The Risk Sensitivity of Global Liquidity Flows: Heterogeneity, Evolution and Drivers

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Abstract

The period after the Global Financial Crisis (GFC) was characterized by a considerable risk migration within global liquidity flows, away from cross-border bank lending towards international bond issuance. We show that the post-GFC shifts in the risk sensitivities of global liquidity flows are related to the tightness of the balance sheet (capital and leverage) constraints faced by international (bank and non-bank) lenders and to the migration of borrowers across funding sources. We document that the risk sensitivity of global liquidity flows is higher when funding is provided by financial intermediaries that are facing greater balance sheet constraints. We also provide evidence that the post-GFC migration of borrowers from cross-border loans to international debt securities was associated with a decline in the risk sensitivity of global liquidity flows to EME borrowers.

JEL Codes: G10, F34, G21

Keywords: Global liquidity, international bank lending, international bond flows, emerging markets, advanced economies

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1 Introduction

The Global Financial Crisis (GFC) marked a stark turning point for the volumes, volatility and drivers of cross-border loans (CBL) and international debt securities (IDS), jointly defined as aggregate global liquidity (AGL). The initial sharp decline in cross-border loans after the GFC was followed by a weak recovery and a second sizable contraction during the peak of the euro area crisis. Meanwhile, growth in international bond issuance remained relatively robust, tilting the balance of international financial intermediation toward bonds and away from loans.

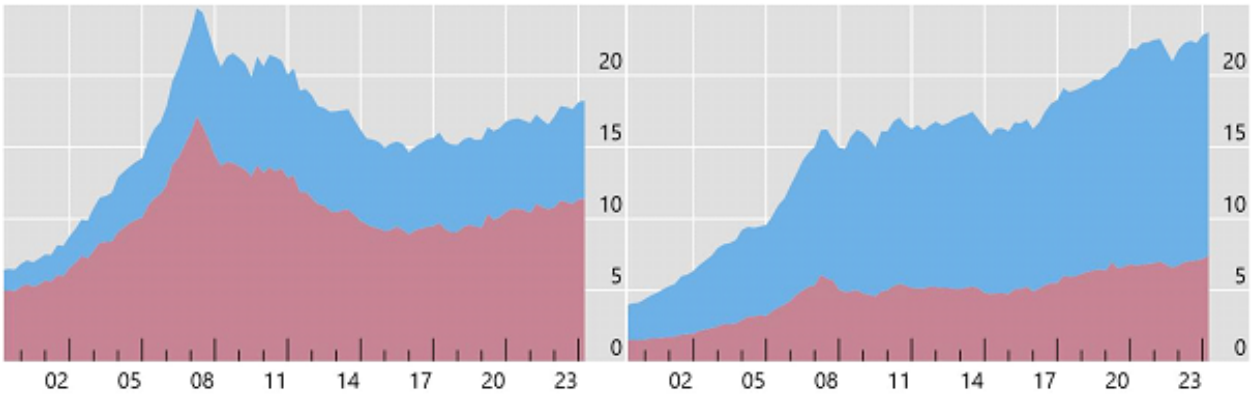
The post-GFC shift in the relative importance of the two main global liquidity components has occurred simultaneously with considerable shifts in their sensitivities to global risk (Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020). The risk sensitivity of cross-border bank lending declined sharply. By contrast, international bond issuance by emerging market borrowers remained sensitive to global risk conditions. Forbes and Warnock (2021) describe the risk sensitivities of global capital flows as having evolved from behaving like waves to appearing more as ripples, based on data through 2020, with sudden stop episodes less pervasive in the latter decade and more associated with debt than with equity events. More generally, research shows that the drivers and features of these main components of global liquidity are key inputs into discussions of international shock transmission and the degree of policy autonomy of countries participating in international financial markets (Rey, 2015; Bank for International Settlements, 2022; International Monetary Fund, 2020; OECD, 2024).

In this paper, we investigate the drivers of the global risk sensitivities of global liquidity flows, as well as the determinants of the post-GFC risk migration across the main global liquidity components. We examine the shifting drivers of global liquidity across its main components (cross-border loans and international bonds), as well as across borrowing country groups (Advanced Economies and Emerging Market Economies) and borrowing sectors (bank sector and non-bank sector). We explicitly separate patterns of so-called safe haven countries from other advanced economies (OAEs). Understanding the nature of the heterogeneity across the above dimensions is key for properly assessing the exposure of economies to global shocks as well as the scope for local toolkits to appropriately target financial flows and institutions in order to support economic and financial stabilization (Borio, Robinson, and Shin, 2023).

Our analysis proceeds in several steps. As a prelude to our main empirical analysis, we illustrate the notable post-GFC shift in international financial intermediation away from cross-border bank lending and towards international bond issuance, which is part of a robust pattern documented in the existing literature (Shin, 2014; Hardy and von Peter, 2023). We then present empirical evidence of the significant variation in global risk sensitivities not only over time, but also across these global liquidity components (cross-border loans and international debt securities), borrowing country groups (advanced economies and emerging markets) and sectors (banks and non-banks). After that, we drill deeper into the sources of heterogeneity in global risk sensitivities across all of the above dimensions by investigating the underlying drivers, with a particular focus on financial frictions. We conjecture that tighter capital and leverage constraints faced by banks and non-bank financial institutions (NBFI) increase the sensitivity of their international credit supply to global risk shocks. We view these constraints as influenced by financial regulation, which in turn has an effect on the migration of risky borrowers between banks and NBFIs.

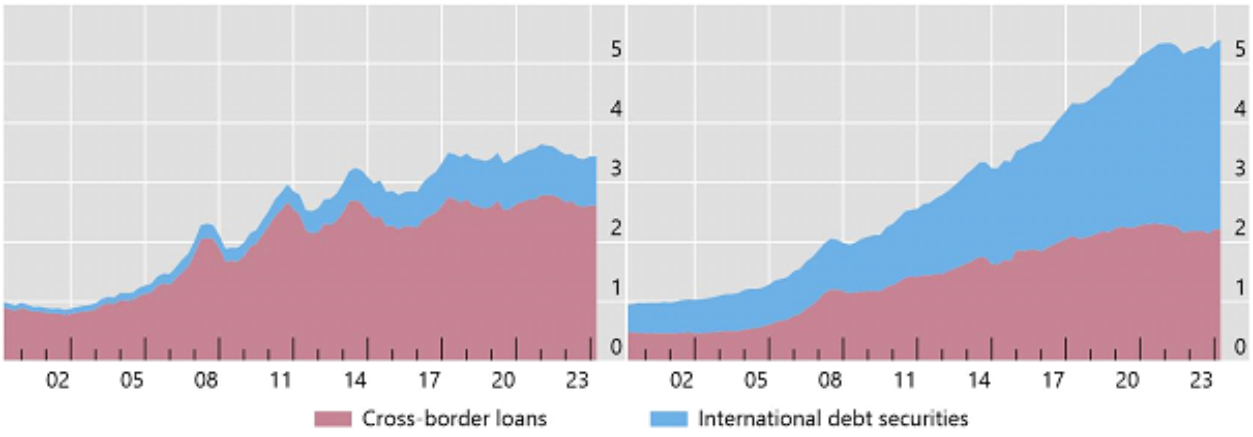
Our empirical analyses utilize a number of datasets to yield the granularity needed for testing the above conjectures. For global liquidity flows, we utilize the International Debt Securities (IDS) Statistics, the Locational Banking Statistics (LBS) and the Consolidated Banking Statistics (CBS), all obtained from the Bank for International Settlements (BIS). The combined information allows the distinction among borrowing countries, lending national banking systems, instrument types (debt securities versus bank loans) and borrowing sectors (bank versus non-bank). Graph 1 displays the evolution of the main global liquidity flow components since the start of the century taking an aggregate perspective. It illustrates that international financial intermediation has clearly shifted away from bank-based (red areas) to market-based (blue areas) financing. International bond issuance has surged, most notably by non-bank borrowers (which include non-financial corporations and sovereigns) in emerging market economies (EMEs). By contrast, cross-border bank lending has stagnated, especially to borrowers in advanced economies.

Advanced economies



(a) Banks (b) Non-Banks

Emerging market and developing economies



(c) Banks (d) Non-Banks

Graph 1: The evolving composition of external debt flows

Notes: Amounts outstanding, in trillions USD. Sources: BIS Locational Banking Statistics by residence and International Debt Securities Statistics.

As our premise is that flows embed the characteristics of institutions involved in international financial intermediation, our analysis also incorporates information on lending banking systems' balance sheet characteristics, drawn from Fitch, in addition to new measures that we have constructed to capture the characteristics of the NBFIs that are active in international bond markets. Data on NBFI characteristics and international activity are more sparse than the respective data on banks. To address this gap, we utilize a novel approach that leverages the annual NBFI data

collection exercise of the Financial Stability Board (FSB) targeted at constructing various NBFI vulnerability metrics, while conditioning on the business model of each data-reporting institution (Financial Stability Board, 2024).

The primary focus of our empirical analysis is on the sensitivity of the main global liquidity components to risk conditions, captured by the VIX (as well as other global risk measures considered for robustness). Additionally, monetary policy developments enter our analysis, including the use of shadow policy rates during periods of unconventional monetary policy and periods during which the zero lower bound is binding.

Our empirical analysis produces novel sets of results on the risk sensitivity of global liquidity flows. First, time variation is shown to be a pervasive feature of risk sensitivities of the main global liquidity components. Furthermore, there is considerable heterogeneity in the evolution of the global risk sensitivities across several key dimensions of global liquidity-flow type, borrowing country and borrowing sector. Declines have been strongest in cross-border bank lending. The sensitivity of CBL to global risk drifted from being significantly negative before the GFC—meaning that loan supply would contract significantly when the risk environment deteriorates– to becoming statistically insignificant after the GFC. The global risk sensitivity of IDS issued by EME borrowers increased further after the GFC and then partially reverted, but remained considerably elevated. The global risk sensitivity of IDS issued by OAEs residents was insignificant throughout the entire period we examine.

Second, the evolutions in the risk sensitivities of global liquidity flows are related to the tightness of the balance-sheet constraints faced by internationally-active (bank and non-bank) financial institutions and to the migration of risky borrowers between CBL and IDS markets. The post-GFC tightening of bank regulation provided global banks with extra risk absorbing capacity while raising the balance sheet cost of risky bank loans. As a consequence, riskier borrowers migrated to IDS markets, where funding is mainly provided by NBFIs.

Third, we document that the post-GFC migration of borrowers from CBL to IDS markets was associated with lower global risk sensitivities of global liquidity flows, especially for EME borrowers. Intuitively, as banks moved away from serving riskier borrowers, the average riskiness of bank borrowers fell. Meanwhile, the overall risk sensitivity of IDS issuance by EME borrowers also declined as the risk sensitivity of credit flows to EME borrowers that migrated from CBL

to IDS markets turned out to be lower than the respective sensitivity of pre-existing IDS issuers from EMEs. These two (risk composition) effects dominated the mechanical effect of the increasing weight of IDS flows, which tend to be more risk sensitive than CBL flows (for EME borrowers). As a consequence, the global risk sensitivity of AGL flows also declined when the IDS share of global liquidity flows rose.

An important implication of our findings is that some of the post-GFC dampening in the global risk sensitivity of aggregate global liquidity flows could reverse. More stringent bank capital regulation has led to risk migration from (bank-supplied) loans to (primarily NBFI-supplied) bond-based finance. Given our estimates of risk sensitivities facing non-bank borrowers in emerging markets, a continued rise in the NBFI-supplied share of global liquidity could move the global risk sensitivity of aggregate global liquidity flows back towards pre-GFC levels. This could happen if, at some point, the mechanical effect of risk migration starts to dominate the risk composition effect. However, as borrowers migrate from CBL to IDS markets, both the mechanical and risk composition channels are likely to strengthen, with uncertain aggregate effects. The mechanical effect will become stronger because the share of total liquidity intermediated through IDS will increase as borrowers migrate from CBL to IDS. The risk composition effect will also likely strengthen because the marginal borrower migrating from CBL to IDS markets is likely to become less risky over time, thereby decreasing the overall risk sensitivities of both CBL and IDS.

The remainder of the paper is organized as follows. Section 2 reviews the existing literature and presents the main conjectures that we test in our empirical analysis. Section 3 presents the main databases used. Section 4 examines the evolution of the global risk sensitivities for the main global liquidity components. Section 5 presents our findings on the determinants of the risk migration within the global liquidity flows that took place after the GFC. This section emphasizes the importance of the balance sheet constraints faced by internationally active bank and non-bank financial institutions and the migration of risk between CBL and IDS markets. Section 6 presents robustness checks along a number of key dimensions. Section 7 concludes.

2 Related Literature and Conjectures

2.1 Related literature

Several strands of literature consider the drivers of international flows, risk sensitivities and migration, and the evolving role of nonbank financial intermediaries. The large early body of research on the drivers of international capital flows,[1] splits the main drivers into global (push) factors and local (pull) factors. The more recent literature emphasizes the common component reflected in the global financial cycle, as argued by Rey (2015), with the most prominent global drivers including advanced economy monetary policies - especially US monetary policy, global risk aversion, and global economic activity. Local factors include the borrowing country's GDP growth, sovereign ratings, and financial openness.

The spillovers of US monetary policy have been those most extensively examined (see Buch, Bussiere, Goldberg, and Hills 2019; Arteta, Kamin, and Franz Ulrich 2022; Caballero and Upper 2023 for recent summaries). US monetary policy clearly drives cross-border bank lending through global banks for EMEs (McCauley, McGuire, and Sushko 2015; Avdjiev and Hale 2019; Bräuning and Ivashina 2020; Financial Stability Board 2022). US monetary policy significantly impacts multiple other key economic and financial variables in EMEs - local-currency bond yields (Frankel, Schmukler, and Serven 2004; Hofmann and Takáts 2015; Kalemli-Özcan 2019; Obstfeld 2015; Kharroubi and Zampolli 2016; Adrian, Gelos, Lamersdorf, and Moench 2024; Gelos, Patelli, and Shim 2024), foreign-currency bond yields (Gilchrist, Yue, and Zakrajšek, 2019), domestic economic activity (Iacoviello and Navarro, 2019), and equity markets (Ehrmann and Fratzscher, 2004; Chari, Dilts Stedman, and Forbes, 2022). Effects work broadly through expenditure switching, expenditure reduction, and financial channels.

