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External wealth of nations and systemic risk

Alin Marius Andrieş[a], Alexandra Maria Chiper[b], Steven Ongena[c], Nicu Sprincean[d,*]

[a] Alexandru Ioan Cuza University of Iași and Institute for Economic Forecasting, Romanian Academy, Romania
[b] Alexandru Ioan Cuza University of Iași, Romania
[c] University of Zurich, Swiss Finance Institute, KU Leuven, NTNU Business School, and CEPR, Switzerland
[d] Alexandru Ioan Cuza University of Iași and National Institute for Economic Research, Romanian Academy, Romania

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ABSTRACT

External imbalances played a pivotal role leading to the global financial crisis and were an important cause of turmoil. While current account (flow) imbalances narrowed in the aftermath of the crisis, the net international investment position (NIIP) (stock) imbalances persisted. This study explores the implications of countries' net foreign positions on systemic risk. Using a sample of 470 banks located in 49 advanced economies, emerging countries, and developing economies over 2000–2020, we find robust empirical evidence that banks can reduce their systemic risk exposure when the countries in which they are incorporated improve their NIIPs and maintain creditor status vis-à-vis the rest of the world. However, only the equity component of the NIIP is responsible for this outcome, whereas debt flows are not significant. Similarly, we find that the mitigating effect of an external balance sheet on systemic risk is derived from valuation gains rather than from the incremental net acquisition of assets or liabilities represented by the current account. Our findings are particularly relevant for policymakers seeking to improve banks' resilience to adverse shocks and maintain financial stability.

1. Introduction

The global financial crisis (GFC) had a serious long-term impact on the financial sector and the real economy. It caused significant changes in the structure of a country's external wealth. Widening external imbalances played a significant role before the GFC (Alberola et al., 2020) and was an important underlying cause of the ensuing turmoil (Bernanke, 2009; Obstfeld and Rogoff, 2010; Blanchard and Milesi-Ferretti, 2012) and the subsequent euro area sovereign debt crisis (Obstfeld, 2012b; IMF, 2014).[1] Whether these vulnerabilities are characterized from the perspective of countries' current accounts (flow imbalances) or their net foreign wealth given by net international investment position (NIIP)/net foreign assets (NFA) (stock imbalances), they are associated with an unsustainable pattern of global growth and systemic risk when countries are large. Capital flows are liquid (Blanchard and Milesi-Ferretti, 2009). Large current account deficits can increase a country's vulnerability to periods of heightened risk (Forbes et al., 2017). Frankel and Saravelos (2012) found that the level of external debt foresees equity market falls and recessions and Obstfeld (2012b) revealed that the ratio of net foreign liabilities to gross domestic product (GDP) is a significant crisis predictor. Similarly, Blanchard et al. (2010) showed that large external debt positions was an important predictor of output losses during the global financial crisis. In contrast, Catão and Milesi-Ferretti (2014) highlighted that the net external debt stock is a robust indicator of external crises. However, Acharya and Schnabl (2010) argued that global imbalances could amplify the financial crisis. Gelos et al. (2022) documented that credit trends (which often coincide with substantial current account deficits, capital inflows from abroad, and NIIP deterioration; Forbes, 2017), rather than external imbalances, are the best determinants of financial instability. Similarly, Mendoza and Terrones (2012) and Lane and McQuade (2014) revealed a significant association between capital inflows and credit booms. Caballero (2016) demonstrated that banking crises are more likely when net capital inflows are accompanied by domestic credit growth and large gross external balance sheets (Al-Saffar et al., 2013).

While current account imbalances were corrected to a great extent in the aftermath of the GFC (Lane and Milesi-Ferretti, 2012), stock imbalances persist and are a source of systemic risk accumulation because debtor countries are sensitive to changes in market conditions (Bergant, 2021). The Committee for International Economic Policy and Reform (2012) emphasizes that guarding against financial instability starts by tracking the complete matrix of gross cross-border capital flows and

* Correspondence to: Alexandru Ioan Cuza University of Iasi, 22 Carol I Boulevard, Iasi 700505, Romania.
E-mail address: sprincean.nicu@uaic.ro (N. Sprincean).

[1] See Kaminsky (2019) for a review of the new trends in research on capital flows fueled by the GFC.

