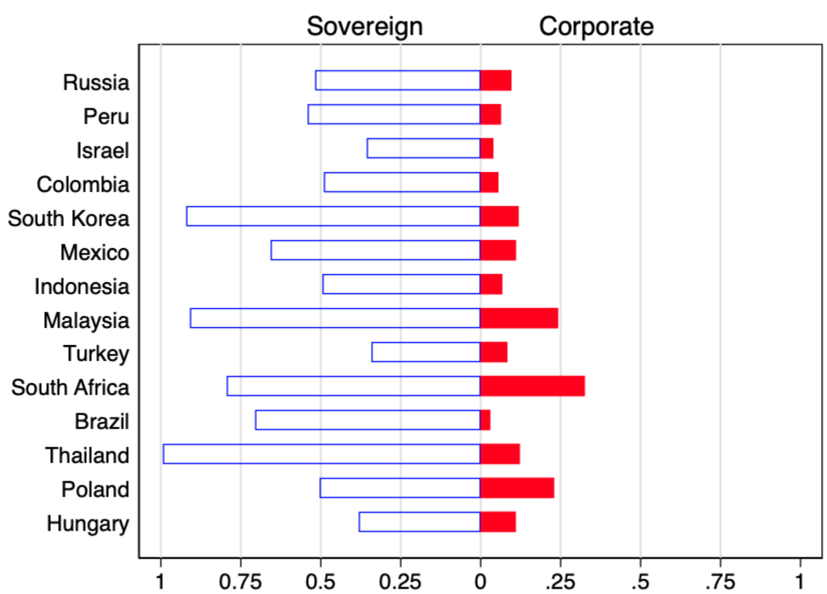
Notes: This figure plots the LC (top panel) and FC (bottom panel) external debt to GDP ratio for various sectors in the economy. "Total" refers to all debt, including corporate and sovereign. Corporate refers to the sum of financial and non-financial corporate debt.

Figure 3: The Currency Composition of External Borrowing

(a) 2005

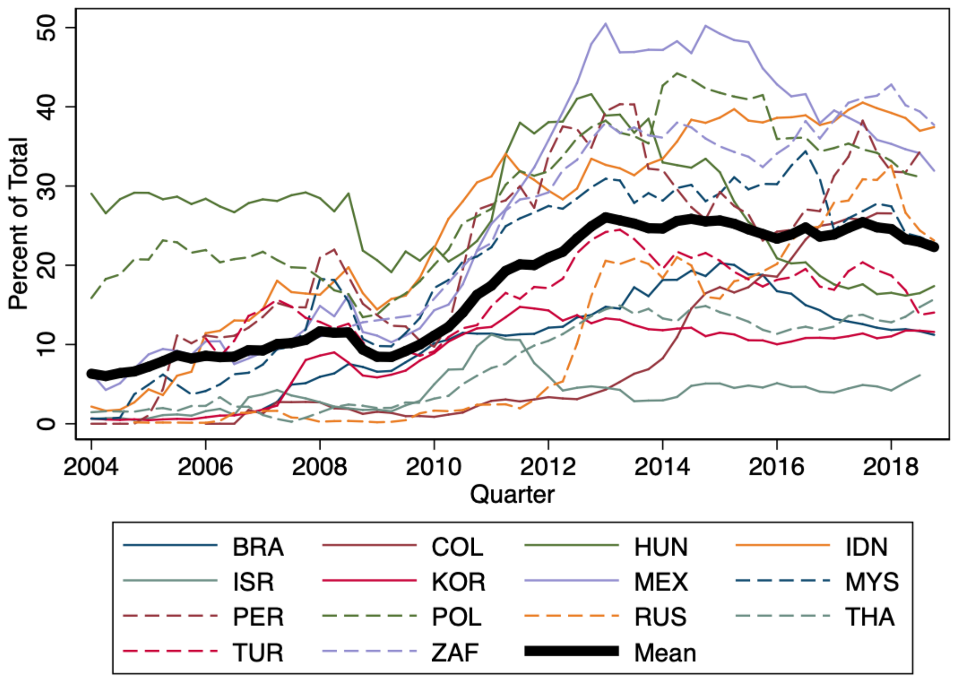


(b) 2017



Notes: These figures plot the sovereign and corporate LC shares in external debt for 2005 (Panel A) and 2017 (Panel B). All variable construction is described in Section 2.

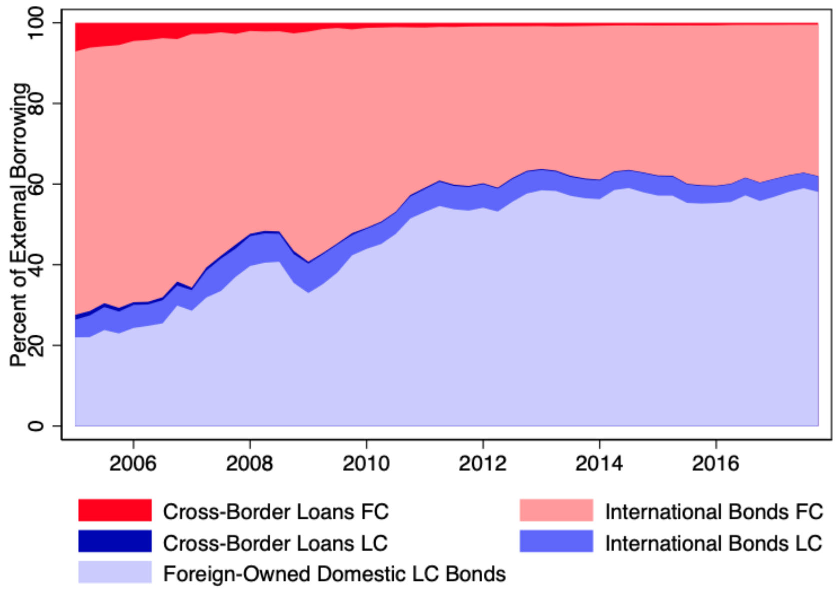
Figure 4: Foreign Ownership of Domestic Sovereign Debt



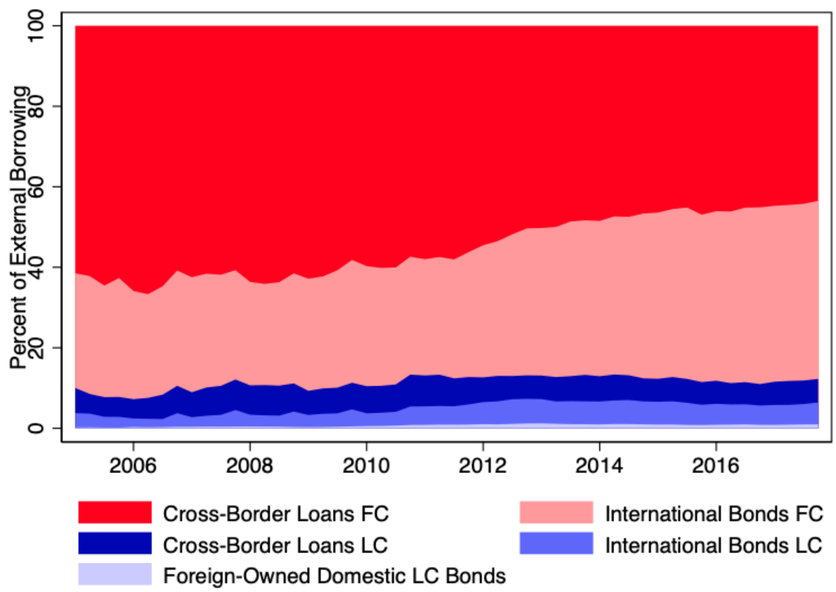
Notes: This figure plots the share of domestically issued sovereign debt owned by foreign investors. Mean reports the unweighted cross country mean.

Figure 5: The Composition of External Borrowing

(a) Sovereign



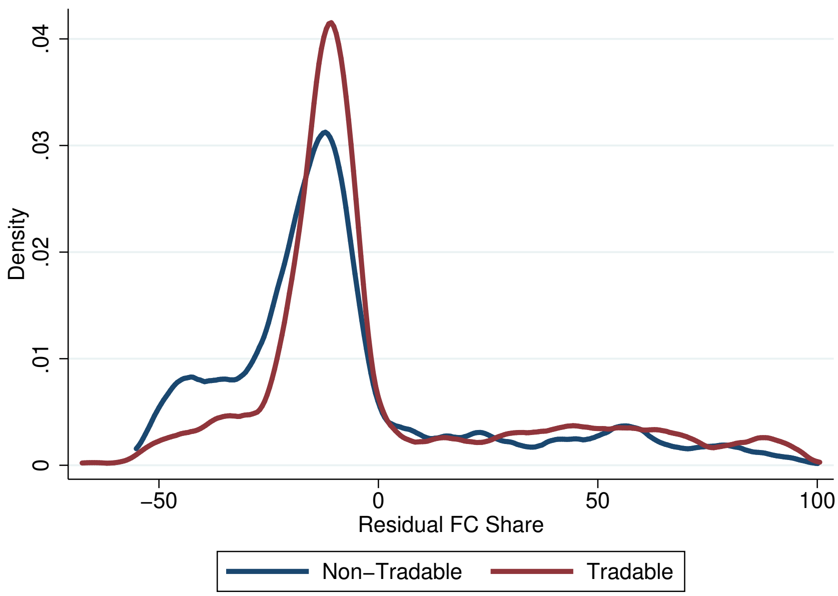
(b) Corporate



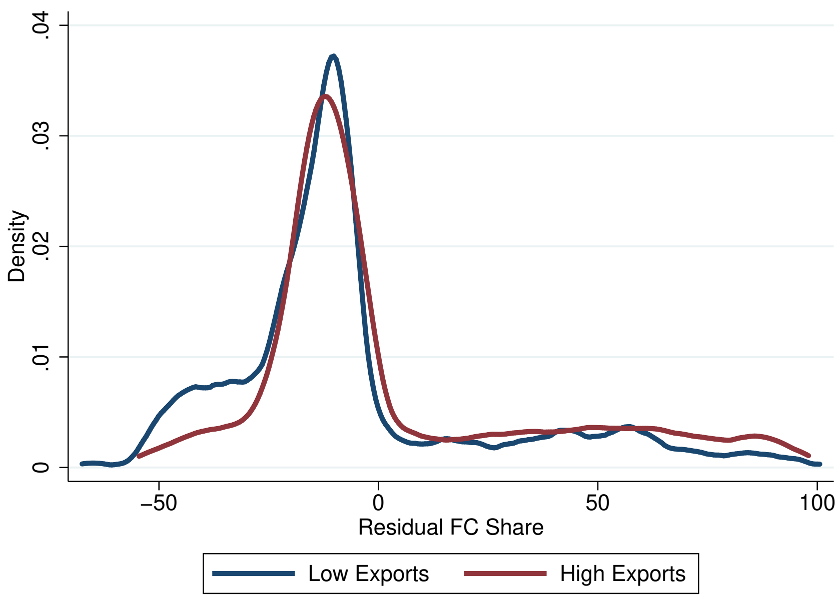
Notes: This figure plots the cross-country mean share of external debt accounted for the components of external debt. The top panel plots the composition for sovereign borrowing and the bottom panel plots it for corporate borrowing.