The sensitivity of global liquidity flows to US monetary policy across a broad group of economies - a combination of advanced and emerging market economies - rose substantially in the immediate aftermath of the GFC, peaked around the time of the 2013 Fed "taper tantrum", and then reverted towards pre-crisis levels (Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020). The main driver of the evolution of the estimated sensitivities of global liquidity to US monetary policy was the degree of convergence among monetary policies of advanced economies. US monetary policy spillovers also

[1] See overview by Koepke (2019).

can be amplified and pervasive because monetary policy can affect risk conditions and the overall global financial cycle (Miranda-Agrippino and Rey, 2020). Emerging market sensitivities are tied to balance sheet conditions, but also argued to clearly work through risk channels (Kalemli-Özcan and Unsal, 2023; Cristi, Kalemli-Özcan, Sans, and Unsal, 2024).

Global risk conditions are the other historically major driver of cross-border capital flows. A global financial cycle in capital flows, asset prices and in credit growth co-moves with market uncertainty and risk aversion (Rey, 2015). Global risk sentiment, often typically proxied by the VIX, is a documented major global driver of international capital flows and, in particular, of cross-border bank lending (e.g. Bekaert, Hoerova, and Duca 2013; Bruno and Shin 2015a,b; Miranda-Agrippino and Rey 2020; Chari, Dilts Stedman, and Lundblad 2021; Bank for International Settlements 2017). Some studies highlight the importance of dollar exchange rates as a reflector of global risk sentiment (Bruno and Shin 2015b; Gelos, Patelli, and Shim 2024). The global risk sensitivity of cross-border bank flows has declined considerably since the GFC (Shin, 2016), driven in part by increases in the international lending shares of better-capitalized banking systems (Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020). Meanwhile, global shocks are increasingly in focus for their impacts on the full distributions (rather than just the means) of asset prices associated with international capital flows, with tail risk effects for EMEs (Chari, 2023). Macroprudential stance can alter the effects of risk-on and risk-off shocks on bond flows (Chari, Dilts Stedman, and Forbes, 2022).

Much of the literature treats the consequences of global risk conditions as distinct for advanced and emerging market economies, as different financial frictions, institutions, and risk assessments characterize associated borrowers and lenders. Yet, the rigid distinction between these two groups may no longer be valid. Goldberg and Krogstrup (2023), using correlations between exchange market pressure indices and the VIX, argue that advanced economies are no longer a cohesive group. In contrast to the pre-GFC period, advanced economies are divided into the few so-called safe-haven countries that receive inflow and appreciation pressures when risk sentiment deteriorates, versus all of the other advanced economies that may have more in common with emerging markets in experiencing outflow pressures during such stress periods (Goldberg, 2023). A complementary conceptual point arises from the rich literature on convenience yields on government debt and covered interest parity deviations after the GFC. Global liquidity and safe haven flows in periods of elevated risk characterize just a few currencies, inclusive of US dollar assets (Nagel, 2016; Du, Tepper,

and Verdelhan, 2018; Krishnamurthy and Vissing-Jorgensen, 2012; van Binsbergen, Diamond, and Grotteria, 2022).

Another relevant literature emphasizes the stark compositional change in the types of institutions involved in financial intermediation. NBFIs have a growing role in the aggregate supply of credit in the economy (Moreira and Savov, 2017; Buchak, Matvos, Piskorski, and Seru, 2018; Elliott, Meisenzahl, and Peydró, 2024; Mehrling, Pozsar, Sweeney, and Neilson, 2013; Chen, Ren, and Zha, 2018; Nelson, Pinter, and Theodoridis, 2018; Fuster, Plosser, Schnabl, and Vickery, 2019; Irani, Iyer, Meisenzahl, and Peydró, 2020). Moreover, on the international side, the declining share of bank-intermediated credit in total capital inflows has been mirrored by the growing importance of market-based flows (see, for example, Shin (2014) and Hardy and von Peter (2023)). This rising share of NBFIs in international capital flows has been driven primarily by the growing roles of open-ended investment funds, pension funds, life insurers, hedge funds, and sovereign wealth funds (Financial Stability Board, 2024).

Regulatory arbitrage, and possible risk migration, have been documented for some dimensions of global banking activity, for example as Houston, Lin, and Ma (2012); Frame, Mihov, and Sanz (2020) consider the location of bank subsidiaries, and Demirgüç-Kunt, Horváth, and Huizinga (2023) examine changes in syndicated loan origination in response to more stringent capital origination. NBFIs in cross-border capital flows have diversified the sources of international financing and are argued to improve access to foreign financing and reduce the cost of capital (Bank of England, 2015). Non-bank lenders can act as global shock absorbers from US monetary policy spillovers (Elliott, Meisenzahl, and Peydró, 2024).

Connecting these strands of literature, open for debate is whether NBFI-intermediated flows are more sensitive to global financial conditions and have introduced additional procyclicality into capital flows to EMEs (Carney, 2019; Bertaut, Bruno, and Shin, 2021; Converse, Levy-Yeyati, and Williams, 2023). The greater sensitivity of NBFI flows to global factors is argued to likely be driven by benchmark-driven investors (Arslanalp, Drakopoulos, Goel, and Koepke 2020; Chari 2023). Raddatz, Schmukler, and Williams (2017) find that 70% of country allocations of mutual funds are influenced by benchmark indices. Arslanalp, Drakopoulos, Goel, and Koepke (2020) show that the sensitivity of flows from benchmark driven investors to global risk is three to five times greater than that of aggregate portfolio flows. Aldasoro, Doerr, and Zhou (2022) show

that NBFIs cut their credit by significantly more than banks during financial crises and argue that the growing importance of NBFIs could lead to a shift from relationship lending towards transaction lending, thus exacerbating the repercussions of financial crises. With more of a focus on institution-specific frictions, Faia, Salomao, and Veghazy (2024) show that different types of European investors have alternative portfolio constraints and preferences across assets sorted by risk and currency denomination. The model of Akinci, Kalemli-Özcan, and Queralto (2022) also emphasizes the role of global financial intermediaries' leverage constraint as a factor amplifying the sensitivity of risky asset prices, capital flows and exchange rates to higher global uncertainty. The key mechanism for this finding in their macroeconomic model is that forward looking risk averse financial intermediaries are marginal investors in global assets, and balance-sheet frictions make them behave as if they are highly risk averse, magnifying effects of uncertainty shocks.

2.2 Conjectures

We present two main conjectures on the drivers of the time variation in the risk sensitivity of global liquidity flows. Our first conjecture focuses on the balance sheet constraints faced by the financial institutions supplying global liquidity. In theory, the tighter balance sheet constraints are, the more sensitive financial intermediaries should be to risk shocks. Therefore, the risk sensitivity of global liquidity flows should depend on the tightness of the balance sheet constraints faced by the financial institutions providing those flows.

Conjecture 1. The risk sensitivity of global liquidity flows is stronger when funding is (in aggregate) provided by financial intermediaries that are facing greater balance sheet (capital and leverage) constraints.

Our second conjecture emphasizes the migration of risk between the two main global liquidity components - cross-border loans (CBL) and international debt securities (IDS). In theory, such risk migration should have two effects on the risk sensitivity aggregate global liquidity (AGL) flows.

The first effect is compositional. If banks become more conservative in risk taking and stop serving borrowers that are riskier than their average borrowers, CBL sensitivity to global risk should decline (since the average riskiness of bank borrowers would fall). Furthermore, the overall risk sensitivity of IDS should also decline, if the respective risk sensitivity of the international credit

activity migrating from CBL to IDS markets is lower than the average (pre-migration) global risk sensitivity of IDS flows.

The second effect is mechanical. If borrowers migrate from CBL to IDS markets, the share of IDS in AGL flows increases. As a consequence, the sensitivity of AGL flows to global risk could potentially increase mechanically, due to the higher weight of IDS, which can be more risk sensitive than cross-border bank loans, at least for certain borrower groups and time periods.

Thus, the migration of risk from CBL to IDS markets should (unambiguously) result in a decline in the global risk sensitivities of CBL and IDS flows due to the borrower compositional effect. Meanwhile, the impact of risk migration on AGL flows depends on which of the above two effects dominates. If the compositional effect dominates the mechanical effect, the global risk sensitivity of AGL flows should decline.

Conjecture 2. As borrowers migrate from CBL to IDS markets, the global risk sensitivities of CBL and IDS flows should fall. This should result in a decline in the global risk sensitivity of AGL flows, if the compositional effect of risk migration dominates its mechanical effect.

3 Data

3.1 The main components of global liquidity

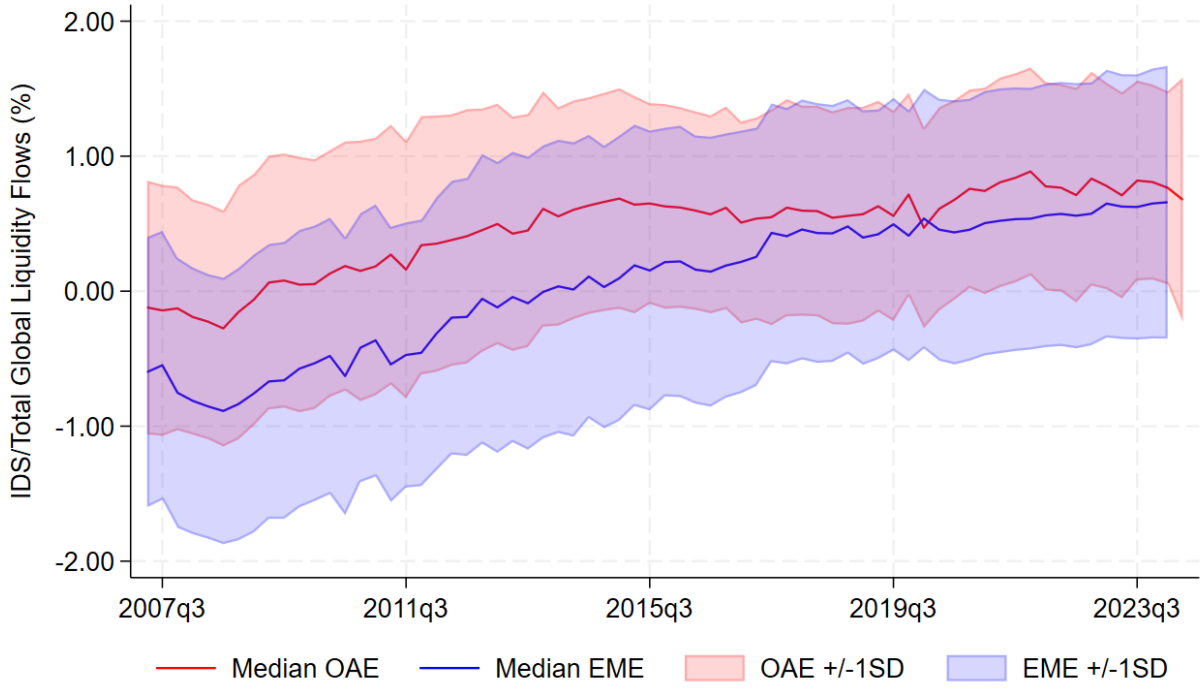
Three databases capture the dimensionality we need to explore the main components of global liquidity (as defined in this paper): the BIS Locational Banking Statistics (LBS), the BIS International Debt Securities Statistics (IDSS), and the BIS Consolidated Banking Statistics (CBS).[2] The BIS LBS captures the outstanding claims and liabilities of internationally active banks located in 44 BIS LBS reporting countries against counterparties residing in more than 200 countries. Banks record their positions on an unconsolidated basis, inclusive of intragroup funding positions that capture international flows between offices of the same banking group. The data, which are aggregated at the country level and compiled following balance of payments statistics principles,

[2]The way we define global liquidity in this paper is related to, but not the same as, the way in which it is defined for the purposes of constructing the BIS Global Liquidity Indicators (GLIs). For a detailed description of the methodology used to construct BIS GLIs, see Bank for International Settlements (2022). For the various ways in which global liquidity could be defined and measured, see Domanski, Fender, and McGuire (2011), Bank for International Settlements, Committee on the Global Financial System (2011), Cohen, Domanski, Fender, and Shin (2017), Shin (2017) and Aldasoro and Ehlers (2018).

capture around 95% of all cross-border interbank business (Bank for International Settlements, 2024). The counterparty sector breakdown available in the BIS LBS enables us also to distinguish between cross-border bank lending to bank and non-bank borrowers. The BIS CBS is used in order to obtain information on the relative importance of lending countries for a given borrowing country. The BIS IDSS data capture borrowing in money and bond markets, encompassing what market participants have traditionally referred to as foreign bonds and eurobonds. International debt securities (IDS) are issued in a market other than the local market of the country where the borrower resides (Gruić and Wooldridge, 2012). The sample used for the empirical analysis consists of quarterly data from Q1 2000 to Q1 2024. On the borrowing side, our analytics focus on a set of 61 countries; on the bank lending side, the data cover the positions of all 44 BIS LBS and 31 CBS reporting countries (see Appendix A).

The typical lenders and borrowers connected by each flow type differ considerably in composition and size (Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020). Cross-border loans are typically supplied by internationally-active banks, which tend to be relatively large. Meanwhile, the creditors in international debt securities markets are usually non-bank financial intermediaries, such as pension funds, insurance companies, money market mutual funds, and hedge funds. The variation on the borrower side is even greater. International bond issuance by non-banks tends to be dominated by sovereigns and large non-financial corporations. The latter are also important players on the borrowing side of the cross-border bank loan market, which also channels funds to exporting and importing firms and leveraged non-bank financials. (See descriptive statistics in Table A1 in the Appendix). Countries differ greatly in their experiences, as illustrated in Graph 2 which shows the distributions across countries of shares of international debt securities in total inflows of loans and debt securities financing at each point in time. The median IDS shares rose for both OAEs and EMEs during the decade following the GFC, with the steepest increases for EMEs. By the 2020s, the median shares of IDS for EMEs caught up to those for the other advanced economies, although with greater variation across EMEs.

Graph 2: IDS Share in Global Liquidity, Split by Borrowing Country Group



Notes: The graph depicts the median share and the one standard deviation (SD) band of the (demeaned) share of International Debt Securities (IDS) in Aggregate Global Liquidity (AGL), while conditioning on the borrowing country group - Other Advanced Economies (OAE) versus Emerging Market Economies (EME).