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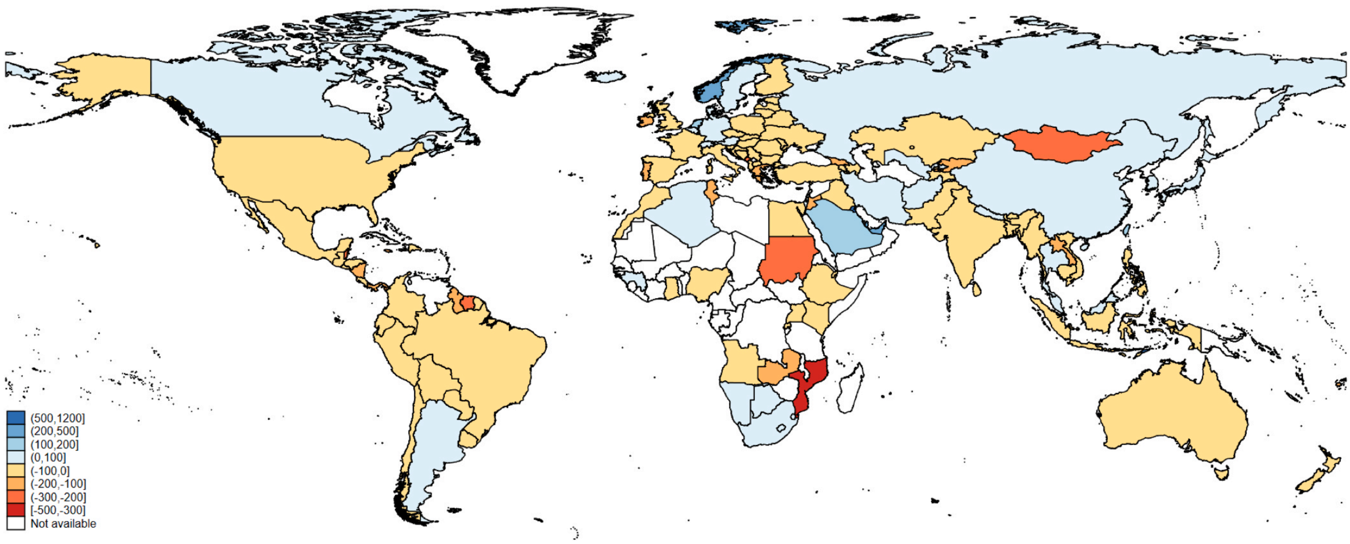

Fig. 1. Net international investment position excluding gold as percent of GDP in 2020.
Source: Lane and Milesi-Ferretti (2018).

gross external asset and liability positions because persistent current account imbalances pose financial stability risks and have implications for the sustainability of net external asset positions. Caballero (2016) argued that policymakers concerned with financial stability should pay attention to the size and acceleration of capital inflows and their composition.

Current account imbalances and NIIP are closely related. The International Monetary Fund (IMF) defines international investment positions (IIPs) as "[…] the balance sheet of the stock of external financial assets and liabilities. The financial items that comprise the position consist of monetary gold, SDRs,[2] claims on non-residents, and liabilities to non-residents" (IMF, 2007). While the trade balance, income balance, and net unilateral transfers form a country's current account, changes in the NIIP are determined by the sum of the current account and valuation changes originating from market value movements of foreign assets and liability positions due to fluctuations in equity prices, bond prices, and exchange rates (Schmitt-Grohé et al., 2021).[3] Moreover, current account surpluses increase the NIIP, whereas deficits drive it downward. Similarly, current account surpluses accumulate in rising stocks, causing two-way feedback (IMF, 2014). For the US, the NIIP is far less negative than the large and persistent current account dynamics would suggest (Beckmann and Czudaj, 2020), making it more desirable to analyze global imbalances, as valuation effects are economically sizable (Gourinchas and Rey, 2014). The IIP has come to the spotlight against the financial globalization process and the increasing role of capital markets in financing national economies.[4] It is a very useful tool for monitoring macro-financial stability (Cezar and Silvestrini, 2021), given its indications for the sustainability of countries' external debt (Lambert and Paul, 2002; Durdu et al., 2013). It can also be employed to assess countries' international wealth transfers; a net deterioration is linked to wealth transfer abroad, whereas a net improvement shows the opposite (Gourinchas et al., 2012).

Fig. 1 depicts global NIIPs as a percentage of the country's GDP in 2020, excluding gold holdings. The data source is the updated dataset of Lane and Milesi-Ferretti (2018). Most countries were either net debtors to the rest of the world, with NIIP/GDP situated within (−100, 0] intervals, or net creditors with positive NIIP/GDP in the range of (0, 100]. The countries with the highest external debt/GDP ratios were Mozambique (−445.88%), Anguilla (−326.68%), and Mongolia (−290.19%), whereas Timor-Leste (+1115.58%), Kuwait (+927.50%), and Brunei Darussalam (+654.72%) had the largest net investment surpluses.

External imbalances are not necessarily undesirable,[5] because they reflect enhanced financial integration and a more efficient allocation of capital across countries (de Mello et al., 2012).[6] Early evidence emphasizes the benefits of globalization and financial integration through international risk-sharing and improved intertemporal consumption smoothing (Bekaert et al., 2006; Faria et al., 2007; Kose et al., 2011) and better living standards, rising capital inflows, and technological advantages in the case of Central and Eastern European countries (Lane and Milesi-Ferretti, 2007), thus reducing exposure to country-specific risk and increasing financial stability (Caruana et al., 2009). However, globalization and international financial integration can also lead to contagion risk,[7] as shocks are rapidly transmitted to several connected countries, thus inducing financial disturbances (Caruana et al., 2009). Obstfeld (2012b) highlighted that recent experience shows that gross international assets and liability positions provide the key conduit through which a financial meltdown is transmitted and amplified.