Figure 6: Foreign Currency Borrowing and Currency Mismatch, 2017

(a) Tradability

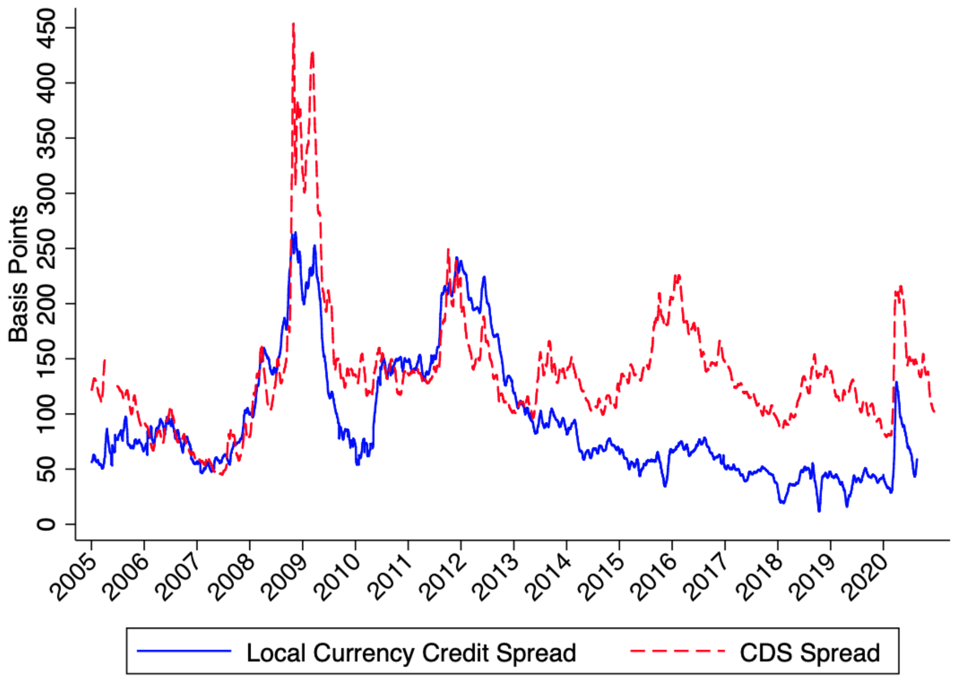


(b) Foreign Sales



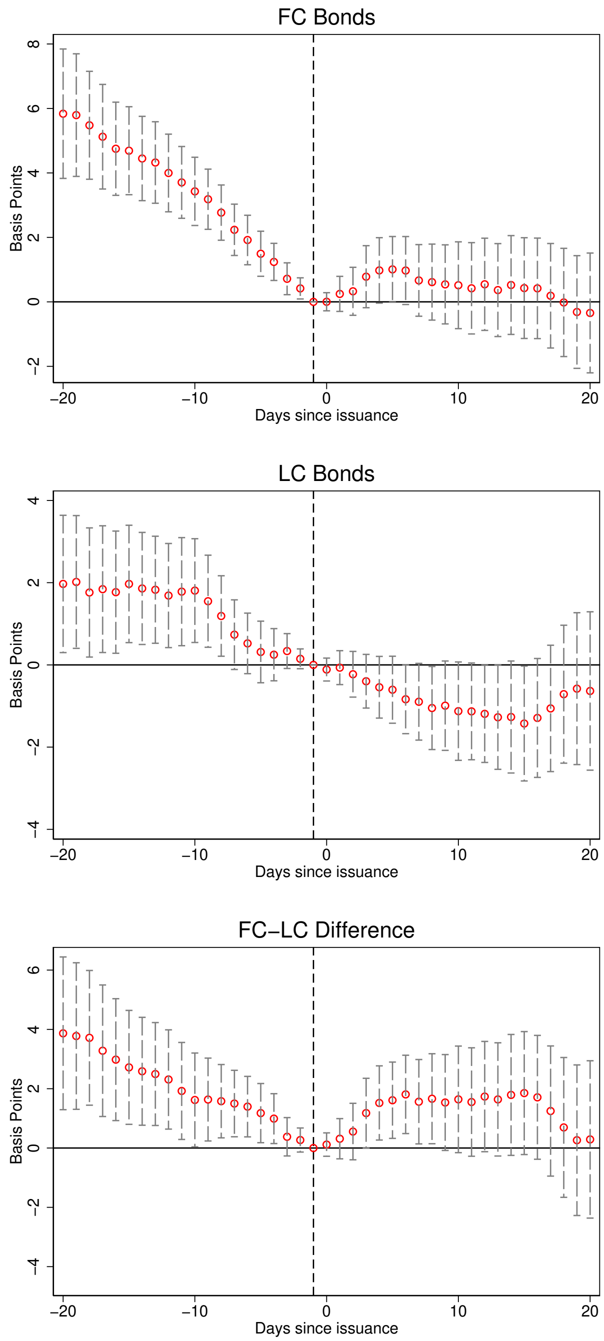
Notes: These figures plot kernel densities of the FC share by sector tradability (panel A) and export intensity (panel B). The FC shares are residualized to the log of total sales and country fixed effects, as in column 2 of Table 5.

Figure 7: Sovereign CDS and LC Credit Spreads



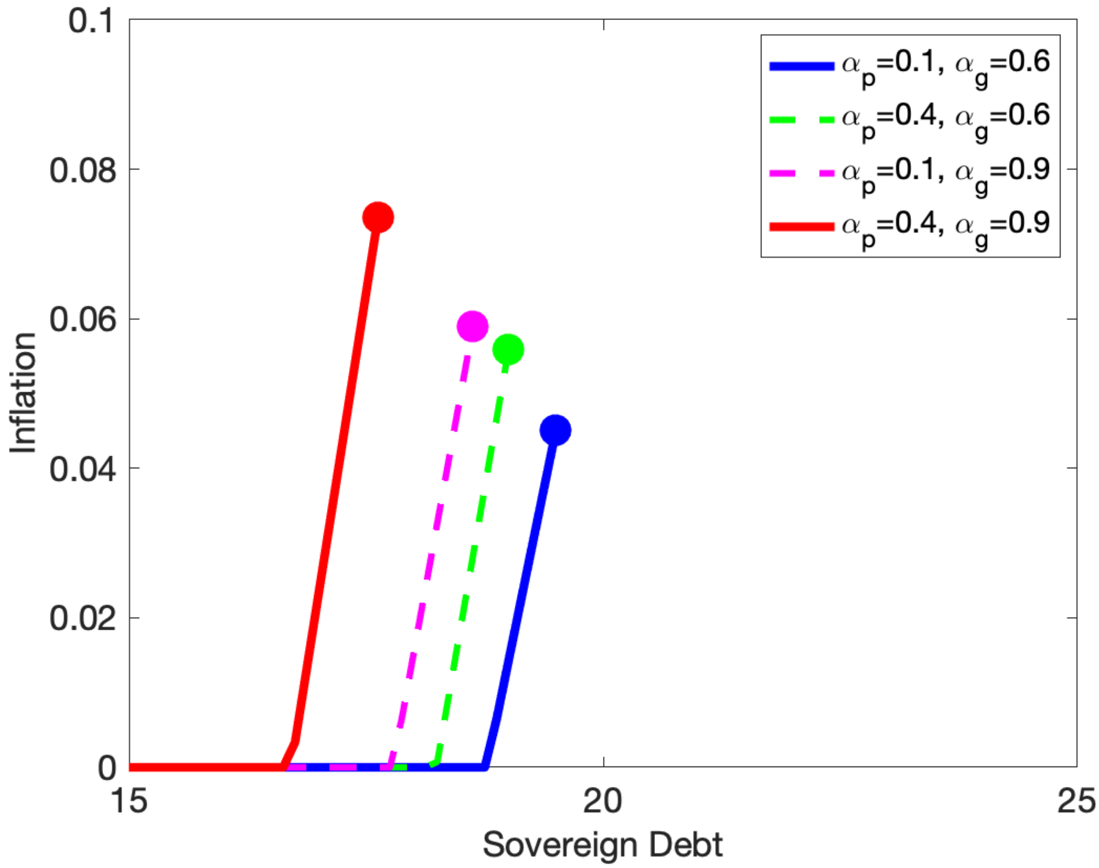
Notes: This figure plots the mean sovereign CDS and LC Credit Spread at the 5-year tenor. Data are plotted as two-week rolling averages.

Figure 8: Sovereign CDS Spreads around Corporate Bond Issuance



Notes: This figure shows changes in the sovereign CDS spread around corporate bond issuance. We require the par amount of the bond to be greater than \$100 million. The top panel shows changes in the sovereign CDS around FC corporate bond issuance, the middle panel show changes in the sovereign CDS spreads around LC corporate bond issuance, and the bottom panel shows the difference in the sovereign CDS spreads around FC and LC bond issuance. All changes to the sovereign CDS spreads are calculated with respect to the CDS level on the day prior to the issuance date. The red dots display point estimates, and the gray dashed lines show 95% confidence internal for the point estimates. The confidence intervals are constructed based on robust standard errors clustered at the issuer level.

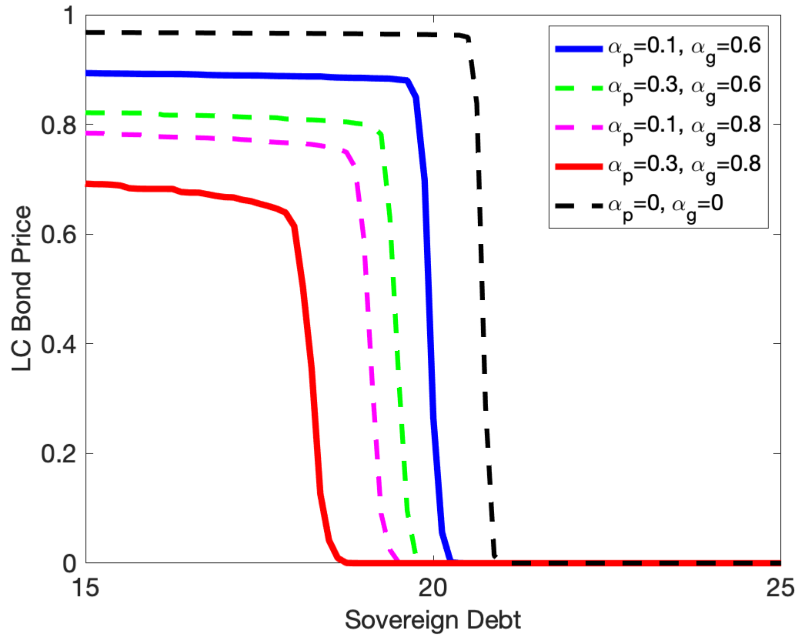
Figure 9: Inflation Policy and Default



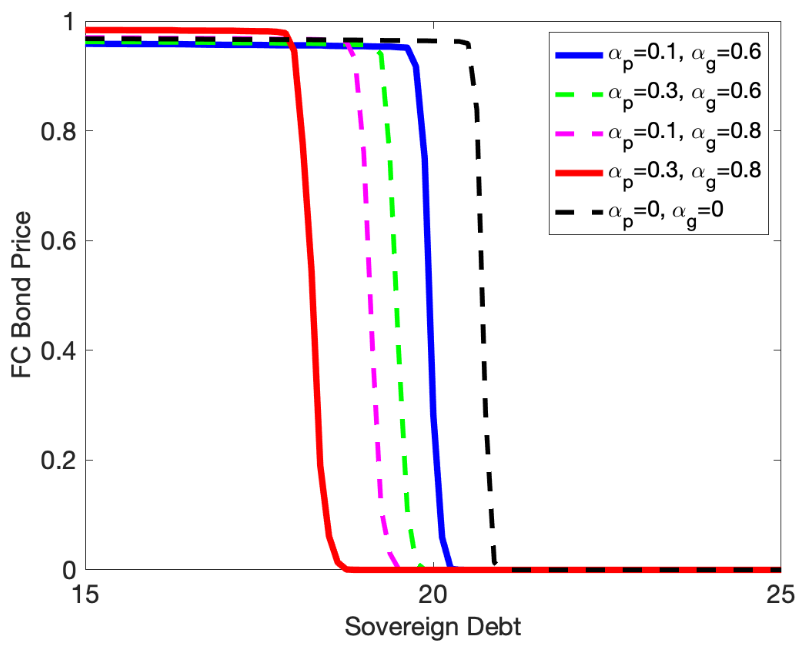
Notes: This figure plots the inflation and default policy functions for different sovereign (α_G) and corporate (α_P) LC debt shares for a single realization of the aggregate TFP state. The x-axis plots the amount of sovereign debt entering the period (B). The y-axis plots the amount of inflation chosen by the government for this combination of productivity and debt. The circle indicates the maximum debt level for which the sovereign repays, and the government therefore defaults for any higher debt levels.