3.2 Bank and NBFI characteristics

The balance sheets and business models of the financial intermediaries involved in these flows, important for shock sensitivities, have evolved post GFC. Following Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020), we construct the balance sheet characteristics of national banking systems using Fitch data. We obtain the balance sheet items of interest for the set of internationally active banks that report to the BIS consolidated banking statistics, and then aggregate bank-level characteristics to national banking system-wide variables, using total asset-weighted averages across the individual banks of a given nationality. In our benchmark empirical exercise, we focus on bank capitalisation, which is measured as the ratio of bank capital to total assets. The lending banking system capitalisation measure is converted into a borrowing country variable using weights based on bilateral

cross-border bank loan exposures obtained from the BIS CBS. That is, for each borrowing country j, we construct a weighted average of the capitalisation levels of the banks lending to country j in period t, where the weight of assigned to each lending national banking system is equal to its share total cross-border loans to country j in period t.

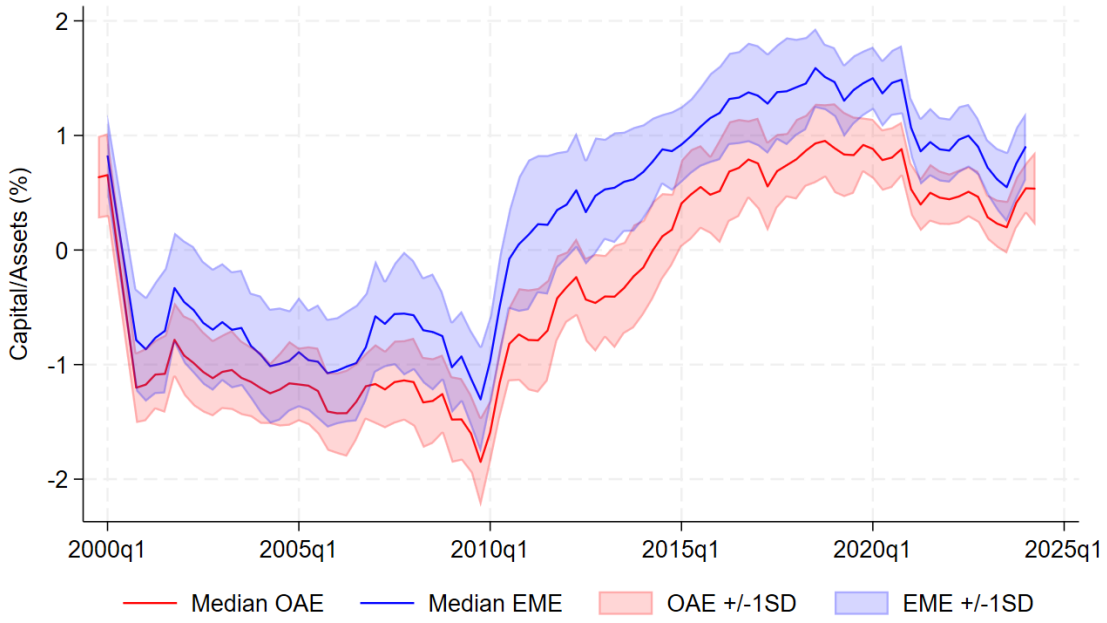
Measurement of relevant characteristics of the non-bank financial intermediaries (NBFIs) involved in international debt securities financing is subject to considerably greater data constraints. The NBFI sector covers a very wide and diverse set of institutions and no consistently defined NBFI health measures are readily available. That is why we take a an indirect approach to characterize the financial conditions of the institutions involved in international debt security markets. Our starting point is a set of NBFI classifications from the Financial Stability Board (2024), whereby institutions are classified according to their engagement in five economic functions . Countries participating in the FSB annual global NBFI monitoring exercise provide certain balance sheet values for each NBFI economic function (EF). Based on this, the FSB calculates a number of vulnerability metrics for each NBFI economic function. By country, each economic function receives a score from the FSB along various dimensions, including leverage, measured as the ratio of total financial assets to equity.[3]

We use the above (home country/EF-specific) NBFI leverage measures to obtain borrowing country-specific NBFI leverage measures using the following two-step procedure. First, for each home country i and period t, we construct a measure of NBFI leverage as a weighted average of the leverage of each NBFI EF, where the weight assigned to each EF is equal to that EF's share of total NBFI assets in country i in period t.[4] Second, for each borrowing country j, we construct a weighted average of the leverage of the NBFIs lending to country j in period t, where the weight of assigned to each NBFI lending (home) country i is equal to its share of country j's total external portfolio debt in period t (obtained using IMF Coordinated Portfolio Investment Survey (CPIS) data). While institution-level data on these NBFI characteristics are not available on a comparable cross-country basis, we utilise country-level FSB data in order to analyze aggregate patterns.

[3]Other dimensions include liquidity transformation, maturity transformation and credit intermediation. The formulas used by the FSB to calculate each vulnerability metric are listed in (Financial Stability Board, 2024).

[4]Constructing the NBFI shares at the home country level is important since there is considerable heterogeneity in the composition of NBFIs in each country (Financial Stability Board, 2024). Since not all reporting countries provide vulnerability metrics for all economic functions in each period, we backfill missing values of the raw metrics by using the respective value for the next period in which the metric is reported.

Graph 3: Lending Banks' (Demeaned) Capitalization Levels, Split by Borrowing Country Group



Notes: The graph depicts the median and the one standard deviation (SD) band of lending banks' (demeaned) capitalization levels, while conditioning on the borrowing country group - Other Advanced Economies (OAE) versus Emerging Market Economies (EME).

Lending banks' (demeaned) capitalisation levels display interesting variation patterns across borrowing country groups and over time (Graph 3). The capitalisation levels of banks financing OAEs tend to be lower than those providing financing to EMEs. The weighted mix of countries involved in EME bank lending is tilted toward banking systems with higher capitalisation levels. Banks' capitalisation levels expanded through 2020, while exhibiting some reversion in the post-pandemic period.

As with all NBFI sector-wide metrics, the overall variation in NBFI leverage should be interpreted with an extra degree of caution since the NBFI sector includes a very diverse set of institution, with a wide range of business models. More concretely, the overall evolution of our borrower-country specific NBFI leverage measure over time could be driven at least three factors: (i) the evolution of the underlying NBFI leverage measure for each NBFI type in each lending country, (ii) the evolution of the weight assigned to each NBFI type in each lending country, and (iii) the evolution of the weight assigned to each lending country in the calculation of the mea-

sure for each borrowing country. Thus, even if, from a borrowing country perspective, the overall lending NBFI leverage measure did not increase in a given period, this does not necessarily imply that overall NBFI leverage in the global financial system did not increase. For example, even if aggregate NBFI leveraged increased during a certain period, a given borrowing country's NBFI leverage metric may have still declined during that period if the weights (described in items (ii) and (iii) above) relevant for that borrowing country shifting in the direction of NBFI entities that tend to operate with low leverage.

It is also important to stress that the above NBFI leverage measure is intended to capture on-balance sheet financial leverage. Consequently, it does not capture off-balance sheet leverage and synthetic leverage. As discussed in Financial Stability Board (2023), these alternative forms of NBFI leverage have grown considerably in recent years and have important implications for the behavior of many NBFIs. For example, there could be significant spikes in required liquidity in stress periods. This could impair the ability and willingness of NBFIs to trade in markets and could even lead to fire sales, adding to strains in markets. Thus, synthetic and off-balance sheet leverage tend to increase the risk sensitivity credit intermediated by NBFIs. Consequently, the fact that they are not included in the NBFI leverage metric used in our econometric analysis should bias the results against finding a significant effect of NBFI leverage on the risks sensitivities of global liquidity flows. Therefore, finding a statistically significant effect even for the (on-balance sheet) NBFI leverage metric used in this paper should be interpreted as strong evidence for the importance of that NBFI financial health measure in explaining the evolution of the risk sensitivities of global liquidity flows.

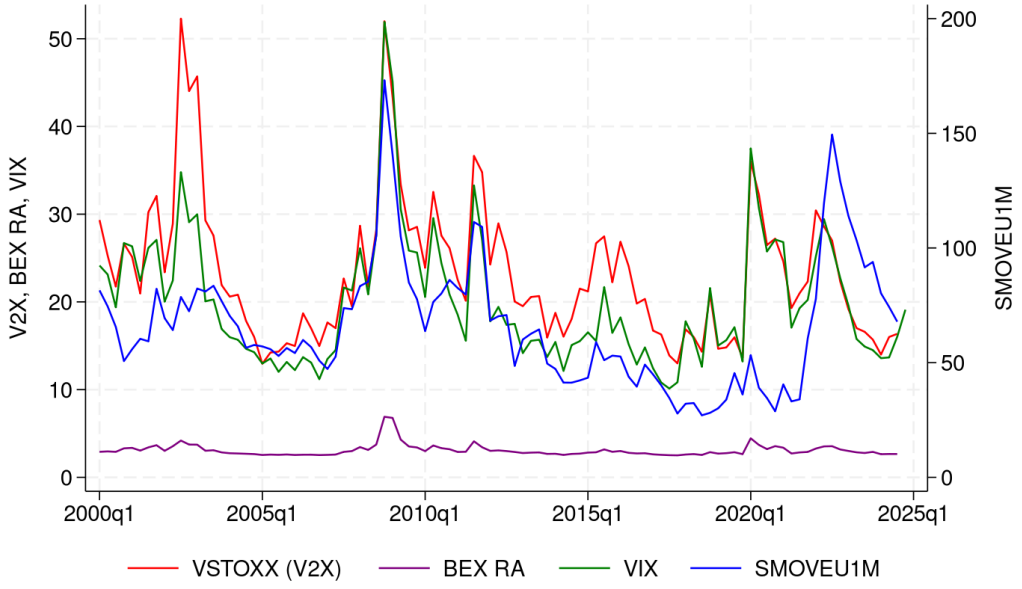
From an econometric perspective, it is important to note that there is substantially more variation in both the composition of NBFI lenders across OAEs and EMEs, and in the implied leverage of financiers as viewed from the borrower perspective. On average, the NBFIs providing international credit to EMEs tend to be more leveraged than those lending to OAEs. However, there is substantial overlap across NBFI financier leverage across borrower country groups.

3.3 Global and local factors

We capture changes in the stance of US monetary policy, a key global factor, using the Federal Funds rate or the shadow policy measure when relevant (Wu and Xia (2016) for Q1 2009 through Q4

2015 and Q3 2020 to Q2 2024). Following the broader literature, our baseline specifications proxy global risk conditions by the VIX index of the implied volatility in S&P500 stock index option prices from Chicago Board Options Exchange (CBOE). For robustness, we alternatively proxy risk conditions utilizing the distribution of realizations of the BEX RA measure of risk sentiment (Bekaert, Engstrom, and Xu, 2022), and the euro VSTOXX index and ICE BofAML Swap MOVE index both sourced from Bloomberg.[5] Albeit on a different scale, the VIX and BEX RA measures move most closely together, with strong overlaps of series peak dates (for example, top 25th and top 10th percentile observations). The VIX and MOVE series have a somewhat weaker comovement and have approximately a 30 percent overlap on which dates are in the top 25th and top 10th percentile of observations.

Graph 4: Alternative Measures of Risk Conditions



Notes: VSTOXX (V2X) denotes the EURO STOXX 50 index and SMOVEU1M denotes the ICE BofAML Swap MOVE Index. VSTOXX and SMOVEU1M are sourced from Bloomberg. VIX is sourced from Chicago Board Options Exchange (CBOE). BEX RA is the Risk Aversion Index and is sourced from Bekaert, Engstrom, and Xu (2022).

The baseline specifications represent local factors by including three borrowing country variables: local real GDP growth, sovereign ratings, and the degree of financial openness. For each

[5]These alternative risk indices are visualized in Graph 4.

borrowing country, the sovereign ratings variable is defined as the average ratings across the three major credit rating agencies (S&P, Moody's and Fitch). The degree of financial openness is captured by the Chinn-Ito index (Chinn and Ito, 2008), normalized between 0 and 1.

4 Global Liquidity Responses to Global Factors

We provide initial facts on global liquidity response to risk by first estimating a baseline model of the relationship between the main global liquidity components (cross-border loans and international debt securities) and both global factors and local (or borrowing country-specific) drivers:

$$GrRateY_t^j = \beta_1 \Delta USMP_t + \beta_2 X_t^j \Delta USMP_t + \beta_3 logVIX_t + \beta_4 X_t^j logVIX_t + \beta_5 \Delta logGlobalGDP_t + \beta_6 \Delta SovRating_t^j + \beta_7 ChinnIto_t^j + \beta_8 \Delta logGDP_t^j + \beta_9 X_t + \mu^j + \varepsilon_t^j \quad (1)$$

where j denotes borrowing country and t is time. As in Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020), this baseline specification considers the global liquidity flows and drivers from the perspective of the borrowing country. Global liquidity is divided by instrument (cross-border loans and international debt securities) and by borrower sector (banks and non-banks), with these components explored separately and in aggregate. Y_t^j can be cross-border loans (to all sectors, to banks, to non-banks) or international debt securities (issued by borrowers in all sectors, by banks, or by non-banks). Following standard practice, the model is expressed in stationary variables to avoid problems of spurious correlations. The international flows on the left-hand side of the equation are expressed in growth rates $GrRateY_t^j$. All specifications include country fixed effects μ^j.

The right-hand-side of the equation contains the change in the US monetary policy rate and the log VIX to measure global risk conditions. The variable $USMP_t$ is given by the US Federal Funds Rate in normal times and the Wu-Xia shadow rate measure during the zero lower bound post-GFC period. Specifications include as control variables the global GDP and local factors corresponding to borrowing country j and flow type. Local controls include sovereign credit ratings $SovRating_t^j$, the level of the Chinn-Ito index of financial openness $ChinnIto_t^j$ (Chinn and Ito, 2008) and local GDP growth $logGDP_t^j$. Sovereign ratings proxy the role of country risk and the perceived creditworthiness of borrowers by country. The Chinn-Ito index gauges the degree of capital account

openness. The Fed funds rate and the sovereign ratings are in first differences, while local and global GDP are in growth rates.