Furthermore, capital flow surges and outflows entail risks (Gelos et al., 2022). Large net and gross capital inflows increase the likelihood of a systemic banking crisis (Roy and Kemme, 2022) through mechanisms related to excessive bank lending and asset price bubbles

[2] Special Drawing Rights.

[3] For example, a reduction in the value of equity positions will lower the NIIP of those countries that are "long" equity, while raising it for those that are "short" equity. See Gourinchas et al. (2012), Gourinchas and Rey (2014) and Schmitt-Grohe et al. (2021) for details. Typically, variations in equity prices are driven by changes in expectations about future income, whereas in the case of fixed income instruments these movements are influenced by changes in market yields and in the perceived creditworthiness of borrowers (Machuca, 2017).

[4] Globalization is commonly referred as the phenomenon of increased international trade and deepening financial integration that has intensified since the mid-1980 s (Kose et al., 2006).

[5] Blanchard and Milesi-Ferretti (2012) argued from the perspective of the country itself that imbalances can be "good" (come from desirable intertemporal choices) or "bad" (reflect underlying distortions).

[6] Mendoza et al. (2009) showed that imbalances can also result from financial integration when countries present different degrees of financial market development.

[7] Contagion occurs after a shock to one country or a group of countries significantly increases cross-market spillovers. For details, see Forbes and Rigobon (2002).

(Caballero, 2016). Additionally, they may also increase vulnerabilities and financial risks due to large exchange rate appreciation and a higher probability of an abrupt reversal of such flows (Furceri et al., 2012). Moreover, reliance on capital flows from abroad may generate vulnerabilities because they lead to NIIP deterioration, which can pressure a country's external debt solvency (Obstfeld, 2012a). However, large capital outflows can exacerbate asset fire sales and undermine financial stability and economic growth (Becker and Mauro, 2006; Kaminsky et al., 2004; Mendoza, 2010; Caballero and Simsek, 2020).

Financial institutions, especially banks, now have easier access to a wider range of markets and financial instruments due to financial globalization. The presence of foreign banks in domestic markets may foster efficiency through heightened competition, improved quality, and availability of financial services, whereas greater cross-border lending activity, risk-sharing, and diversification of their operations curtail their exposure to domestic shocks (Hawkins and Turner, 2001; Allen et al., 2011). For instance, banks can diversify their sources of income (through fees-based activities and trading profits; non-interest income), as found in literature, to curb bank risk (Baele et al., 2007) and reduce bank failures during the global financial crisis (DeYoung and Torna, 2013). Similarly, a higher NIIP improves a country's solvency and reduces sovereign premiums, lowering bank funding costs. Furthermore, because of their large holdings of sovereignty, including cross-border debt, in their balance sheets (Al-Saffar et al., 2013), an improvement in sovereign risk causes an appreciation in the value of these bonds, which can further be used as collateral in wholesale funding and central bank liquidity. Finally, reduced country risk enhances the funding benefits that banks derive from implicit and explicit government guarantees (BIS, 2011) and countries' capacity to support the financial sector if needed. Conversely, an increase in the NIIP position can put upward pressure on interest rates (Schuler and Sun, 2022) and incentivize banks to raise funds from foreign depositors and international counterparties in the inter-bank and money markets (non-core liabilities) to finance their lending activities (Lane and McQuade, 2014). These non-core liabilities are linked to greater risk-taking in the banking sector (Hahm et al., 2013).

Simultaneously, banks are exposed to the same risk factors as they compete in the same markets, thus increasing the interconnectedness between them (Allenspach and Monnin, 2009) and further raising systemic risk (Chen, 2022) and individual risk-taking (Berger et al., 2017). Indeed, Fecht et al. (2012) showed in their theoretical setup that integration partly reduces banks' default risk and amplifies the risk of contagion and, thus, the probability of a joint banking crisis, ultimately causing system-wide distress. Acharya (2009) noted that a financial crisis is "systemic" in the context of the failure of many banks, or the default of one bank that is transmitted as contagion leading to the failure of many other banks and a wide-ranging negative effect on other institutions or financial markets (de Bandt and Hartmann, 2000). Consequently, systemic risk significantly negatively affects real economic activities (He and Krishnamurthy, 2019). Furthermore, Jokipii and Monnin (2013) showed that banking sector stability has a beneficial impact on real output growth.

Literature devotes significant attention to the links between (systemic banking) crises and countries' NIIPs (Ahrend and Goujard, 2014; Catão and Milesi-Ferretti, 2014; Boukef Jlassi et al., 2018; Binici and Ganioglu, 2021). However, little is known about the implications of a country's external wealth on systemic risk. To the best of our knowledge, only one study, Karolyi et al. (2023), is related to ours, but their focus is different, assessing the impact of cross-border bank flows on systemic risk at the country level. This study aims to fill this gap in the literature.