Figure 10: Bond Prices

(a) LC Bond Prices



(b) FC Bond Prices



Notes: This figure plots the bond price functions for different sovereign (α_G) and corporate (α_P) LC debt shares for a single realization of the aggregate TFP state. The upper panel is for LC bond prices and the lower panel is for FC bond prices. The x-axis plots the amount of sovereign debt issued in the period (B'). The y-axis plots the bond price.

7 Tables

Table 1: Corporate and Sovereign Debt

	(1) CDS	(2) CDS	(3) CDS	(4) CDS
Sovereign LC Share	-0.916***	-0.793***	-0.411	-0.319
	(0.140)	(0.118)	(0.272)	(0.273)
Corporate LC Share	-1.749***	-1.916***	-1.196*	-1.445**
	(0.567)	(0.588)	(0.599)	(0.607)
Sovereign Debt/GDP	0.0225**	0.0233**	0.0486**	0.0484**
	(0.00845)	(0.00888)	(0.0202)	(0.0196)
Corporate Debt/GDP	0.0113	0.0109	0.0600***	0.0599***
	(0.00669)	(0.00733)	(0.00913)	(0.0115)
Observations	795	742	795	742
R-squared	0.447	0.342	0.708	0.659
Number of groups	14	14	14	14
Country FE	No	No	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Excludes GFC	No	Yes	No	Yes

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: The Sovereign and Corporate LC Share measure the share of a country's external debt in foreign currency, as measured in Section 2. Sovereign Debt/GDP and Corporate Debt/GDP also refer to a country's external debt. Driscoll and Kraay (1998) standard errors are reported in parentheses.

Table 2: Sovereign CDS and Corporate Debt Composition

	(1) CDS	(2) CDS	(3) CDS	(4) CDS
Sovereign FC Debt/GDP	0.196***	0.197***	0.204***	0.208***
	(0.036)	(0.037)	(0.041)	(0.043)
Corporate FC Debt/GDP	0.066***			
	(0.010)			
Financial FC Debt/GDP		0.070***		
		(0.013)		
Non-Financial Corp. FC Debt/GDP		0.059***		
		(0.017)		
Tradable FC Debt/GDP			0.063***	0.053**
			(0.018)	(0.022)
Non-Tradable FC Debt/GDP			0.135***	0.136***
			(0.043)	(0.039)
Observations	875	875	875	875
R-squared	0.681	0.682	0.656	0.657
Number of groups	14	14	14	14
Country FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Tradable Def	None	None	JK	SL

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the results of quarterly country-level regressions for our 14 country sample over 2003q1 to 2017q4. In column 1 we regress CDS spreads on sovereign and corporate debt expressed as a share of GDP. In column 2, we divide corporate debt into the financial and non-financial sectors then run the same analysis. In column 3 we use our benchmark definition of the tradable sector, which we take from Jensen and Kletzer (2010), to subdivide the non-financial sector into the tradable and non-tradable sector. In column 4, we use a definition of the tradable sector from Sachs and Larrain (1993) to subdivide the non-financial sector into the tradable and non-tradable sector. We include country and quarter fixed effects in all specifications. The debt variables are from the dataset constructed in Section 2. Driscoll and Kraay (1998) standard errors are reported in parentheses.

Table 3: Sovereign Default Risk, Exchange Rates, and Currency Composition

	(1) ΔCDS	(2) ΔCDS	(3) ΔCDS	(4) ΔCDS	(5) ΔCDS	(6) ΔCDS
$\Delta\mathcal{E}_{i,t}$	7.486***	6.445***	7.947***	5.085***	4.247***	5.413***
	(1.056)	(0.758)	(0.937)	(1.192)	(0.787)	(1.056)
Sov. LC Share	0.961			1.947		
	(2.945)			(3.416)		
$\Delta\mathcal{E}_{i,t}\times$ Sov. LC Share	-4.180**			-4.163**		
	(1.549)			(1.815)		
Corp. LC Share		25.00**			8.530	
		(8.814)			(10.09)	
$\Delta\mathcal{E}_{i,t}\times$ Corp. LC Share		-8.688**			-9.973**	
		(3.884)			(4.291)	
Total LC Share			9.140			7.973
			(6.135)			(4.546)
$\Delta\mathcal{E}_{i,t}\times$ Total LC Share			-9.985***			-9.286**
			(2.947)			(3.557)
Observations	2,409	2,409	2,409	2,409	2,409	2,409
R-squared	0.365	0.363	0.373	0.685	0.686	0.691
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: ΔCDS is the monthly change in the Credit Default Swap spread spread. $\Delta\mathcal{E}_{i,t}$ is the monthly log change in currency i's bilateral exchange rate against the US dollar. The Sovereign, Corporate, and Total LC share are defined as in Section 2. Standard errors are clustered at the currency level.

Table 4: FC borrowing and LC Credit Spreads

	(1) LCCS	(2) LCCS	(3) LCCS	(4) LCCS
Sovereign FC Debt/GDP	0.032	0.025	0.037	0.033
	(0.034)	(0.034)	(0.032)	(0.032)
Corporate FC Debt/GDP	0.026**			
	(0.009)			
Bank FC Debt/GDP		-0.002		
		(0.010)		
Non-Financial Corp. FC Debt/GDP		0.077***		
		(0.020)		
Tradable FC Debt/GDP			0.093***	0.098***
			(0.026)	(0.029)
Non-Tradable FC Debt/GDP			0.037	0.044
			(0.025)	(0.033)
Observations	703	703	703	703
R-squared	0.711	0.721	0.723	0.723
Number of groups	13	13	13	13
Country FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Tradable Def	None	None	JK	SL

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: The Local Currency Credit Spread (LCCS) is defined in Section 3.1.3. This table shows the results of quarterly country-level regressions for our 14 country sample over 2003q1 to 2017q4. In column 1 we regress CDS spreads on sovereign and corporate debt expressed as a share of GDP. In column 2 we divide corporate debt into the financial and non-financial sectors then run the same analysis. In column 3 we use our benchmark definition of the tradable sector, which we take from Jensen and Kletzer (2010), to subdivide the non-financial sector into the tradable and non-tradable sector. In column 4, we use a definition of the tradable sector from Sachs and Larrain (1993) to subdivide the non-financial sector into the tradable and non-tradable sector. We include country and quarter fixed effects in all specifications. The debt variables are from the dataset constructed in Section 2. Driscoll and Kraay (1998) standard errors are reported in parentheses.

Table 5: Corporate Foreign Currency Borrowing

VARIABLES	(1) FC Debt	(2) FC Debt	(3) FC Debt	(4) FC Debt	(5) FC Debt
Log Total Sales		2.356***	1.367***	1.923***	2.458***
		(0.462)	(0.459)	(0.461)	(0.469)
Foreign Sales Share			0.290***		
			(0.0288)		
Foreign Asset Share				0.391***	
				(0.0712)	
Tradable Sector					7.908***
					(1.658)
Constant	19.01***	21.23***	14.88***	19.46***	15.56***
	(0.527)	(0.725)	(0.827)	(0.753)	(1.335)
Observations	3,879	2,038	2,009	2,027	1,999
R-squared	0.138	0.170	0.219	0.188	0.180
Country FE	Yes	Yes	Yes	Yes	Yes
NAICS 4 FE	No	No	No	No	No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows firm level regressions of the foreign currency debt share on measures of foreign currency exposure. All columns include country fixed effects. The Tradable sector is based on the definition of Jensen and Kletzer (2010). Foreign currency debt data and NAICS codes are from FactSet. Total sales, foreign sales share, and foreign assets share are from Worldscope. Robust standard errors are reported in parentheses.

Table 6: Calibration

Parameter	Value	Description
Parameters Selected Directly		
γ	1/3	Intermediate Share
ρ	.8	Productivity Autocorrelation
σ_z	.034	S.D. of Log of Aggregate Productivity
λ	4.9%	Probability of redemption after default
r^*	1%	Risk-free rate
σ	2	Coefficient of relative risk aversion
Z	.68	Firm-level indebtedness
μ	.75	Share of fixed prices
Parameters selected by Matching Moments		
d_0	0.02	Default cost parameter
d_1	0.011	Default cost parameter
ψ	0.889	Investor Risk Aversion
β	0.91	Discount Factor
ξ	1.2195	Entrepreneur Productivity

Notes: This table summarizes the calibrations of the model described in Section 4. The sources of the calibration targets are described in-text.

Table 7: Empirical and Model-Simulated Moments

	(1) Data	(2) Baseline	(3) FC Only	(4) LC Corp	(5) LC Sov	(6) LC Corp + Sov
α_P	0.1	0.1	0.0	0.3	0.1	0.3
α_G	0.6	0.6	0.0	0.6	0.8	0.8
$s^{FC/US}$	1.59	1.06	0.83	0.95	0.59	0.39
$s^{LC/US}$	4.32	2.95	0.83	5.43	8.19	11.73
$Pr\left(D\right)$	1.5	0.90	0.71	0.89	0.51	0.28
$\overline{B}$	30	18.85	19.86	18.51	18.12	17.82
$\sigma\left(s^{LC/US}\right)$	3.3	0.50	0.08	0.82	0.97	1.34
$\sigma\left(c\right)/\sigma\left(y\right)$	1.23	1.10	1.03	1.13	1.14	1.11
$corr\left(c, y\right)$	0.72	0.92	0.95	0.90	0.91	0.93
$corr\left(NX/y, y\right)$	-0.51	-0.18	-0.03	-0.23	-0.44	-0.52
$corr\left(\pi, y\right)$	-0.28	-0.65	0.0	-0.74	-0.84	-0.85
$\overline{\pi}$	1.5	1.73	0.00	4.23	7.40	11.23

Notes: This table reports the empirical and model-generated moments of currency and credit risk. The first column, Data, the empirical moments. The first two rows report the calibration of the corporate LC share, α_p, and the sovereign LC share, α_g. All other parameters are held fixed. The next 5 columns report the model-simulated moments from the five different calibrations.