The model is estimated under the assumption that the two key global liquidity drivers, the Fed funds rate and the VIX, are exogenous when controlling for local and global GDP, sovereign ratings and degree of financial openness. Moreover, the sensitivities to the VIX are allowed to differ across various dimensions of heterogeneity. Baseline specifications allow for different sensitivities for the OAEs and EMEs. Subsumed within vector X_t^j, a significant coefficient on interaction terms containing an EME dummy implies statistically different EME sensitivities from those of OAEs. Results tables also report the implied total risk sensitivity for EMEs. When we depart from the baseline in the next sections, specifications introduce within X_t^j interactions the characteristics of types of (bank and non-bank) financial institutions intermediating global liquidity flows, with appropriately specified lag structures.

Baseline results: As a first step, the baseline specification in equation (1) is estimated over the full data sample (2000:Q1 – 2024:Q1), taking the perspective of quarterly flows into borrowing countries and sectors. The key estimated coefficients are in line with conventional priors. The estimated impacts of the US monetary policy and global risk conditions on the main global liquidity components are both negative and statistically significant for most borrowing country groups and sectors (Table 1). Tests of two dimensions of heterogeneity are included in this baseline, conducted across the dimensions of categories of global liquidity (CBL, IDS, sum of CBL and IDS) and of borrowing country sectors (banks and non-banks). Tighter US monetary policy is associated with lower growth in both cross-border bank loans and international bond issuance.

Similarly, during periods in which risk aversion (measured by the VIX) is higher, the growth rates of cross-border loans and international bond issuance tend to be lower. Using this baseline specification and for this full time frame, sensitivity comparisons for EMEs contrast with those for OAEs. Cross-border bank loans' sensitivity to risk for all sectors does not differ significantly for OAEs and EMEs. By contrast, the financing of international debt securities and aggregate global liquidity is considerably more risk sensitive for EMEs than for the issuance done by OAE borrowers.

Table 1: Sensitivities to global risk and US monetary policy

	Cross Border Loans			International Debt Securities			Global Liquidity		
	(1) all sectors	(2) to banks	(3) to non-banks	(4) all borrowers	(5) to banks	(6) to non-banks	(7) all sectors	(8) to banks	(9) to non-banks
Log(VIX)	-1.60***	0.59	-3.56***	-0.56	-0.50	-0.29	-1.33***	0.87	-1.70***
	(0.61)	(0.91)	(0.63)	(0.61)	(1.07)	(0.64)	(0.49)	(0.80)	(0.47)
Log(VIX) * EME	-0.85	-2.99**	1.26	-2.76***	-4.65***	-2.65***	-1.48**	-3.64***	-0.80
	(0.79)	(1.23)	(0.79)	(0.76)	(1.45)	(0.81)	(0.61)	(1.10)	(0.59)
US MP	-0.40	0.44	-1.53***	-1.19***	-0.58	-1.59***	-0.79***	0.11	-1.75***
	(0.39)	(0.63)	(0.39)	(0.39)	(0.65)	(0.43)	(0.30)	(0.52)	(0.30)
US MP * EME	-1.04*	-1.66*	0.15	-0.0023	-0.85	0.59	-0.68*	-1.42*	0.46
	(0.53)	(0.85)	(0.53)	(0.50)	(0.91)	(0.53)	(0.39)	(0.74)	(0.39)
Log(VIX) + Log(VIX) * EME	-2.45***	-2.40***	-2.29***	-3.32***	-5.16***	-2.95***	-2.81***	-2.77***	-2.50***
	(0.54)	(0.89)	(0.53)	(0.48)	(1.06)	(0.52)	(0.39)	(0.81)	(0.39)
US MP + US MP * EME	-1.44***	-1.22**	-1.39***	-1.19***	-1.43**	-0.99***	-1.47***	-1.31**	-1.29***
	(0.37)	(0.58)	(0.37)	(0.31)	(0.64)	(0.32)	(0.26)	(0.54)	(0.25)
Observations	5,088	5,088	5,088	5,101	4,632	5,100	5,101	5,100	5,101
R^2	0.050	0.045	0.034	0.047	0.039	0.044	0.050	0.042	0.044

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over 2000:Q1 - 2024:Q1. US MP is given by the Federal Fund Rate and by the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4. The regressions include ΔReal Global GDP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Local factors are also significant determinants of global liquidity flows to both OAE and EME borrowers. Higher borrowing countries' GDP growth rates attract stronger global liquidity flows. Similarly, there is a positive link between a borrowing country's degree of financial openness (captured by the Chinn-Ito index) and global liquidity flows. Lastly, better sovereign credit ratings also have a positive impact on global liquidity flows, highlighting the importance of borrowing countries' fiscal positions as drivers of global liquidity flows. Relatedly, monetary policy and central bank credibility in the borrowing country have also been found to be important determinants of cross-border financial flows (Burger and Warnock, 2007; Burger, Warnock, and Warnock, 2012; Koepke, 2019).

Time variation: Using the baseline specification, we next document heterogeneity in risk sensitivities along the time dimension. Following the approach of Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020), the coefficients in the benchmark specification are subject to a structural break.[6] Tests confirm that the break date for both main global liquidity components (cross-border loan flows and international bond flows) is 2009:Q1. We proceed by investigating the post-GFC evolution of the key sensitivities to global risk by sequentially estimating equation (1) with a break in 2009:Q1, starting with data for 2000:Q1 – 2013:Q1 to reflect risk sensitivity differences in the early post GFC period (up until the 2013 Fed Taper Tantrum), and then add one quarter at time until we reach the full sample period (2000:Q1 – 2024:Q1). This procedure generates a distinct set of parameter estimates for each possible post-GFC time window that has an end-quarter from 2013:Q1 to the sample period end (2024:Q1).

Estimated sensitivities to the VIX for the EME and OAE borrowers (without distinguishing the sector being funded) during the three key time windows are provided in Table 2. These results show that EME sensitivities to risk have historically been stronger than those for OAEs, and that the post GFC period is characterized by risk sensitivities concentrated in IDS and EMEs.

[6] Rather than exogenously imposing an ad-hoc break date, we test for its presence and exact timing endogenously, using the tools developed in Bai (1994), Bai (1997), Kurozumi (2002) and Carrion-i Silvestre and Sansó (2006).

Table 2: Evolution of global risk sensitivities over time

	Pre-GFC		
	(1) CBL	(2) IDS	(3) AGL
Pre Log(VIX)	-3.92***	0.11	-2.56***
	(1.12)	(1.27)	(0.81)
Pre Log(VIX) * EME	-0.85	-4.24***	-1.76*
	(1.37)	(1.47)	(1.00)
Pre Log(VIX) + Log(VIX) * EME	-4.77***	-4.13***	-4.32***
	(1.14)	(1.05)	(0.81)
R^2	0.20	0.098	0.22
Observations	2,785	2,785	2,785
	Post-GFC Until 2013		
Post Log(VIX)	-4.11***	-0.91	-3.84***
	(1.32)	(1.68)	(1.03)
Post Log(VIX) * EME	1.63	-4.35**	0.58
	(1.62)	(1.75)	(1.19)
Post Log(VIX) + Log(VIX) * EME	-2.47*	-5.26***	-3.26***
	(1.35)	(1.39)	(0.97)
R^2	0.20	0.098	0.22
Observations	2,785	2,785	2,785
	Post-GFC Until 2024		
Log(VIX)	-0.95	0.38	-0.63
	(0.74)	(0.73)	(0.57)
Log(VIX) * EME	0.89	-2.84***	-0.11
	(0.95)	(0.92)	(0.71)
Log(VIX) + Log(VIX) * EME	-0.06	-2.47***	-0.74
	(0.64)	(0.62)	(0.47)
R^2	0.13	0.084	0.16
Observations	5,088	5,101	5,101

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. The regressions include ΔReal Global GDP, US MP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate and by the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4. The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Elaborating on time variation results, Graph 5a and Graph 5b plot the estimated sensitivities to global risk, with a breakdown by instrument (loans and bonds), by borrowing country group (OAE and EME) and by borrowing sector (all sectors, banks, non-banks). These visualizations respective pertain to other advanced economies (Graph 5a) and of emerging market economies as borrowers (Graph 5b) experiencing risk sensitivity in components of global liquidity. Within each panel, the solid purple line is the corresponding sensitivity to risk in the pre-GFC period. The blue lines show the quarter-by-quarter expanding window estimated risk sensitivity and red and green lines the upper and lower edges of a one standard deviation interval for these estimates.

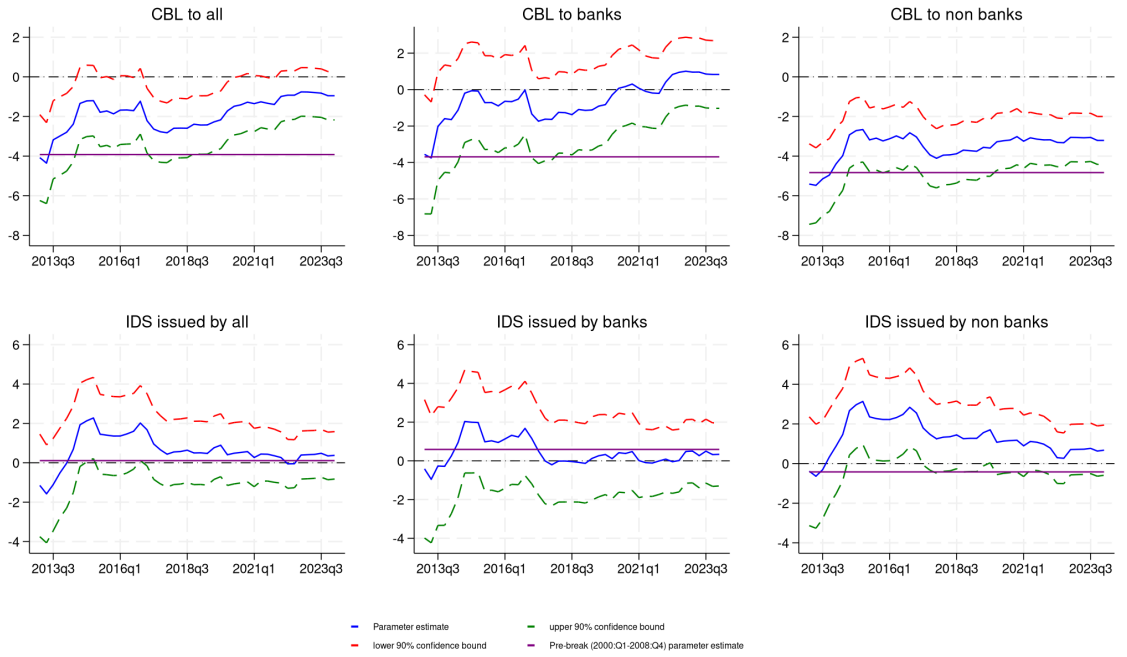
The upper panels of Graph 5a and Graph 5b show that overall sensitivities to risk of cross-border bank loans are smaller in magnitude in the post-GFC period, compared with pre-GFC. For advanced economies, this reduced sensitivity was particularly strong for inter-bank lending. Indeed, this type of risk response became insignificantly different from zero. A similar dynamic pattern for interbank lending applies to EMEs, with the pre-GFC risk sensitivity that was even stronger than for OAEs. EMEs experienced a starker decline in the risk sensitivity of cross-border lending to non-bank borrowers.

Our prior research had already emphasized that the sensitivity of cross-border bank lending to global risk aversion declined dramatically after the GFC, with sharply moderated credit supply contractions in the context of elevated risk conditions (Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020). The results presented in Table 2 and Graph 5a-5b inform the heterogeneity of these developments. For both OAE and EME borrowers, the estimated impact of the VIX on CBL, which was negative and strongly statistically significant before the GFC, declined considerably during the post-GFC period and lost its statistical significance.

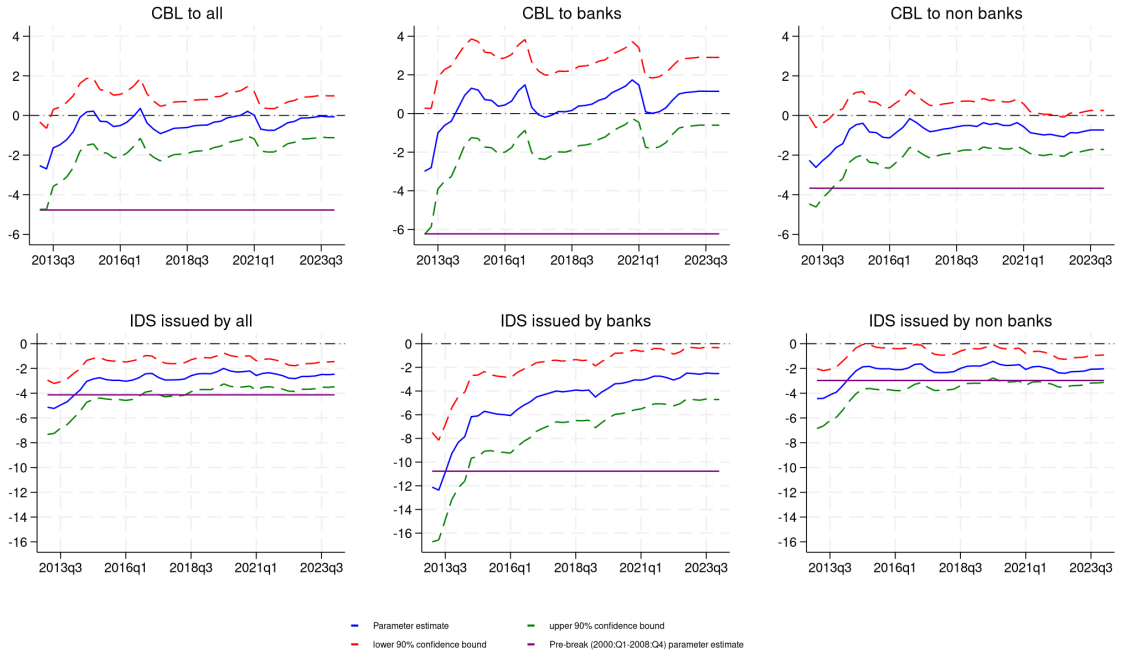
The above reductions in sensitivities are quantitatively relevant. The impact of a 1 per cent increase in the VIX on cross-border loans declined from 4 per cent (before the GFC) to 1 per cent (after the GFC) for OAE borrowers and from 5 per cent to 0 per cent for EME borrowers.