This study explores the financial stability implications of the balance sheet of a country's external assets and liabilities on banks' systemic resilience as measured by the well-established marginal expected shortfall (MES) indicator developed by Acharya et al. (2017). We focus on the change in NIIPs gathered by Lane and Milesi-Ferretti (2018) because it includes critical valuation effects in assessing countries' external vulnerabilities (Forbes et al., 2017). Bergant (2021) argued that stock imbalances would have been much larger without capital gains or losses due to valuation changes. The analysis relies on net rather than gross flows because changes in the former may ultimately trigger crises and financing difficulties (Levchenko and Mauro, 2007), being used, for instance, by the European Commission in its Macroeconomic Imbalances Procedure (MIP) scoreboard. Employing a large dataset of 470 banks in 49 advanced, emerging, and developing economies over 2000–2020, we document the beneficial impact of higher changes in the NIIP and countries' net foreign creditor status on banks' exposure to system-wide financial market instability. Overall, the findings imply that banks can diminish their systemic risks when the countries where they are incorporated increase their net foreign assets and maintain creditor positions vis-à-vis the rest of the world or when they have sustainable external statuses. Moreover, these countries are more likely to bail out distressed banks during financial fragility. However, only net equity position, portfolio equity and foreign direct investment (FDI)—commonly referred to as risky assets over liabilities—are responsible for this outcome,[8] whereas net debt is unimportant. These results are consistent across a series of robustness tests, static and dynamic, including alternative estimation models, in which we control for the potential endogeneity of changes in net foreign assets and different systemic risk measures, capturing exposure and contribution for multiple sample structures. Additionally, the effect holds for small and large banks in advanced, emerging and developing economies. We also interacted with the creditor status variable with specific (macroeconomic) indicators to gain further insight. First, during systemic banking crises, banks' exposure to the system's tail risk is amplified, but the effect diminishes if the countries are net creditors. Second, fiscal policy stance, fiscal fragility, and sovereign risk matter for banks' systemic behavior, and their influence is tamed by interacting with countries' net creditor status. Finally, more-developed financial institutions act as channels for systemic risk amplification, standalone and in interaction with creditor variables, lending more support to the conclusion that bank-based financial structures are associated with more systemic risk (Langfield and Pagano, 2016; Bats and Houben, 2020).

This study makes three important contributions to literature. First, it highlights the importance of countries' external wealth and its components in banks' systemic risk exposure. Our estimates provide strong evidence that a country's external position is significant in ensuring the systemic resilience of banks. Our approach differs from those of Ahrend and Goujard (2014) and Binici and Ganioglu (2021), who investigated how a country's external balance sheet shields nations from banking crises, and Karolyi et al. (2023), who assessed how cross-border bank flows influence banks' systemic fragility at the country level. Using bank-level data, we explore how a nation's external wealth can tame system-wide distress. Second, we improve our current knowledge of the factors driving systemic fragility. Literature identifies several other determinants of system-wide distress at the bank-level – such as size, capitalization, funding structure, income diversification, credit risk ratio, profitability, lending (Laeven et al., 2016; Bostandzic and Weiß, 2018; Varotto and Zhao, 2018; Xu et al., 2019; Brunnermeier et al., 2020; Andrieș and Sprincean, 2021; Andrieș et al., 2022), banking system structure described by competition (Anginer et al., 2014; Silva-Buston, 2019) or concentration (Beck et al., 2006; Beck et al., 2022), and specific macroeconomic characteristics, such as economic freedom, inflation, GDP growth, or central bank independence (Boyd et al., 2001; Weiß et al., 2014; Bostandzic et al., 2018; Andrieș and Sprincean, 2021; Andrieș et al., 2022). Third, we investigate the asymmetric impact of specific (macroeconomic) variables on banks' systemic risk exposure conditional on a country's net foreign creditor status.

The remainder of this study is divided into four sections: Section 2

[8] Equity holdings in a company larger than 10% of that company's total value (Kubelec et al., 2007).