Table 8: Model and Data

	(1) Model	(2) Model	(3) Data
α_G	-0.865***	-0.656***	-0.916***
	(0.0537)	(0.0968)	(0.140)
α_P	-0.431***	-0.321***	-1.749***
	(0.0627)	(0.0742)	(0.567)
Observations	121	121	795
R-squared	0.677	0.699	0.447
Controls	No	Debt	Debt and Time FE

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Regression of the FC spread on the sovereign LC debt share (α_G) and the corporate LC debt share. Columns 1 and 2 are based on model generated moments for all LC shares between 0 and 1 at 10% intervals. The empirical results reported in column 3 come from from column 1 of Table 1.

Appendix

A Dataset Construction and Details

A.1 Nonresident Holdings of Domestic Market Government Debt

We use data on nonresident holdings of domestically issued government debt to estimate external LC debt for governments and, in combination with mutual fund holdings data, external LC debt for banks and non-banks. We use three data sources for our data on nonresident holdings of domestically issued government debt: Haver, Asian Bonds Online (ABO), and the Colombian Ministry of Finance. We assume all domestically issued government bonds are denominated in LC.

Our first and largest data source for non-resident holdings of domestic market sovereign debt is Haver. Where a series was available from both Haver and ABO, we used ABO. We use the USD denominated series Foreign Holdings in LCY Government Bonds, except for Philippines where the USD denominated series is unavailable so we convert the LC denominated series to USD. The Haver and ABO amounts are similar for all countries except Indonesia, for which the ABO series is consistently about half the Haver amount.

For Colombia, which is not present in the Haver or ABO data, we use data kindly provided by the Colombian Ministry of Finance.[40] They provided data that begins in 2010. The following table shows the source used for each country in our sample.

[40] For Colombia, the series used are "Extranjeros - Saldo Nominal COP" and "Total Saldo TES" for nonresident holdings and total domestic issuance respectively.

Table A.1: Non-Resident Holdings of Domestic Market Government Debt Data Sources

Country	Data Source
Brazil	Haver
Colombia	MoF
Hungary	Haver
Indonesia	ABO
Israel	Haver
South Korea	ABO
Mexico	Haver
Malaysia	ABO
Peru	Haver
Philippines	ABO
Poland	Haver
Russia	Haver
Thailand	ABO
Turkey	Haver
South Africa	Haver

Notes: "Haver" denotes use of the Haver series. "MoF" denotes use of data from the Colombian Ministry of Finance. "ABO" denotes use of data from Asian Bonds Online.

A.2 SDC Platinum Bond Data

We download the entire universe of bonds in Refinitiv SDC Platinum Global New Issues database. The database only records a bond at issuance. We drop bonds issued in perpetuity, and assume all other bonds are outstanding until maturity. We drop bonds for which we cannot identify the quarter of issuance or maturity. We use the "Nation" field to identify residency and use the "Ultimate Parent Nation" field, which corresponds to ultimate parent residency, to identify nationality. We drop corporate families for which a single ultimate parent CUSIP6 has multiple associated NAICS codes, SIC codes, or nationalities in a given quarter. We then assign to all firms the NAICS and SIC codes of their ultimate parent and use these throughout the nationality version.

We identify banks as issuers whose SIC codes begin with 6 and governments as issuers whose SIC codes are 999A or 999B. This definition of government is narrow and matches closely the definition of central government in the BIS data. The code 999A corresponds to the central government itself. We include 999B because ministries of finance or treasuries are sometime included in 999B. These agencies are sometimes listed as the issuers of sovereign debt. We do not include local governments or government owned entities in our definition of government. In addition, we drop issuers whose SIC code is 999G as these are international organization not obviously tied to any single country. All remaining issuers are classed as non-banks. In order to subdivide non-banks into tradable and non-tradable sectors we apply our definitions using the NAICS codes included with the bond data. See Section A.5 for details.

Having categorized the issuers in the data, we generate a time series version of the data. We then aggregate outstanding debt by country, currency, and sector for both our nationality and residency allocations.

A.3 SDC Platinum Loan Data

Our treatment of the SDC Platinum syndicated loan data is very similar to our treatment of the SDC Platinum bond data. The primary difference is that for the loan data we filter out domestic loans. For both our nationality and residency versions, we drop any loans for which all book-runners share the same country as the borrower. If the book-runner nation field is empty, we assume the loan is cross-border and keep it.

We keep all loan types, including revolving credit facilities. As with the bond data we drop any loans that are missing announcement dates or maturities. We aggregate the tranches of a given loan. While summing across tranches typically generates the principal amount, when the sum of the tranche values is greater than the principal amount we use the principal amount. Otherwise we use the sum of the tranche amounts.

For some countries, sectors, and currencies (LC or FC) in the loan data, individual loans make up a large share of the total amount outstanding for some quarters. As a result, individual loans entering the dataset or reaching maturity can cause large swings in the

SDC Platinum loan data which are not present in the LBS data. This has the potential to affect the quarterly nationality/residency ratios we calculate with the SDC loan data. To get around this potential problem, when an individual loan in SDC is more than 60% of the total amount outstanding in any quarter for a given country, sector, and currency (local of foreign), we calculate the ratio as the the ratio of the average amount outstanding on a residency and nationality basis over 2005-2017. The following table shows the countries, sectors, and currencies for which we use the ratio of the time series averages rather than the time series of the ratios.

Table A.2: Use of Ratio of Averages to Generate LBS Nationality Series

Country	Bank LC	Bank FC	Non-bank LC	Non-bank FC
BRA	1	0	1	0
CHL	1	0	1	0
COL	0	1	1	0
HUN	1	1	1	0
IDN	1	0	1	0
ISR	0	1	1	1
KOR	1	1	0	0
MEX	1	0	1	0
MYS	0	0	0	0
PER	0	0	1	0
PHL	1	0	0	0
POL	1	0	0	0
RUS	1	0	1	0
THA	1	1	0	0
TUR	1	0	1	0
ZAF	1	0	1	0

Notes: A "1" denotes that the LBS nationality series for that sector and currency was calculated using the ratio of the times series average of the SDC Platinum series rather the time series of the ratios calculated on a quarterly basis. We used the time series average if the largest loan in the SDC Platinum data made up more than 60% of the total or if the SDC series was ever 0.

A.4 Domestic Local Currency Debt

To estimate the ratio of foreign holdings of domestically issued corporate bonds to foreign holdings of domestically issued sovereign bonds, we use the Morningstar mutual fund holdings data from Maggiori et al. (2020) and Coppola et al. (2020) . We multiply this ratio by our data on nonresident holdings of domestically issued sovereign bonds to estimate external LC corporate debt. We do these calculations separately for banks and non-banks and allocating firms to countries on a residency and nationality basis.

First, within the Morningstar holdings data we determine whether a bond is issued in domestic or international markets using ISIN codes. We match ISIN codes to the CUSIP9 codes in the Morningstar data, then we strip the 2-character market identifying code from the beginning of a bond's ISIN code and compare it to the country of the firm or sovereign that issues it. Where the market does not match the country or where the market is identified as international, we mark that bond as an international issuance. Bonds for which we cannot match an ISIN are marked as domestic.

Our method accounts for the fact that some sovereigns, such as Brazil, issued some international market LC sovereign bonds early in our sample period. These international issuances account for a significant portion of LC sovereign debt for some countries in certain years. We exclude these international market bonds when calculating the ratios we use from the Morningstar data, because those bonds will not be included in our data on non-resident holdings of domestically issued sovereign debt. If we were to include them we would underestimate corporate LC domestic debt for those countries and years. On the bank and non-bank side, excluding international market debt is important because we add our estimate of domestically issued debt to the IDS series, and hence we would double count international corporate issuances if we did not exclude them from the ratio we calculate using the Morningstar data.

After determining market of issuance, we allocate bonds by nationality and residency, classify them as LC or FC for each allocation, and map them to a sector. We then combine the mutual fund holdings data with the our data on non-resident holdings of domestic government debt to estimate non-resident holdings of LC bank and non-bank debt as described in Section 2.

A.5 Tradability Definition

Our simplest definition of tradable and non-tradable goods comes from Sachs and Larrain (1993). They define manufacturing, agriculture, forestry, and other natural resource extraction as tradable industries and define all other industries as non-tradable. We map this definition to 2-digit NAICS codes and classify 11, 21, 31, 32, 33, and 48 as tradable, while all other non-bank 2-digit NAICS codes are classed as non-tradable. In this first definition, all services are non-tradable.

However, it is the case that some services, for instance call-centers, are commonly traded across international borders. In order to account for this, we use as our benchmark the definition of tradable in Jensen and Kletzer (2010). This definition is based on Sachs and Larrain (1993), but subdivides services into tradable and non-tradable services according to geographic concentration. Jensen and Kletzer (2010) calculate the Gini coefficient of the geographic distribution of industries across the United States. We use their preferred cutoff to generate a discrete definition.

A.6 Tradable and Non-Tradable Debt

We begin by taking non-bank issuers in the SDC Platinum bond and loan data and using NAICS codes to classify them as belonging to the tradable sector ($B^{SDC}_{trd,c}$ and $CBL^{SDC}_{trd,c}$) or non-tradable sector ($B^{SDC}_{ntrd,c}$ and $CBL^{SDC}_{ntrd,c}$). We describe our two definitions of the tradable and non-tradable sectors in Section A.5. We then calculate the share of non-bank debt held by firms in the tradable and non-tradable sectors by currency. Finally, we multiply those shares by our estimates of externally held non-bank bond and loan data. We combine the tradable (non-tradable) bond and loan series to estimate externally held debt from the tradable (non-tradable) sector. The equations are as follows:

$$\begin{aligned}
\widehat{CBL}_{trd,c} &= \widehat{CBL}_{nfc,c} \times \frac{CBL^{SDC}_{trd,c}}{CBL^{SDC}_{nfc,c}} \\
\widehat{B}_{trd,c} &= \widehat{B}_{nfc,c} \times \frac{B^{SDC}_{trd,c}}{B^{SDC}_{nfc,c}} \\
\widehat{CBL}_{ntrd,c} &= \widehat{CBL}_{nfc,c} \times \frac{CBL^{SDC}_{ntrd,c}}{CBL^{SDC}_{nfc,c}} \\
\widehat{B}_{ntrd,c} &= \widehat{B}_{nfc,c} \times \frac{B^{SDC}_{ntrd,c}}{B^{SDC}_{nfc,c}}
\end{aligned} \tag{A.32}$$

A.7 FX Data

Our foreign exchange data is from Factset. We take the daily data and generate log appreciation against USD and log appreciation against an equally weighted basket of the G10 currencies. For each of those two series, we generate both a quarterly average and end of quarter value.

A.8 CDS Data Merge

We use credit default swap (CDS) data from Markit, downloaded via the Wharton Research Data Service (WRDS). We restrict our attention to CDS quotes in US dollars ("CCY - Instrument Currency"), Document Clause ("docclause" "CR", or Cum-Restructuring, with an Instrument Seniority Tier ("tier") "SNRFOR" for foreign currency sovereign debt.

