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The Sovereign-Bank Nexus in Emerging Markets and Developing Economies

Trends, Determinants, and Macroeconomic Implications

Torsten Wezel, Zulma Barrail, and Salim Dehmej

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ABSTRACT: As public debt in emerging markets (EMs) and low-income countries (LICs) has surged since the COVID-19 pandemic, so has the exposure of domestic banks to their sovereigns—raising concerns of destabilizing feedback loops if fiscal conditions deteriorate. This paper provides a comprehensive analysis of this sovereign-bank nexus using a new granular dataset covering over 120 EMs and LICs, combined with IMF Financial Soundness Indicators. We document a marked post-pandemic strengthening of the nexus, particularly in Sub-Saharan Africa and the Middle East and Central Asia, and show that public debt levels, deposit rates, and nonperforming loans are its most robust correlates. While we find no broad evidence of financial repression, higher sovereign refinancing needs significantly increase banks' government debt holdings in countries with substantial state-owned bank presence. Sensitivity analysis illustrates that the consequences of a strong nexus can be severe: even a moderate domestic debt restructuring could render several banking systems undercapitalized, underscoring that high reported capital ratios in strong-nexus countries may provide a false sense of security.

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WORKING PAPERS

The Sovereign-Bank Nexus in Emerging Markets and Developing Economies

Trends, Determinants, and Macroeconomic Implications

Prepared by Torsten Wezel, Zulma Barrail, and Salim Dehmej¹

¹ This working paper is dedicated to the memory of Torsten Wezel, who passed away before its publication. The authors would like to thank IMF reviewers and the participants of an internal IMF seminar and of the 15th Commerzbank Emerging Markets Macro Conference, both held in June 2025, for their helpful comments and suggestions. The views expressed in this paper are those of the authors and do not necessarily reflect those of the IMF, its Executive Board, or management.

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I. Introduction

The relationship between the financial health of the public sector and the domestic banking system, often termed the sovereign-bank nexus, is a critical area of analysis for macrofinancial stability. While a certain nexus is normal and desirable in facilitating government funding, strengthening the sovereign yield curve, which provides a benchmark for private securities, and providing low-risk liquid assets to banks (including as collateral for repos, for example), excessive interdependence can become perilous, especially when sovereigns increasingly rely on domestic banks for financing amid rising and increasingly unsustainable public debt. Specifically, this deep interconnectedness implies that distress in one sector can propagate and amplify stress in the other, potentially creating adverse feedback loops (Dell’Ariccia et al. 2018). Banks often hold large portfolios of sovereign bonds, while governments implicitly or explicitly backstop banks in crisis. This creates a two-way feedback loop: fiscal distress can weaken banks, and banking crises can worsen public finances. Furthermore, a strong nexus can create vulnerabilities even absent a default. It can crowd out credit to the private sector (Broner et al. 2014) and, in an environment of rising interest rates, expose banks to potential capital losses (Copestake et al. 2023).

The euro area sovereign debt crisis of the early 2010s highlighted the destabilizing potential of these feedback loops. More recently, policy responses to the COVID-19 pandemic led to a significant rise in public debt globally, with a pronounced increase in domestic banks’ holdings of sovereign debt, particularly in emerging markets and developing economies (EMDEs; Deghi et al. 2022). This trend, coupled with tighter global financial conditions and deteriorating fiscal positions in some countries, has renewed focus on the risks emanating from the nexus.

While the nexus has been explored in previous research and some surveillance activities, analysis has largely focused on advanced economies, while research on EMDEs has been scarce and often constrained by data limitations. This gap is significant, as the nature and risks of the nexus in EMDEs differ substantially from those in advanced economies. EMDEs often feature shallower domestic capital markets, greater susceptibility to external financing shocks and to capital flight, and less developed macroprudential frameworks. These factors can amplify nexus-related vulnerabilities in ways not observed in advanced economies, justifying a dedicated analysis. This paper contributes to the literature by employing a new, comprehensive database covering around 150 countries (with an econometric estimation sample of up to 127 EMDEs and a restructuring simulation sample of 123), allowing for a detailed examination of the size and composition (by public sector entity, instrument, and currency) of banks’ exposure to the public sector. It provides a quantitative assessment of the key correlates and potential determinants of the sovereign-bank nexus, alongside sensitivity analysis evaluating banking sector vulnerabilities under alternative sovereign debt restructuring scenarios, conditional on the strength of that nexus.

Using this database and combining it with other cross-country data sources (e.g., IMF financial soundness indicators (FSIs)), we show that (i) the sovereign-bank nexus has continued to strengthen

in EMDEs in recent years (while not changing much in advanced economies), particularly in Sub-Saharan Africa countries and the Middle East and Central Asia region; (ii) banks' sovereign exposure is associated with the level of public debt, deposit rates, and nonperforming loans (NPLs), with access to external markets and external financing conditions also playing important roles; (iii) despite lack of evidence of broad financial repression, higher refinancing needs noticeably increase sovereign debt holdings in countries with significant state-owned bank presence, suggesting policy influence; and (iv) banking systems in countries with a strong nexus are vulnerable to potential domestic debt restructuring, particularly those with relatively thin capital buffers.

The remainder of the paper is organized as follows. Section II presents a literature review. Section III describes the dataset used to measure the sovereign-bank nexus across countries. Section IV analyzes recent trends in the nexus, focusing on the post-COVID-19 period and variations across country groups. Section V presents an econometric analysis of the factors that may be driving the nexus. Section VI conducts a sensitivity analysis to assess banking sector vulnerabilities to sovereign debt distress. Section VII concludes.

II. Literature Review

The frequently adverse interdependency of banks and their sovereign has been termed the “doom loop” for being a self-reinforcing downward spiral: banks that assume they will be bailed out by their sovereign have an incentive to hold substantial government debt instead of self-ensuring through capital buffers (Cooper and Nikolov 2018). If investors fear a sovereign default, banks holding large amounts of sovereign bonds appear riskier, and if they fear bank failures, the expected fiscal cost to the sovereign rises—in both cases, the fear becomes self-fulfilling (Farhi and Tirole 2018).

The literature identifies several key factors influencing banks' decisions to hold sovereign debt. Understanding these determinants is crucial for assessing the drivers of nexus dynamics and potential vulnerabilities.

- **Regulatory treatment of sovereign exposures.** Under Basel frameworks, domestic sovereign debt often benefits from zero or low-risk weights and exemptions from large exposure limits (Dell’Ariccia et al. 2018). This preferential treatment reduces the regulatory capital required to hold sovereign bonds compared to other risk assets like private sector loans, creating a powerful incentive for banks to allocate capital toward government debt. Banks hold sovereign debt for legitimate liquidity management and investment purposes, using it as high-quality collateral for central bank operations or interbank markets. In some countries, exposure to the sovereign benefits from an exemption from provisioning requirements.
- **Bank-specific incentives** such as risk-taking and principal-agent problems also play a significant role. Banks may hold government debt not only as a safe asset but also as part of a risk-taking

strategy. If banks expect government bailouts—and/or potential losses to be absorbed by deposit insurance schemes—in case of sovereign default, they may underprice the associated risks, leading to excessive holdings (Broner et al. 2014; Farhi and Tirole 2018). In the euro area, the marked increase in banks' holdings of domestic sovereign bonds following the 2008 global financial crisis has been linked to incentives aimed at hedging redenomination risk in the context of growing financial fragmentation. As cross-border interbank lending contracted, banks and other financial intermediaries increasingly aligned their asset and liability positions within national boundaries—a process of financial renationalization. This trend was particularly pronounced in countries with weaker fiscal positions, where concerns over potential sovereign defaults intensified the incentive to hold domestic government securities (Angelini et al. 2014). Acharya et al. (2014) show that bailouts triggered the rise of sovereign credit risk in 2008 and that post-bailout changes in sovereign credit default swap (CDS) spreads explain changes in bank CDS, confirming the sovereign-bank loop. Empirical evidence from the European debt crisis suggests that weaker or state-owned banks, potentially seeking higher yields, increased their holdings of domestic sovereign debt ("home bias") as foreign investors retreated. European banks' home bias in sovereign bonds almost doubled in the wake of the euro area crisis (Saka 2020).

- **Government actions** are also key determinants. Governments may implicitly or explicitly pressure banks to hold sovereign debt, especially during episodes of elevated public debt or fiscal stress. Historically, financial repression—through interest rate caps, directed lending, and capital controls—was widely practiced post-World War II (Reinhart 2012; Reinhart and Sbrancia 2015). Partially prompted by the sharp rise in government debt following the global financial crisis and efforts to ease debt burdens, some countries have reinstated administrative caps on interest rates (Jafarov et al. 2019). In addition, governments may use moral suasion to pressure banks into purchasing government debt. Gennaioli et al. (2014) find that banks often increased their holdings of government bonds in the run-up to sovereign default, suggesting search for yield or possibly government pressure ahead of crises—a pattern consistent with both gambling and moral suasion. Ongena et al. (2019) provide further evidence from the euro area, showing that smaller banks, those with weaker balance sheets, or those recently having received government support are particularly susceptible to such pressure. The extent of government involvement in a bank's governance—whether through ownership stakes or board connections—appears to have a lesser influence. Governments facing fiscal stress or limited external financing may turn to domestic banks—especially in less developed capital markets—using moral suasion or financial repression to secure a captive market for government debt. Deghi et al. (2022) find that domestic state-owned banks in emerging markets are particularly prone to such government influence, significantly increasing sovereign debt holdings during periods of stress.
- **Central bank policies, market conditions, and capital market development** influence exposure levels. For instance, monetary financing by or large-scale asset purchase programs of central banks can impact the availability of sovereign debt and its relative return, influencing

banks' portfolio decisions. Periods of heightened global risk aversion, tighter external financing conditions and/or limited external financing—either domestic or externally driven—may also push sovereigns toward greater reliance on domestic bank financing. Furthermore, in countries with underdeveloped capital markets, sovereign securities are among the few available options of highly liquid assets, and flight to quality by banks typically favors sovereign bonds (Bouis 2019). Hardy and Zhu (2023) show that sovereign borrowing surged globally in the wake of the COVID-19's outbreak, but only banks in emerging market economies steadily increased their holdings of sovereign debt. It is worth emphasizing that the attractiveness of government debt as a safe way to store liquidity in developing economies is increased by weak institutions and poor enforcement of creditor rights, as these factors impede the private sector's creation of financial assets (Holmstrom and Tirole 1998).

Evidence from emerging markets—the focus of our investigation—has traditionally been limited, often due to data limitations. However, recent studies have focused on the EMDE experience. IMF (2022) finds that the strong association between sovereign and banking sector risks has amplified past financial crises and that banking and sovereign debt crises have been particularly prevalent in emerging markets, frequently occurring at the same time or in quick succession. Deghi et al. (2022) show that for emerging markets, an increase in sovereign credit risk can adversely affect banks' balance sheets and credit supply, with strong nonlinearities. World Bank (2024) reports that the sovereign-bank nexus is particularly high in countries already facing government debt distress—banks' holding of government debt is on average 6 percentage points of assets higher than in non-debt-distressed countries, and half of EMDEs with high government exposures of banks face high government debt risks. Regarding the impact of the nexus, World Bank (2024) argues that although most banks appear to have adequate buffers to withstand shocks, reductions in the value of government debt in countries with both high government exposure and high government debt risks could threaten macroeconomic and financial sector stability and trigger banking crises.

Recent empirical papers offer further granularity regarding these risks. For instance, Atsebi and Menkulasi (2025) show that there is a nonlinear relationship between the probability of initiating domestic debt restructurings (DDRs) and the share of domestic debt in total debt. They also find that DDRs involving a stronger sovereign-bank nexus exhibit a more pronounced decline in public debt and interest payments but are associated with a sharper gross domestic product (GDP) contraction and a larger reduction in domestic credit. Also, Menkulasi and Nose (2025) find that greater reliance on domestic banks for deficit financing amplifies the impact of loose fiscal policy on domestic bond yields. They highlight that the post-pandemic shift in domestic financing toward banks has made sovereign yields increasingly dependent on banks' investment behavior, raising potential financial sector risks in major EMDEs.

III. Data

This paper combines the IMF's FSI dataset with a new dataset that measures the exposure of domestic banking systems to the public sector across a wide range of countries. The nexus dataset is derived primarily from the IMF's Monetary and Financial Statistics (MFS) database (Annex I).²

A key feature of this dataset is its granularity in measuring banks' exposures to the public sector, typically expressed as a share of total banking system assets. The data allow for differentiation of exposures based on several dimensions: (i) public sector entity, to distinguish between claims on the central government, state and local governments, and public nonfinancial corporations (state-owned enterprises—SOEs); (ii) financial instrument, separating exposures held in the form of loans from those held as debt securities; and (iii) currency, distinguishing between claims in the national currency and those in foreign currencies.

The econometric analysis of determinants of the nexus in Section V uses other macroeconomic data extracted from a variety of sources (Annex II, Table 1). The final sample is composed of an unbalanced panel of up to 127 EMDEs (70 EMs and 57 LICs) during 2005–23, depending on the specification (see Annex II for sample coverage). The data ranges from GDP growth and interest rates to inflation and the public debt ratio, but they also comprise dummy variables proxying liquidity, fiscal stress, market access, and rollover bunching, in part sourced from other similar studies.

The sensitivity analysis in Section VI on the impact of hypothetical domestic debt restructuring on bank capital adequacy uses additional bank data on total assets, regulatory capital, and risk-weighted assets sourced from countries' FSIs, financial stability reports, and other official publications. It also uses information about the sovereign debt investor base, from Arslanalp and Tsuda (2014, updated), to finetune the share of debt that can realistically be expected to be included in a restructuring of sovereign domestic debt.

IV. Recent Trends

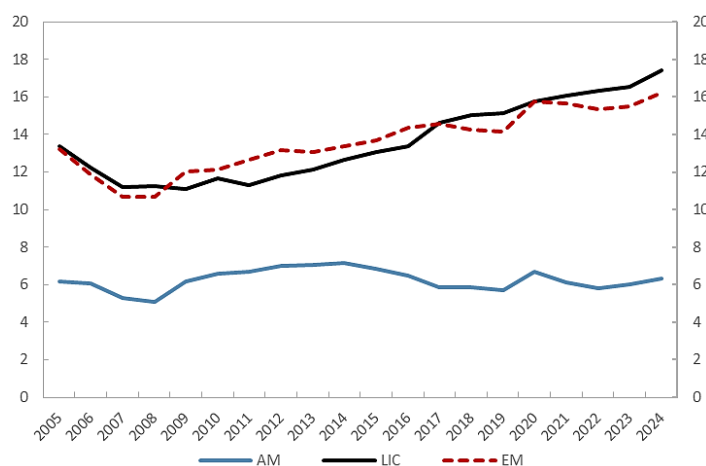
An analysis of the sovereign-bank nexus, including the general government³ and SOEs, across income groups reveals distinct trends over the past two decades, with a notable acceleration following the COVID-19 pandemic, particularly in EMs and LICs (Figure 1). In advanced economies, the nexus remained relatively stable, fluctuating between 5 and 7 percent of bank assets between

² The underlying MFS database described in Annex I covers approximately 150 countries. The econometric analysis (Section V) covers 127 EMDEs. The simulation (Section VI) uses a 123-country sample based on end-2023 data availability for exposures and capital.

³ The definition of "general government" includes central and local governments. In other parts of the paper, we use also the nonfinancial public sector (NFPS). See more details in the annex.

2005 and 2024. EMs started with higher exposure, around 13 percent in 2005, rising gradually to 14 percent pre-pandemic. A jump occurred in 2020, pushing the nexus to 17 percent. The most pronounced trend is observed in LICs. Starting at 13 percent in 2005, the nexus in LICs climbed steadily to 15 percent by 2017–19. The pandemic marked a clear inflection point, with the ratio rising to around 18 percent by 2024, underscoring growing reliance on bank financing in this country group. Advanced economies have consistently exhibited the lowest nexus ratios, near 6 to 7 percent.