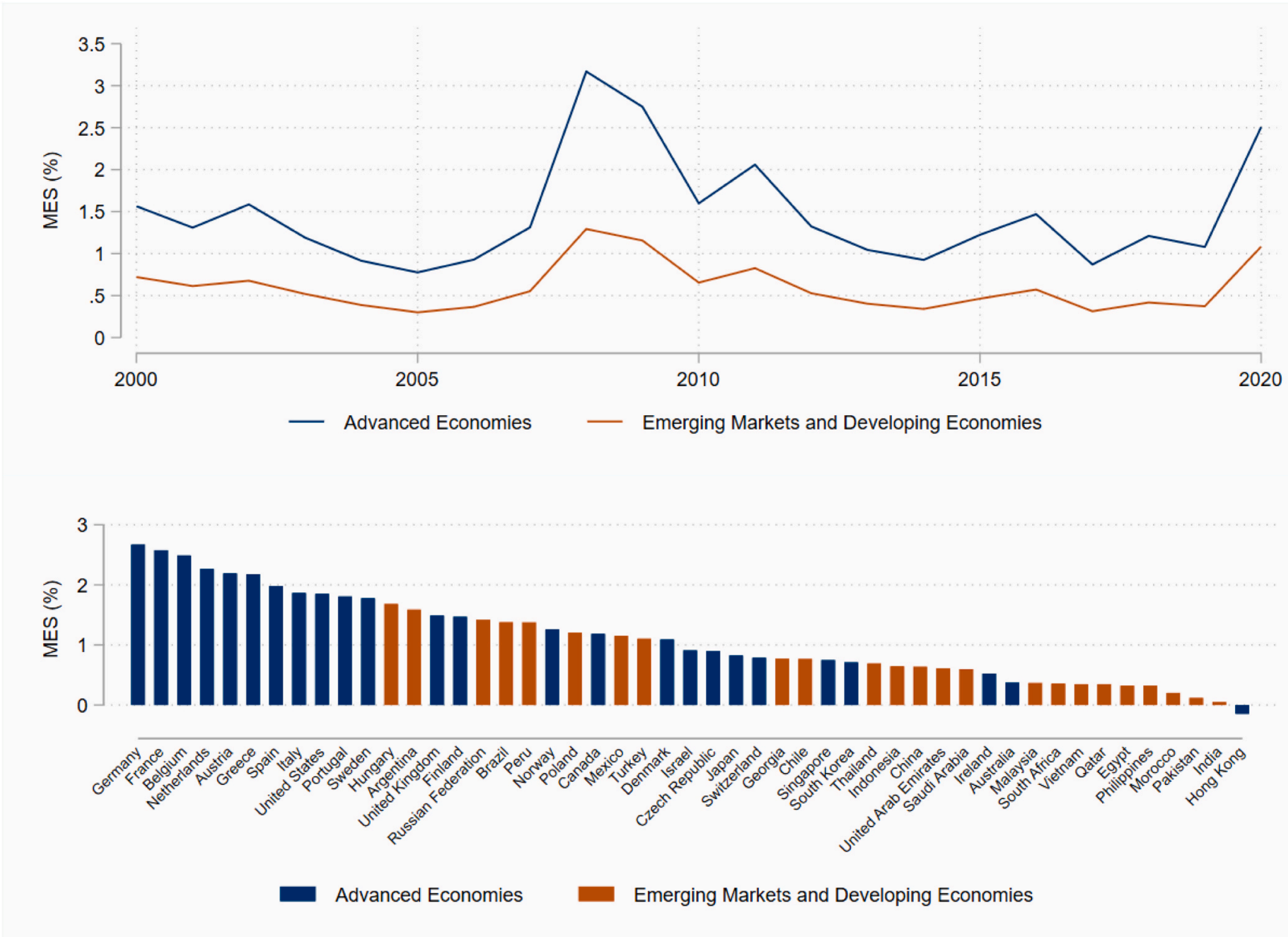

Fig. 2. Average MES by year and by country.

discusses related literature; Section 3 describes the data, sample, and methodology employed; Section 4 presents and discusses the estimation results and performs various robustness tests; and Section 5 concludes.

2. Literature Review

Our work relates to other strands of literature that focus on the nexus between cross-border assets and liabilities and (systemic banking) crises and the determinants of system-wide fragility. Joyce (2018) discussed the channels through which countries' external balance sheets influenced their performance during a crisis and highlighted that an external shock would be amplified or attenuated depending on the magnitude and composition of the balance sheet. First, wealth effects are caused by valuation changes in foreign assets and liabilities, driven by movements in market prices, including exchange rates. For example, due to an adverse global equity market shock, the NIIP positions of those countries that are "long" equity will drop while raising the position for those that are "short" equity (Kubelec et al., 2007; Joyce, 2018), leading to wealth effects on expenditures with subsequent implications for potential bail-outs or public interventions. Second, the composition of the IIP by instrument, sector, term, and currency may imply different degrees of a country's vulnerability to external risks. For instance, the expected returns of different securities are sensitive to different types of shocks (Kubelec et al., 2007): equity investment historically provides higher returns than debt (Huizinga et al., 2022), but simultaneously, equities are associated with higher uncertainty than fixed income instruments. Similarly, payments for equity investments are state-contingent and thus variable, whereas remunerations for debt instruments are contractual (the channel of flow of net investment income). Therefore, during distressed periods, dividend payments are cut owing to a deterioration in profitability, whereas interest payments on debt continue, except when the issuer defaults. Furthermore, some flows, such as foreign direct investments (FDIs), are considered more stable than portfolio financial flows and are thus less likely to cause financial disruptions (Levchenko and Mauro, 2007).