Graph 5: Post-break sensitivities to log (VIX), evolution over time

(a) Other Advanced Economies (excluding safe havens)



(b) Emerging Market Economies



Notes: The graph shows the evolution over time of sensitivities to the log (VIX) for borrowers using recursive estimations of equation 1. For each quarter t, the charts show the post-break coefficient (and its 90% confidence interval) obtained by estimating the model with a sample from 2000:Q1 up to quarter t, with a break in 2009:Q1. The purple line in each panel represents the pre-break estimate of the sensitivity to VIX. Sources: authors' calculations.

The lower panels of these exhibits show the time variation in estimated risk sensitivities of IDS for OAEs (Graph 5a) and for EMEs (Graph 5b). These results sharply contrast sharply with patterns for cross-border loans. The estimated impact of the VIX on the sensitivity of international debt securities issued by residents of OAE remained statistically insignificant throughout the entire sample period (both before and after the GFC). Meanwhile, the global risk sensitivity of IDS issued by EME borrowers remained negative and statistically significant before and after the GFC.The impact of global risk aversion on international bond issuance by EME borrowers briefly went from 4 per cent pre-crisis to 5 per cent in the immediate aftermath of the GFC, and then reverted to 2.5 per cent after the 2013 Fed Taper tantrum. By contrast, the respective global risk sensitivity for OAE international bond issuers remained statistically insignificant throughout the entire sample.

5 Drivers of fluctuations in global risk sensitivities

We next provide evidence on possible drivers of time variation in risk sensitivities of global liquidity flows. *Conjecture 1* posited that the composition of the financial institutions supplying global liquidity flows matters for risk sensitivity of these flows to the extent that the balance sheet constraints faced by these institutions bind risk-taking. The risk sensitivity of funding flows should be stronger (more negative) when funding is (in aggregate) provided by financial intermediaries that face tighter capital and leverage constraints. The scope of our empirical investigation is broader than that in the existing literature, which focused solely on cross-border bank lending and only on bank capital (Avdjiev, Gambacorta, Goldberg, and Schiaffi, 2020), without distinguishing borrowers in safe havens from borrowers in other advanced economies and emerging markets, and without conditioning on the borrowing sector and on the relative importance of international debt securities. Accordingly, the results we provide considerably expand the evidence relevant for understanding the drivers of the variation in the global risk sensitivities of the main global liquidity components.

Recall also that *Conjecture 2* posits that risk migration, taking the form of activity shifting and movement of riskier borrowers from CBL to IDS markets is associated with lower risk sensitivity of aggregate global liquidity. The post-GFC strengthening of global bank regulatory standards increased banks' marginal costs of holding riskier assets. This should, all else the same, generate migration of riskier borrowers to IDS markets, where the main suppliers of funding (NBFIs) did not

face a similar post-GFC regulatory tightening. The migration of risky borrowers from CBL to IDS markets when bank capital constraints are tighter should have affected the marginal risk sensitivities of both CBL and IDS flows. The post-GFC decline in the average riskiness of bank borrowers should have led to a fall in the global risk sensitivity of cross-border bank loans. Meanwhile, the global risk sensitivity of IDS flows could have also declined, if the risk sensitivity of the international credit activity that migrated from CBL to IDS markets was lower than the average (pre-migration) global risk sensitivity of IDS flows. Meanwhile, changes in business models of NBFIs involved in such flows could alter the constraints on the overall balance sheets, with an additional effect on risk sensitivity.

We test these conjectures by estimating a modified version of the baseline regressions in which global risk aversion is interacted with measures of the financial health of the two main types of financial intermediaries (banks and NBFIs) supplying global liquidity and include a risk migration proxy. These metrics are associated with the lending institutions and viewed from the vantage point of the composition of foreign financiers for each borrowing country and sector at each point in time. Banking sector constraints are proxied by the (lagged) capitalization levels of the lending national banking systems. NBFIs constraints are proxied by the (lagged) levels of leverage for that sector. For each borrowing jurisdiction, we use a weighted average of the financial health metric, where the weight assigned to each lending financial system for each borrowing country is equal to the lending system's share of cross-border financing to that borrowing country. The health measures enter the regressions in deviations from their respective sample means. For each borrowing country j and time period t, we proxy risk migration from CBL to IDS markets by the IDS share of aggregate global liquidity, constructed as: $IDSshare_t^j = IDS_t^j/(IDS_t^j + CBL_t^j)$. A borrowing country-specific vector H_t^j consists of the above (bank and NBFI) financial health metrics and the IDS share. H_t^j is inserted in our specifications as a standalone term and as an interaction with the VIX, as shown in Equation 2.

$$GrRateY_t^j = \beta_1 \Delta USMP_t + \beta_2 logVIX_t + \beta_3 H_t^j + \beta_4 logVIX_t * H_t^j + \beta_5 \Delta logGlobalGDP_t + \beta_6 \Delta SovRating_t^j + \beta_7 ChinnIto_t^j + \beta_8 \Delta logGDP_t^j + \beta_9 X_t + \mu^j \quad (2)$$

Table 3 provides the empirical results for the cross-border bank lending, distinguishing All Bor-

rowing Countries, Other Advanced Economies, and Emerging Market Economies. Covering the full time frame from 2000Q1 through 2024Q1, and 61 borrowing countries overall, cross-border lending is consistently depressed when risk conditions are adverse. Bank capital is a robust driver, with higher capitalization rates for sources of funds associated with consistently lower risk sensitivities. This is in line with our conjectures and with the findings of Avdjiev, Gambacorta, Goldberg, and Schiaffi (2020). Intuitively, bank capital acts as a buffer against shocks and can dampen the impact of spikes in global risk aversion on bank lending, in general, and on the cross-border bank loan origination in particular (Gambacorta and Shin, 2018). Activity migration to IDS also consistently reduces the risk sensitivity of cross-border bank lending, in line with *Conjecture 2*.

The effects of bank capitalization and risk migration are not only statistically significant but also economically meaningful. The estimated coefficients (on the standalone VIX term and on the interaction term between the VIX and bank capitalization) for the specification over all borrowers (Table 3, Column 3) imply that increasing the capitalization levels of lending banks by one standard deviation would more than fully offset the negative impact of global risk on cross-border bank lending. Meanwhile, a one-standard deviation increase in the IDS share reduces the global risk sensitivities of CBL flows by roughly one half. Furthermore, including the IDS share as risk migration proxy in the regression considerably enhances its overall fit.[7]

We also estimate borrower sector-specific versions of the above specifications (Table B1 and Table B2). The same patterns of statistical significance arise for bank and nonbank borrowing sectors as for the aggregates presented in Table 3. Both bank capitalization and IDS share deliver quantitatively and qualitatively stronger risk-stabilization effects for bank borrowers than for non-bank borrowers.

[7]For example, in the regressions for all borrowing countries the R2 goes from 8.4% to 9.9%.

Table 3: Impact of bank health metrics on global risk sensitivity of cross border loans

	All Borrowing Countries			Other Advanced Economies			Emerging Market Economies		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(VIX)	-2.22***	-2.55***	-2.28***	-0.59	-2.89***	-0.72	-3.15***	-2.32***	-2.92***
	(0.46)	(0.40)	(0.40)	(0.86)	(0.58)	(0.75)	(0.50)	(0.55)	(0.46)
Log(VIX) * Bank Capital	3.21***		3.12***	4.57***		4.60***	2.65***		2.51***
	(0.38)		(0.40)	(0.59)		(0.67)	(0.44)		(0.43)
Log(VIX) * IDS Share		1.96***	1.11**		1.42*	-0.29		2.05***	1.22**
		(0.49)	(0.44)		(0.73)	(0.68)		(0.59)	(0.51)
Observations	4,705	4,800	4,705	2,187	2,233	2,187	2,518	2,567	2,518
R^2	0.084	0.075	0.099	0.107	0.087	0.126	0.086	0.079	0.096

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table 4 investigates the drivers of the time variation in the global risk sensitivities of international debt securities. The interaction term between NBFI leverage and the VIX has a negative and statistically significant coefficient in the regression specifications estimated on the sample of all borrowing countries. This suggests that higher NBFI leverage amplifies the sensitivity of international debt securities to global risk - results that are consistent with *Conjecture 1* and complementary to the bank capital results (Table 3). Since highly leveraged NBFIs have smaller buffers against contingencies triggered by shocks, their IDS holdings are more sensitive to fluctuations in global risk aversion. The corresponding coefficients estimated for the two main borrowing country groups are also negative. Estimates are statistically significant for other advanced economies but noisier for EMEs. Meanwhile, our proxy for risk migration (the interaction term between the VIX and the IDS share) is once again positive and significant for the benchmark sample of all borrowing countries. This provides further evidence in support of *Conjecture 2*. This interaction term is positive and statistically significant for EMEs, but not significant for OAE borrowers. Additional borrowing sector-specific regressions reveal that the above results appear to be driven by non-bank borrowers (Table B3 and Table B4).

The economic magnitudes of the coefficients presented in Table 4 are substantial. Results for the full sample (Column 3) suggest that the global risk sensitivity of IDS flows to a country whose NBFI lenders have leverage one standard deviation below the global mean would be less than half of the respective sensitivity for the average country in our benchmark sample. Moreover, a one-standard deviation increase in the IDS share is associated with a 70% reduction in the global risk sensitivity of IDS flows.

Table 4: Impact of NBFI health metrics on global risk sensitivity of international debt securities

	All Borrowing Countries			Other Advanced Economies			Emerging Market Economies		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(VIX)	-2.21***	-2.26***	-2.50***	-1.84**	-0.69	-1.92**	-3.29***	-3.39***	-3.25***
	(0.51)	(0.59)	(0.56)	(0.66)	(1.08)	(0.91)	(0.74)	(0.59)	(0.68)
Log(VIX) * NBFI Leverage	-1.51***		-1.38**	-2.16**		-2.10**	-0.44		-0.53
	(0.52)		(0.58)	(0.83)		(0.87)	(0.63)		(0.56)
Log(VIX) * IDS Share		1.50**	1.74**		-0.25	0.38		2.18***	2.43**
		(0.65)	(0.70)		(0.93)	(0.98)		(0.79)	(1.01)
Observations	3,163	4,812	3,163	1,556	2,240	1,556	1,607	2,572	1,607
R^2	0.069	0.048	0.074	0.072	0.045	0.072	0.066	0.070	0.077

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Next, we examine the effect of each of the above characteristics on the risk sensitivity of aggregate global liquidity flows. Table 5 reports the distinction between OAE and EME country groupings, while the analysis for all borrowing countries is reported in Table A4 in the Appendix. The results from this exercise are consistent with those from Table 3 and Table 4 as well as with our main conjectures. In line with their respective effects on the main global liquidity components (CBL and IDS), higher bank capital and lower NBFI leverage dampen the sensitivity of aggregate global liquidity flows to global risk conditions. These results are fully in line with *Conjecture 1*. Moreover, a greater IDS share is associated with lower global risk sensitivities of AGL flows. This set of results provides even stronger evidence in support of *Conjecture 2*. The compositional effects (associated with the migration of borrowers with certain risk profiles from CBL to IDS markets) driving this conjecture are not only present, but also strong enough to dominate the mechanical effect of IDS flows (which tend to be more risk sensitive than CBL flows, at least in the post-GFC period) getting a greater weight as the IDS share rises. These findings also are consistent at the level of sectoral breakdowns (Table B5 and Table B6).

The results presented in Table 5 are quantitatively similar to those presented in Table 3 and Table 4. Increasing the capitalization levels of lending banks by one standard deviation would more than fully offset the negative impact of global risk on AGL flows to OAE borrowers and would decrease the respective impact on EME borrowers by roughly two thirds. Meanwhile, decreasing the NBFI leverage by one standard deviation reduces the global risk sensitivity of AGL flows by 60% for OAE borrowers and by 30% for EME borrowers. Finally, a one-standard deviation increase in the IDS share reduces the global risk sensitivities of AGL flows by 25% for OAE borrowers and by 20% for EME borrowers.

Table 5: Impact of bank and NBFI health metrics on global risk sensitivity of aggregate global liquidity

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(VIX)	-1.01*	-2.67***	-2.26***	-2.39***	-2.47***	-3.43***	-1.65***	-3.61***	-2.76***	-3.50***
	(0.58)	(0.59)	(0.49)	(0.69)	(0.49)	(0.39)	(0.57)	(0.46)	(0.43)	(0.45)
Log(VIX) * Bank Capital	3.70***		3.05***		2.90***	2.16***		2.54***		2.33***
	(0.45)		(0.48)		(0.50)	(0.37)		(0.51)		(0.41)
Log(VIX) * NBFI Leverage		-2.58***	-1.59***		-1.55***		-1.51***	-1.02**		-1.07**
		(0.44)	(0.46)		(0.50)		(0.47)	(0.45)		(0.42)
Log(VIX) * IDS Share				1.78**	0.59				1.86***	0.72
				(0.78)	(0.58)				(0.57)	(0.64)
Observations	2,194	1,556	1,556	2,240	1,556	2,523	1,607	1,607	2,572	1,607
R^2	0.144	0.079	0.101	0.081	0.102	0.091	0.080	0.103	0.079	0.104

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

There is evidence in the existing literature suggesting that the risk shifting we have documented could be linked to regulatory arbitrage. Houston, Lin, and Ma (2012) find that banks may circumvent domestic activity restrictions and stringency of capital regulation and take excessive risks by increasing funding flows to locations with weaker regulations, identified after controlling for economic legal and institutional factors. Frame, Mihov, and Sanz (2020) identify more banking subsidiary use in countries with weaker regulation. When acquisitions occur across borders, acquiring banks tend to be from countries with stronger levels of regulation than the acquired banks. On the lending side, Demirgüç-Kunt, Horváth, and Huizinga (2023) find that banks are less likely to originate a loan in a country with more stringent capital regulation, conditional on originating a loan.[8] These effects are stronger for weakly capitalized banks and for riskier borrowers. Loan location choice trades off weaker regulation and more efficient information acquisition.