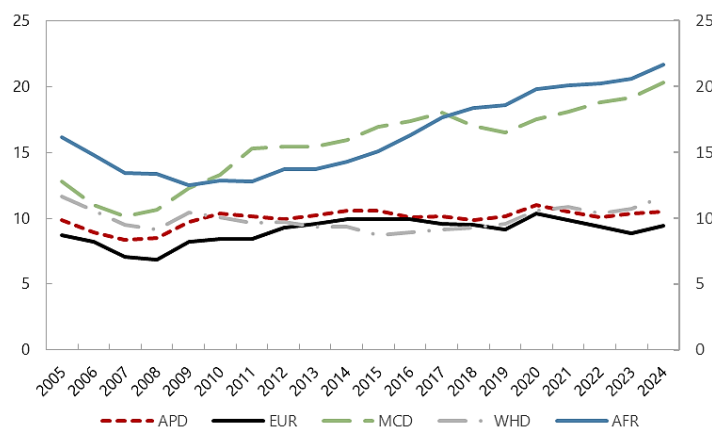
Figure 1. Evolution of the Sovereign-Bank Nexus, by Income Level (share of bank assets)



Source: IMF MFS database; authors' calculations. Note: The sovereign covers the nonfinancial public sector, which includes the central and local government and SOEs. Simple averages are used for each region or income group.

Significant regional disparities⁴ exist in the level and evolution of the sovereign-bank nexus (Figure 2). The African Department (AFR) and Middle East and Central Asia Department (MCD) regions consistently exhibit the highest exposures. Starting at 16 percent and 13 percent, respectively, in 2005, the nexus in both regions trended upward over the period, albeit with some volatility. The AFR region saw a particularly steep rise, from 14 percent in 2014 to 22 percent by 2024, while the MCD region also reached 22 percent by 2024, having peaked earlier at 18 percent in 2017 before rising again post-pandemic. In contrast, the Asia and Pacific Department (APD) and European Department (EUR) regions displayed considerably lower and more stable nexus levels, generally fluctuating around 8–11 percent throughout the 2005–24 period, with only modest increases observed around the pandemic's onset before stabilizing again. The Western Hemisphere Department (WHD) region occupied an intermediate position initially (12 percent in 2005) but saw a decline to 9 percent for much of the 2010s. While it experienced an increase post-COVID-19, rising back to 12 percent by 2024, its level remained well below those seen in the AFR and MCD regions.

⁴ We use the geographical differentiation by IMF area departments: the African Department (AFR), which covers Sub-Saharan Africa; Asia and Pacific Department (APD); European Department (EUR); Middle East and Central Asia Department (MCD), which also covers North Africa; and Western Hemisphere Department (WHD), which covers North and Latin America as well as the Caribbean.

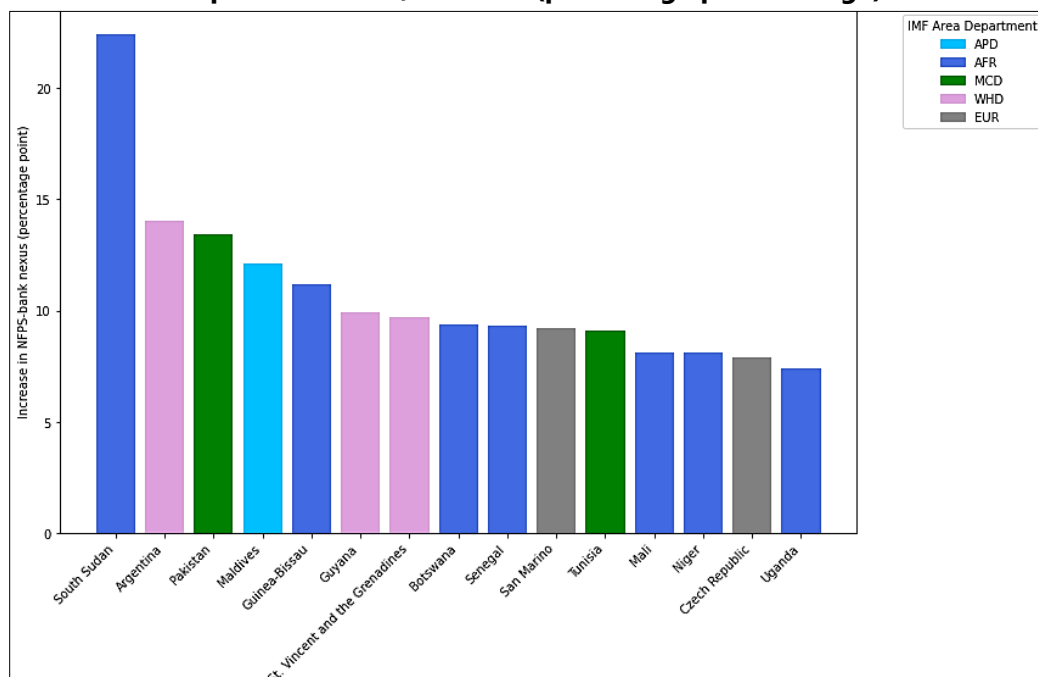
Figure 2. Evolution of the Sovereign-Bank Nexus, by Region (share of bank assets)

Source: IMF MFS database; authors' calculations. Note: The sovereign covers the nonfinancial public sector, which includes the central and local government and SOEs. Simple averages are used for each region or income group.

While regional averages illustrate broad trends, considerable heterogeneity exists within each geographic area regarding the sovereign-bank nexus by the end of 2024. In AFR, for instance, some countries, such as South Sudan (SSD), exhibit exceptionally high public sector exposures in bank assets, exceeding 60 percent. Other countries have significant nexus ratios like Sierra Leone (SLE) at 40 percent, or Angola (AGO) and Uganda (UGA) at 29 and 27 percent respectively. The MCD region, which includes North Africa, features countries like Pakistan (PAK), Egypt (EGY), and Algeria (DZA) with substantial nexus levels, above 50 percent. Within the APD region, Maldives (MDV) and Bangladesh (BGD) stand out, with the nexus ratios surpassing 35 and 25 percent, respectively. In the EUR region, Albania (ALB), Ukraine (UKR), and Romania (ROU) display higher exposures, 27 percent, compared to their regional peers. Finally, in the WHD region, Argentina (ARG), Guyana (GUY), Mexico (MEX), and Brazil (BRA) have relatively elevated banking system exposures to the public sector, above 20 percent.

Post-COVID-19, the nexus shifted markedly, with some countries seeing sharp rises in banks' nonfinancial public sector (NFPS) exposures. An examination of the top 15 countries in the MFS database registering the highest increases in this nexus between 2019 and 2023, measured in percentage points, reveals notable regional concentrations and individual country experiences (Figure 3). South Sudan (AFR) stands out with the most substantial rise, exceeding 20 percentage points. Argentina (WHD) and Pakistan (MCD) follow, each up roughly 13-14 percentage points. Seven of the 15 biggest post-pandemic jumps occur in AFR countries, with the WHD (three) and MCD regions (two) also represented. It is important to note that the risk posed by these increases depends on the initial conditions.

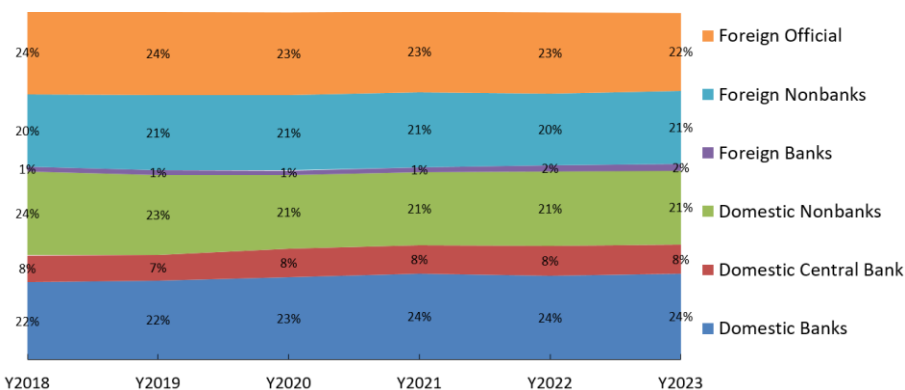
Figure 3. Largest Post-Pandemic Increases in the NFPS-Bank Nexus: Top 15 Countries, 2019–23 (percentage point change)



Source: IMF MFS database; authors' calculations.

Complementing the analysis of bank exposures to the sovereign, data on the broader sovereign debt investor base for emerging markets, based on the Arslanalp and Tsuda (2014, updated) methodology, reveal important trends between 2018 and 2023 (Figure 4). Domestic investors consistently held most of the EM sovereign debt, accounting for slightly over half of total holdings throughout the period. Within this group, domestic banks saw their share increase modestly, from 22 percent in 2018–19 to 24 percent by 2021–23.

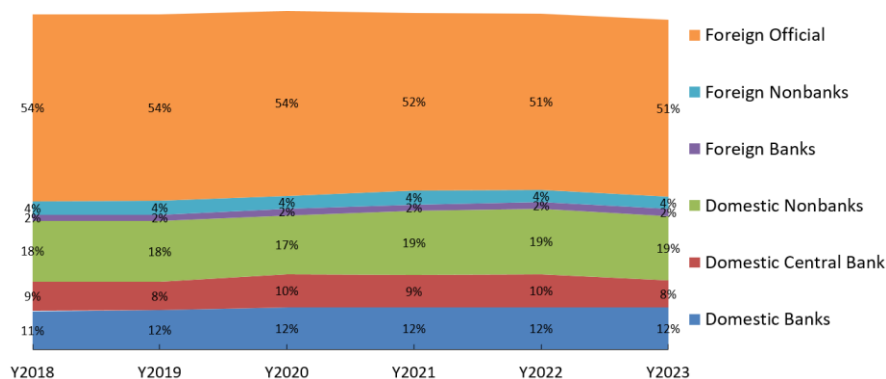
Figure 4. Sovereign Debt Investor Base in EMs, by Category (percent of total debt)



Source: Arslanalp and Tsuda (2014, updated); authors' calculations. Note: Simple averages are used for each income group.

The composition of the sovereign debt investor base in LICs presents a distinct structure compared to EMs (Figure 5). Foreign official creditors overwhelmingly dominate, holding over half of LIC sovereign debt throughout the period, although their share experienced a slight decline, from 54 percent in 2018–20 to 51 percent by 2022–23. Domestic investors played a comparatively smaller role, collectively accounting for less than 40 percent of total holdings. Among domestic players, domestic banks held a relatively stable share, around 11 percent.

Figure 5. Sovereign Debt Investor Base in LICs, by Category (percent of total debt)



Source: Arslanalp and Tsuda (2014, updated); authors' calculations. Note: Simple averages are used for each income group.

However, the averages hide large heterogeneity across countries. For example, domestic banks in Türkiye, Kazakhstan, Algeria, and Nepal held more than half of sovereign debt. This has consequences for the burden felt by domestic banks when the nexus is significant and the country faces debt sustainability issues (see Section VI).

V. Sovereign-Bank Nexus Correlates and Exploratory Determinants

Data and Baseline Model

As mentioned, public debt in EMs has risen sharply since the COVID-19 pandemic, driven by a slowdown in economic activity and rising government spending to support households and businesses throughout the crisis. Section IV also illustrates how the pandemic marked a clear inflection point for the sovereign-bank nexus in both EMs and LICs. This section documents correlates of the sovereign-bank nexus and reports estimates adjusted for endogeneity.

Our baseline model of banking system domestic sovereign asset exposure (relative to total system assets) from country i in year t follows Dell'Ariccia et al. (2018):

$$\begin{aligned} \text{ClaimsGvt}_{i,t} = & \beta_0 + \beta_1 \text{ClaimsGvt}_{i,t-1} + \beta_2 \mathbf{X}_{i,t} + \beta_3 \text{Fin_Depth}_{i,t-1} + \beta_4 \text{SovereignCrisis}_{i,t} + \beta_5 \text{Pubdebt}_{i,t-1} + \eta_i \\ & + \theta_t + \epsilon_{i,t} \end{aligned}$$

where *ClaimsGvt* is banking sector direct exposure to general government bond securities and loans issued in all currencies in percent of system assets. The vector \mathbf{X}_t is a set of commonly included macroeconomic variables, such as annual real GDP growth, annual CPI inflation in percent, and an interest rate. *Fin_Depth* proxies the availability of alternative investment opportunities, *SovereignCrisis* is a dummy variable taking the value of one in years experiencing a sovereign crisis,⁵ *Pubdebt* is general government gross debt as a percent of GDP. The terms η_i and θ_t denote, respectively, country and year fixed effects.

Regarding macroeconomic variables, the interest rate, proxied by the deposit rate, is expected to have a positive relation with banks' holdings of government debt. Since banks are more likely to adjust their portfolios toward safer, more liquid assets such as government debt during times of distress or as the macro economy deteriorates, we expect real GDP growth and inflation (a proxy for economic uncertainty) to have negative and positive effects, respectively. When financial depth increases—measured by the ratio of private sector claims to the annual nominal GDP—it generally leads to a reduction in banks' holdings of sovereign assets, since banks have more investment alternatives available to them. Finally, as higher public debt to GDP tends to reflect higher public financing needs, we expect the sovereign-bank nexus to increase.

We extend the baseline model by adding two additional controls for asset quality and fiscal stress. Higher NPLs as a share of total gross loans indicate weaker reported asset quality, which we expect to strengthen the sovereign-bank nexus. Following Bouis (2019), we define fiscal stress using a dummy variable that is set to one for any year in which the public deficit rises by more than its country-specific standard deviation, calculated across the entire sample period.⁶ Since such an increase signals greater fiscal requirements, we anticipate that fiscal stress will contribute to a stronger sovereign-bank nexus. Unless stated otherwise, all explanatory variables are included in the regressions with a one-year lag to mitigate concerns about reverse causality (see Annex II, Table 2, for variable definitions and data sources).

Results of the regressions are reported in Table 1. As expected, the lagged dependent variable is highly significant. The fixed effects models (Table 1, columns 1-2) suggest that public debt to GDP, deposit rates, fiscal stress, and the NPL ratio have positive and significant effects on banks' holdings of sovereign assets. These results, except in the case of fiscal stress, are robust when calculating bias-

⁵ See Laeven and Valencia (2020).

⁶ Our fiscal-stress measure follows Bouis (2019) to preserve comparability. However, we interpret the estimated coefficients with caution, since fiscal expansions are often predictable—for example, around budget cycles, elections, or natural disasters—and a stronger identification strategy would rely on plausibly exogenous shocks (e.g., Bartik/shift-share instruments). This is left for future research.

corrected least-squares dummy variable (LSDV) estimators using the bias approximations in Bruno (2005), who extends the results by Bun and Kiviet (2003), Kiviet (1999), and Kiviet (1995) to unbalanced panels (Table 1, columns 3-4). Point estimates suggest that a one standard deviation change in deposit rates (5.11 percent in our sample) and in the NPL ratio (6.85 percent in our sample) would be associated with an increase in the nexus by 0.3-0.5 and 0.3 percentage point, respectively. Inflation, real GDP growth, and the credit-to-⁷GDP ratio show no significance.

To further address any concerns on potential endogeneity of regressors, we present the results of estimating the model with predetermined regressors using system GMM and up to four lags when building internal instruments.⁸ The estimates (Table 1, columns 5-6) suggest that only the public-debt-to-GDP ratio retains the statistical significance found in the fixed effects models. Point estimates across all models suggest that a one standard deviation change in public debt to GDP (33.2 percent in our sample) would increase the nexus by 0.4-1.9 percentage points.

Our results remain robust when including central bank refinancing operations with commercial banks (measured as a share of commercial banks' total assets). As expected, since this measure may proxy liquidity conditions in the banking sector, it is negatively associated with banks' public debt purchases.⁹ Although the coefficient on refinancing operations is only weakly significant—reaching the 10 percent level in one model using Bruno's (2005) correction (Table 1, column 3)—its inclusion strengthens the statistical significance of the fiscal stress variable in the system GMM specification (see Annex II, Table 4).