A.9 Firm-Level Balance Sheet Data

We construct a separate firm level dataset based on micro data on firm liabilities from Factset Debt Capital Structure. We supplement this with data on total and foreign assets, sales, and income from Worldscope. We combine the bond and loan data into a single data set. We then combine debt by currency to the firm level, using FactSet entity identification codes to identify firms. When our bond data does not contain FactSet entity identification codes, we use ISIN, CUSIP, and FSYM codes to match to FactSet identification codes.

We subdivide firms by sector, classifying firms with a 2-digit NAICS code of 52 as banks and all others as non-banks. We then use NAICS codes to classify non-banks as belonging to the tradable or non-tradable sectors according to the process in Section A.5.

We downloaded the following series from Worldscope: total exports, sales, and income; foreign exports, sales and income; foreign exports, sales, and income share. We match CUSIPs and ISINs to FSYM codes and then FactSet entity identification codes.

In order to maximize our matches between the debt data and Worldscope data, we merge the debt and Worldscope data twice. This is necessary because for a given corporate family the Worldscope data may contain subsidiaries, parent firms, or both. In order to avoid potential mismatch where Worldscope has subsidiaries but not their ultimate parent, we perform an initial match between our debt data and the Worldscope data, before doing a second match after aggregating the Worldscope data to the ultimate parent level using the same crosswalk we use for our debt data.

B Model

B.1 Partial Default

In this section, we extend the model to include partial default. Instead of fully repudiating the debt, suppose that some fraction of the face value ψ needs to be repaid immediately. For simplicity, we assume that ψ is constant and exogenous. Yue (2010) solves for the endogenous recovery rate through Nash bargaining between the government and lenders, generating variation in the debt recovery rate as a function of indebtedness and the output level. Here, we will simply treat it as a parameter.

With partial default, we can rewrite Equation 26 as

$$C_D = C^D\left(A\right) = A_D\left(A\right) X\left(\zeta\right)^{\gamma} - \psi B\left(1 - \alpha_G \zeta\right) \tag{A.33}$$

We can then solve for the inflation rate that maximizes period consumption exactly as in equation 25, but with $A_D(A)$ for productivity, and $\psi\alpha_G B$ replacing the denominator.

We also must account for the recovery rate of the debt in the bond pricing equations:

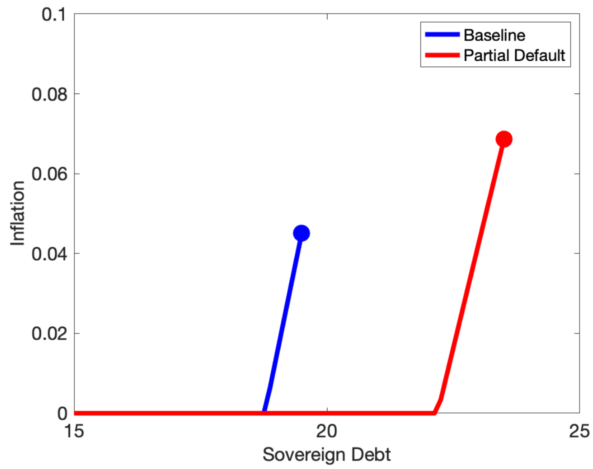
$$q^{LC}\left(A, B'\right) = \int_{A'} M\left(A'\right)\left(\left[\left(1 - D\left(A', B'\right)\right)\left(1 - \zeta\left(A', B'\right)\left(\kappa + \delta q^{LC}\left(A', B''\right)\right)\right)\right] + \left[\psi D\left(A', B'\right)\left(1 - \zeta_D\left(A', B'\right)\right)\right]\right) f\left(A, A'\right) dA' \tag{A.34}$$

$$q^{FC}\left(A, B'\right) = \int_{A'} M\left(A'\right)\left(\left[\left(1 - D\left(A', B'\right)\right)\left(1 - \zeta\left(A', B'\right)\left(\kappa + \delta q^{FC}\left(A', B''\right)\right)\right)\right] + \left[\psi D\left(A', B'\right)\right]\right) f\left(A, A'\right) dA' \tag{A.35}$$

The challenge in calibrating recovery upon default is that, using long-term bonds, only a small fraction of the bonds' present value is actually scheduled to be repaid during any given period (a quarter). In the benchmark calibration, the coupon payment κ is equal to slightly more than 5% of the face value of the bond. As such, $\psi > \kappa$ would actually involve a government making a larger immediate payment that in repayment. However, given that output is persistent and the government defaults in bad states, we can have $\psi \geq \kappa$ and still have a government choose to default in equilibrium. We therefore assume that two coupon payments need to be repaid immediately upon default, setting $\psi = 0.1$.

Because partial default reduces the benefits of default, we will reduce the cost of sovereign default for these calibrations. Here, we reduce the cost of default by 25% relative to our baseline calibration. In Figure A.1, we compare the inflation and default policy functions for the benchmark calibration to a version with partial default. Because the benefits of default are reduced, we see that the government accumulates more debt before it defaults, and in addition it tolerates higher inflation. In Figure A.2 we plot a version of Figure 10 that compares of Baseline Calibration to one with partial default. In the left panel, we see that while for low levels of debt the price of LC bonds in a partial default regime are lower, we see that the movement in the default threshold and the recovery upon default raise the bond prices at higher debt levels. For foreign currency debt, we see that the price of the bond with partial default is uniformly higher. In Table A.3, we compare the model moments with the baseline calibration.

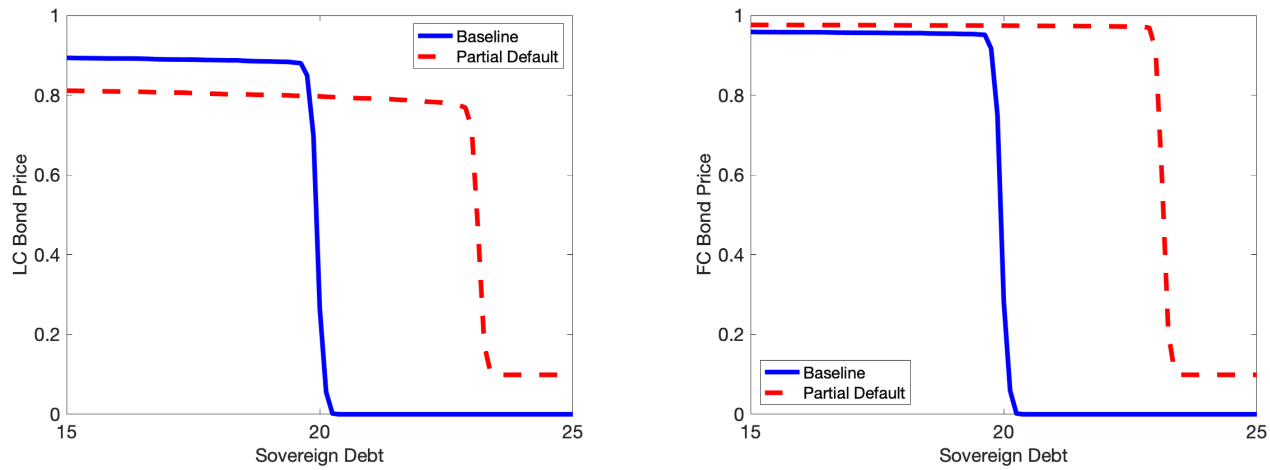
Figure A.1: Inflation Policy and Default



Notes: This figure plots the inflation and default policy functions for the baseline calibration and the extension with partial default for a single realization of the aggregate TFP state. The x-axis plots the amount of sovereign debt entering the period (B). The y-axis plots the amount of inflation chosen by the government for this combination of productivity and debt. The circle indicates the maximum debt level for which the sovereign repays, and the government therefore defaults for any higher debt levels.

Figure A.2: Bond Prices

(a) LC Bond Prices (b) FC Bond Prices



Notes: This figure plots the bond price functions for the baseline calibration and the extension with partial default for a single realization of the aggregate TFP state. The left panel is for LC bond prices and the right panel is for FC bond prices. The x-axis plots the amount of sovereign debt issued in the period (B'). The y-axis plots the bond price.

Table A.3: Partial Default

	Baseline	Partial Default
α_P	0.1	0.10
α_G	0.6	0.60
$s^{FC/US}$	1.06	0.56
$s^{LC/US}$	2.95	7.66
$Pr(D)$	0.90	0.46
$\overline{B}$	18.85	23.68
$\sigma(c)/\sigma(y)$	1.10	1.30
$corr(c, y)$	0.92	0.93
$corr(NX/y, y)$	-0.18	-0.63
$corr(y, \pi)$	-0.65	-0.87
$\overline{\pi}$	1.73	7.30

Notes: This table reports the model-generated moments of currency and credit risk. The first column, repeats the results for the baseline calibration and the second does so for the partial default extension.

B.2 Deadweight Costs of Inflation

In the main-text, we assumed that the only costs of inflation came due to a corporate currency mismatch. Here, we show how our posited mechanism would be work if we modified the model to include a reduced form deadweight cost of inflation. In particular, we now write

$$Y = A\left(\xi\left(\eta - \theta\zeta\right)\right)^{\gamma} - \frac{\chi}{2}\zeta^{2} \tag{A.36}$$

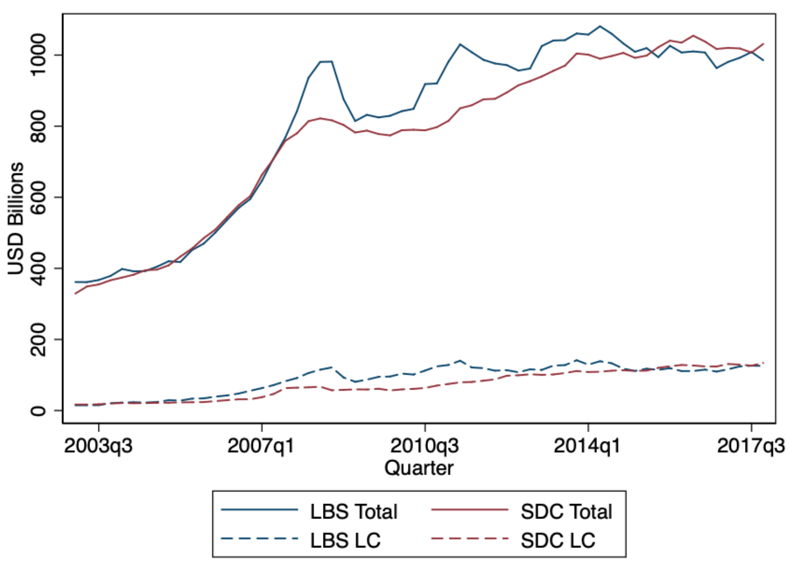
Here, $\frac{\chi}{2}\zeta^2$ is a reduced form for the costs of inflation, such as price dispersion, that are usually modeled and are distinct from those arising from balance sheet effects. Taking a second order approximation of output, we can solve for the optimal inflation policy as

$$\zeta^{*} = \frac{\alpha_G B\left(\kappa + \delta q^{LC}\left(A, B'\right)\right)}{\left(\phi\theta^2 + \chi\right)} - \frac{\gamma\xi A\theta}{\left(\phi\theta^2 + \chi\right)} \tag{A.37}$$

where $\phi = \gamma\left(1-\gamma\right)\left(\xi\right)^2$. Here, one can see that increasing the degree of currency mismatch, θ, works very similarly to increasing the deadweight cost of inflation χ.