6 Robustness checks and additional exercises

We check the robustness of our results in several ways. First, we consider whether the core results generated using the VIX are robust to using three alternative indicators of risk. Second, as our baseline specifications use a measure of US monetary policy that is constructed by combining the Federal Funds rate with the Wu-Xia shadow rate during zero lower bound periods, we compute alternative results using the Wu-Xia for the full sample period. A third category of robustness tests is an alternative specification for introducing bank capitalization, NBFI leverage, and international debt securities share (IDS share) into regression specifications, so that in this new specification, IDS share interacts with these variables.

Finally, in addition to the above robustness checks, we also conduct one more auxiliary empirical exercise. Namely, we examine the effect of splitting particularly high or extreme risk periods from the business as usual values of risk, since extreme risk and crisis period considerations are identified in other research studies as having particular dynamics.

[8] Results are based on analysis of micro-data on syndicated loan origination and the international subsidiary level of multinational banking groups, covering 10 source countries and for 1999-2014.

6.1 Alternative risk measures

While our baseline specifications proxy global risk conditions by the VIX index of the implied volatility in S&P500 stock index option prices, the robustness checks utilize respectively the BEX RA measure of risk sentiment (Bekaert, Engstrom, and Xu, 2022), the euro VSTOXX index, and MOVE index. We re-estimate the regressions presented in Table 1 (baseline) and Table 5, on financial institution health metrics as contributors to global risk sensitivity. Tables of robustness results are provided in Appendix C. Table C11 provides the correlation among these alternative risk measures. Table C12 provides an illustration of differences across risk series by summarizing the top 10% dates of each risk metric over time.

Regression tables using the alternative measures of global risk all reproduce the main findings that the effect of global risk conditions on the main global liquidity components are both negative and statistically significant for most borrowing country groups and sectors, albeit with some differences in patterns of statistical significance. Across risk measures the finding is robust that the sensitivity of liquidity flows to global risk tends to be higher for EME borrowers, with some differences for loans and bonds across the different risk measures (Table C1, Table C2, and Table C3). For both OAEs and EMEs, results are consistent across risk proxies in the sensitivity of CBL to global risk, which continue to show important roles for bank capitalization, NBFI leverage and the IDS share (Table C4, Table C5, and Table C6).

6.2 Alternative monetary policy measure

We also test the robustness of our main results to an alternative measure of the US monetary policy variable. More concretely, we re-estimate all specifications reported in our key results tables (Table 1 and Table 5) while using the Wu-Xia shadow rate for the full sample period, in lieu of using it only during zero lower bound periods. Using this alternative measure of US monetary policy does not influence significantly the sign or significance patterns of risk sensitivity along any of the dimensions of heterogeneity that we examine (Table C7 and Table C8).

6.3 Alternative specification using IDS Share

The baseline specifications introduced the share of financing accounted for by international debt securities as a stand-alone term and in an interaction term with the VIX. We interpret this as a separate risk migration proxy. However, an alternative specification could treat the actual effects of bank capital and of NBFI leverage on VIX sensitivities as changing over time as the importance of NBFIs versus banks evolves. In this case, IDS would interact with these sensitivities, beyond the direct additive effects. Accordingly, triple interaction terms enter the regression specifications. Our alternative regression specifications show that these triple interaction terms generally are not statistically significant for risk sensitivities in cross-border loans and that our key results are robust to their inclusion in all specifications.[9]

6.4 Business as usual versus high stress periods

As a final exercise, we explore whether the risk sensitivity results are driven primarily by the extreme risk periods, or if these sensitivity evolutions likewise characterize more business-as-usual values of the VIX index. Prior research by Chari (2023), Chari, Dilts Stedman, and Lundblad (2021, 2022), and Forbes and Warnock (2012, 2021) stresses that risk responses and flow dynamics are fundamentally different in high-risk periods compared with times characterized as business-as-usual. Accordingly, we test the robustness of our main results about risk sensitivity to including or excluding the most extreme values of the VIX (top 10th percentile) from the regression specifications.

Many of the key coefficients retain their sign and statistical significance during business-as-usual periods. Nevertheless, baseline regression results show a few interesting differences in global liquidity risk sensitivities when the results over the full sample of observations are compared with results excluding extreme stress periods as indicated by high VIX (compare Table 1 with Table C9). For other advanced economies, risk sensitivities tend to be quantitatively weaker outside of the high stress periods. Moreover, some categories of flows to OAE borrowers show weakly positive coefficients on risk sensitivity - for example cross-border loans to banks and IDS flows to non-banks. By contrast, the global risk sensitivities of flows to EMEs are smaller when peak VIX

[9] The results for these robustness specifications are available from the authors upon request.

periods are excluded, but qualitatively similar to those estimated in the full-sample regressions. Another interesting finding is that, for EMEs, the moderating effects on risk sensitivities of higher funding bank capitalization and lower NBFI leverage appear to be statistically important only when high stress periods are included in the estimation (based on comparing the results in Table 5 with those in Table C10).

7 Conclusions

Risk conditions are a key global factor driving patterns in international financial flows. This paper has documented heterogeneities in sensitivities of global liquidity to risk from the perspective of countries with a different level of development and institutional design. We first separate the so-called "safe haven" countries - those that receive positive international capital flow pressures when risk is elevated - from other advanced economies, and instead focus our analytics on the comparison between Other Advanced Economies and Emerging Market Economies. We provide evidence that risk sensitivities differ for cross-border loans versus international bonds, across borrowing country groups (OAE vs EME), and by banking sector versus non-bank private sector borrowers. Balance sheet constraints originating in funding source countries are important for financial flow sensitivities to risk of destination countries, pointing to the prevalence of financial frictions. Moreover, balance sheet constraints apply to both bank and non-bank financial firms involved in sourcing global liquidity. Higher capitalization rates of banks and lower leverage levels of non-bank financial institutions are associated with lower risk sensitivities of global liquidity.

We also provide evidence that the migration of risk between the two main global liquidity components - cross-border loans and international debt securities - has two effects on the risk sensitivity of aggregate global liquidity flows. The first effect is compositional. If banks become less willing to extend loans to risky borrowers, the cross-border lending sensitivity to global risk should decline since the average riskiness of bank borrowers would fall. Furthermore, the global risk sensitivity of international debt funding should also decline, if the risk sensitivity of the credit flows that migrated from cross-border loans to international debt securities markets is lower than the respective sensitivity of pre-existing IDS flows. The second effect is mechanical. Borrower migration from banks to debt markets should mechanically increase the sensitivity of aggregate

flows to global risk if international debt securities flows have greater risk sensitivity than cross-border loan flows. We document that since the first (compositional) effect dominates the second (mechanical) effect, an increase in international debt securities share is associated with a fall in the risk sensitivities of aggregate global liquidity flows.

Our results shed light on why the risk sensitivities for the main global liquidity components diverged starkly since the Global Financial Crisis. The sensitivity of cross-border bank loans to global risk shifted from being significantly negative before the crisis to becoming statistically insignificant afterwards. By contrast, the global risk sensitivity of international debt securities issued by emerging market borrowers remained considerably elevated before and after the crisis, while the risk sensitivity of debt securities issued by other advanced economy borrowers stayed insignificant.

Finally, our evidence shows that the post-GFC shifts in the composition of the main global liquidity components (cross-border loans and international bonds), as well as the fluctuations in their respective sensitivities to global risk, are related to the tightness of the balance sheet constraints they face and to the migration of risky borrowers across funding sources. These changes occurred against the backdrop of the still relatively loose regulatory framework for non-bank financial institutions.

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Appendix

A Country Lists

Borrowing countries (61)

Argentina (AR), Australia (AU), Austria (AT), Belgium (BE), Brazil (BR), Bulgaria (BG), Canada (CA), Chile (CL), China (CN), Colombia (CO), Croatia (HR), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hong Kong SAR (HK), Hungary (HU), Iceland (IS), India (IN), Indonesia (ID), Ireland (IE), Israel (IL), Italy (IT), Korea (KR), Kuwait (KW), Latvia (LV), Lebanon (LB), Lithuania (LT), Luxembourg (LU), Malaysia (MY), Malta (MT), Mexico (MX), Mongolia (MN), Netherlands (NL), New Zealand (NZ), Nigeria (NG), Norway (NO), Peru (PE), Philippines (PH), Poland (PL), Portugal (PT), Romania (RO), Russia (RU), Saudi Arabia (SA), Serbia (RS), Singapore (SG), Slovakia (SK), Slovenia (SI), South Africa (ZA), Spain (ES), Sweden (SE), Taiwan (TW), Thailand (TH), Turkey (TR), Ukraine (UA), United Kingdom (GB), Uruguay (UY), Vietnam (VN).

CBS lending bank nationalities (31)

Australia (AU), Austria (AT), Belgium (BE), Brazil (BR), Canada (CA), Chile (CL), Denmark (DK), Finland (FI), France (FR), Germany (DE), Greece (GR), Hong Kong SAR (HK), India (IN), Ireland (IE), Italy (IT), Japan (JP), Korea (KR), Luxembourg (LU), Mexico (MX), Netherlands (NL), Norway (NO), Panama (PA), Portugal (PT), Singapore (SG), Spain (ES), Sweden (SE), Switzerland (CH), Taiwan (TW), Turkey (TR), United Kingdom (GB), United States (US).

Table A1: Descriptive Statistics of Global Liquidity and Institutions

	Other Advanced Economies					Emerging Market Economies				
	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max	Obs
IDS (Total)	2.88	13.86	-80.51	373.56	2,522	3.27	15.34	-76.47	323.87	3,227
IDS (Banks)	5.80	74.26	-62.65	3,191.63	2,232	7.54	1,333.86	-100.00	6,783.48	2,912
IDS (Nonbanks)	2.97	17.15	-80.51	458.00	2,522	3.66	30.94	-82.71	1,500.00	3,302
CBL (Total)	1.65	9.53	-75.79	76.87	2,496	2.04	12.18	-87.88	212.50	3,332
CBL (Banks)	2.07	14.14	-92.63	133.77	2,496	2.96	27.38	-72.75	1,100.00	3,323
CBL (Nonbanks)	1.96	11.26	-54.92	176.94	2,496	2.35	13.23	-51.02	285.21	3,332
Bank Capital Ratio	4.92	0.98	3.61	6.88	2,496	5.46	1.08	2.27	8.37	3,333
NBFI Leverage	2.04	0.64	1.12	4.46	1,744	2.55	0.83	1.12	5.46	1,884
IDS Share	51.46	19.57	0.73	93.21	2,583	44.10	22.90	0.00	90.63	3,359
GDP Growth (GDP)	2.25	4.10	-21.94	28.10	2,497	3.67	5.43	-40.30	88.01	2,877
Ratings (Demeaned)	0.00	0.25	-4.67	1.19	2,442	0.02	0.27	-3.68	3.83	3,223
Capital Openness	0.93	0.16	0.16	1.00	2,343	0.58	0.32	0.00	1.00	3,119
US MP (Demeaned)	0.00	0.51	-1.73	1.46	2,522	0.00	0.51	-1.73	1.46	3,368
Log(VIX)	2.93	0.33	2.31	3.95	2,610	2.94	0.33	2.31	3.95	3,368
Global GDP	3.48	2.29	-8.63	13.30	2,522	3.47	2.29	-8.63	13.30	3,368
Bank Capital Ratio (Demeaned)	-0.27	0.92	-2.40	1.67	2,532	0.21	1.01	-2.73	2.93	3,295
NBFI Leverage (Demeaned)	-0.35	0.82	-1.53	2.79	1,744	0.32	1.08	-1.54	4.08	1,884
IDS Ratio (Demeaned)	0.24	0.89	-2.05	2.13	2,583	-0.09	1.04	-2.09	2.01	3,359

Notes: International debt securities (IDS) cross-border loans (CBL) are growth rates. The respective bank and NBFI health metrics, bank capital ratio and NBFI leverage are both reported in levels. Borrower types are specified in parentheses.

Table A2: Classification of Non-Bank Financial Intermediation by Economic Functions (EFs)

Economic function	**Definition**	**Typical entity types**
EF1	Management of collective investment vehicles with features that make them susceptible to runs	MMFs, fixed income funds, mixed funds, credit hedge funds, real estate funds
EF2	Loan provision that is dependent on short-term funding	Finance companies, leasing/factoring companies, consumer credit companies
EF3	Intermediation of market activities that is dependent on short-term funding or on secured funding of client assets	Broker-dealers, securities finance companies
EF4	Facilitation of credit creation	Credit insurance companies, financial guarantors, monolines
EF5	Securitisation-based credit intermediation and funding of financial entities	Securitisation vehicles, structured finance vehicles, asset-backed securities

Source: Financial Stability Board (2024)

Table A3: Sensitivities to global risk and US Monetary Policy, with global and local factors

	Cross Border Loans			International Debt Securities			Global Liquidity		
	(1) all sectors	(2) to banks	(3) to non-banks	(4) all borrowers	(5) to banks	(6) to non-banks	(7) all sectors	(8) to banks	(9) to non-banks
Log(VIX)	-1.67**	0.89	-4.26***	-0.50	-1.51	0.30	-1.19**	1.21	-1.66***
	(0.73)	(1.10)	(0.80)	(0.81)	(1.84)	(0.98)	(0.54)	(0.93)	(0.51)
Log(VIX) * EME	-0.95	-3.48**	1.73*	-3.06***	-9.74	-3.84***	-1.48**	-3.85***	-0.80
	(0.91)	(1.49)	(0.93)	(0.97)	(7.20)	(1.17)	(0.68)	(1.29)	(0.65)
US MP	-0.44	0.47	-1.54***	-1.92**	-0.86	-2.38***	-0.89***	0.08	-1.84***
	(0.49)	(0.84)	(0.43)	(0.84)	(0.88)	(0.90)	(0.33)	(0.64)	(0.35)
US MP * EME	-1.01	-1.71	0.12	0.35	-3.13	1.15	-0.56	-1.34	0.52
	(0.63)	(1.05)	(0.60)	(0.91)	(2.13)	(0.96)	(0.43)	(0.85)	(0.44)
GDP Growth (GDP)	0.22***	0.31***	0.19***	0.03	0.29	0.02	0.14***	0.27***	0.08***
	(0.05)	(0.08)	(0.05)	(0.04)	(0.22)	(0.05)	(0.03)	(0.06)	(0.03)
Global GDP	0.12	0.20	0.01	-0.13	-0.32	-0.22	0.00	0.21*	-0.11
	(0.08)	(0.14)	(0.09)	(0.11)	(0.57)	(0.13)	(0.06)	(0.11)	(0.07)
Ratings	2.73***	4.18***	0.87	1.39*	-2.06	1.28	1.40***	2.64***	0.85
	(0.76)	(1.14)	(0.65)	(0.72)	(2.15)	(0.79)	(0.54)	(0.85)	(0.54)
Capital Openness	-1.47	-2.84	0.08	5.37**	19.07	2.72	0.34	-1.33	0.31
	(1.41)	(2.34)	(1.48)	(2.14)	(13.81)	(2.25)	(0.87)	(2.13)	(0.85)
Observations	5,088	5,088	5,088	5,101	4,632	5,100	5,101	5,100	5,101
R^2	0.046	0.039	0.029	0.043	0.013	0.035	0.045	0.037	0.041