The results, particularly for the public-debt-to-GDP ratio, deposit rates, and NPL ratio, are robust to measuring the sovereign-bank nexus as (i) banks' direct exposure to the central government, issued in all currencies (% of assets); (ii) banks' direct exposure to the total government (general and SOEs), issued in all currencies (% of assets); (iii) banks' direct exposure to the central government, issued in national currency (% of assets); (iv) banks' direct exposure to the general government, issued in national currency (% of assets); and (v) banks' direct exposure to the total government (general and SOEs), issued in national currency (% of assets).¹⁰

⁷ For robustness, we use alternative measures of investment opportunities—such as number of listed companies (per 1 million people) and stock market capitalization—and found no significance.

⁸ Both the Hansen J test of over-identifying restrictions and the Arellano-Bond test for autocorrelation suggest that these models are well specified. Two-step results are presented with the Windmeijer small sample correction, which according to Roodman (2014) reduces the problem of downward bias and removes the need to present first-step estimates.

⁹ In certain instances, central bank refinancing might be positively linked to banks' holdings of government securities, as the central bank could provide liquidity with the intention that banks subsequently use it to purchase public securities—effectively a form of indirect public debt monetization.

¹⁰ Tables are available upon request. Note that we follow the IMF's Monetary and Financial Statistics (MFS) framework to classify the components of the public sector (general government, central government, and SOEs). Cross-country application of these definitions, however, often varies.

Splitting the Sample Between EMs and LICs

To assess the robustness of our results and examine whether the estimates differ across country groups, we re-estimate the fixed effects models separately for EMs and LICs. The findings suggest that the main drivers of the sovereign-bank nexus vary by country group.

For the EM sample, the fixed effects estimates, adjusted via the Bruno (2005) LSDV correction bias (Annex II, Table 5, columns 5-8), indicate that deposit rates and the NPL ratio have the expected positive signs and are robustly significant in explaining banks' relative exposure to the general government. By contrast, for the LIC sample, the public-debt-to-GDP ratio and inflation show a consistently significant and positive association with banks' sovereign exposures (Annex II, Table 6, columns 5-8). Deposit rates appear less influential, reaching significance in only one specification.

Table 1. Determinants of General–Government-Bank Nexus (domestic and foreign currency)

Dependent variable:	Direct Exposure to the General Government, domestic and foreign currencies (% Assets)					
	FE model (1)	FE model (2)	Bruno (3)	Bruno (4)	Sys GMM (5)	Sys GMM (6)
Dependent, lagged	0.719*** (0.0379)	0.701*** (0.0349)	0.804*** (0.0229)	0.794*** (0.0271)	0.862*** (0.101)	0.927*** (0.0876)
Deposit rate, lagged	0.0803 (0.0410)	0.109* (0.0471)	0.0718* (0.0349)	0.102** (0.0378)	0.0229 (0.0390)	0.0128 (0.0489)
Real GDP growth, lagged	-0.000566 (0.0157)	-0.000706 (0.0187)	-0.000253 (0.0117)	-0.00244 (0.0125)	-0.00103 (0.0139)	0.0153 (0.0162)
Inflation, lagged	0.0159 (0.0193)	0.0105 (0.0266)	0.0214 (0.0163)	0.0167 (0.0172)	-0.00755 (0.0433)	-0.0176 (0.0438)
Public debt-to-GDP ratio, lagged	0.0197 (0.0113)	0.0289* (0.0121)	0.0144** (0.00537)	0.0203** (0.00762)	0.0597*** (0.0169)	0.0447 (0.0266)
Credit-to-GDP ratio, lagged	-0.0136 (0.00946)	-0.0180 (0.0121)	-0.00806 (0.00734)	-0.0129 (0.00774)	-0.0201 (0.0172)	-0.0160 (0.0189)
Sovereign crisis dummy	-0.417 (1.012)	-1.588 (1.782)	-0.443 (0.873)	-1.569 (1.296)	2.396 (7.246)	-4.843 (5.860)
NPL ratio, lagged		0.0548*** (0.0149)		0.0508** (0.0171)		0.0787 (0.0594)
Fiscal stress		0.363* (0.159)		0.354 (0.195)		2.459 (1.250)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1189	959	1189	959	1253	1018
Number of countries	89	85	89	85	90	86
Adjusted R-squared	0.657	0.698				
Number of instruments					48	53
Hansen test p -value					0.155	0.396
AR(2) test p -value					0.399	0.745

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations

Note: Columns 1-2 report estimates from Fixed Effects model with robust standard errors clustered by country in OLS. Columns 3-4 report estimates after Bruno's (2005) correction. Columns 5-6 displays two step system GMM results with the Windmeijer small sample correction and including time effects. Sample is an unbalanced panel of EMDEs and LICs countries spanning from 2005-2023. Regressions use robust standard errors and treat all regressors except dummies as predetermined but not strictly exogenous variables. Instrument matrix considers up to two lags and is collapsed by the estimation. The row for the Hansen J-test reports the p-values for the null hypothesis of instrument validity. The values reported for AR(2) are the p-values for second order autocorrelated disturbances in the first differences equations. Constant term is included in all models but not reported.

Global Financial Conditions and External Market Access

Periods of heightened global risk aversion, tighter external financing conditions, and/or more costly access to international markets may prompt sovereigns to increasingly rely on domestic bank financing. In this subsection, we explore the role of global financial conditions and external market access in shaping such dynamics.

To assess the role of external financial conditions, we use the U.S. 10-year Treasury yield (in percent) and the CBOE VIX index (annual mean) as measures of global financial conditions, with data sourced from the Federal Reserve Economic Data (FRED). For country-specific indicators of access to international capital markets, we use EMBIG spreads (annual mean, percent) and, alternatively, sovereign external debt issuance as a share of GDP.¹¹ To construct the latter, we use the updated database by Arslanalp and Tsuda (2014), calculating the annual change in general government gross debt held by foreign private creditors, including both foreign banks and nonbank institutions such as insurance companies, pension funds, and investment funds.

A higher U.S. long-term yield—potentially signaling expectations of monetary tightening in the U.S.—can lead to local currency depreciation and weaken EMDE banks' balance sheets, given their exposure to dollar-denominated liabilities¹² Additionally, tighter U.S. monetary policy may reduce bank capital flows through the interconnectedness of global and domestic banks, thereby straining domestic liquidity conditions¹³ While banks with lower capital and riskier portfolios tend to increase their holdings of government debt¹⁴—tight liquidity conditions can have the opposite effect, reducing banks' capacity to absorb public debt. Our estimates provide empirical support for the latter channel.

We estimate three categories of models: (i) those that include only country-specific measures of external market access; (ii) those that include only variables proxying global financial conditions; and (iii) those that include both.

In both the first and third set of models, the coefficients for sovereign external debt issuance are not statistically significant. However, the results show that spreads are statistically significant at least at the 10 percent level in the fixed effects specifications, after correcting Bruno bias (see Annex II, Table 7, columns 5-6; and Annex II, Table 8, columns 3-4). Specifically, an increase of one standard

¹¹ Da Silva et al. (2021) consider these variables as measures of access to international capital markets.

¹² See Akinci and Queralto (2024) and Aoki et al. (2018) for frameworks related to effects on foreign economies of monetary policy shifts in the U.S.

¹³ See Bruno and Shin (2015a, 2015b) and references therein regarding spillovers through the "risk-taking channel" of monetary policy.

¹⁴ Acharya and Steffen (2015) provide evidence in this regard using a sample of euro area banks.

deviation in spreads (5.1 percent in our sample) corresponds to a 0.42-0.65 percentage point rise in the sovereign-bank nexus.

In both the second and third set of models, the VIX index does not demonstrate consistent statistical significance. However, the U.S. long-term yield remains strongly significant at the 1 percent level and maintains a negative relationship with the sovereign-bank nexus, regardless of which measure of external market access is used. The estimated impact ranges from -0.4 to -0.6, as reported in Annex II, Table 8.

Moral Suasion

In many EMs and LICs, the rising public sector debt levels and concerns about fiscal sustainability may have yielded limited or costlier external demand for their sovereign assets. This, in turn, could potentially force governments to rely more on domestic financing to cover fiscal needs and thus increase incentives for exerting moral suasion. In this subsection, we explore the relevance of the financial repression and moral suasion hypothesis.

To test for moral suasion, we model banks' exposure to domestic sovereign debt (relative to assets) by country i in year t as follows:

$$ClaimsGvt_{i,t} = \beta_0 + \beta_1 ClaimsGvt_{i,t-1} + \beta_2 X_{i,t} + \beta_3 Fiscal\ Stress_{i,t} + \beta_4 High\ Maturing\ Debt + \eta_i + \theta_t + \epsilon_{i,t}$$

where *Fiscal Stress* is a dummy variable taking the value one in years when the public deficit to GDP increases by more than its country-specific standard deviation and *High Maturing Debt* is a dummy variable taking the value one in years when public debt maturing is above its country-specific 75th percentile¹⁵ (see Annex II, Table 1, for variable definitions and sources). The vector X_t includes annual real GDP growth, annual consumer price index (CPI) inflation in percent, an interest rate, the credit-to-GDP ratio in percent, a sovereign crisis dummy, general government gross debt as a percent of GDP, and the NPL ratio. These controls correspond to those in column 4 of Table 1. Terms η_i and θ_t denote, respectively, country and year fixed effects.

Banks' holdings of government debt are expected to rise with the public-debt-to-GDP ratio, and fiscal stress, reflecting greater financing needs. However, as both variables are tied to the business cycle, they cannot clearly distinguish between financial repression and banks' incentives to invest in safer assets or liquidity management. By contrast, the volume of maturing debt is plausibly exogenous to current economic conditions, as well as to banks' demand for sovereign debt, because

¹⁵ Unlike Ongena et al. (2019) and Bouis (2019), we choose the 75th percentile and not the median to be more conservative.

it results from decisions made by previous governments in earlier years (Ongena et al. 2019).¹⁶ The moral suasion hypothesis predicts a positive link between banks' government claims and higher refinancing needs. The coefficient of interest is therefore β_4 .

We also extend the model by interacting higher maturing debt with a dummy variable denoting a high presence of state-owned banks. This approach follows Deghi et al. (2022), who find that domestic state-owned banks—typically prominent in emerging markets¹⁷ and more susceptible to government influence—significantly increase their holdings of sovereign debt during periods of heightened fiscal need. We construct two alternative proxies for a strong presence of state-owned banks based on two country-year-level indicators of bank ownership by Panizza (2024). These indicators are presented in Table 2. The dummy takes the value of 1 when the mean of a country's indicator is above the 75th percentile of the full sample. In our sample, the high presence of state-owned banks corresponds to a country's SOCB and SOCB50 averages over 2005–23 exceeding 20.8 and/or 20.2 percent, respectively.

Table 2. Bank Ownership Indicators

Variable Name	Description	Definition of Government Ownership
SOCB	Country year % of state ownership—constructed by weighting the assets by the share of government ownership in a specific bank-year and then dividing by the total banking assets in the same country-year.	Domestic bank in which domestic government holds direct ownership stakes, or indirect stakes through shareholdings in other companies that, in turn, own shares in the same bank.
SOCB50	Country year % of state ownership—constructed by summing the assets of state-owned banks in a specific year and then dividing by total banking assets in the same country year.	State-owned banks defined as those with state participation in shares above 50%.

Source: Panizza (2023).

To address any concerns on potential endogeneity of regressors, we present only results of the model with predetermined regressors using system GMM and up to two lags when building internal instruments. Two-step results apply the Windmeijer small sample correction.¹⁸

¹⁶ While Ongena et al. (2019) treat large maturing debt volumes as exogenous in the European context, this may be a strong assumption in EMDEs, where debt management offices, prevailing market conditions, and banks' or investors' anticipatory behavior often reshape redemption profiles. A more rigorous identification strategy could exploit data on preannounced issuance calendars or mechanical maturity schedules, or else control for the intensity of liability-management operations (e.g., debt exchanges and buybacks, maturity-smoothing indicators, or auction-level metrics). We leave this refinement for future research.

¹⁷ While public banks' market share in EMDEs has been steadily declining over the past two decades, it still remains above the levels observed in advanced economies (Adams et al. 2022).

¹⁸ Both the Hansen J test of over-identifying restrictions and the Arellano-Bond test for autocorrelation suggest that these models are well specified.

Estimates, presented in Tables 3 and 4, suggest that when we exclude the interaction term, there is no significant evidence of financial repression, i.e., evidence of government pressure at the system level. However, when we include the interaction term with the share of state-owned banks dummy, in five out of six specifications we find significant and positive coefficient estimates, suggesting that higher refinancing needs tend to increase the sovereign-bank nexus in economies with a significant presence of state-owned banks.¹⁹ More precisely, the point estimates imply that during years of high refinancing needs and compared to systems with a low presence of state-owned banks, systems in which the government owns a significant share of bank shares would increase holdings of domestically issued sovereign debt relative to assets by 12 to 15 percentage points. These results are aligned with Deghi et al. (2022).

¹⁹ It is also important to highlight that the coefficient for the high maturing public debt indicator is notably negative. Although this result may initially seem unexpected, there is a logical rationale behind it. When a government faces a substantial amount of debt maturing soon—requiring the rapid issuance of new debt—domestic banks in countries with minimal state ownership may not be compelled to purchase this debt. Instead, these banks may act more as disciplined investors, making decisions based on market conditions. If the returns offered do not adequately compensate for the perceived risks, these banks are more likely to decrease their holdings of sovereign debt rather than increase them. As a result, the connection between banks and the sovereign may weaken at the very time the government's refinancing needs are most acute.

Table 3. Moral Suasion Regression Estimates Excluding and Including High Presence of State-Owned Banks (SOCB indicator)

Dependent variable:	System GMM											
	DECG (Local and Foreign)		DEGG (Local and Foreign)		TEGG (Local and Foreign)		DECG (Local currency)		DEGG (Local currency)		TEGG (Local Currency)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Public debt-to-GDP ratio	0.046 -0.030	0.128* -0.051	0.048 -0.031	0.119* -0.052	0.048 -0.044	0.053 -0.040	0.033 -0.029	0.130* -0.053	0.035 -0.030	0.124* -0.054	0.024 -0.041	0.118* (0.0493)
Credit-to-GDP ratio	-0.003 -0.019	-0.130* -0.064	-0.005 -0.019	-0.131* -0.064	-0.002 -0.029	-0.128* -0.061	-0.001 -0.018	-0.103 -0.053	-0.002 -0.017	-0.101 -0.052	-0.003 -0.029	-0.0969 (0.0514)
NPL ratio	0.054 -0.073	0.070 -0.115	0.050 -0.071	0.060 -0.112	0.094 -0.080	0.025 -0.097	0.034 -0.074	0.074 -0.096	0.030 -0.072	0.073 -0.095	0.064 -0.086	0.0939 (0.122)
Fiscal stress dummy	1.483 -2.230	-3.156 -5.097	1.163 -2.136	-4.034 -5.297	1.152 -2.323	-4.080 -5.195	0.833 -2.270	-0.065 -3.826	0.559 -2.157	-0.587 -4.107	0.643 -2.478	-1.017 (4.312)
High maturing public debt dummy	0.129 -2.073	-9.878* (3.947)	-0.023 -1.961	-9.628* (4.057)	-0.137 -2.715	-6.950 (4.870)	0.806 -2.055	-8.800* (4.116)	0.592 -1.980	-8.856* (4.188)	1.070 -2.674	-9.681* (4.296)
High State owned banks dummy		-5.768 (8.295)		-4.025 (8.733)		4.989 (7.223)		-11.46 (5.872)		-10.88 (6.065)		-9.098 (7.430)
High maturing public debt X High State owned banks		13.19* (5.675)		12.76* (5.971)		6.551 (6.346)		13.49** (4.870)		13.44** (4.969)		12.46* (5.820)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	687	523	687	523	687	523	687	523	687	523	687	523
Number of countries	84	73	84	73	84	73	84	73	84	73	84	73
Number of instruments	46	36	46	36	46	36	46	36	46	36	46	36
Hansen test p-value	0.364	0.334	0.354	0.280	0.292	0.177	0.195	0.562	0.202	0.514	0.155	0.562
AR(2) test p-value	0.956	0.686	0.959	0.716	0.801	0.645	0.924	0.769	0.921	0.787	0.705	0.817

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations.