Ahrend and Goujard (2014) examine whether financial account vulnerabilities affect the probability of bank crashes in a sample composed of 184 economies during 1970–2009. The authors report that external liabilities, with debt instruments as a strong predictor, enhance, and external assets lessen the likelihood of a systemic banking crisis when they reach a certain level. Financial integration through short-term bank debt amplifies contagion shocks. Joyce (2011), Catão and Milesi-Ferretti (2014), and Jlassi et al. (2018) drew the same conclusion for debt liability. While Catão and Milesi-Ferretti (2014) documented no effect of FDI liabilities on country-specific stress for advanced, emerging and developing countries, Joyce (2011) and Boukef Jlassi et al. (2018) highlighted a lower probability of a crisis for emerging markets and developing countries, respectively. Similarly, Gaies and Nabi (2021) pinpointed theoretically and empirically that while external debt liabilities positively impact domestic banking crises in developing economies, FDI flows attenuate. However, Gourinchas and Obstfeld (2012) found no significant link between the external debt ratio to total cross-border liabilities and the likelihood of banking crises in emerging markets only in high-income economies. Cubeddu et al.

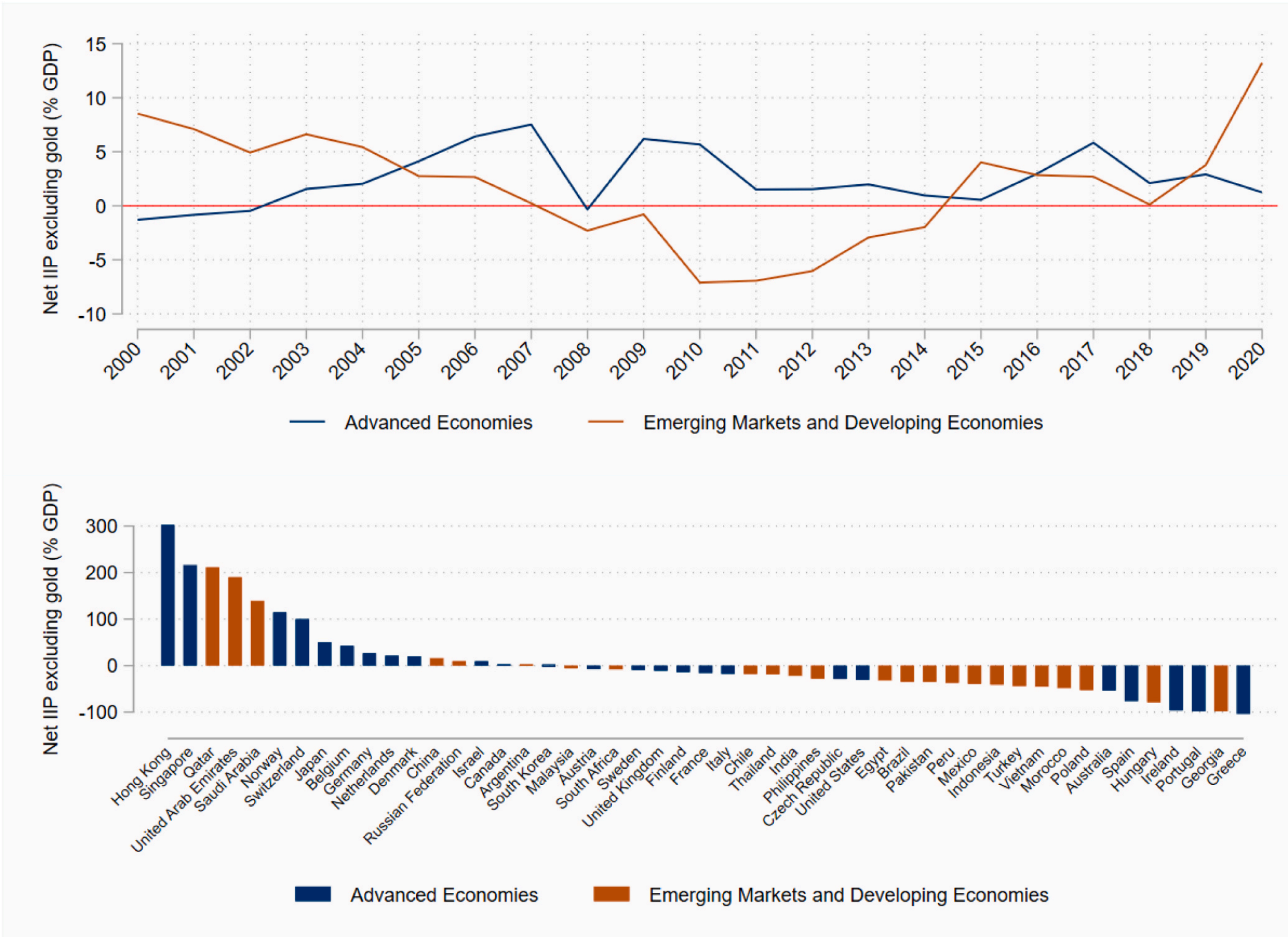

Fig. 3. Average net international investment position excluding gold as percent of GDP by year and by country.

(2023) reported that for 73 advanced and emerging economies over 1991–2018, higher levels of foreign currency-denominated external debt increased the likelihood of an external crisis and a sudden stop.