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over 2000:Q1 - 2024:Q1. US MP is given by the Federal Fund Rate and by the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4. The regressions include ΔReal Global GDP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table A4: Impact of bank and NBFI health metrics on risk sensitivity of aggregate global liquidity, All Countries

	All Borrowing Countries				
	(1)	(2)	(3)	(4)	(5)
Log(VIX)	-2.52***	-1.91***	-2.72***	-2.52***	-2.86***
	(0.37)	(0.40)	(0.38)	(0.38)	(0.37)
Log(VIX) * Bank Capital	2.48***		2.44***		2.25***
	(0.33)		(0.40)		(0.37)
Log(VIX) * NBFI Leverage		-2.07***	-1.78***		-1.73***
		(0.33)	(0.36)		(0.38)
Log(VIX) * IDS Share				2.03***	0.94**
				(0.47)	(0.42)
Observations	4,717	3,163	3,163	4,812	3,163
R^2	0.095	0.076	0.096	0.071	0.098

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

B Sectoral results

Table B1: Alternative specification: Impact of bank health metrics and IDS Share on risk sensitivity of cross-border loans, bank borrowers

	All Borrowing Countries			Other Advanced Economies			Emerging Market Economies		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(VIX)	-1.07	-1.46**	-1.15*	1.35	-1.20	1.25	-2.97***	-1.88**	-2.68***
	(0.67)	(0.60)	(0.61)	(0.98)	(0.76)	(0.94)	(0.92)	(0.89)	(0.87)
Log(VIX) * Bank Capital	3.80***		3.62***	5.16***		5.21***	3.98***		3.77***
	(0.50)		(0.54)	(0.75)		(0.89)	(0.72)		(0.70)
Log(VIX) * IDS Share		2.60***	1.59**		1.63	-0.35		2.72***	1.53**
		(0.66)	(0.61)		(1.02)	(0.98)		(0.81)	(0.65)
Observations	4,705	4,800	4,705	2,187	2,233	2,187	2,518	2,567	2,518
R^2	0.066	0.056	0.072	0.079	0.059	0.087	0.069	0.060	0.073

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table B2: Alternative specification: Impact of bank health metrics and IDS Share on risk sensitivity of cross-border loans, nonbank borrowers

	All Borrowing Countries			Other Advanced Economies			Emerging Market Economies		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(VIX)	-3.29***	-3.33***	-3.34***	-3.00***	-4.43***	-3.05***	-3.38***	-2.47***	-3.26***
	(0.49)	(0.46)	(0.47)	(0.95)	(0.70)	(0.92)	(0.57)	(0.57)	(0.56)
Log(VIX) * Bank Capital	2.63***		2.63***	3.23***		3.29***	2.16***		2.15***
	(0.37)		(0.36)	(0.59)		(0.58)	(0.48)		(0.44)
Log(VIX) * IDS Share		1.22***	0.50		0.93	-0.33		1.35**	0.64
		(0.40)	(0.36)		(0.59)	(0.68)		(0.53)	(0.48)
Observations	4,705	4,800	4,705	2,187	2,233	2,187	2,518	2,567	2,518
R^2	0.059	0.049	0.068	0.074	0.061	0.082	0.060	0.054	0.069

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table B3: Impact of NBFI health metrics and IDS Share on risk sensitivity of international debt securities, bank borrowers

	All Borrowing Countries			Other Advanced Economies			Emerging Market Economies		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(VIX)	-3.07***	-3.09***	-3.36***	-2.52**	-2.20	-3.97**	-4.59***	-4.79***	-4.09***
	(0.98)	(0.96)	(1.03)	(1.14)	(1.31)	(1.57)	(1.34)	(1.42)	(1.40)
Log(VIX) * NBFI Leverage	-2.53***		-2.57***	-2.70***		-2.36***	-1.06		-1.61*
	(0.69)		(0.68)	(0.74)		(0.78)	(1.09)		(0.94)
Log(VIX) * IDS Share		2.06*	2.59***		1.93	3.22*		0.98	1.92*
		(1.09)	(0.84)		(1.35)	(1.58)		(1.58)	(1.07)
Observations	2,904	4,343	2,904	1,379	1,998	1,379	1,525	2,345	1,525
R^2	0.067	0.038	0.074	0.110	0.065	0.116	0.058	0.042	0.063

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table B4: Impact of NBFI health metrics and IDS Share on risk sensitivity of international debt securities, nonbank borrowers

	All Borrowing Countries			Other Advanced Economies			Emerging Market Economies		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(VIX)	-1.90***	-2.00***	-2.10***	-1.39**	-0.60	-1.18	-2.93***	-2.90***	-2.93***
	(0.50)	(0.48)	(0.55)	(0.65)	(0.75)	(0.93)	(0.70)	(0.57)	(0.64)
Log(VIX) * NBFI Leverage	-1.26**		-1.15**	-1.79**		-1.89**	-0.32		-0.37
	(0.48)		(0.53)	(0.79)		(0.78)	(0.58)		(0.51)
Log(VIX) * IDS Share		1.21*	1.07		-0.53	-0.61		1.90**	1.94*
		(0.62)	(0.72)		(0.83)	(1.12)		(0.80)	(0.97)
Observations	3,163	4,811	3,163	1,556	2,240	1,556	1,607	2,571	1,607
R^2	0.064	0.044	0.065	0.064	0.042	0.064	0.064	0.059	0.070

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. (1) Wu-Xia Shadow rate for the period 2009:Q1 – 2015:Q4. (2) Lagged NBFI leverage in deviation from its sample mean. (3) Share of international debt securities (IDS) in country's total borrowing. The regressions include ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index, ΔReal Global GDP as well lagged bank and/or NBFI health metrics. The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table B5: Impact of Bank and NBFI health metrics and IDS Share on risk sensitivity of international debt securities, bank borrowers

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(VIX)	1.14	-1.57**	-0.57	-0.86	-0.93	-3.47***	-0.86	-4.66***	-2.45***	-4.69***
	(0.84)	(0.70)	(0.62)	(0.95)	(0.78)	(0.83)	(1.18)	(1.09)	(0.82)	(1.10)
Log(VIX) * Bank Capital	4.84***		4.12***		3.89***	3.87***		4.92***		5.04***
	(0.70)		(0.69)		(0.71)	(0.68)		(0.87)		(0.87)
Log(VIX) * NBFI Leverage		-3.62***	-2.14***		-2.02**		-2.73***	-1.79**		-1.57*
		(0.80)	(0.68)		(0.77)		(0.94)	(0.84)		(0.87)
Log(VIX) * IDS Share				2.05*	0.97				2.40***	0.12
				(1.03)	(0.90)				(0.81)	(0.69)
Observations	2,194	1,556	1,556	2,240	1,556	2,522	1,607	1,607	2,571	1,607
R^2	0.101	0.061	0.076	0.063	0.077	0.066	0.068	0.085	0.054	0.086

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table B6: Impact of Bank and NBFI health metrics and IDS Share on global risk sensitivity of international debt securities, nonbank borrowers

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(VIX)	-2.19***	-2.56***	-3.05***	-2.65***	-3.03***	-3.15***	-1.60***	-3.02***	-2.45***	-2.95***
	(0.53)	(0.54)	(0.63)	(0.60)	(0.70)	(0.40)	(0.49)	(0.44)	(0.41)	(0.45)
Log(VIX) * Bank Capital	1.99***		1.17***		1.17**	1.57***		1.65***		1.50***
	(0.36)		(0.39)		(0.44)	(0.37)		(0.47)		(0.38)
Log(VIX) * NBFI Leverage		-1.57***	-1.42**		-1.43**		-1.06***	-0.74*		-0.79**
		(0.41)	(0.55)		(0.53)		(0.37)	(0.38)		(0.34)
Log(VIX) * IDS Share				1.37*	-0.030				1.42**	0.44
				(0.72)	(0.61)				(0.52)	(0.68)
Observations	2,194	1,556	1,556	2,240	1,556	2,523	1,607	1,607	2,572	1,607
R^2	0.109	0.075	0.086	0.062	0.086	0.072	0.065	0.077	0.062	0.077

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

C Robustness Checks

C.1 Utilizing Alternative Proxies for Risk Conditions

Table C1: Sensitivities to global risk (MOVE) and US monetary policy

	Cross Border Loans			International Debt Securities			Global Liquidity		
	(1) all sectors	(2) to banks	(3) to non-banks	(4) all borrowers	(5) to banks	(6) to non-banks	(7) all sectors	(8) to banks	(9) to non-banks
Log(MOVE)	0.11	1.39*	-0.79*	1.10***	1.18*	1.25***	0.090	1.26**	0.21
	(0.46)	(0.73)	(0.44)	(0.42)	(0.68)	(0.45)	(0.35)	(0.60)	(0.34)
Log(MOVE) * EME	-0.19	-1.21	0.57	-2.67***	-2.49**	-2.75***	-1.12**	-1.47*	-1.28***
	(0.62)	(0.99)	(0.58)	(0.54)	(1.03)	(0.58)	(0.45)	(0.85)	(0.44)
US MP	-0.16	0.24	-0.89**	-1.18***	-0.69	-1.62***	-0.61**	-0.16	-1.48***
	(0.39)	(0.60)	(0.39)	(0.37)	(0.64)	(0.41)	(0.29)	(0.49)	(0.29)
US MP * EME	-0.88*	-1.00	-0.17	0.59	0.18	1.17**	-0.36	-0.61	0.61
	(0.53)	(0.82)	(0.52)	(0.48)	(0.88)	(0.52)	(0.39)	(0.72)	(0.38)
Log(MOVE) + Log(MOVE) * EME	-0.08	0.18	-0.22	-1.57***	-1.31*	-1.51***	-1.03***	-0.22	-1.08***
	(0.41)	(0.67)	(0.39)	(0.35)	(0.76)	(0.37)	(0.29)	(0.60)	(0.28)
US MP + US MP * EME	-1.03***	-0.77	-1.06***	-0.59**	-0.51	-0.45	-0.97***	-0.77	-0.86***
	(0.37)	(0.58)	(0.37)	(0.30)	(0.62)	(0.31)	(0.27)	(0.54)	(0.25)
Observations	5,088	5,088	5,088	5,101	4,632	5,100	5,101	5,100	5,101
R^2	0.045	0.044	0.026	0.043	0.035	0.042	0.042	0.040	0.038

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over 2000:Q1 - 2024:Q1. US MP is given by the Federal Fund Rate and by the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4. The regressions include ΔReal Global GDP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C2: Sensitivities to global risk (VSTOXX) and US monetary policy

	Cross Border Loans			International Debt Securities			Global Liquidity		
	(1) all sectors	(2) to banks	(3) to non-banks	(4) all borrowers	(5) to banks	(6) to non-banks	(7) all sectors	(8) to banks	(9) to non-banks
Log(VSTOXX)	-1.79***	0.18	-3.71***	-0.26	-0.59	0.20	-1.13**	0.78	-1.32***
	(0.64)	(0.93)	(0.69)	(0.62)	(1.19)	(0.63)	(0.51)	(0.85)	(0.49)
Log(VSTOXX) * EME	-0.62	-2.72**	1.55*	-2.04***	-3.29**	-2.19***	-1.23*	-3.29***	-0.69
	(0.83)	(1.30)	(0.87)	(0.78)	(1.60)	(0.83)	(0.64)	(1.19)	(0.63)
US MP	-0.38	0.33	-1.43***	-1.18***	-0.66	-1.55***	-0.74**	0.026	-1.65***
	(0.39)	(0.61)	(0.39)	(0.38)	(0.65)	(0.42)	(0.29)	(0.50)	(0.29)
US MP * EME	-0.96*	-1.46*	0.13	0.25	-0.38	0.80	-0.56	-1.18	0.51
	(0.53)	(0.83)	(0.53)	(0.49)	(0.89)	(0.53)	(0.39)	(0.73)	(0.38)
Log(VSTOXX) + Log(VSTOXX) * EME	-2.41***	-2.54***	-2.16***	-2.30***	-3.88***	-1.99***	-2.36***	-2.52***	-2.01***
	(0.55)	(0.95)	(0.57)	(0.50)	(1.12)	(0.55)	(0.42)	(0.88)	(0.42)
US MP + US MP * EME	-1.35***	-1.13**	-1.30***	-0.92***	-1.03*	-0.75**	-1.31***	-1.15**	-1.14***
	(0.37)	(0.58)	(0.37)	(0.31)	(0.62)	(0.32)	(0.26)	(0.54)	(0.25)
Observations	5,088	5,088	5,088	5,101	4,632	5,100	5,101	5,100	5,101
R^2	0.050	0.045	0.033	0.042	0.037	0.040	0.047	0.041	0.040

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over 2000:Q1 - 2024:Q1. US MP is given by the Federal Fund Rate and by the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4. The regressions include ΔReal Global GDP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C3: Sensitivities to global risk (BEX RA) and US monetary policy