Note: All columns report displays two step system GMM results with the Windmeijer small sample correction and including time effects. Sample is an unbalanced panel of EMDEs and LICs countries spanning from 2005-2023. Regressions use robust standard errors and treat all regressors except dummies as predetermined but not strictly exogenous variables. Instrument matrix considers up to three lags and is collapsed by the estimation. The row for the Hansen J-test reports the p-values for the null hypothesis of instrument validity. The values reported for AR(2) are the p-values for second order autocorrelated disturbances in the first differences equations. Lagged dependent, constant term, sovereign crisis dummy, inflation, real GDP growth, interest rates are included in all models but not reported.

Table 4. Moral Suasion Regression Estimates Excluding and Including High Presence of State-Owned Banks (SOCB50 indicator)

Dependent variable:	System GMM											
	DECG (Both Currencies)		DEGG (Both Currencies)		TEGG (Both Currencies)		DECG (Local Currency)		DEGG (Local Currency)		TEGG (Local Currency)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Public debt-to-GDP ratio	0.0459 (0.0301)	0.143** (0.0514)	0.0477 (0.0308)	0.137* (0.0530)	0.0479 (0.0439)	0.0685 (0.0461)	0.0333 (0.0294)	0.149** (0.0549)	0.0347 (0.0296)	0.143* (0.0545)	0.0239 (0.0405)	0.131* (0.0501)
Credit-to-GDP ratio	-0.00341 (0.0193)	-0.105 (0.0537)	-0.00497 (0.0186)	-0.104 (0.0527)	-0.00184 (0.0293)	-0.106* (0.0471)	-0.000648 (0.0177)	-0.0900 (0.0507)	-0.00207 (0.0171)	-0.0866 (0.0492)	-0.00313 (0.0289)	-0.0862 (0.0442)
NPL ratio	0.0537 (0.0729)	0.0879 (0.121)	0.0503 (0.0710)	0.0726 (0.116)	0.0938 (0.0799)	0.0163 (0.0876)	0.0343 (0.0744)	0.0784 (0.109)	0.0295 (0.0718)	0.0798 (0.106)	0.0639 (0.0858)	0.107 (0.130)
Fiscal stress dummy	1.483 (2.230)	-3.127 (4.831)	1.163 (2.136)	-4.006 (4.771)	1.152 (2.323)	-5.187 (4.799)	0.833 (2.270)	-0.931 (3.670)	0.559 (2.157)	-1.475 (3.851)	0.643 (2.478)	-2.331 (4.098)
High maturing public debt dummy	0.129 (2.073)	-9.940* (4.098)	-0.0232 (1.961)	-9.839* (4.115)	-0.137 (2.715)	-7.854 (4.850)	0.806 (2.055)	-9.948* (4.374)	0.592 (1.980)	-10.13* (4.492)	1.070 (2.674)	-11.01* (4.578)
High State owned banks dummy		-5.929 (6.765)		-4.450 (6.996)		5.565 (5.403)		-11.52* (5.288)		-10.99* (5.205)		-8.141 (6.531)
High maturing public debt X High State owned banks		14.25* (5.741)		13.97* (5.992)		8.817 (7.031)		14.98** (5.372)		15.03** (5.456)		14.18* (6.375)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	687	523	687	523	687	523	687	523	687	523	687	523
Number of countries	84	73	84	73	84	73	84	73	84	73	84	73
Number of instruments	46	36	46	36	46	36	46	36	46	36	46	36
Hansen test p -value	0.364	0.537	0.354	0.480	0.292	0.262	0.195	0.860	0.202	0.818	0.155	0.686
AR(2) test p -value	0.956	0.579	0.959	0.606	0.801	0.623	0.924	0.610	0.921	0.638	0.705	0.689

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations.

Note: All columns report displays two step system GMM results with the Windmeijer small sample correction and including time effects. Sample is an unbalanced panel of EMDEs and LICs countries spanning from 2005-2023. Regressions use robust standard errors and treat all regressors except dummies as predetermined but not strictly exogenous variables. Instrument matrix considers up to three lags and is collapsed by the estimation. The row for the Hansen J-test reports the p-values for the null hypothesis of instrument validity. The values reported for AR(2) are the p-values for second order autocorrelated disturbances in the first differences equations. Lagged dependent, constant term, sovereign crisis dummy, inflation, real GDP growth, interest rates are included in all models but not reported.

VI. Simulating the Impact of Debt Restructuring

Concept and Additional Data

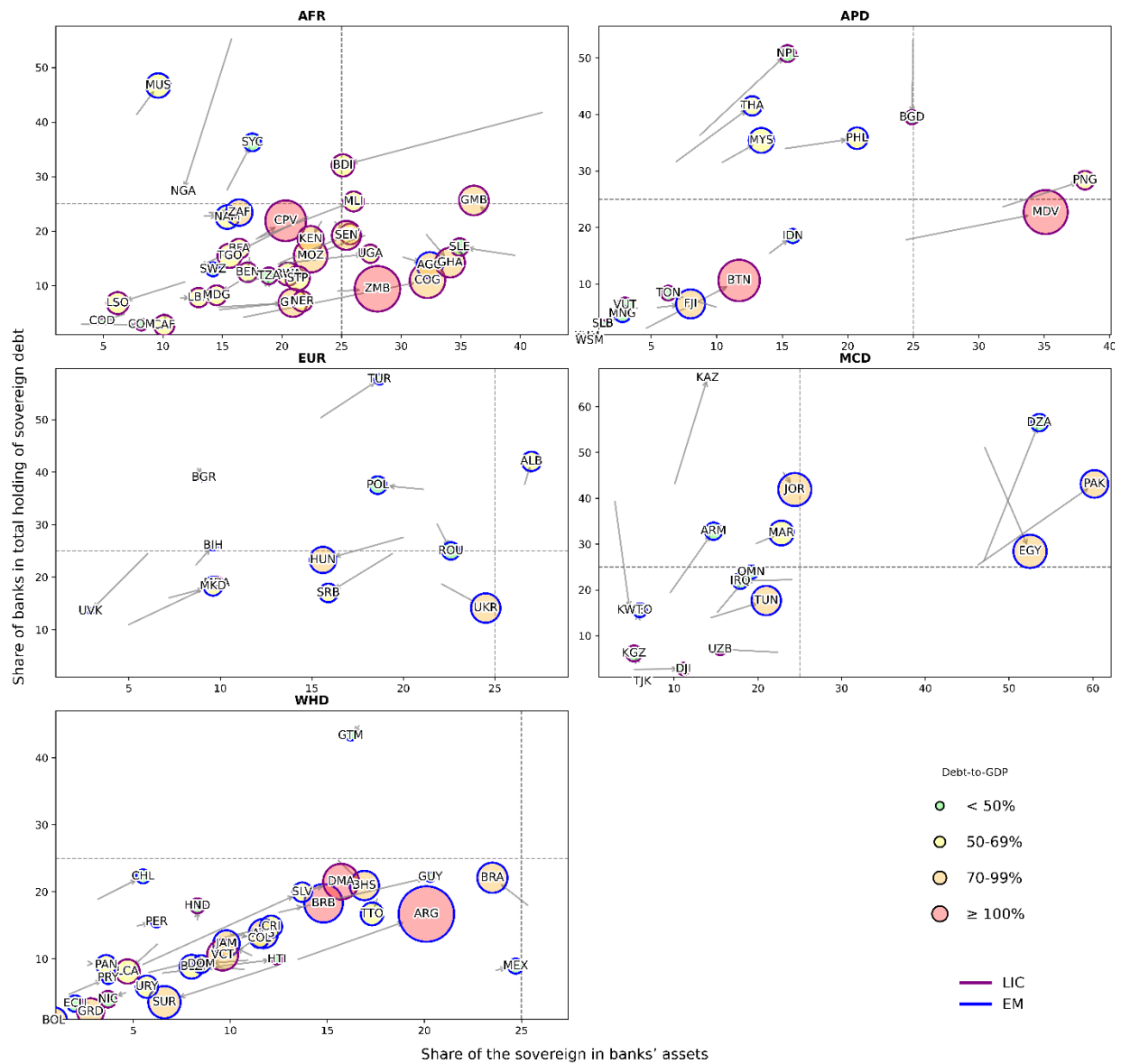
Having ascertained an array of factors associated with the sovereign-bank nexus, we now turn to its consequences for financial stability, notably how bank capitalization would be affected if there were a need to address sovereign over-indebtedness by domestic debt restructuring (DDR).

As Figure 6 illustrates, in several regions, there is a confluence of a strong sovereign-bank nexus (shown on the x-axis), a high share of domestic banks in holdings of sovereign debt (y-axis), and an elevated debt-to-GDP ratio (indicated by the size of the bubble). Where there are cases of a “dual shock” in every region, Sub-Saharan African countries stand out for the incidence of high-debt cases (around 100 percent of GDP) in conjunction with a strong, perhaps excessive, nexus. Such debt levels are otherwise only found in the WHD region, although there the share of banks in sovereign debt holdings generally does not exceed 25 percent (with one exception). In the APD and MCD regions, there are also some remarkable country cases even if public debt ratios are generally only moderately high (again, with a few exceptions of debt ratios close to 100 percent of GDP).

Figure 6 also shows the evolution between 2019 and 2023, where arrows originate from the 2019 values. With the exception of Europe and several countries in other regions, the nexus has strengthened, in some cases considerably. This trend has been accompanied by an increase in the share of sovereign debt held by banks.

Figure 6. The Sovereign-Bank Nexus and Banks' Share in Total Sovereign Debt in EMs and LICs

(percent, with debt-to-GDP ratio as bubble, 2019–23)



Source: IMF *World Economic Outlook*; Arslanalp and Tsuda (2014, updated, and authors' calculations).

Note: See Annex I for the list of countries.

Several countries that had featured excessive indebtedness and, in some cases, a strong nexus, chose to undergo DDR, as financing options were reduced after external investors had exited and became unwilling to exchange longer-term instruments for short-term debt (T-bills), leading to an unsustainable bunching of rollover needs. Typically, when embarking on a DDR, the ability of the banking sector to withstand the impact of the DDR is an important consideration, as the health of the sector will be key to the eventual speed and strength of economic recovery. In general, DDRs have been executed such that capital adequacy ratios remained above the minimum requirement, although regulatory forbearance occasionally came into play (Togo et al. 2025).

Using sensitivity analysis, we simulate the impact on banks' regulatory capital brought about by the restructuring of their domestic sovereign debt holdings.²⁰ In a first set of simulations, only the debt held by domestic banks is restructured, whereas in a second set, all creditors except official creditors²¹ are assumed to participate in the restructuring. The exercise links the exposures of the new sovereign-bank nexus database to key FSIs.

The dataset for this sensitivity analysis consists of (i) the ratio of a banking sector's holdings to domestic sovereign securities in both domestic and foreign currency; (ii) total banking sector assets, which are needed to obtain the amounts of banks' sovereign exposure in their balance sheets; and (iii) the banking sector's capital adequacy ratio (CAR), obtained from supervisory authorities or calculated using balance sheet and other information from financial stability reports, annual reports, or the IMF's FSI database and IMF staff reports. The exposure data were obtained from the nexus database.

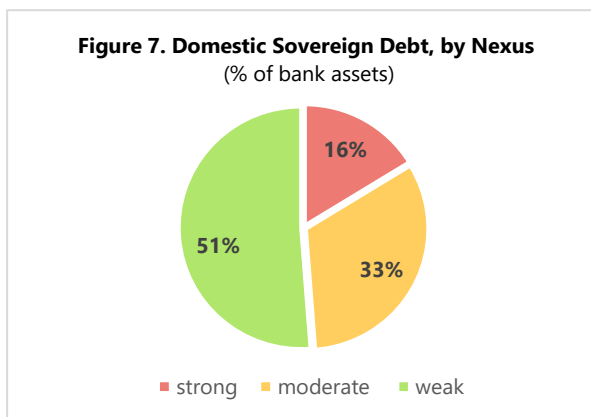
The sample comprises 123 emerging markets and developing economies, with bank exposure and balance sheet data primarily as of end-2023 or, in a few cases, earlier dates (but not older than 2022). A total of 22 countries were excluded due to zero sovereign exposure or otherwise incomplete/outdated records. A regional breakdown of the sample by strength of the nexus is provided in Annex III.

We categorize countries based on the strength of their sovereign-bank nexus: strong—sovereign domestic debt exceeding 20 percent of bank assets, aligned with the classification of World Bank (2024); moderate (10–20 percent), and weak (less than 10 percent). Figure 7 shows the distribution. About half of banking systems have a weak exposure to their sovereign, while one-sixth have strong exposure (above 20 percent, reaching 30 percent in some cases, with a maximum of 52 percent).

²⁰ As the focus of our analysis is on the domestic sovereign-bank nexus, we do not include in the restructuring simulations any debt issued by foreign jurisdictions nor holdings of domestic debt by domestic nonbanking financial institutions or nonresidents.

²¹ Bilateral official creditors are often included in DDR unless their claims are small. However, as we do not know the share of these creditors in overall official creditors, we assume that multilateral official creditors dominate, particularly in developing economies, so that all official claims are excluded.

Given limited information on DDR and the uncertainty surrounding the extent of restructuring in overindebted countries, we apply a sensitivity analysis to assess the impact of DDR on bank capitalization. Specifically, it is assumed that 10, 25, and 50 percent of the domestic debt is written off²² (moderate, severe, and extreme scenarios, respectively). The upper and lower bounds correspond roughly to the range of writedowns as specified in Erce et al. (2024) and Togo et al. (2025). Specifically, Erce et al. (2024) find that in 32 DDR events during 1980–2018, the average NPV loss to investors was 40 percent. Togo et al. (2025) note range of haircuts in NPV terms of 20 to 73 percent, though they highlight that the upper bounds often apply to official creditors or central banks, with commercial bank losses typically falling in the lower range (e.g., 50 percent for Grenada and 28 percent for Barbados). We choose a writedown rate of 25 percent in the severe scenario.



Source: Authors' Calculations.

As it is reasonable to assume that these sovereign exposures have a regulatory risk weight of zero, as is typically the case (and assuming that no provisions have been made), the restructured amount can be directly subtracted from regulatory capital²³ and the CAR re-calculated. Incidentally, the zero risk-weighting provides significant capital relief to strong-nexus banking systems.²⁴

We then compare the pre- and post-restructuring CARs to determine how many banking systems fall below a critical threshold. Recognizing that minimum CARs vary between countries, we assume a critical value of 10 percent of risk-weighted assets (RWA). While this may exceed the minimum required in some jurisdictions, dropping below this level would likely trigger corrective supervisory action. As the results are measured at the sector level, this could mean that only some large institutions become undercapitalized while others remain adequately capitalized.

²² According to World Bank (2024), direct face value reductions are rare; instead, maturity lengthening is used to achieve a reduction in net present value (NPV). The concrete form of restructuring is not of importance in our simulation; we assume that it leads to a value correction or writedown of the carrying value. Also, rates of participation of certain instruments differ across countries (as low as 45 percent of domestic debt in two restructuring cases due to the exclusion of certain instruments, like T-bills; Togo et al. (2025)); note that for our exercise, the issue of the participation rate does not matter, effectively because we assume a final writedown (e.g., if only half of the debt were included, 20 percent of restructurable debt would have to be included to achieve a 10 percent haircut).

²³ We do not incorporate any tax shields arising from the restructuring operation. If the writedown gives rise to tax credits, these may mitigate the impact on capital over the medium term. In that sense, our results represent a simulated worst-case outcome.