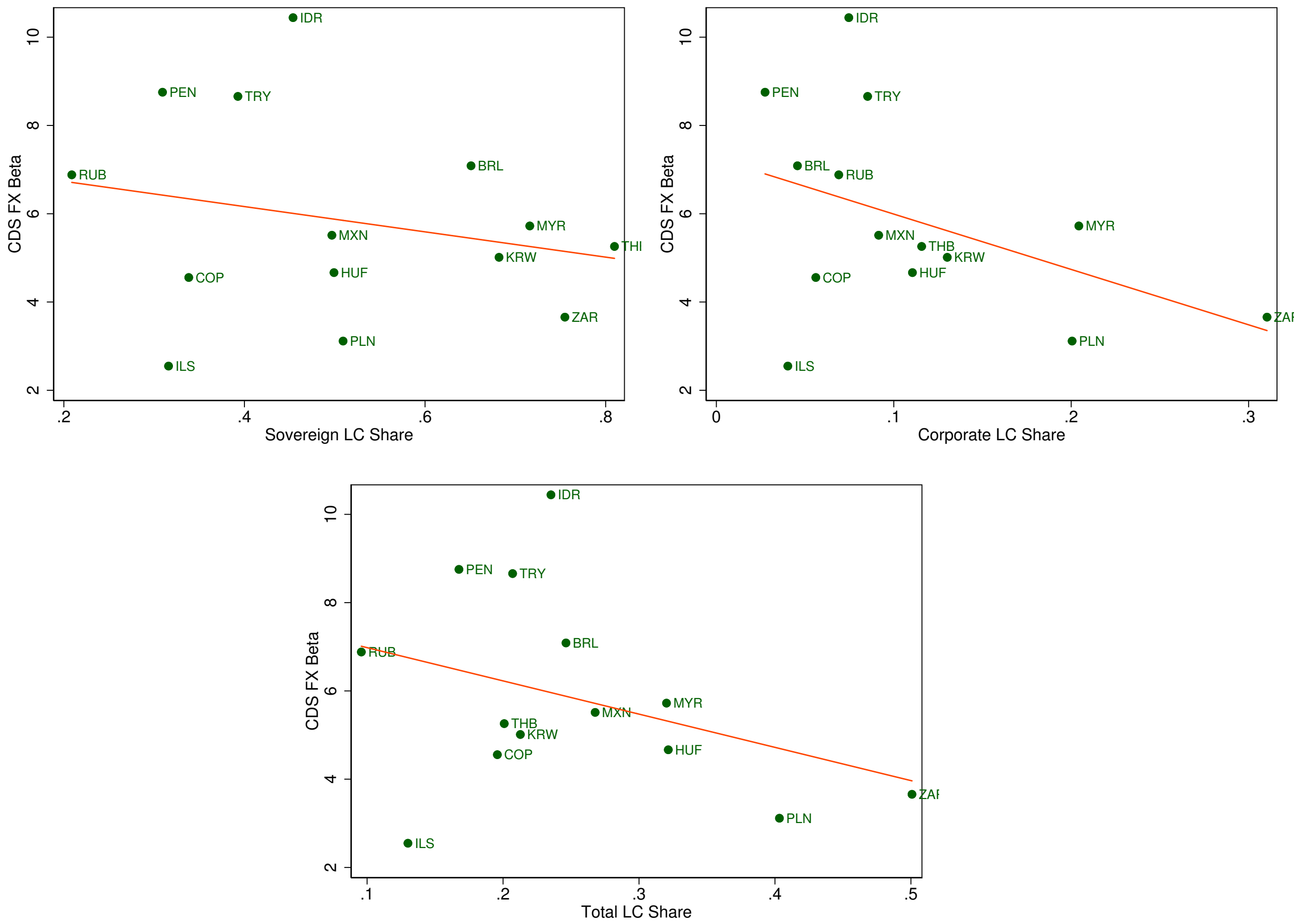
C Appendix Figures and Tables

Figure A.3: BIS LBS and SDC Platinum Comparison



Notes: Total and LC outstanding loan amounts for our 14 country sample. Allocated by residency.

Figure A.4: Sovereign Default Risk, Exchange Rates, and Currency Composition



Notes: This figure plots plots the results from a two-step procedure, where we first estimate the beta of CDS changes on FX changes for each country, and then regress these estimate betas on the LC share. In panel (a), we use the sovereign LC share, in panel (b) the corporate LC share, and in panel (c) we use the total LC share.

Figure A.5: Country-Level Currency Composition of External Debt

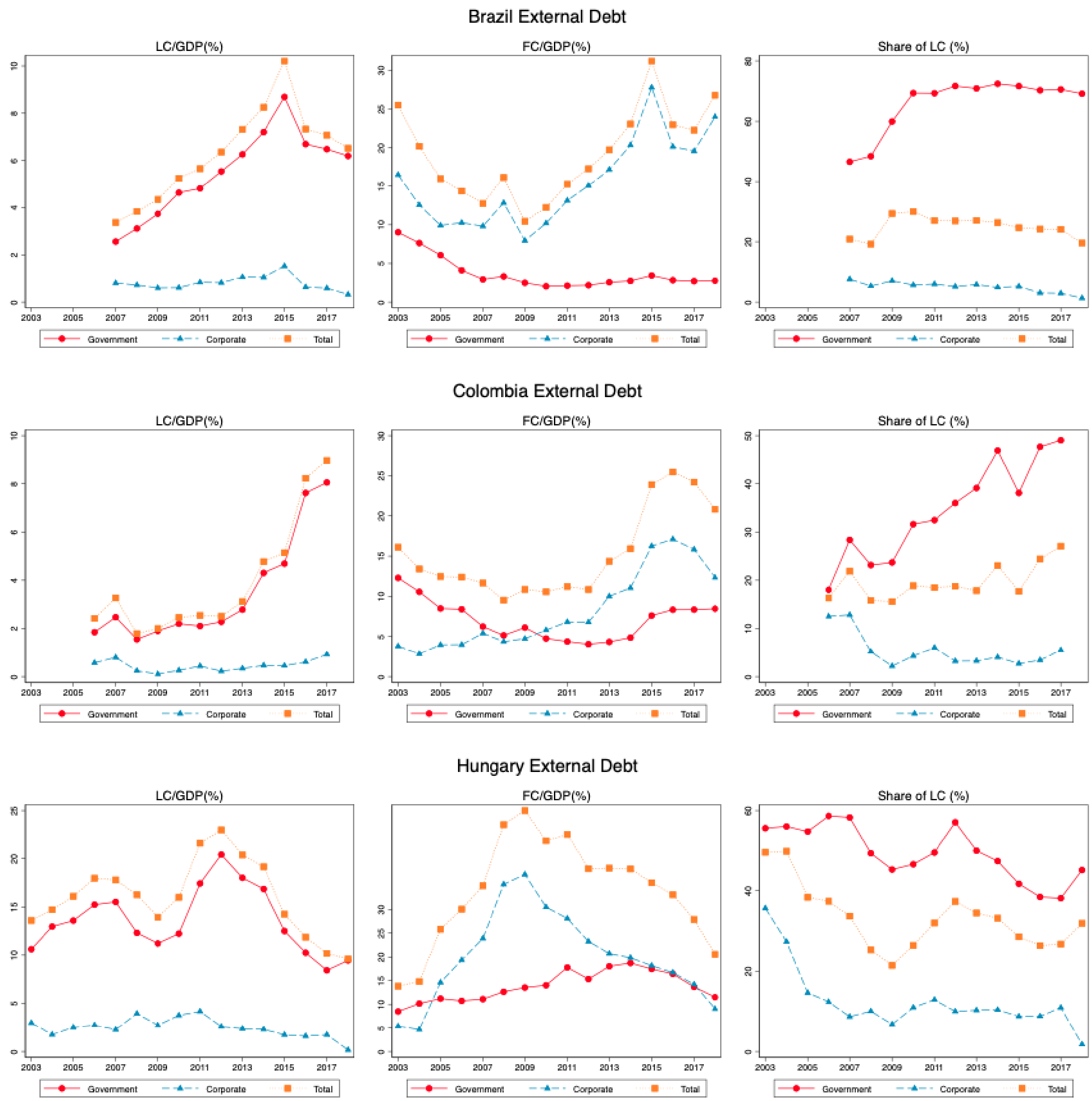


Figure A.5: Country-Level Currency Composition of External Debt (Continued)

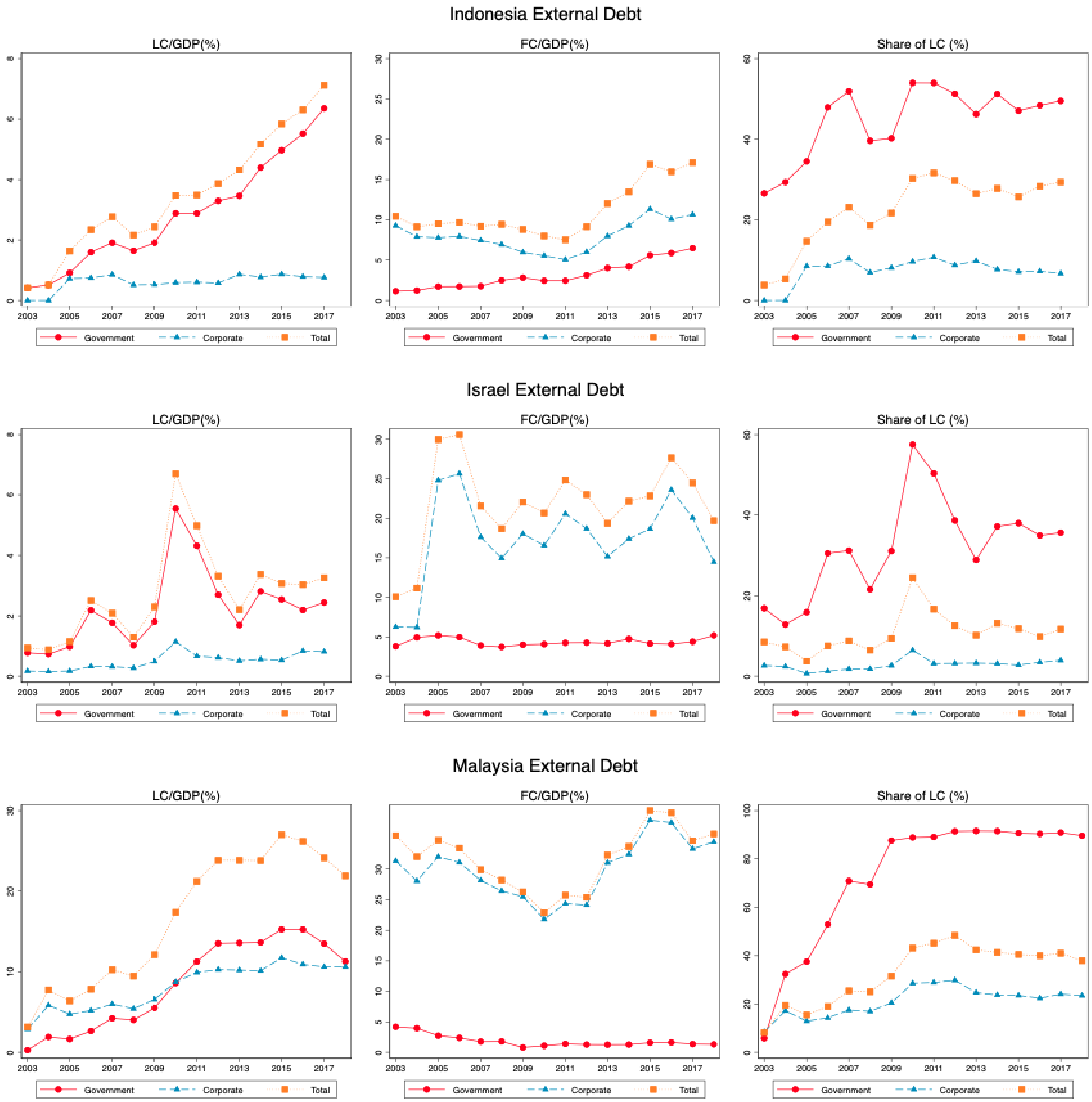


Figure A.5: Country-Level Currency Composition of External Debt (Continued)