Binici and Ganioglu (2021) explored the net external position-systemic banking crisis linkage for a sample of 149 emerging, developing, and advanced countries for 1970–2011, arguing that the creditor status of a country relative to the rest of the world significantly affects the likelihood of financial turmoil and that the outcome depends on the level of financial development. They highlighted that low-to-moderate levels of financial development, against the background of positive NIIPs, significantly reduce the risk of banking crises. Our study is closely related to Karolyi et al. (2023), who analyzed the impact of cross-border bank flows on financial stability in 86 countries over 1995–2018 at a country-level and suggested a negative association between bank flows and systemic risk in recipient countries. Transmission mechanisms improve bank asset quality, efficiency, and profitability.

Regarding the factors driving banks' systemic behavior, literature identifies many variables. From the balance sheet perspective, size is an important predictor that amplifies systemic distress (Laeven et al., 2016; Bostandzic and Weiß, 2018; Varotto and Zhao, 2018), together with the lower quality of their loan portfolios (Bostandzic and Weiß, 2018; Andrieş and Sprincean, 2021), whereas better capitalization dampens it (Laeven et al., 2016; Bianchi et al., 2022; Andrieş et al., 2022). Diversification through non-traditional sources of income can go either way (Sedunov, 2016; Brunnermeier et al., 2020; Andrieş and Sprincean, 2021; Karolyi et al., 2022). However, Weiß et al. (2014) found little evidence in favor of these indicators during international financial crises. Rather, the characteristics of the regulatory regimes seem to be significant. At the country level, Andrieş et al. (2022) provided evidence that a more independent central bank is associated with a lower bank systemic risk, contribution and exposure.

3. Data and Methodology

3.1. Data

We investigate the potential impact of external wealth of nations on banks' systemic risk exposure using bank-level data for 2000–2020. We started with 593 banks in 57 countries included in the Refinitiv Global Banks Index from Datastream Eikon.[9] Owing to missing or incomplete data necessary for the systemic risk indicator computation, the final sample comprised 470 publicly listed banks from 49 countries (Table A1 in the Appendix), with a mean size of USD 221 billion at the end of 2020. We selected large and small banks because smaller institutions can pose systemic threats when they are part of a herd (Brunnermeier et al., 2009; Varotto and Zhao, 2018) and because smaller domestic banks are also affected by foreign capital flows (Dinger and te Kaat, 2020).

[9] Ticker *X4GLBK$*.

3.2. Measure of Systemic Risk Exposure

Our main indicator used to quantify banks' systemic risk exposure is marginal expected shortfall (MES),[10] developed by Acharya et al. (2017), defined as the average bank stock return conditional on the whole market experiencing losses greater than a specific threshold C indicative of financial distress. Kleinow et al. (2017) documented that out of four alternative risk metrics, MES produces the most accurate measurement of systemic risk over time and across different industry sectors. Similar to Bostandzic and Weiß (2018), we proxied the financial system by the Morgan Stanley Capital International (MSCI) World Financials Index.[11] The relation for the MES can be written as follows:

$$MES_{i,t-1} = E_{t-1}(R_{i,t}|R_{M,t} < C) \tag{1}$$

where $R_{i,t}$ is the log-return of bank I at time t, $R_{M,t}$ is the log return of the MSCI World Financial Index at time t, and C is the threshold for the left tail of the financial system log returns, which we set at 5% following Acharya et al. (2017). The bivariate processes of bank and financial system log returns are given by

$$R_{i,t} = \sigma_{i,t}\varepsilon_{i,t} = \sigma_{i,t}\rho_{i,t}\varepsilon_{M,t} + \sigma_{i,t}\sqrt{1-\rho_{i,t}^2}\varphi_{i,t} \tag{2}$$

$$R_{M,t} = \sigma_{M,t}\varepsilon_{M,t} \tag{3}$$

where $\sigma_{i,t}$ and $\sigma_{M,t}$ are the volatilities of each bank i and financial system, respectively, $\rho_{i,t}$ is the correlation between the log return of bank i and the log return of the market, and $\varepsilon_{M,t}$, $\varepsilon_{i,t}$ and $\varphi_{i,t}$ are the error terms assumed to be independently and identically distributed (iid) at time t. It follows that MES also depends on the tail expectation of the disturbances $\varepsilon_{M,t}$ and $\varphi_{i,t}$ that we modeled using a non-parametric kernel estimation approach. Thus, the MES can be rewritten as

$$MES_{i,t-1} = E_{t-1}\left(R_{i,t}\middle|R_{M,t} < C\right) = \sigma_{i,t}E_{t-1}(\varepsilon_{i,t}|\varepsilon_{M,t} < \frac{C}{\sigma_{M,t}}) = \sigma_{i,t}\rho_{i,t}E_{t-1}(\varepsilon_{i,t}|\varepsilon_{M,t} < \frac{C}{\sigma_{M,t}}) + \sigma_{i,t}\sqrt{1-\rho_{i,t}^2}E_{t-1}(\varphi_{i,t}|\varepsilon_{M,t} < \frac{C}{\sigma_{M,t}}) \tag{4}$$