²⁴ While at first glance it appears that these systems are on average better capitalized than those with a weak to moderate nexus (24.6 percent vs. 20.2 percent of RWA), this is primarily due to such capital relief. When hypothetically assuming that all sovereign debt holdings above the median debt-to-assets ratio (9.7 percent) are invested in risk assets (at the RWA density—RWA to total assets—of the other risk assets), RWAs increase and the average CAR thereby drops to 19 percent—a percentage point lower than the comparator group's CAR.

Impact of Domestic Debt Restructuring Involving Domestic Bank Creditors Only

The results (Table 5) indicate that even with a 10 percent writedown, the overall CAR drops by 2.3 percentage points (6.7 for the strong-nexus group), causing a significant share of banking systems to drop below the critical CAR mark due to a large sovereign exposure and/or low initial capitalization. Overall, eight out of 123 banking systems become undercapitalized (6.5 percent, with one being insolvent due to negative initial capital). Half of these noncompliant systems feature a strong nexus (20 percent of countries). This result compares broadly with the findings of World Bank (2024) on the average loss and that for strong-nexus countries (10 and 19 percent of banks, respectively, becoming undercapitalized, albeit at a NPV loss of only 5 percent).

When increasing the writedown rate to 25 percent in the severe scenario, the impact on capital adequacy increases considerably (Table 6). Banking systems with a strong nexus are particularly vulnerable, with an average CAR decline of 16 percentage points, and one-sixth becoming insolvent. Even those with a moderate nexus are slightly more likely to experience undercapitalization. Banking systems with a weak nexus experience relatively little stress, despite lower initial CARs compared to strong-nexus banking systems (whose CARs are inflated by the pervasive zero risk-weighting of sovereign exposures).

The outcome deteriorates further in the extreme case of a 50 percent writedown. Almost half of banking systems become undercapitalized, and one-third of them even insolvent. Compared to the previous scenario, the largest change occurs among those with a moderate nexus, with the share of undercapitalized systems increasing by almost 45 percentage points, reaching 80 percent, and the insolvency share reaching 15 percent. Two-thirds of strong-nexus banking systems become insolvent. Changes are less pronounced for banking systems that have a low exposure to their sovereign, although the share of undercapitalization nearly doubles. Importantly, the post-restructuring CAR falls below the critical value, to 8.5 percent, driven by moderate- and strong-nexus banking systems (Table 7).

Table 5. Capital Impact of a 10 Percent DDR, Domestic Bank Creditors Only

Strength of nexus	# of systems CAR \geq 10%	# of systems CAR < 10%	o/w # systems CAR <0 %	Total	Pct. undercapitalized/ insolvent	Starting/ ending CAR
Strong (\geq 20%)	16	4	0	20	20.0% / 0.0%	24.6% / 17.9%
Moderate ($10\% \leq x < 20\%$)	38	2	0	40	5.0% / 0.0%	19.5% / 17.1%
Weak (<10%)	61	2	1	63	3.0% / 1.6%	19.2% / 18.4%
Total	115	8	1	123	6.5% / 0.8%	20.2% / 17.9%

Source: Authors' calculations.

Table 6. Capital Impact of a 25 Percent DDR, Domestic Bank Creditors Only

Strength of nexus	# systems CAR \geq 10%	# systems CAR < 10%	o/w # systems CAR <0 %	Total	Pct. undercapitalized/ insolvent	Starting/ ending CAR
Strong (\geq 20%)	6	14	3	20	70.0% / 15.0%	24.6% / 8.6%
Moderate ($10\% \leq x < 20\%$)	27	13	1	40	35.0% / 2.5%	19.5% / 12.6%
Weak (<10%)	59	4	2	63	6.3% / 3.2%	19.2% / 17.1%
Total	92	31	6	123	25.2% / 4.9%	20.2% / 14.3%

Source: Authors' calculations.

Table 7. Capital Impact of a 50 Percent DDR, Domestic Bank Creditors Only

Strength of nexus	# of systems CAR \geq 10%	# of systems CAR < 10%	o/w # systems CAR <0 %	Total	Pct. undercapitalized/ insolvent	Starting/ ending CAR
Strong (\geq 20%)	3	17	13	20	85.0% / 65%	24.6% / -6.9%
Moderate ($10\% \leq x < 20\%$)	8	32	6	40	80.0% / 15.0%	19.5% / 5.8%
Weak (<10%)	54	9	2	63	14.3% / 3.2%	19.2% / 15.1%
Total	65	58	21	123	47.2% / 17.1%	20.2% / 8.5%

Source: Authors' calculations.

Impact of Domestic Debt Restructuring Involving All Nonofficial Creditors

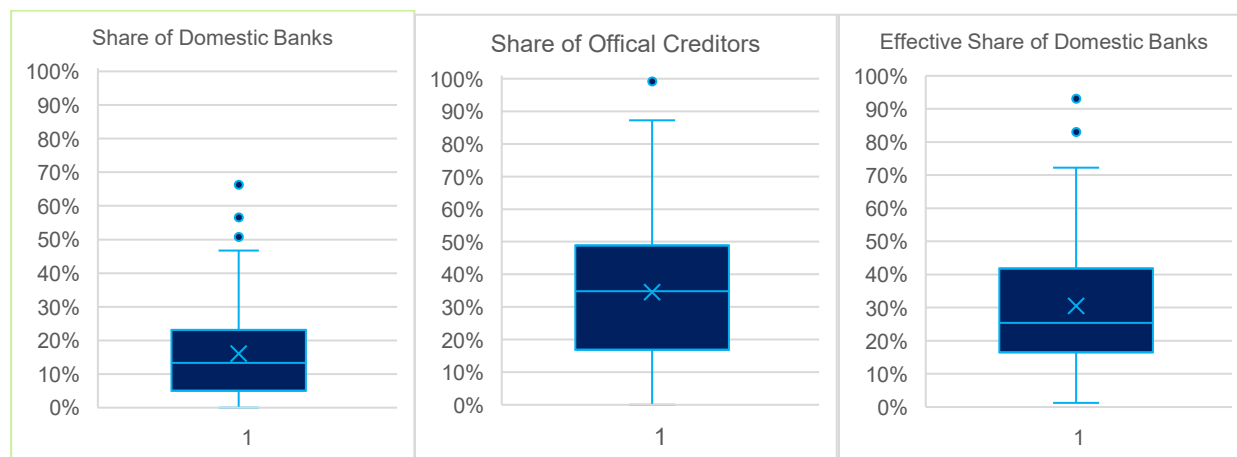
However, as discussed in Section IV, domestic banks are not the only holders of domestic sovereign debt. In many country cases, foreign banks and domestic nonbank financial institutions (NBFIs) also hold significant shares of a country's sovereign debt. In fact, in a DDR, most financial institutions, except official creditors, are typically included.

The second set of simulations therefore assumes a *pari passu* treatment of all other creditors except official creditors such as multilateral development institutions, whose claims are typically exempt from restructuring. A special case is the central bank of the sovereign under restructuring. Evidence suggests that in many cases it has been included in the restructuring (e.g., Ghana, Sri Lanka, some Caribbean countries), which leads us to include its claims in the assumed debt writedown.

To determine the effective share of the domestic bank system in the DDR, we obtain its share in total domestic sovereign debt from the database of Arslanalp and Tsuda (2014, updated) and correct it for

the share of official creditors that are exempt. Figure 8 illustrates that the average share of domestic banks is only around 15 percent (within the interquartile range of about 5 to 25 percent). Given that the share of official creditors ranges from 20 to 50 percent in most countries, with an average of about 35 percent, the effective share of domestic banks rises to 25 to 30 percent on average. Still, this reduces the burden placed on the banking system considerably, decreasing the drop in CARs and the number of systems becoming undercapitalized or even insolvent.

Figure 8. Computing the Effective Share of Domestic Banks in DDR



Source: Database by Arslanalp and Tsuda (2014, updated); authors' calculations.

The second set of simulations shows that all but three banking systems survive a 10 percent DDR (Table 8). Even in the strong-nexus group, the CAR drops by less than 3 percentage points (the average drop is 1 percentage point). The number of undercapitalized systems rises by two in the moderate DDR case of 25 percent debt reduction (Table 9), with a larger impact on systems having a moderate or strong nexus. Finally, in the extreme case of a 50 percent DDR (Table 10), one in six systems fails, with the CAR in the strong-nexus group halving to 12.5 percent (and dropping by close to 5 percentage points for the whole sample).

Table 8. Capital Impact of a 10 Percent DDR, All Nonofficial Creditors

Strength of nexus	# of systems CAR \geq 10%	# of systems CAR < 10%	o/w # systems CAR <0 %	Total	Pct. undercapitalized/ insolvent	Starting/ ending CAR
Strong (\geq 20%)	19	1	0	20	5.0% / 0.0%	24.6% / 21.8%
Moderate ($10\% \leq x < 20\%$)	34	1	0	35	2.9% / 0.0%	19.8% / 18.7%
Weak (<10%)	47	1	1	48	2.1% / 2.1%	19.4% / 19.2%
Total	100	3	1	103	2.9% / 1.0%	20.5% / 19.5%

Source: Authors' calculations.

Table 9. Capital Impact of a 25 Percent DDR, All Nonofficial Creditors

Strength of nexus	# of systems CAR \geq 10%	# of systems CAR < 10%	o/w # systems CAR <0 %	Total	Pct. undercapitalized/ insolvent	Starting/ ending CAR
Strong (\geq 20%)	18	2	1	20	10.0% / 5.0%	24.6% / 18.3%
Moderate ($10\% \leq x < 20\%$)	33	2	0	35	5.7% / 0.0%	19.8% / 17.1%
Weak (<10%)	47	1	1	48	2.1% / 2.1%	19.4% / 18.9%
Total	98	5	2	103	4.9% / 1.9%	20.5% / 18.3%

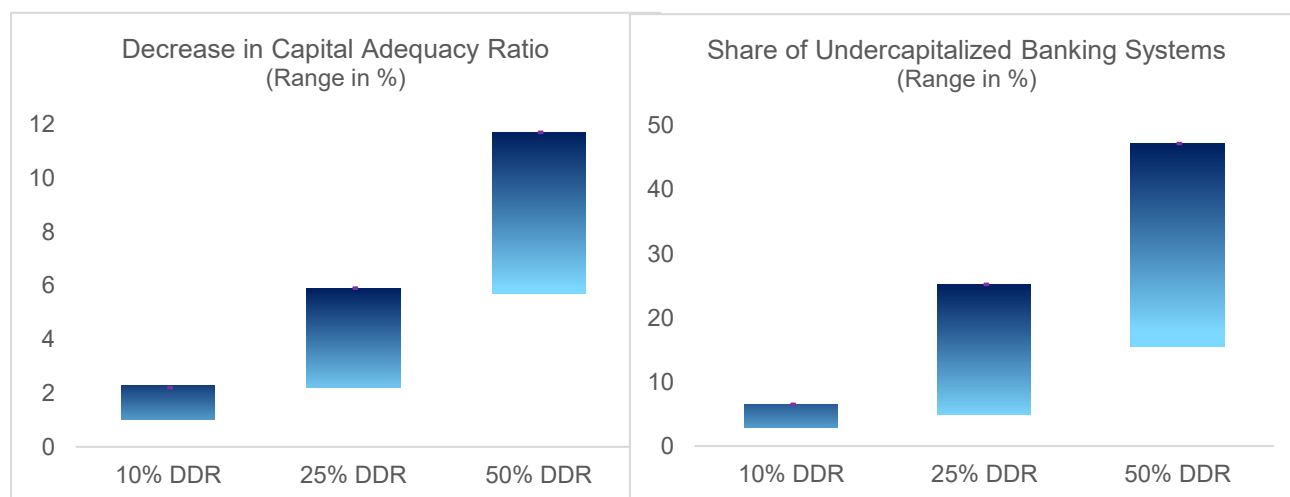
Source: Authors' calculations.

Table 10. Capital Impact of a 50 Percent DDR, All Nonofficial Creditors

Strength of nexus	# of systems CAR \geq 10%	# of systems CAR < 10%	o/w # systems CAR <0 %	Total	Pct. undercapitalized/ insolvent	Starting/ ending CAR
Strong (\geq 20%)	14	6	1	20	30.0% / 5.0%	24.6% / 12.5%
Moderate ($10\% \leq x < 20\%$)	27	8	0	35	22.9% / 0.0%	19.8% / 14.5%
Weak (<10%)	46	2	1	48	4.2% / 2.1%	19.4% / 18.3%
Total	87	16	2	103	15.5% / 1.9%	20.5% / 15.8%

Source: Authors' calculations.

While the impact in the extreme DDR case is still considerable, it is less severe than in the first set of simulations. In general, the fall in capitalization and share of systems failing the mark are less than half in the first case of only domestic banks shouldering the burden. Figure 9 summarizes the results of the two sets of simulations, showing the ranges of drops in capitalization and the share of undercapitalized banking systems. While a light-touch DDR of 10 percent causes an average drop in CAR between 1 percentage point (for DDRs that include other creditors) and 2.3 percentage points (DDR for domestic banks only), this range shifts up, to about 6-12 percent, respectively, for a DDR of 50 percent (with the range of the intermediate DDR of 25 percent being 2-6 percent). These capital reductions lead to projections of shares of undercapitalized banking systems that range from 2.9-6.5 percent (10 percent DDR) to 16-47 percent (50 percent DDR). As mentioned, in practice the actual capital reductions and incidences of undercapitalization will likely fall between these extremes and depend on the participation of other foreign and domestic creditors, including the central bank.

Figure 9. Ranges of DDR Impact on CAR and Share of Undercapitalized Banking Systems

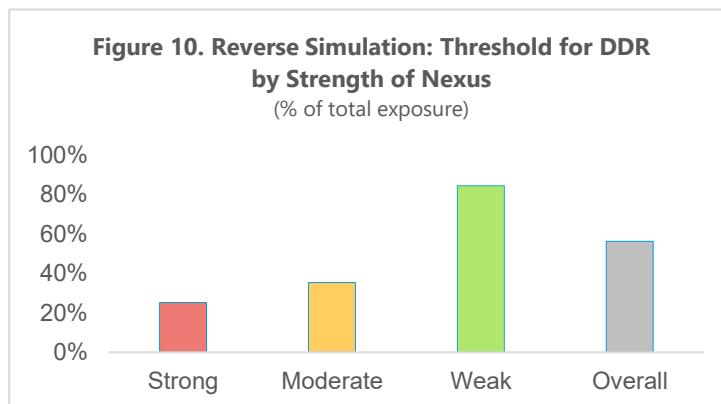
Source: Authors' calculations.

In practice, banks must meet both the minimum CAR and the leverage ratio requirement (where required in addition). As mentioned, zero risk-weighting may provide capital relief to strong-nexus systems such that a seemingly comfortable regulatory capital position becomes tight when considering the leverage ratio, which relates Tier 1 capital to total assets. We therefore rerun the two scenarios with the NPV losses directly deducted from Tier 1 capital (imputed from information on banking systems' leverage ratios) and also correcting total assets. Against the usual leverage ratio requirement of a minimum 3 percent of total assets, we find only a single case (scenario 2, with a 50 percent DDR) of a system under severe stress failing the leverage ratio requirement that does not already fail the CAR hurdle rate. However, there are several cases where indeed the distance to the leverage threshold is much smaller than that to the CAR hurdle rate such that these systems remain at risk of noncompliance where a leverage ratio requirement exists.

Reverse Simulation

Lastly, instead of assuming a certain writedown, we establish the maximum feasible debt reduction in an exercise akin to a reverse stress test. Given the extent of banks' sovereign exposures and their initial CAR, we calculate the maximum writedown a system can sustain without its CAR dropping below the hurdle rate on average (DDR for domestic bank creditors only).

Unsurprisingly, banking systems with a low nexus could sustain a large writedown of 84 percent of the sovereign debt exposure. This threshold is much lower for moderate- and strong-nexus banking systems, at 35 percent and 25 percent, respectively. On average, EMDEs' banking systems could sustain a 56 percent writedown (Figure 10).