Figure A.5: Country-Level Currency Composition of External Debt (Continued)

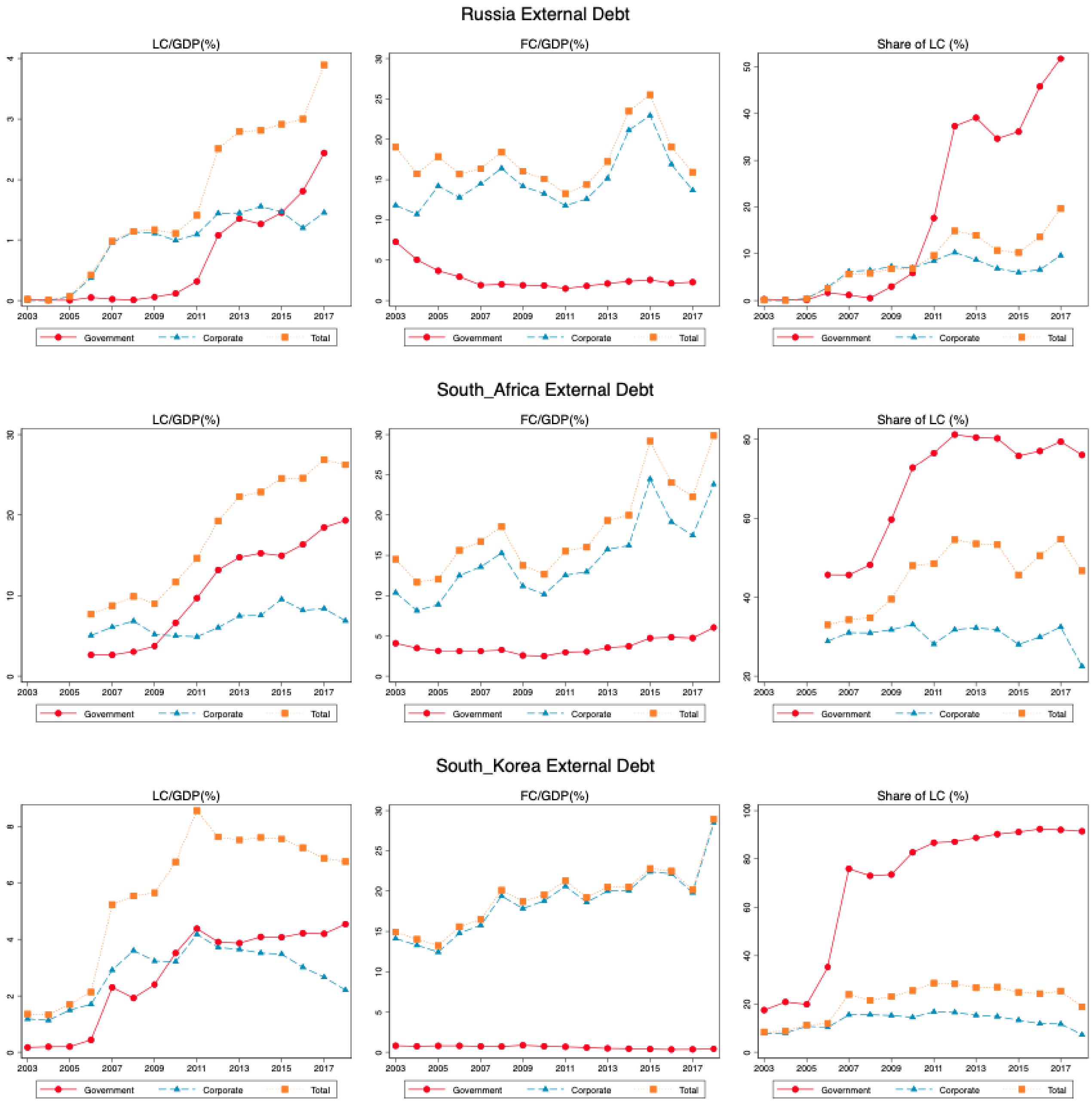
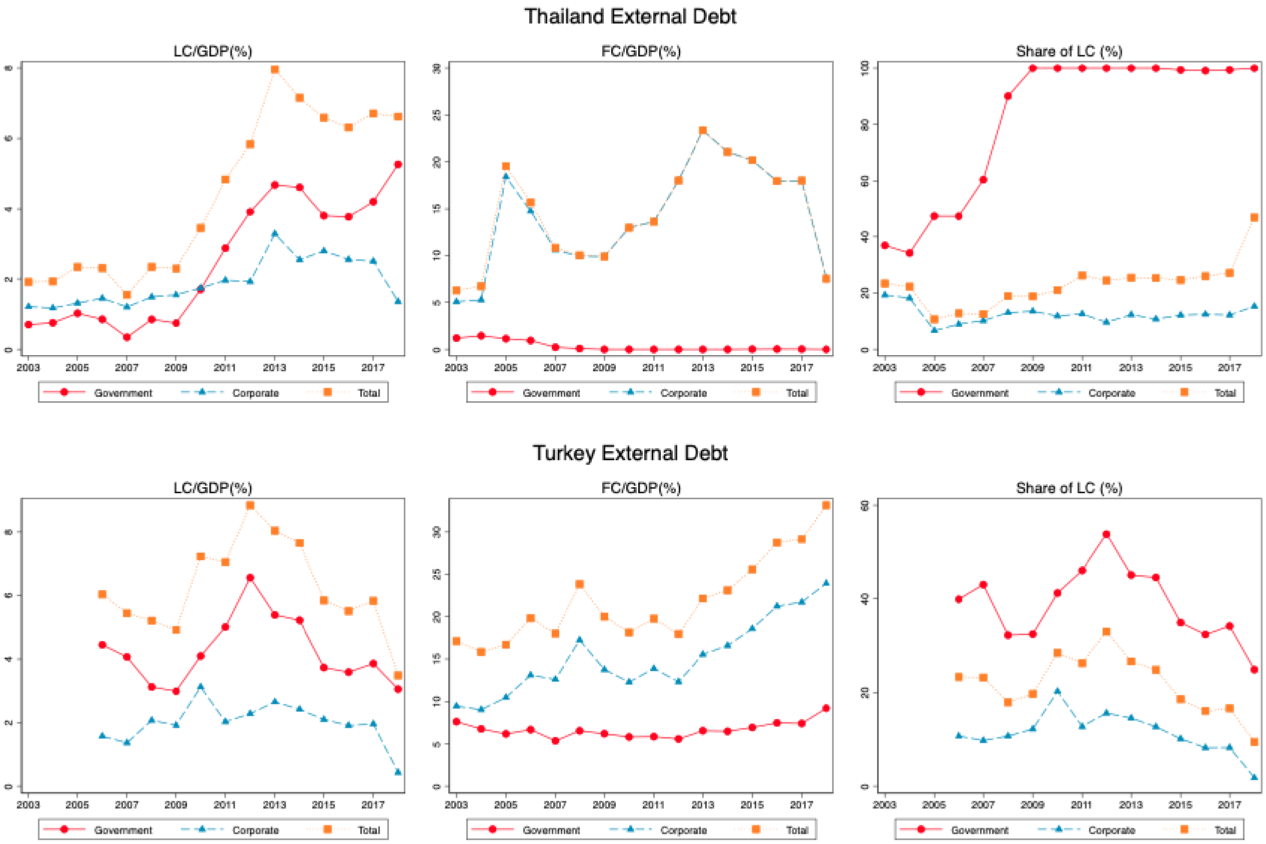


Figure A.5: Country-Level Currency Composition of External Debt (Continued)



Notes: The first panel plots the amount of LC external debt held by non-official lenders. The middle panel, FC/GDP is defined equivalently. The dotted orange line (Total) is the sum of corporate and government debt/GDP. Finally, the third panel is the share of each type of debt that is in LC. The dotted orange line is the average of the share of corporate and government external debt in LC, weighted by the amount of each type of debt outstanding.

Table A1: Share of External Borrowing in Local Currency

		Government			Financial			NFC			Total Corporate		
Country	Country	2005	2012	2017	2005	2012	2017	2005	2012	2017	2005	2012	2017
LC Share	BRA	.	71.7	70.5	.	6.0	2.4	.	4.4	3.3	.	5.2	2.9
	COL	.	36.0	49.1	.	0.0	4.7	.	6.5	5.9	.	3.2	5.5
	HUN	54.8	57.1	38.2	18.6	12.8	12.6	8.3	5.7	7.9	14.6	10.0	10.9
	IDN	34.5	51.3	49.5	9.0	2.4	8.8	8.2	10.6	5.6	8.5	8.7	6.7
	ISR	15.9	38.7	35.6	0.3	2.9	1.8	1.6	3.4	4.4	0.7	3.2	3.9
	KOR	20.0	87.0	92.1	9.8	15.9	12.1	12.8	18.6	11.2	10.8	16.6	11.9
	MEX	22.6	75.7	65.7	10.8	16.4	20.2	2.8	13.2	9.6	3.7	13.7	11.0
	MYS	37.6	91.5	90.9	2.0	20.2	18.5	23.5	43.2	32.3	13.0	29.9	24.2
	PER	9.2	51.4	.	0.1	1.7	.	0.0	15.8	.	0.1	5.3	.
	POL	51.1	53.4	50.4	39.0	23.9	27.1	10.8	17.6	18.6	19.4	20.8	22.9
	RUS	0.1	37.3	51.8	0.6	12.9	11.1	0.4	7.4	8.6	0.4	10.3	9.6
	THA	47.3	100.0	99.4	5.0	6.9	11.3	13.1	19.0	13.9	6.7	9.6	12.2
	TUR	.	53.9	34.2	.	16.2	7.0	.	15.1	10.3	.	15.7	8.3
	ZAF	.	81.2	79.4	.	41.3	47.2	.	22.4	19.3	.	31.9	32.5
Debt/GDP	BRA	.	7.7	9.2	.	7.7	8.1	.	8.2	12.1	.	15.9	20.2
	COL	.	6.3	16.4	.	3.5	5.5	.	3.5	11.2	.	7.0	16.8
	HUN	24.8	35.7	22.1	10.6	15.6	10.2	6.6	10.3	5.7	17.1	25.8	16.0
	IDN	2.6	6.4	12.8	3.7	1.5	3.9	4.8	5.1	7.5	8.5	6.6	11.4
	ISR	6.2	7.0	6.9	17.0	8.4	4.0	7.9	10.9	16.9	25.0	19.3	20.9
	KOR	1.0	4.5	4.6	9.7	16.3	16.9	4.3	6.0	5.5	14.0	22.3	22.5
	MEX	5.8	14.9	15.7	1.0	2.3	3.0	7.6	11.1	20.1	8.5	13.3	23.1
	MYS	4.4	14.8	14.8	18.0	19.9	26.0	18.8	14.5	18.0	36.8	34.4	43.9
	PER	11.0	10.7	.	2.8	8.3	.	1.5	2.9	.	4.3	11.2	.
	POL	16.4	25.4	21.3	1.9	6.6	4.8	4.4	6.2	4.7	6.4	12.9	9.5
	RUS	3.7	2.9	4.7	6.0	7.2	5.9	8.2	6.8	9.2	14.2	14.0	15.1
	THA	2.2	3.9	4.2	15.6	15.4	13.3	4.1	4.6	7.2	19.7	20.0	20.5
	TUR	.	12.2	11.3	.	7.4	14.3	.	7.2	9.4	.	14.6	23.7
	ZAF	.	16.2	23.2	.	9.6	12.3	.	9.5	13.6	.	19.0	25.9

Notes: LC Share is the local currency share of externally held debt. Debt/GDP is the total amount of externally held debt as a percent of GDP. The calculations include both loan and bond debt. NFC refers to all external debt of the non-financial corporate sector, and Total Corporate is the sum of Financial and Non-Financial Corporate Debt.