	Cross Border Loans			International Debt Securities			Global Liquidity		
	(1) all sectors	(2) to banks	(3) to non-banks	(4) all borrowers	(5) to banks	(6) to non-banks	(7) all sectors	(8) to banks	(9) to non-banks
BEX RA	-1.41***	-0.94**	-1.70***	-0.94***	-0.96*	-0.52	-1.39***	-0.86**	-1.03***
	(0.27)	(0.42)	(0.26)	(0.32)	(0.54)	(0.35)	(0.23)	(0.37)	(0.22)
BEX RA * EME	-0.16	-1.14**	0.45	-0.84**	-1.47**	-1.09***	-0.32	-1.23**	-0.37
	(0.34)	(0.55)	(0.34)	(0.38)	(0.66)	(0.41)	(0.28)	(0.49)	(0.27)
US MP	-0.56	0.050	-1.41***	-1.39***	-0.81	-1.69***	-0.99***	-0.32	-1.75***
	(0.38)	(0.61)	(0.38)	(0.39)	(0.61)	(0.42)	(0.28)	(0.50)	(0.29)
US MP * EME	-0.91*	-1.45*	0.055	0.27	-0.44	0.72	-0.47	-1.10	0.48
	(0.52)	(0.83)	(0.52)	(0.50)	(0.87)	(0.54)	(0.38)	(0.73)	(0.38)
BEX RA + BEX RA * EME	-1.58***	-2.08***	-1.24***	-1.77***	-2.42***	-1.61***	-1.71***	-2.09***	-1.40***
	(0.24)	(0.40)	(0.24)	(0.24)	(0.43)	(0.25)	(0.19)	(0.36)	(0.19)
US MP + US MP * EME	-1.47***	-1.40**	-1.36***	-1.12***	-1.25**	-0.96***	-1.46***	-1.42***	-1.26***
	(0.37)	(0.57)	(0.37)	(0.31)	(0.63)	(0.32)	(0.25)	(0.53)	(0.24)
Observations	5,088	5,088	5,088	5101	4632	5,100	5,101	5,100	5,101
R^2	0.055	0.049	0.034	0.050	0.039	0.045	0.059	0.045	0.048

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over 2000:Q1 - 2024:Q1. US MP is given by the Federal Fund Rate and by the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4. The regressions include ΔReal Global GDP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C4: Impact of bank and NBFI health metrics on global risk (MOVE) sensitivity of aggregate global liquidity

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(MOVE)	-2.81***	-1.53***	-2.17***	-1.56**	-2.48***	-3.06***	-0.45*	-3.20***	-1.28***	-3.24***
	(0.46)	(0.43)	(0.44)	(0.74)	(0.45)	(0.32)	(0.23)	(0.46)	(0.32)	(0.44)
Log(MOVE) * Bank Capital	2.56***		3.08***		2.93***	1.68***		2.54***		2.66***
	(0.48)		(0.62)		(0.56)	(0.34)		(0.38)		(0.37)
Log(MOVE) * NBFI Leverage		-1.99***	-1.33***		-1.24**		-1.56***	-1.23***		-1.24***
		(0.45)	(0.38)		(0.45)		(0.38)	(0.34)		(0.31)
Log(MOVE) * IDS Share				1.99***	0.79				0.53	-0.36
				(0.64)	(0.51)				(0.31)	(0.28)
Observations	2,194	1,556	1,556	2,240	1,556	2,523	1,607	1,607	2,572	1,607
R^2	0.134	0.069	0.092	0.077	0.094	0.076	0.076	0.096	0.059	0.097

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C5: Impact of bank and NBFI health metrics on global risk (VSTOXX) sensitivity of aggregate global liquidity

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(VSTOXX)	-1.44**	-4.80***	-5.19***	-2.06***	-5.37***	-2.88***	-2.41***	-5.67***	-2.47***	-5.62***
	(0.63)	(0.76)	(0.65)	(0.66)	(0.67)	(0.41)	(0.61)	(0.78)	(0.42)	(0.65)
Log(VSTOXX) * Bank Capital	2.70***		4.27***		4.14***	1.63***		3.74***		3.47***
	(0.40)		(0.65)		(0.66)	(0.38)		(0.56)		(0.45)
Log(VSTOXX) * NBFI Leverage		-2.39***	-1.05*		-1.01		-1.21**	-0.47		-0.43
		(0.55)	(0.57)		(0.61)		(0.54)	(0.50)		(0.42)
Log(VSTOXX) * IDS Share				1.07	0.51				1.82***	0.97
				(0.83)	(0.69)				(0.54)	(0.65)
Observations	2,194	1,556	1,556	2,240	1,556	2,523	1,607	1,607	2,572	1,607
R^2	0.130	0.093	0.128	0.076	0.129	0.079	0.078	0.111	0.073	0.113

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C6: Impact of bank and NBFI health metrics on global risk (BEX RA) sensitivity of aggregate global liquidity

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
BEX RA	-1.20***	-1.91***	-1.59***	-1.75***	-1.62***	-1.64***	-1.42***	-1.63***	-1.57***	-1.54***
	(0.33)	(0.29)	(0.33)	(0.25)	(0.32)	(0.19)	(0.22)	(0.18)	(0.21)	(0.20)
BEX RA * Bank Capital	1.09***		0.58***		0.55***	0.63***		0.58**		0.51***
	(0.22)		(0.19)		(0.19)	(0.18)		(0.21)		(0.18)
BEX RA * NBFI Leverage		-0.66***	-0.48**		-0.48**		-0.38**	-0.26*		-0.31**
		(0.21)	(0.20)		(0.21)		(0.15)	(0.15)		(0.13)
BEX RA * IDS Share				0.57**	0.23				0.55**	0.30
				(0.25)	(0.22)				(0.21)	(0.20)
Observations	2,194	1,556	1,556	2,240	1,556	2,523	1,607	1,607	2,572	1,607
R^2	0.152	0.105	0.112	0.094	0.113	0.093	0.099	0.112	0.081	0.113

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

C.2 Alternative US Monetary Policy Proxy

Table C7: Baseline regressions: Wu-Xia over full sample period

	Cross Border Loans			International Debt Securities			Global Liquidity		
	all sectors	to banks	to non-banks	all borrowers	to banks	to non-banks	all sectors	to banks	to non-banks
Log(VIX)	-1.77***	0.48	-3.50***	-0.65	-0.29	-0.37	-1.41***	0.90	-1.65***
	(0.62)	(0.92)	(0.64)	(0.60)	(1.11)	(0.63)	(0.49)	(0.80)	(0.48)
Log(VIX) * EME	-0.50	-2.66**	1.25	-2.75***	-5.00***	-2.66***	-1.35**	-3.51***	-0.93
	(0.80)	(1.24)	(0.80)	(0.74)	(1.47)	(0.79)	(0.61)	(1.10)	(0.60)
US MP	-0.55	0.36	-1.23***	-1.18***	0.0081	-1.56***	-0.77***	0.31	-1.45***
	(0.38)	(0.60)	(0.40)	(0.37)	(0.55)	(0.40)	(0.27)	(0.49)	(0.29)
US MP * EME	-0.41	-1.09	0.14	0.024	-1.52*	0.61	-0.44	-1.22*	0.25
	(0.52)	(0.82)	(0.54)	(0.47)	(0.86)	(0.50)	(0.36)	(0.72)	(0.37)
Log(VIX) + Log(VIX) * EME	-2.27***	-2.17**	-2.25***	-3.40***	-5.29***	-3.04***	-2.76***	-2.61***	-2.58***
	(0.55)	(0.91)	(0.54)	(0.47)	(1.06)	(0.51)	(0.40)	(0.82)	(0.39)
US MP + US MP * EME	-0.95***	-0.73	-1.09***	-1.16***	-1.51**	-0.95***	-1.22***	-0.91	-1.20***
	(0.37)	(0.56)	(0.37)	(0.28)	(0.66)	(0.29)	(0.24)	(0.52)	(0.23)
Observations	5,088	5,088	5,088	5,101	4,632	5,100	5,101	5,100	5,101
R^2	0.048	0.045	0.032	0.047	0.039	0.044	0.049	0.041	0.043

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over 2000:Q1 - 2024:Q1. US MP is given by the Wu-Xia Shadow rate over the whole sample period. The regressions include ΔReal Global GDP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C8: Financial institution health metrics and global risk sensitivity: Wu-Xia over full sample period

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(VIX)	-1.14*	-2.93***	-2.53***	-2.46***	-2.74***	-3.45***	-1.82***	-3.85***	-2.76***	-3.75***
	(0.58)	(0.58)	(0.48)	(0.71)	(0.49)	(0.39)	(0.56)	(0.47)	(0.44)	(0.45)
Log(VIX) * Bank Capital	3.75***		3.11***		2.96***	2.01***		2.55***		2.37***
	(0.44)		(0.48)		(0.50)	(0.38)		(0.51)		(0.41)
Log(VIX) * NBFI Leverage		-2.64***	-1.66***		-1.61***		-1.50***	-1.01**		-1.03**
		(0.44)	(0.47)		(0.49)		(0.47)	(0.46)		(0.42)
Log(VIX) * IDS				1.77**	0.58				1.82***	0.66
				(0.78)	(0.59)				(0.56)	(0.64)
Observations	2,194	1,556	1,556	2,240	1,556	2,523	1,607	1,607	2,572	1,607
R^2	0.146	0.089	0.112	0.082	0.113	0.088	0.083	0.106	0.076	0.107

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Wu-Xia Shadow rate for the whole sample period. The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

C.3 Excluding High Stress Observations (top 10 percentile VIX)

Table C9: Baseline regressions: Dropping top 10% VIX

	Cross Border Loans			International Debt Securities			Global Liquidity		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	all sectors	to banks	to non-banks	all borrowers	to banks	to non-banks	all sectors	to banks	to non-banks
Log(VIX)	-0.74	2.16*	-3.81***	-0.19	-0.62	-0.29	-0.51	2.23**	-1.79***
	(0.77)	(1.16)	(0.80)	(0.70)	(1.22)	(0.73)	(0.58)	(0.99)	(0.59)
Log(VIX) * EME	-0.71	-2.38	1.98*	-2.63***	-3.97**	-2.17**	-1.34*	-3.11**	-0.017
	(1.03)	(1.62)	(1.04)	(0.92)	(1.84)	(0.97)	(0.75)	(1.43)	(0.75)
US MP	-0.68	0.027	-1.39***	-1.46***	-0.48	-1.87***	-0.92***	-0.11	-1.70***
	(0.42)	(0.69)	(0.44)	(0.40)	(0.68)	(0.44)	(0.31)	(0.56)	(0.32)
US MP * EME	-0.96	-1.62*	-0.16	0.10	-0.86	0.74	-0.73*	-1.54*	0.26
	(0.58)	(0.93)	(0.60)	(0.52)	(0.98)	(0.56)	(0.41)	(0.82)	(0.42)
Log(VIX) + Log(VIX) * EME	-1.46**	-0.22	-1.84***	-2.82***	-4.59***	-2.46***	-1.85***	-0.88	-1.80***
	(0.69)	(1.12)	(0.67)	(0.60)	(1.38)	(0.64)	(0.48)	(1.03)	(0.47)
US MP + US MP * EME	-1.64***	-1.59**	-1.55***	-1.36***	-1.34*	-1.12***	-1.66***	-1.64***	-1.44***
	(0.41)	(0.63)	(0.41)	(0.33)	(0.72)	(0.34)	(0.27)	(0.59)	(0.26)
Observations	4,554	4,554	4,554	4,567	4,151	4,566	4,567	4,566	4,567
R^2	0.040	0.034	0.035	0.045	0.042	0.042	0.048	0.034	0.047

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over 2000:Q1 - 2024:Q1. US MP is given by the Federal Fund Rate and by the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4. The regressions include ΔReal Global GDP and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C10: Impact of bank and NBFI health metrics on risk sensitivity of aggregate global liquidity: Dropping top 10% VIX

	Other Advanced Economies					Emerging Market Economies				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(VIX)	-0.35	0.054	-0.14	-1.67**	-0.23	-2.83***	0.41	-1.03	-1.99***	-1.06
	(0.59)	(0.46)	(0.45)	(0.73)	(0.49)	(0.46)	(0.69)	(0.91)	(0.44)	(0.90)
Log(VIX) * Bank Capital	4.36***		3.21***		3.17***	2.16***		1.22		1.37
	(0.58)		(0.53)		(0.56)	(0.62)		(0.96)		(0.88)
Log(VIX) * NBFI Leverage		-1.81***	-1.17*		-1.15*		-1.10*	-0.94		-0.87
		(0.58)	(0.64)		(0.63)		(0.63)	(0.67)		(0.69)
Log(VIX) * IDS Share				1.89**	0.21				1.61**	-0.29
				(0.87)	(0.63)				(0.69)	(0.91)
Observations	1,956	1,393	1,393	2,002	1,393	2,257	1,440	1,440	2,306	1,440
R^2	0.149	0.082	0.094	0.087	0.095	0.082	0.083	0.087	0.073	0.088

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes quarterly data for 61 recipient countries (26 advanced economies and 35 emerging economies) over the period 2000:Q1 - 2024:Q1. Bank capital is given by the lagged bank equity to total assets ratio in deviation from its sample mean. NBFI leverage is lagged and in deviation from its sample mean. IDS share is given by the share of international debt securities (IDS) in country's total borrowing. The regressions include US MP, and borrowing country controls (ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index). US MP is given by the Federal Fund Rate (the Wu-Xia Shadow rate for 2009:Q1 – 2015:Q4). The regressions also include a full set of borrowing country fixed effects. Specifications are winsorized at the 1% level.

Table C11: Correlation Among Alternative Risk Measures

	Log(VIX)	Log(VSTOXX)	Log(MOVE)	BEX RA
Log(VIX)	1			
Log(VSTOXX)	0.889***	1		
Log(MOVE)	0.538***	0.526***	1	
BEX RA	0.841***	0.776***	0.538***	1

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

Notes: Correlations computed using logged values of each of the alternative risk measures. VSTOXX and MOVE are sourced from Bloomberg. BEX is sourced from Bekaert, Engstrom, and Xu (2022).

Table C12: Top 10% Quarters by Risk Metric

Quarter	VIX	VSTOXX	MOVE	BEX RA
2002q3	✓	✓		✓
2002q4	✓	✓		✓
2003q1	✓	✓		✓
2008q3			✓	✓
2008q4	✓	✓	✓	✓
2009q1	✓	✓	✓	✓
2009q2	✓	✓	✓	✓
2010q2		✓		
2011q3	✓	✓	✓	✓
2011q4	✓	✓	✓	
2020q1	✓	✓		✓
2020q2	✓			✓
2022q2			✓	
2022q3			✓	
2022q4			✓	
2023q1			✓	

Notes: Table displays overlap among the top 10% of VIX and alternative risk measures considered for robustness. VSTOXX and MOVE are sourced from Bloomberg. BEX is sourced from Bekaert, Hoerova, and Duca (2013).