Source: Authors' calculations.

Takeaways and Caveats

Our simulations confirm the implications of the sovereign-bank nexus for financial stability. Countries with a strong sovereign-bank nexus are likely to experience financial sector distress even with relatively moderate debt restructuring. This highlights that the high CARs of these banking systems may convey a false sense of security. As mentioned, given their vulnerability to changes in the value of sovereign debt portfolios, banks in these countries should hold relatively more capital than banks with lower sovereign exposures.

Beyond the concern about capitalization, the need for DDR may have secondary effects even for banking systems that remain adequately capitalized. As Togo et al. (2025) show, the drop in CAR, which in some countries reached 5 percentage points, also affected private sector credit that ended up 5-10 percent of GDP lower than pre-DDR. In some cases (Ghana, Jamaica, Sri Lanka), this was also because private banks chose not to accept the infusion of public money for fear of nationalization, delaying the process of banking sector recapitalization. Also, interest rates continued to be elevated as central banks took action to rein in inflation that had been caused by monetary financing.

Several caveats regarding the methodology are in order. First, the simulation is essentially a static full pass-through exercise to bank capital ratios, holding other key balance-sheet items and macrofinancial conditions constant. This narrow scope means the exercise should be interpreted as an accounting sensitivity rather than a "DDR impact" analysis. While it may overstate the potential direct effect on banks by assuming immediate recognition of losses, it abstracts from critical negative spillovers—such as loan-portfolio losses, higher funding costs, or collateral downgrades—that shape the systemic impact of sovereign restructuring. Nonetheless, it provides useful first-order insights into how sovereign risk can affect financial institutions.

Second, regarding the perimeter of the analysis involving nonofficial creditors, we abstract from foreign holders. While some nonresident holders of domestic debt are consequently missed from the

analysis (based on Arslanalp and Tsuda (2014), updated data), most external nonofficial creditors typically hold external bonds and loans, which would not be part of the DDR.

Third, accounting treatment matters. Some of the recent restructuring cases were carried out by way of maturity extension at the original coupon rate with little or no NPV loss from an accounting perspective, as regulators allowed the banks to book the new bond at par without taking much of a loss to their equity. As noted by Togo et al. (2025), historical examples illustrate how DDR impacts vary significantly under different accounting regimes (e.g., Held-to-Maturity vs. Available-for-Sale), similar to how banks manage interest rate risk. In general, the NPV loss is hard to pin down in DDRs given the volatility of interest rates during a debt crisis. Also, banks were shielded in some sense by the high coupon rates, often in double digits, that some government bonds offer, providing extra wide interest spreads.

Fourth, the treatment has tended to differ across creditors, with pension funds and even central banks taking higher haircuts, whereas we assume a uniform haircut, at least within a creditor group. These insights from recent DDRs show that a wide range of assumed NPV losses is appropriate (we did not opt for a loss smaller than 10 percent, because of the very limited impact in the sensitivity analysis).

Finally, extending this exercise to the bank level, where the required data are available, would provide additional insights by quantifying how alternative DDR designs—entailing different valuation haircuts or writedowns—affect individual institutions' capital buffers.

VII. Conclusions

Using a novel granular dataset measuring banks' exposures to the public sector, we show that the sovereign-bank nexus in EMDEs has strengthened in recent years, particularly in Sub-Saharan Africa and the Middle East and Central Asia region. However, in all regions, there are countries experiencing a challenging confluence of a high share of sovereign debt in bank assets, a strong participation of banks in holding government debt, and an elevated public-debt-to-GDP ratio. While domestic investors have consistently held most of the EM sovereign debt, in LICs, foreign official creditors dominate, holding over half of LIC sovereign debt.

The analysis exploring determinants of the sovereign-bank nexus finds that public-debt-to-GDP, deposit rates, and the NPL ratio are the most consistent and significant factors associated with banks' sovereign exposure. System GMM estimates reinforce the importance of public debt, while the significance of other variables weakens under this approach. Robustness checks—including specifications that control for central bank refinancing operations—not only confirm the baseline results but also highlight the added importance of fiscal stress as a contributing factor. Subsample analysis reveals some heterogeneity: in emerging markets, deposit rates and NPLs are key factors, while in low-income countries, public debt and inflation stand out as the main correlates.

When we consider additional drivers, weaker external market access—captured by higher spreads—is associated with stronger bank holdings of domestic sovereign debt. By contrast, tighter global financial conditions—measured by higher U.S. long-term yields—are consistently linked to a weaker sovereign-bank nexus, suggesting that reduced global liquidity constrains banks' capacity to absorb public debt. Finally, although there is no systemwide evidence of financial repression, the results suggest that in countries with a strong presence of state-owned banks, higher refinancing needs tend to significantly increase banks' holdings of domestic sovereign debt.

A sensitivity analysis combining a simulation of different degrees of domestic debt restructuring to remedy an excessive nexus with banking systems' capital adequacy ratios illustrates that even under modest restructuring (a writedown of 10 percent of domestic government debt, held by banks, or alternatively, all nonofficial creditors), about 5 percent of banking systems become undercapitalized, with the incidence rising to between 20 and almost 50 percent in the case of a sweeping restructuring (50 percent of domestic government debt). The impact is found to be very large for countries with a strong sovereign nexus (as high as 85 percent of systems missing the mark in the extreme restructuring cases) and particularly pronounced for systems with low starting capital buffers. In addition, reverse simulations confirm that higher bank exposure to sovereign debt materially weakens the banking system's ability to absorb public debt value corrections. By quantifying how alternative DDR designs—entailing valuation haircuts or writedowns—affect capital buffers, the analysis provides policymakers with a clear gauge of the financial stability tradeoffs embedded in different restructuring scenarios.

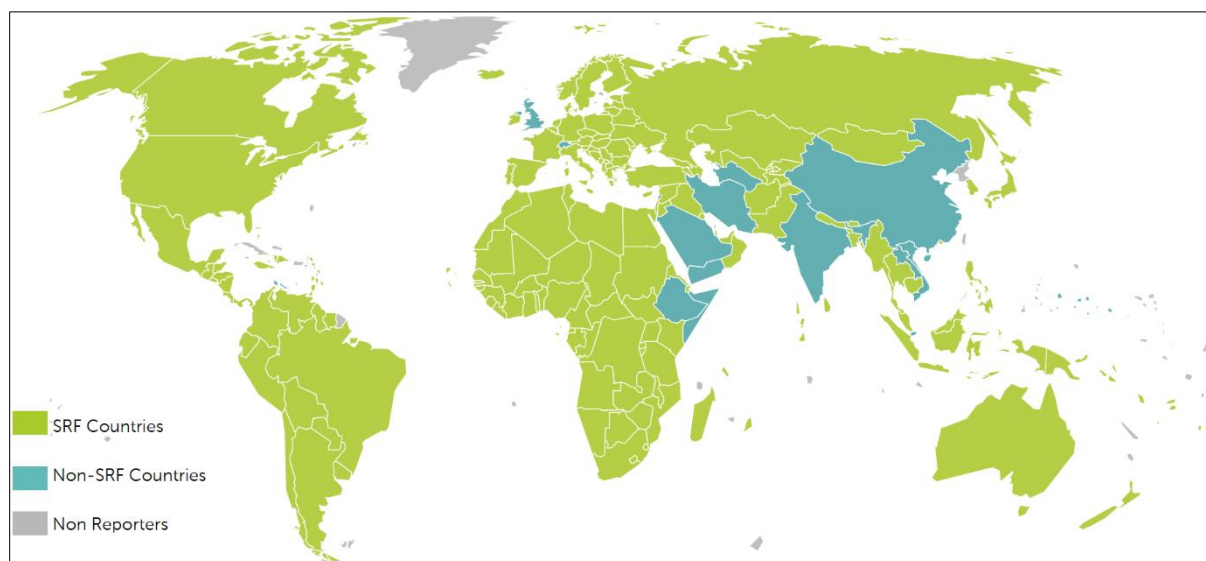
In sum, our paper offers deeper insights into why the sovereign-bank nexus is high and strengthening in EMDEs, testing several hypotheses put forth in the literature, and what financial stability risks the nexus entails if the sovereign financing situation turns unsustainable, requiring debt restructuring with distinct balance sheet effects for banks. Since our study is, for reasons of data availability, conducted at the country and banking-sector levels, further research could analyze drivers and impacts at the entity level in country studies where the required data are provided. This would provide a more differentiated view of bank vulnerabilities, such as the share of banks in a given system becoming undercapitalized, which would indicate specific financial stability risks where on average a system would appear resilient.

A natural avenue for future research is to investigate more explicitly how country-specific structural and institutional features shape the strength of the sovereign-bank nexus and its sensitivity to macrofinancial drivers. In particular, institutional quality, progress in financial sector reforms, and the degree of financial dollarization may all condition the coefficients we estimate here and help explain cross-country heterogeneity that we do not model, given the already wide scope of this paper. Future work could also test for nonlinearities in the determinants of the nexus: for example, whether very high public debt levels (upper quantiles) are associated with disproportionately stronger bank exposures to the sovereign.

Annex I. Data Coverage in Nexus Database

The nexus ratios are built from the IMF Monetary and Financial Statistics (MFS) database, which contains aggregated surveys submitted by countries, and provides a consistent framework for macroeconomic analysis. The standardized report forms (SRFs) present the sectoral balance sheets of the central bank; other depository corporations (ODCs) (mostly banks, in the majority of countries, and therefore the focus of this paper); and other financial corporations (OFCs), in a balance-sheet-like structure according to the instrument, the currency of denomination, and the counterpart sector, including government units. The derived dataset has offered monthly observations for about 150 countries since 2005 (Figure A1.1).

Figure A1.1. MFS Database: Country Coverage with Standardized Report Forms



Source: IMF MFS database.

The new database enables a comprehensive assessment of banking-sector exposure to the public sector (Figures A1.2 and A1.3). The approach goes beyond measuring banks' holdings of central-government debt. Specifically, banks' exposures to the public sector, measured as a share of their total assets, are disaggregated along several dimensions:

- **Public sector entity:** The database allows for differentiation of claims on the central government, state and local governments, and state-owned enterprises (SOEs). It also encompasses banks' exposures to the central bank,²⁵ excluding banks' deposits.

²⁵ Monitoring banks' excessive exposures to the central bank—particularly in foreign exchange (FX)—is essential for identifying cases of indirect sovereign financing.

- **Financial instrument:** Exposures are distinguished by the type of financial instrument, primarily loans and debt securities.
- **Currency:** The database differentiates claims by currency of denomination, distinguishing between those in the national currency and those in foreign currencies.

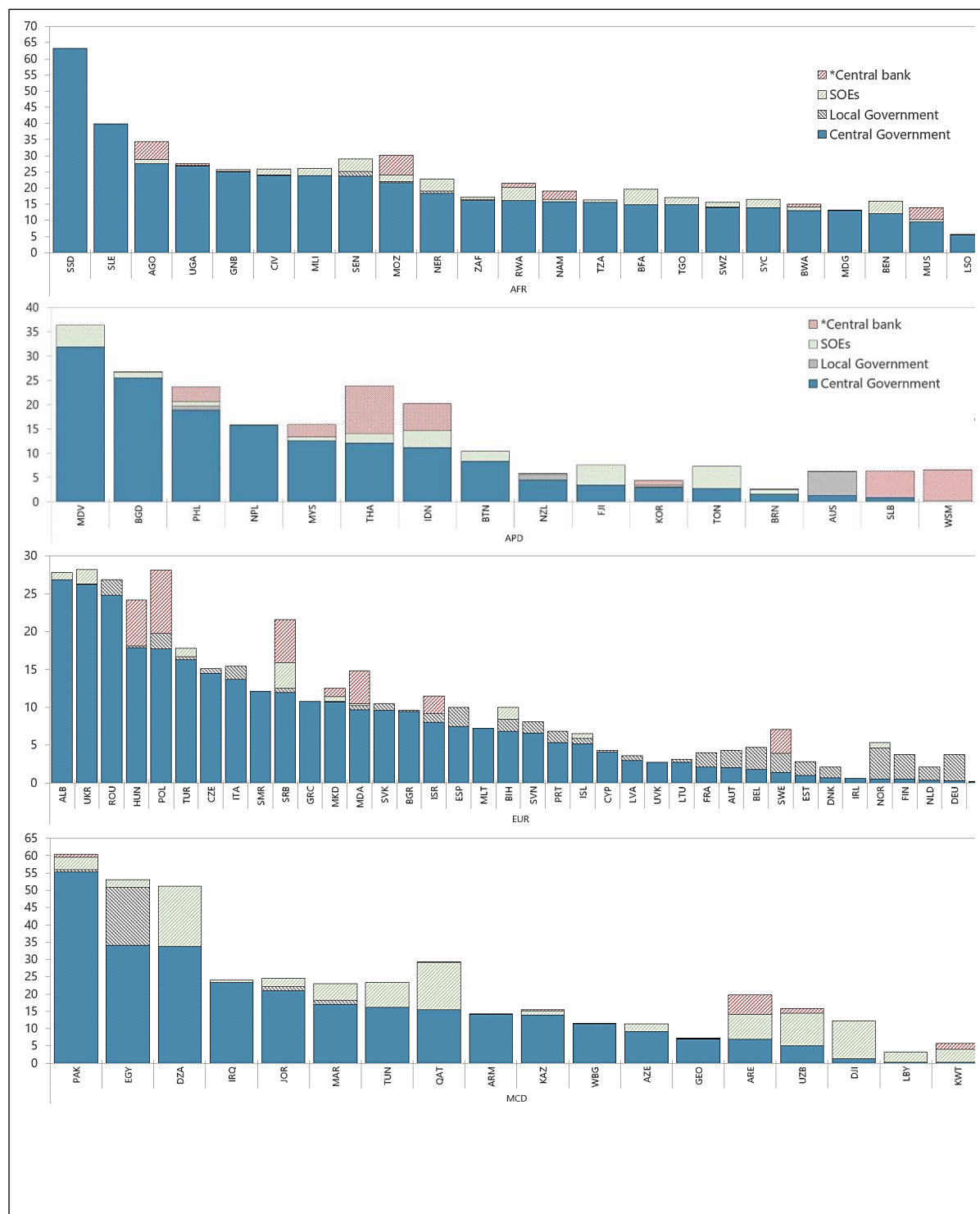
Nexus ratios were calculated for each configuration of public sector entity, financial instrument, and currency. Such granularity supports richer analysis of nexus dynamics. The public–sector–bank nexus ratio is calculated as follows:

$$\text{Nexus Ratio} = \frac{\sum \text{loans to the "public sector"} + \sum \text{holdings of securities issued by the "public sector"}}{\text{Total banks' assets}}$$

In the formula, “public sector” refers to the public sector entity’s perimeter, including the central government, state and local governments, or SOEs in domestic and foreign currencies. A comprehensive coverage of the nexus includes all these entities, excluding the central bank, and is referred to as the nonfinancial public sector (NFPS).

Four caveats merit mention. First, the nexus database leverages the MFS database, which provides data at an aggregated, country-wide level for the banking sector. This aggregation may mask considerable heterogeneity in exposures across individual banking institutions within a country. Second, the database inherits any data-quality limitations of the underlying MFS submissions. Third, it covers only banks’ exposures to the domestic public sector. Hence, total sovereign exposure may be higher when domestic banks also hold sizable claims on foreign governments. Fourth, it should also be considered that public sector deposits with banks reduce net sovereign exposure.