Table A2: Share of External Borrowing in Foreign Currency

Country Code	N	Mean	SD
BRA	406	14.1	29.1
COL	39	33.5	42.3
HUN	17	59.8	42.7
IDN	341	37.3	45.0
ISR	229	25.4	38.0
KOR	1120	10.4	27.2
MEX	121	51.4	44.1
MYS	429	10.9	27.7
PER	51	59.5	44.3
POL	235	19.7	36.3
RUS	243	14.2	31.0
THA	389	8.2	23.0
TUR	169	44.9	43.8
ZAF	90	30.2	42.1
All	3879	19.0	35.3

Notes: Mean and standard deviation of foreign currency debt shares for emerging market firms in FactSet. Firms are aggregated to the FactSet ultimate parent, and the statistics are calculated for the residency of the firm's ultimate parent. All firms are weighted equally at the country level.

Table A3: External Debt Calculations

			Bonds	Loans
Government		FC	IDS	SDC/LBS
		LC	NHDG + IDS	SDC/LBS
Bank	Residency	FC	IDS	LBS
		LC	MS/NHDG + IDS	LBS
	Nationality	FC	IDS	SDC/LBS estimate
		LC	MS/NHDG + IDS	SDC/LBS estimate
Non-Bank	Residency	FC	IDS	SDC/LBS
		LC	MS/NHDG + IDS	SDC/LBS
	Nationality	FC	IDS	SDC/LBS estimate
		LC	MS/NHDG + IDS	SDC/LBS estimate

Notes: "IDS" denotes use of the BIS IDS series. "LBS" denotes use of the BIS LBS series. "SDC/LBS" denotes the use of the share of central government loans in SDC Platinum to split the LBS non-bank series, which contains government debt, into a government and non-bank series. "SDC/LBS estimate" denotes the use of the ratio of nationality to residency loans in SDC Platinum to estimate a nationality version of the LBS series for a country and sector. "NHDG" denotes domestic market government issuances which are held by foreigners, from Haver, ABO, and the Colombian Ministry of Finance. "MS/NHDG" denotes the use of the ratio of domestically issued government debt and corporate debt in the Morningstar mutual fund holdings data in combination with data on nonresident holdings of domestically issued government debt to estimate external corporate debt.

Table A4: Corporate Foreign Currency Borrowing

VARIABLES	(1) FC Debt	(2) FC Debt	(3) FC Debt	(4) FC Debt
Log Total Sales		2.159***	1.144**	1.699***
		(0.546)	(0.544)	(0.543)
Foreign Sales Share			0.251***	
			(0.0324)	
Foreign Asset Share				0.380***
				(0.0749)
Constant	19.22***	17.44**	8.749	15.82*
	(6.619)	(8.419)	(9.526)	(8.797)
Observations	3,772	2,003	1,974	1,992
R-squared	0.238	0.299	0.325	0.315
Country FE	Yes	Yes	Yes	Yes
NAICS 4 FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows firm level regressions of the foreign currency debt share on measures of foreign currency exposure. All columns include country fixed effects and NAICS 4 industry fixed effects. Foreign currency debt data and NAICS codes are from FactSet. Total sales, foreign sales share, and foreign assets share are from Worldscope. Robust standard errors are reported in parentheses.

Table A5: CCS and FC Debt Outstanding

Currency	CCS Outstanding	Mean Maturity	FC Corp. Outstanding	FC Govt. Outstanding
BRL	11.9	2.5	393.2	54.4
COP	170.5	1.7	49.4	26.1
HUF	210.5	1.5	21.8	21.0
IDR	4.5	2.3	110.2	67.2
ILS	6.3	2.6	74.5	16.4
KRW	19.8	2.1	344.1	6.2
MXN	197.9	2.4	233.4	61.2
MYR	0.4	1.0	113.9	4.6
PHP	1.2	1.9	38.2	26.7
PLN	10.2	1.0	42.7	61.7
RUB	78.8	1.3	221.4	36.9
THB	0.7	2.6	88.5	0.1
TRY	727.9	1.7	192.9	66.1
ZAR	72.5	2.7	68.0	18.6

*Notes*CCS notional outstanding from Table 3 in the DTCC Trade Information Warehouse: Link. "CCS Outstanding" and "Mean Maturity" refer to the total notional outstanding and mean maturity in years of cross-currency swaps that include the currency identified in the first column and were outstanding at the end of 2017. "FC Corporate" refers to notional outstanding of FC external corporate debt, and "FC Government" refers to notional outstanding of FC external government debt. Corporate FC and Government FC data are from the dataset constructed in Section 2.

Table A6: Sovereign Local Currency Credit Spreads, Corporate and Sovereign Debt

	(1) LCCS	(2) LCCS	(3) LCCS	(4) LCCS
Sovereign LC Share	1.568***	1.659***	0.518	0.578
	(0.246)	(0.235)	(0.310)	(0.332)
Corporate LC Share	-5.715***	-6.035***	1.372	0.778
	(0.962)	(0.976)	(1.302)	(1.340)
Sovereign Debt/GDP	0.0401***	0.0402***	0.0444**	0.0527***
	(0.00858)	(0.00961)	(0.0156)	(0.0148)
Corporate Debt/GDP	0.0111*	0.00864	0.0177*	0.0109
	(0.00592)	(0.00680)	(0.00816)	(0.00809)
Observations	662	613	662	613
R-squared	0.401	0.403	0.732	0.735
Number of groups	13	13	13	13
Country FE	No	No	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Excludes GFC	No	Yes	No	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The Local Currency Credit Spread (LCCS) is defined in Appendix Section 3.1.3. The Sovereign and Corporate LC Share measure the share of a country's external debt in foreign currency, as measured in Section 2. Sovereign Debt/GDP and Corporate Debt/GDP also refer to a country's external debt. Driscoll and Kraay (1998) standard errors are reported in parentheses.

Table A7: Corporate and Sovereign Debt

	(1) CDS	(2) CDS	(3) CDS	(4) CDS
Sovereign LC Share	-0.908***	-0.801***	-0.441	-0.353
	(0.129)	(0.108)	(0.259)	(0.259)
Corporate LC Share	-1.569**	-1.681**	-1.073*	-1.287**
	(0.543)	(0.574)	(0.553)	(0.568)
Sovereign Debt/GDP	0.0205**	0.0211**	0.0448**	0.0440**
	(0.00827)	(0.00868)	(0.0197)	(0.0189)
Corporate Debt/GDP	0.0103	0.0100	0.0571***	0.0570***
	(0.00623)	(0.00685)	(0.00907)	(0.0115)
GDP Growth	-2.552***	-2.882***	-1.639**	-1.900***
	(0.778)	(0.843)	(0.545)	(0.594)
Observations	788	735	788	735
R-squared	0.469	0.370	0.726	0.681
Number of groups	14	14	14	14
Country FE	No	No	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Excludes GFC	No	Yes	No	Yes

Standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: The Sovereign and Corporate LC Share measure the share of a country's external debt in foreign currency, as measured in Section 2. Sovereign Debt/GDP and Corporate Debt/GDP also refer to a country's external debt. We also include GDP Growth, calculated as the log change in GDP from the prior quarter. GDP data is from the IMF IFS, except for MEX and ZAF–for which the data is from the OECD–and COL–for which the data is from the World Bank. The debt variables are from the dataset constructed in Section 2. Driscoll and Kraay (1998) standard errors are reported in parentheses.

Table A8: Sovereign CDS and Corporate Debt Composition: Alternative Definitions

	(1) CDS	(2) CDS	(3) CDS	(4) CDS
Sovereign FC Debt/GDP	0.179***	0.179***	0.187***	0.190***
	(0.036)	(0.036)	(0.042)	(0.043)
Corporate FC Debt/GDP	0.065***			
	(0.010)			
Bank FC Debt/GDP		0.068***		
		(0.013)		
Non-Financial Corp. FC Debt/GDP		0.060***		
		(0.016)		
Tradable FC Debt/GDP			0.068***	0.060***
			(0.015)	(0.018)
Non-Tradable FC Debt/GDP			0.116***	0.120***
			(0.035)	(0.034)
GDP Growth	-0.268	-0.282	-0.565	-0.556
	(0.745)	(0.732)	(0.774)	(0.782)
Observations	862	862	862	862
R-squared	0.695	0.695	0.667	0.668
Number of groups	14	14	14	14
Country FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Tradable Def	None	None	JK	SL

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: This table shows the results of quarterly country-level regressions for our 14 country sample over 2003q1 to 2017q4. In column 1 we regress CDS spreads on sovereign and corporate debt expressed as a share of GDP. In column 2 we divide corporate debt into the financial and non-financial sectors then run the same analysis. In column 3 we use our benchmark definition of the tradable sector, which we take from Jensen and Kletzer (2010), to subdivide the non-financial sector into the tradable and non-tradable sector. In column 4, we use a definition of the tradable sector from Sachs and Larrain (1993) to subdivide the non-financial sector into the tradable and non-tradable sector. We include country and quarter fixed effects in all specifications. We also include GDP Growth, calculated as the log change in GDP from the prior quarter. GDP data is from the IMF IFS, except for MEX and ZAF–for which the data is from the OECD–and COL–for which the data is from the World Bank. The debt variables are from the dataset constructed in Section 2. Driscoll and Kraay (1998) standard errors are reported in parentheses.

Table A9: Inflation Comparison in Model and Data

	(1) Model	(2) Model	(3) Data
α_G	17.74***	24.35***	-6.124***
	(1.602)	(2.723)	(1.218)
α_P	11.64***	15.11***	7.106***
	(2.561)	(3.133)	(1.279)
Observations	121	121	196
R-squared	0.519	0.554	0.202
Controls	No	Debt	Debt and Time FE

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Regression of inflation rate on the sovereign LC debt share (α_G) and the corporate LC debt share. Columns 1 and 2 are based on model generated moments for all LC shares between 0 and 1 at 10% intervals.