Figure A1.2. Sovereign-Bank Nexus: Breakdown by Entity Across Regions and Countries, End-2024 (percent of bank assets)





The diversity of the sovereign-bank nexus across countries is further evident when examining its composition in the top 10 countries with the highest NFPS-bank nexus based on available MFS data. A panel chart comparing data between the pre-pandemic period and end-2024 reveals significant variations across several dimensions (Figure A1.3). First, by public sector entity, while claims on the central government are typically the dominant component, some countries present a different structure; for instance, Algeria shows a high share of banking-sector exposure to SOEs, and in Egypt, exposure to local government is notable, underscoring the importance of a comprehensive measure of the public sector nexus beyond solely central government debt. Second, by financial instrument, debt securities generally constitute the largest share of banks' public sector claims; however, loans remain a significant instrument in specific cases, such as in South Sudan and Algeria. Third, the composition by currency indicates that while exposures are predominantly in domestic currency, the share of foreign exchange (FX) claims is substantial in several countries, including South Sudan, Egypt, Qatar, and Maldives; this characteristic could warrant additional attention, given the potential for FX liquidity to become scarce during economic or financial crises. Finally, a proxy for the crowding-out effect, measured by the ratio of claims on the public sector to claims on the private sector, is particularly pronounced in countries like Sierra Leone, Egypt, and Pakistan, suggesting that a considerable portion of bank credit is directed toward the public sector relative to private enterprise in these economies. Each of these aspects is illustrated with comparative data from end-2019 and end-2024, highlighting the strengthening of the nexus and the evolution of its composition.

Figure A1.3. Dynamics of the Nexus in High-Exposure Countries in MFS: Compositional Shifts Since the Pandemic, 2019 vs. 2024 (percent of bank assets)

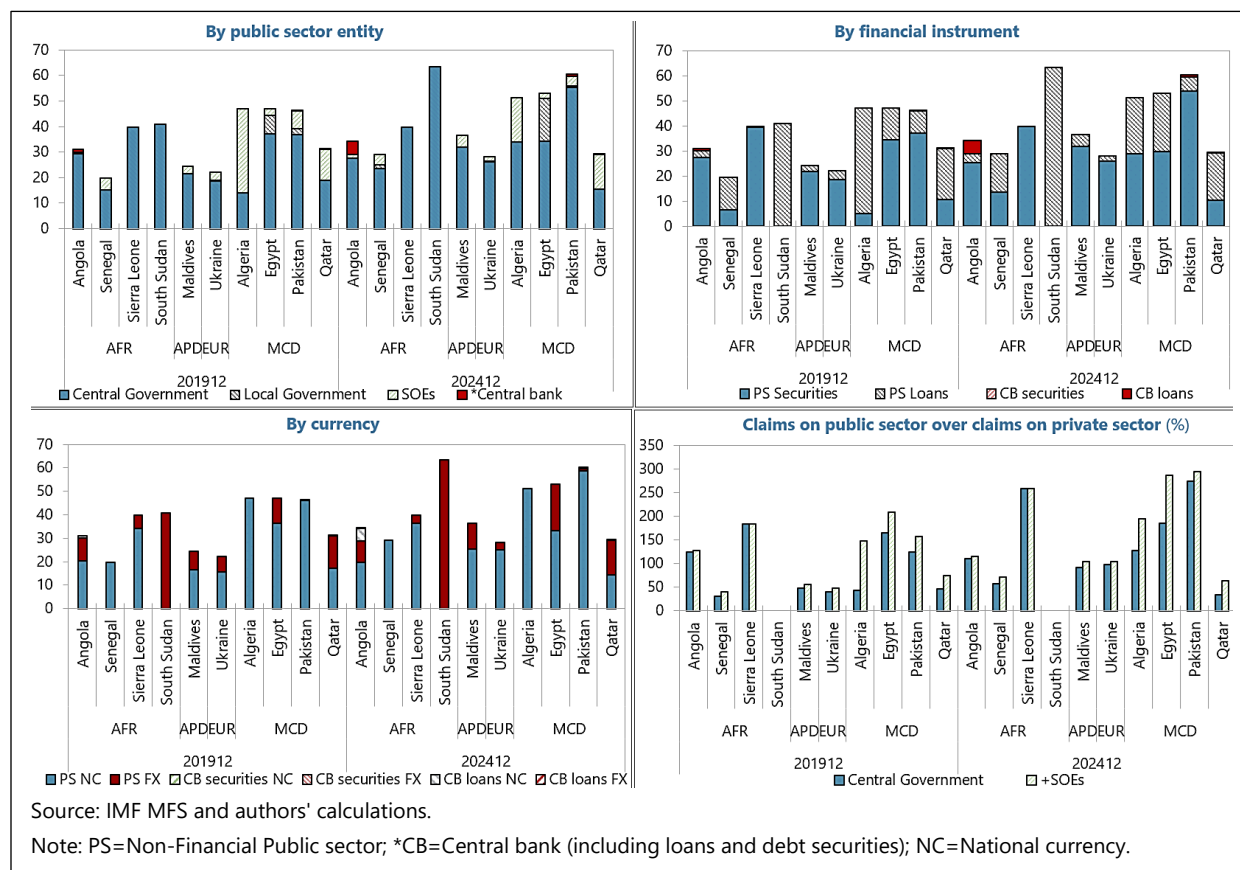


Table A1.1. Countries with Data in Both the IMF MFS Database and Arslanalp and Tsuda (2014, updated)

	Emerging Markets	Low-Income Countries
AFR	Angola (AGO), Botswana (BWA), Eswatini (SWZ), Mauritius (MUS), Namibia (NAM), Nigeria (NGA), Seychelles (SYC), South Africa (ZAF)	Benin (BEN), Burkina Faso (BFA), Burundi (BDI), Cabo Verde (CPV), Central African Republic (CAF), Côte d'Ivoire (CIV), Democratic Republic of the Congo (COD), Ghana (GHA), Guinea Bissau (GNB), Kenya (KEN), Lesotho (LSO), Liberia (LBR), Madagascar (MDG), Mali (MLI), Mozambique (MOZ), Niger (NER), Republic of Congo (COG), Rwanda (RWA), São Tomé and Príncipe (STP), Senegal (SEN), Sierra Leone (SLE), Tanzania (TZA), The Gambia (GMB), Togo (TGO), Uganda (UGA), Zambia (ZMB)
APD	Fiji (FJI), Indonesia (IDN), Malaysia (MYS), Mongolia (MNG), Philippines (PHL), Thailand (THA), Brunei Darussalam (BRN)	Bangladesh (BGD), Bhutan (BTN), Cambodia (KHM), Maldives (MDV), Nepal (NPL), Papua New Guinea (PNG), Samoa (WSM), Solomon Islands (SLB), Timor-Leste (TLS), Tonga (TON), Vanuatu (VUT)
EUR	Albania (ALB), Bosnia and Herzegovina (BIH), Bulgaria (BGR), Hungary (HUN), Kosovo (UVK), North Macedonia (MKD), Poland (POL), Romania (ROU), Serbia (SRB), Türkiye (TUR), Ukraine (UKR)	Moldova (MDA)
MCD	Algeria (DZA), Armenia (ARM), Azerbaijan (AZE), Egypt (EGY), Georgia (GEO), Iraq (IRQ), Jordan (JOR), Kazakhstan (KAZ), Kuwait (KWT), Morocco (MAR), Oman (OMN), Pakistan (PAK), Qatar (QAT), Tunisia (TUN), United Arab Emirates (ARE), Libya (LBY), West Bank and Gaza (WBG)	Djibouti (DJI), Kyrgyz Republic (KGZ), Sudan (SDN), Tajikistan (TJK), Uzbekistan (UZB)
WHD	Antigua and Barbuda (ATG), Argentina (ARG), Bahamas (BHS), Barbados (BRB), Belize (BLZ), Brazil (BRA), Chile (CHL), Colombia (COL), Costa Rica (CRI), Dominican Republic (DOM), Ecuador (ECU), El Salvador (SLV), Guatemala (GTM), Guyana (GUY), Jamaica (JAM), Mexico (MEX), Panama (PAN), Paraguay (PRY), Peru (PER), Suriname (SUR), Trinidad and Tobago (TTO), Uruguay (URY), St. Kitts and Nevis (KNA)	Dominica (DMA), Grenada (GRD), Haiti (HTI), Honduras (HND), Nicaragua (NIC), St. Lucia (LCA), St. Vincent and the Grenadines (VCT)

Note: Names in bold are in both datasets; names not in bold are in MFS only.

Annex II. Data and Results of Empirical Section

Table A2.1. Sample

Emerging Markets (70 countries)	Low-Income Countries (57 countries)
Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Barbados, Belarus, Belize, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Eswatini, Fiji, Gabon, Georgia, Guatemala, Guyana, Hungary, Indonesia, Iraq, Jamaica, Jordan, Kazakhstan, Kosovo, Kuwait, Libya, Malaysia, Mauritius, Mexico, Mongolia, Morocco, Namibia, Nigeria, North Macedonia, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Serbia, Seychelles, South Africa, Sri Lanka, St. Kitts and Nevis, Suriname, Syria, Thailand, The Bahamas, Trinidad and Tobago, Tunisia, Türkiye, Ukraine, United Arab Emirates, Uruguay	Afghanistan, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Dominica, Eritrea, Ghana, Grenada, Guinea-Bissau, Haiti, Honduras, Kenya, Kyrgyz Republic, Lesotho, Liberia, Madagascar, Maldives, Mali, Mauritania, Moldova, Mozambique, Myanmar, Nepal, Nicaragua, Niger, Papua New Guinea, Republic of Congo, Rwanda, Samoa, São Tomé and Príncipe, Senegal, Sierra Leone, Solomon Islands, St. Lucia, St. Vincent and the Grenadines, Sudan, Tajikistan, Tanzania, The Gambia, Togo, Tonga, Uganda, Uzbekistan, Vanuatu, Zambia, Zimbabwe

Table A2.2. Variable Definition and Sources

Variable	Definition	Sources
Central Government-Bank Nexus, domestic and foreign currency	Direct Exposure to the Central Government, loans and securities, domestic and foreign currency (% Assets)	IMF's Monetary and Financial Statistics (MFS), Financial Soundness Indicators database (FSI) and authors calculations
General Government-Bank Nexus, domestic and foreign currency	Direct Exposure to the General Government, loans and securities, domestic and foreign currency (% Assets)	
Total Government-Bank Nexus, domestic and foreign currency	Direct Exposure to the General Government and State-Owned Enterprises, loans and securities, domestic and foreign currency (% Assets)	
Central Government-Bank Nexus, domestic currency	Direct Exposure to the Central Government, loans and securities, domestic currency (% Assets)	
General Government-Bank Nexus, domestic currency	Direct Exposure to the General Government, loans and securities, domestic currency (% Assets)	
Total Government-Bank Nexus, domestic currency	Direct Exposure to the General Government and State-Owned Enterprises, loans and securities, domestic currency (% Assets)	
Deposit rate	Deposit Rate, Percent per annum	
Real GDP Growth	real GDP, year-on-year % change	WEO, IMF IFS and authors calculations
Inflation	Annual CPI inflation	WEO, IMF IFS and authors calculations
Debt to GDP	General government gross debt, percent of Fiscal year GDP	WEO
Credit to GDP	Claims on private sector to annual nominal GDP in percent	IMF IFS, Haver/WEO and authors calculations
Listed Companies	Listed domestic companies per 1 million people	World Bank World Development Indicators
Stockmarket Cap.	Market capitalization of listed domestic companies, % of GDP	World Bank World Development Indicators
CB Refin	Central Bank total loans to banks, domestic and foreign currency (% Assets)	IMF MFS, FSI
NPL Ratio	Non-performing loans as a share of total loans, %	IMF FSI

External Debt to GDP	External debt stocks, public and publicly guaranteed, disbursed and outstanding, excluding multilateral loans, % GDP	World Bank International Debt Statistics, Haver/WEO and authors calculations
Net External Issuance	Net issuance of External Debt, % GDP	
Spread	JP Morgan's Emerging Market Bond Index Global (EMBIG), annual mean, %	Bloomberg
Fiscal Stress	Dummy variable taking the value one in years when the public deficit to GDP increases by more than its country-specific standard deviation	IMF Global Financial Development Database and authors' calculations
High Maturing Debt	Dummy variable taking the value of one in years when public debt maturing as % GDP is above its country specific 75th percentile for the sample period. Maturing debt is computed as the difference between the gross financing need and the overall fiscal balance of the general government.	IMF Debt Sustainability Analysis database, WEO, Haver and authors' calculations.
Sovereign Crisis	Dummy variables for years of sovereign debt crises.	Laeven and Valencia (2020) systemic banking crises database

Table A2.3. Summary Statistics

Variable	Mean	Median	p75	SD	Min	Max
Central Government-Bank Nexus, domestic and foreign currency	10.63	8.24	15.07	8.92	0.00	54.58
General Government-Bank Nexus, domestic and foreign currency	10.99	8.47	15.68	9.20	0.00	55.85
Total Government-Bank Nexus, domestic and foreign currency	13.53	11.14	18.87	10.19	0.00	60.19
Central Government-Bank Nexus, domestic currency	9.72	7.43	13.89	8.55	0.00	53.79
General Government-Bank Nexus, domestic currency	10.03	7.62	14.47	8.74	0.00	55.06
Total Government-Bank Nexus, domestic currency	11.91	9.87	16.80	9.57	0.00	59.10
Deposit rate	5.47	4.00	7.56	5.11	0.00	68.65
Real GDP Growth	3.73	3.83	6.18	6.38	-36.39	63.33
Inflation	6.57	4.30	7.67	17.55	-16.86	557.20
Debt to GDP	49.59	43.49	62.84	33.20	0.00	366.81
Credit to GDP	35.87	30.00	50.71	24.21	0.00	138.86
Listed Companies	14.78	4.49	13.77	36.54	0.31	473.51
Stockmarket Cap.	46.73	31.14	60.45	48.01	0.01	322.71
CB Refin	1.42	0.11	1.14	3.09	0.00	22.65
NPLs	7.08	4.70	9.13	6.85	0.74	59.76
External Issuance to GDP	1.17	0.28	1.79	2.63	-10.84	22.96
Spread (percent)	4.47	3.14	5.12	5.10	0.20	49.36

Note: This table presents summary statistics for the variables used in the regressions and for an unbalanced panel of 127 Emerging and LICs over the period is 2005–2023.

Source: Authors' calculations.

Table A2.4. Central Bank Refinancing and the Nexus (domestic and foreign currency)

Dependent variable:	Direct Exposure to the General Government, domestic and foreign currencies (% Assets)					
	FE model (1)	FE model (2)	Bruno (3)	Bruno (4)	Sys GMM (5)	Sys GMM (6)
Dependent, lagged	0.720*** (0.0376)	0.701*** (0.0347)	0.806*** (0.0234)	0.795*** (0.0263)	0.854*** (0.0965)	0.934*** (0.0815)
Deposit rate, lagged	0.0893* (0.0398)	0.124** (0.0438)	0.0809* (0.0347)	0.116** (0.0390)	0.0165 (0.0406)	0.0196 (0.0388)
Real GDP growth, lagged	-0.00149 (0.0157)	-0.000817 (0.0189)	-0.00106 (0.0114)	-0.00237 (0.0120)	-0.000498 (0.0155)	0.0156 (0.0147)
Inflation, lagged	0.0145 (0.0195)	0.00899 (0.0273)	0.0205 (0.0156)	0.0156 (0.0161)	-0.00711 (0.0395)	-0.0214 (0.0339)
Public debt-to-GDP ratio, lagged	0.0197 (0.0115)	0.0292* (0.0126)	0.0143* (0.00566)	0.0205* (0.00806)	0.0565*** (0.0162)	0.0449 (0.0253)
Credit-to-GDP ratio, lagged	-0.0127 (0.00929)	-0.0175 (0.0127)	-0.00705 (0.00764)	-0.0123 (0.00758)	-0.0201 (0.0180)	-0.0201 (0.0211)
Sovereign crisis dummy	-0.316 (0.934)	-1.400 (1.702)	-0.344 (0.885)	-1.394 (1.315)	3.331 (7.664)	-5.892 (5.049)
NPL ratio, lagged		0.0479** (0.0147)		0.0443* (0.0178)		0.0628 (0.0579)
Fiscal stress		0.344* (0.156)		0.333 (0.195)		2.244* (1.033)
Central Bank refin to Assets, lagged	-0.111* (0.0504)	-0.103 (0.0536)	-0.105* (0.0510)	-0.0945 (0.0526)	0.0135 (0.0887)	-0.0270 (0.0873)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1177	947	1177	947	1239	1004
Number of countries	89	85	89	85	90	86
Adjusted R-squared	0.658	0.700				
Number of instruments					53	58
Hansen test p-value					0.199	0.476
AR(2) test p-value					0.375	0.669

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations.

Note: Columns 1-2 report estimates from Fixed Effects model with robust standard errors clustered by country in OLS. Columns 3-4 report estimates after Bruno's (2005) correction. Columns 5-6 displays two step system GMM results with the Windmeijer small sample correction and including time effects. Sample is an unbalanced panel of EMDEs and LICs countries spanning from 2005-2023. Regressions use robust standard errors and treat all regressors except dummies as predetermined but not strictly exogenous variables. Instrument matrix considers up to two lags and is collapsed by the estimation. The row for the Hansen J-test reports the p-values for the null hypothesis of instrument validity. The values reported for AR(2) are the p-values for second order autocorrelated disturbances in the first differences equations. Constant term is included in all models but not reported.

Table A2.5. Sovereign-Bank Nexus (domestic and foreign currencies), Emerging Markets

Dependent variable:	Direct Exposure to General Government, domestic and foreign currencies (% Assets)							
	FE model (1)	FE model (2)	FE model (3)	FE model (4)	Bruno (5)	Bruno (6)	Bruno (7)	Bruno (8)
Dependent, lagged	0.757*** (0.0418)	0.770*** (0.0308)	0.760*** (0.0415)	0.775*** (0.0310)	0.829*** (0.0253)	0.842*** (0.0273)	0.833*** (0.0271)	0.848*** (0.0273)
Deposit rate, lagged	0.0578 (0.0574)	0.0912 (0.0613)	0.0642 (0.0562)	0.106 (0.0577)	0.0513 (0.0412)	0.0873* (0.0382)	0.0586 (0.0406)	0.101** (0.0382)
Real GDP growth, lagged	-0.0114 (0.0127)	-0.0251* (0.0104)	-0.0127 (0.0123)	-0.0253* (0.0105)	-0.0102 (0.0131)	-0.0255 (0.0145)	-0.0114 (0.0146)	-0.0256 (0.0135)
Inflation, lagged	0.00271 (0.0198)	-0.00827 (0.0277)	0.00239 (0.0206)	-0.00907 (0.0294)	0.00839 (0.0174)	-0.00209 (0.0167)	0.00878 (0.0165)	-0.00258 (0.0173)
Public debt-to-GDP ratio, lagged	0.00791 (0.0172)	0.00145 (0.0180)	0.00671 (0.0176)	-0.000125 (0.0186)	0.00261 (0.00702)	-0.00639 (0.00931)	0.00150 (0.00692)	-0.00784 (0.00915)
Credit-to-GDP ratio, lagged	-0.0118 (0.0139)	-0.00661 (0.0128)	-0.0103 (0.0138)	-0.00651 (0.0140)	-0.00634 (0.00839)	-0.00250 (0.00749)	-0.00475 (0.00888)	-0.00233 (0.00813)
NPL ratio, lagged		0.0718*** (0.0142)		0.0624*** (0.0153)		0.0664*** (0.0180)		0.0578** (0.0182)
Fiscal stress		0.366 (0.196)		0.338 (0.199)		0.354 (0.234)		0.322 (0.241)
Central Bank refin to Assets, lagged			-0.105* (0.0522)	-0.0774 (0.0586)			-0.100 (0.0652)	-0.0705 (0.0639)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	743	616	731	604	743	616	731	604
Number of countries	52	50	52	50	52	50	52	50
Adjusted R-squared	0.709	0.783	0.709	0.785				

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations.

Note: Columns 1-4 report estimates from Fixed Effects model with robust standard errors clustered by country in OLS. Columns 5-8 report estimates after Bruno's (2005) correction. Sample is an unbalanced panel of EME countries spanning from 2005-2023.

Constant term and sovereign crisis dummy included in all models but not reported.

Table A2.6. Sovereign-Bank Nexus (domestic and foreign currencies), Low-Income Countries

Dependent variable:	Direct Exposure to General Government, domestic and foreign currencies (% Assets)							
	FE model (1)	FE model (2)	FE model (3)	FE model (4)	Bruno (5)	Bruno (6)	Bruno (7)	Bruno (8)
Dependent, lagged	0.621*** (0.0688)	0.521*** (0.0730)	0.622*** (0.0674)	0.520*** (0.0699)	0.725*** (0.0502)	0.635*** (0.0566)	0.726*** (0.0503)	0.633*** (0.0563)
Deposit rate, lagged	0.101 (0.0633)	0.160* (0.0655)	0.114 (0.0604)	0.178** (0.0596)	0.0880 (0.0630)	0.155 (0.0882)	0.100 (0.0637)	0.175* (0.0886)
Real GDP growth, lagged	0.0300 (0.0341)	0.0479 (0.0341)	0.0285 (0.0344)	0.0471 (0.0344)	0.0284 (0.0201)	0.0447 (0.0229)	0.0269 (0.0201)	0.0441 (0.0229)
Inflation, lagged	0.0880* (0.0383)	0.0851 (0.0467)	0.0855* (0.0384)	0.0814 (0.0462)	0.0933** (0.0313)	0.0900* (0.0402)	0.0906** (0.0313)	0.0858* (0.0403)
Public debt-to-GDP ratio, lagged	0.0354** (0.0115)	0.0578*** (0.0104)	0.0364** (0.0114)	0.0599*** (0.0101)	0.0301** (0.00943)	0.0477*** (0.0135)	0.0312** (0.00948)	0.0500*** (0.0135)
Credit-to-GDP ratio, lagged	-0.00524 (0.00851)	-0.0214 (0.0150)	-0.00492 (0.00875)	-0.0208 (0.0141)	0.00202 (0.0132)	-0.0152 (0.0182)	0.00211 (0.0132)	-0.0145 (0.0182)
NPL ratio, lagged		0.0330 (0.0289)		0.0333 (0.0312)		0.0353 (0.0391)		0.0354 (0.0391)
Fiscal stress		0.153 (0.240)		0.164 (0.235)		0.164 (0.350)		0.178 (0.350)
Central Bank refin to Assets, lagged			-0.131 (0.0663)	-0.134* (0.0614)			-0.126 (0.0941)	-0.127 (0.0950)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	446	343	446	343	446	343	446	343
Number of countries	37	35	37	35	37	35	37	35
Adjusted R-squared	0.567	0.581	0.568	0.582				

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations.

Note: Columns 1-4 report estimates from Fixed Effects model with robust standard errors clustered by country in OLS. Columns 5-8 report estimates after Bruno's (2005) correction. Sample is an unbalanced panel of LICs countries spanning from 2005-2023.

Constant term and sovereign crisis dummy included in all models but not reported.

Table A2.7. External Market Access and the Sovereign-Bank Nexus (domestic and foreign currencies)

Dependent variable:	Direct Exposure to General Government, domestic and foreign currencies (% Assets)											
	FE model (1)	FE model (2)	FE model (3)	FE model (4)	Bruno (5)	Bruno (6)	Bruno (7)	Bruno (8)	System (9)	System (10)	System (11)	System (12)
Dependent, lagged	0.631*** (0.0335)	0.612*** (0.0405)	0.738*** (0.0330)	0.734*** (0.0363)	0.741*** (0.0407)	0.717*** (0.0427)	0.817*** (0.0294)	0.811*** (0.0276)	0.810*** (0.0870)	0.805*** (0.0897)	0.787*** (0.0778)	0.835*** (0.0875)
Deposit rate, lagged	0.0861 (0.0569)	0.0983 (0.0591)	0.103* (0.0480)	0.120* (0.0502)	0.0981 (0.0558)	0.110 (0.0595)	0.0933** (0.0349)	0.114** (0.0380)	-0.0538 (0.0667)	0.0146 (0.0816)	0.0312 (0.0434)	-0.0511 (0.0404)
Real GDP growth, lagged	0.0133 (0.0244)	0.0115 (0.0258)	-0.0241 (0.0123)	-0.0246 (0.0134)	0.0141 (0.0216)	0.0112 (0.0229)	-0.0248 (0.0145)	-0.0249 (0.0162)	-0.000669 (0.0289)	0.0149 (0.0495)	0.0249 (0.0239)	0.0479 (0.0323)
Inflation, lagged	0.00436 (0.0254)	-0.00356 (0.0234)	0.00251 (0.0258)	0.00473 (0.0287)	0.00681 (0.0240)	0.00122 (0.0243)	0.00847 (0.0166)	0.0108 (0.0173)	0.0874 (0.0673)	0.0528 (0.0707)	-0.0341 (0.0643)	0.0374 (0.0640)
Public debt-to-GDP ratio, lagged	0.0263 (0.0244)	0.0130 (0.0246)	0.0322 (0.0199)	0.0302 (0.0231)	0.0203 (0.0135)	0.00693 (0.0154)	0.0262** (0.00930)	0.0233* (0.00975)	0.0378 (0.0309)	0.0225 (0.0587)	0.0858* (0.0324)	0.0391 (0.0205)
Credit-to-GDP ratio, lagged	-0.0207 (0.0169)	-0.0181 (0.0162)	-0.0183 (0.0149)	-0.0157 (0.0146)	-0.0177 (0.0135)	-0.0152 (0.0131)	-0.0152* (0.00769)	-0.0119 (0.00808)	-0.0650 (0.0341)	-0.0541 (0.0474)	-0.0631* (0.0301)	-0.0314 (0.0292)
NPL ratio, lagged		0.114** (0.0326)		0.0540** (0.0171)		0.0984** (0.0317)		0.0508** (0.0187)		0.103 (0.0809)		0.0568 (0.0615)
Fiscal stress		0.0687 (0.411)		0.470* (0.201)		0.0155 (0.422)		0.451 (0.240)		-2.998 (2.083)		2.431 (1.704)
Spreads, lagged	0.102* (0.0502)	0.119* (0.0506)			0.110* (0.0474)	0.129** (0.0455)			-0.0411 (0.0848)	-0.0653 (0.117)		
External issuance to GDP, lagged			-0.0590 (0.0432)	-0.0634 (0.0531)			-0.0524 (0.0405)	-0.0527 (0.0430)			-0.0975 (0.0832)	0.00205 (0.0765)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	422	404	731	658	422	404	731	658	460	439	773	698
Number of countries	45	44	53	51	45	44	53	51	46	45	54	52
Adjusted R-squared	0.606	0.625	0.727	0.735								
Number of instruments									40	44	46	50
Hansen test p-value									0.239	0.343	0.137	0.104
AR(2) test p-value									0.538	0.377	0.124	0.149

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations.

Note: Columns 1-4 report estimates from Fixed Effects model with robust standard errors clustered by country in OLS. Columns 5-8 report estimates after Bruno (2005) corrections. Columns 9-12 display two step system GMM results with the Windmeijer small sample correction and including time effects. Sample is an unbalanced panel of EMDEs and LICs countries spanning from 2005-2023. Regressions use robust standard errors and treat all regressors except dummies as predetermined but not strictly exogenous variables. Instrument matrix considers up to two lags and is collapsed by the estimation. The row for the Hansen J-test reports the p-values for the null hypothesis of instrument validity. The values reported for AR(2) are the p-values for second order autocorrelated disturbances in the first differences equations. Constant term and sovereign crisis dummy are included in all models but not reported.

Table A2.8. Global Financial Conditions and the Sovereign-Bank Nexus (domestic and foreign currencies)

	Dependent variable: Direct Exposure to General Government, domestic and foreign currencies (% Assets)					
	Bruno (1)	Bruno (2)	Bruno (3)	Bruno (4)	Bruno (5)	Bruno (6)
Dependent, lagged	0.799*** (0.0265)	0.788*** (0.0269)	0.734*** (0.0421)	0.693*** (0.0426)	0.808*** (0.0271)	0.802*** (0.0282)
Deposit rate, lagged	0.0803* (0.0360)	0.0609 (0.0373)	0.0783 (0.0575)	0.0724 (0.0586)	0.0959** (0.0357)	0.0711 (0.0366)
Real GDP growth, lagged	-0.00450 (0.0111)	-0.0142 (0.0114)	0.00403 (0.0209)	-0.0227 (0.0201)	-0.0317* (0.0147)	-0.0423** (0.0153)
Inflation, lagged	0.0283 (0.0160)	0.00934 (0.0163)	0.0145 (0.0237)	-0.0107 (0.0232)	0.0198 (0.0158)	0.00447 (0.0160)
Public debt-to-GDP ratio, lagged	0.0300*** (0.00651)	0.0350*** (0.00656)	0.0358** (0.0114)	0.0262* (0.0126)	0.0348*** (0.00783)	0.0378*** (0.00794)
Credit-to-GDP ratio, lagged	-0.00789 (0.00747)	-0.00319 (0.00781)	-0.0144 (0.0133)	-0.0132 (0.0135)	-0.00841 (0.00782)	-0.000584 (0.00803)
NPL ratio, lagged	0.0416* (0.0169)	0.0411* (0.0177)	0.0745* (0.0304)	0.0932** (0.0312)	0.0443* (0.0181)	0.0454* (0.0190)
Fiscal stress	0.640*** (0.171)	0.772*** (0.184)	0.458 (0.319)	0.431 (0.369)	0.738*** (0.208)	0.919*** (0.217)
US LT yields	-0.436*** (0.0843)		-0.579*** (0.161)		-0.426*** (0.105)	
VIX		0.0123 (0.0117)		0.0660** (0.0253)		0.00724 (0.0131)
Spreads, lagged			0.0826* (0.0419)	0.0983* (0.0438)		
External issuance to GDP, lagged					-0.0789 (0.0421)	-0.0534 (0.0438)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No	No
Observations	959	959	404	404	658	658
Number of countries	85	85	44	44	51	51

Standard errors in parentheses. ***, **, and * denote significance at the 1, 5 and 10 percent levels, respectively.

Source: Authors' calculations.

Note: Columns report estimates after Bruno (2005) corrections. Constant term and sovereign crisis dummy are included in all models but not reported.

Annex III. Sensitivity Analysis

Countries Included in Sensitivity Analysis, Disaggregated by Strength of Sovereign-Bank Nexus

Strong nexus: Albania, Algeria, Angola, Argentina, Bangladesh, Brazil, Burundi, Republic of Congo, Egypt, The Gambia, Ghana, Kenya, Maldives, Mexico, Pakistan, Papua New Guinea, Sierra Leone, Uganda, Ukraine, Zambia

Moderate nexus: Armenia, Bahamas, Barbados, Bhutan, Cabo Verde, Côte d'Ivoire, El Salvador, Eswatini, Guatemala, Guyana, Haiti, Hungary, Indonesia, Jordan, Kazakhstan, Liberia, Madagascar, Malaysia, Mali, Morocco, Mozambique, Namibia, Nepal, Niger, Philippines, Romania, Rwanda, São Tomé and Príncipe, Senegal, Serbia, Seychelles, South Africa, Tanzania, Togo, Trinidad and Tobago, Tunisia, Türkiye

Weak nexus: Antigua and Barbuda, Azerbaijan, Belarus, Belize, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brunei Darussalam, Burkina Faso, Cambodia, Central African Republic, Chad, Colombia, Democratic Republic of the Congo, Costa Rica, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Grenada, Guinea-Bissau, Honduras, Iraq, Jamaica, Kosovo, Kuwait, Kyrgyz Republic, Lesotho, Mauritius, Moldova, Mongolia, Nicaragua, Nigeria, North Macedonia, Oman, Panama, Paraguay, Peru, Qatar, Solomon Islands, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Thailand, Tonga, United Arab Emirates, Uruguay, Uzbekistan, Vanuatu, Zimbabwe

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