We modeled the conditional volatilities of each bank i and the financial system's log returns using an asymmetric Glosten, Jagannathan, and Runkle - Generalized AutoRegressive Conditional Heteroskedasticity (GJR-GARCH) specification:

$$\sigma_{i,t}^2 = \omega_i + \alpha_i R_{i,t-1}^2 + \gamma_i R_{i,t-1}^2 \|_{R_{i,t}<0} + \beta_i \sigma_{i,t-1}^2 \tag{5}$$

$$\sigma_{M,t}^2 = \omega_M + \alpha_M R_{M,t-1}^2 + \gamma_M R_{M,t-1}^2 \|_{R_{M,t}<0} + \beta_M \sigma_{M,t-1}^2 \tag{6}$$

where $\sigma_{i,t}^2$ and $\sigma_{M,t}^2$ are the conditional volatilities of bank i and the MSCI World Financials Index, respectively. The indicator variables $\|_{R_{i,t}<0}$ and $\|_{R_{M,t}<0}$ capture the asymmetric effects of leverage on volatility because negative shocks at time *t-1* have a stronger volatility impact on variance at time t than positive shocks. The GJR-GARCH specification considers the effects of volatility clusters as β_i and β_M measure the persistence of conditional volatility.

Time-varying conditional correlations were modeled using a modified Dynamic Conditional Correlation (DCC) approach proposed by Cappiello et al. (2006) to account for possible asymmetries using a quasi-maximum likelihood (QML) estimator. We estimated MES using daily frequency and average data to obtain annual data aligned with Bostandzic and Weiß (2018).[12] The larger the MES, the greater the bank's exposure to system-wide distress.

Fig. 2 shows the evolution of the average banks' systemic risk exposure, proxied by MES, during 2000–2020 and the average exposure to system-wide fragility by country. One can observe a sharp increase in MES during distressed periods, such as the dot-com crisis, global financial crisis, and COVID-19 health crisis, with a peak in 2008, the year associated with the collapse of the Lehman Brothers investment bank and the subsequent onset of the global financial crisis. Additionally, banks in advanced economies exhibit higher levels of systemic risk exposure than their peers in emerging and developing economies. Regarding average systemic risk exposure, banks from Germany, France, and Belgium were the most exposed to aggregate tail shocks. In contrast, banks in Hong Kong, India, and Pakistan registered the lowest marginal expected shortfall.

3.3. Net International Investment Position Indicators (NIIP)

The NIIP for a particular country, also known as the net foreign assets (NFA), is determined by subtracting foreign liabilities (the value of domestic assets owned by foreigners) from foreign assets (the assets held by countries abroad), comprising the following items: FDI, portfolio equity, portfolio debt, other investments, financial derivatives (market value of outstanding derivatives contracts), and foreign exchange reserves. The NIIP also considers changes in the valuation of assets and liability stocks owing to fluctuations in market prices or currency exchange rates in which they are denominated. Data were obtained from the updated dataset of Lane and Milesi-Ferretti (2018), spanning 2000–2020. We use the NIIP as a share of GDP, excluding gold holdings, similar to Lane and Milesi-Ferretti (2018), because gold does not represent financial claims on other economies, nor does it maximize the sample size. We employed changes in the NIIP as a percentage of GDP (NIIP/GDP) as our main variable of interest. Additionally, we constructed a dummy variable (NIIP Dummy) taking the value one when NIIP/GDP is above zero, that is, when a specific country has a net creditor position (it receives more revenue from its foreign assets than the payments made on its cross-border liabilities), and zero otherwise (it has a debtor status or, foreign liabilities exceed foreign assets).

Fig. 3 shows the average evolution of the NIIP, excluding gold/GDP, by year (2000–2020) and country. We note that the net position of advanced economies (AEs) that compose our sample experienced an upward trend preceding the crisis, with two sharp drops in 2008 and 2011. However, emerging markets and developing economies (EMDEs) registered opposite trends. The NIIP status for AEs was, on average, much of the time creditor, reflecting an increase in external asset position at a more rapid pace than external liability stocks. In contrast, EMDE portfolios were registered on an aggregate basis of net borrower status. These developments were driven by countries categorized as financial centers, such as Hong Kong, Singapore, and Switzerland. Figure A1 in the Appendix shows the evolution of the NIIP as a share of the GDP by country.

3.4. Empirical Framework

Our data have two levels of aggregation: countries and banks. Individual banks are nested within countries over a specific period, thus generating a strong within-cluster correlation. To account for data hierarchy and to capture potential dependency due to nesting effects, we employed a hierarchical linear modeling (HLM) approach used recently,

[10] For recent surveys see Benoit et al. (2017) and Ellis et al. (2022).

[11] To test the consistency of our findings, we use the national stock market indices. Results remain unchanged. We thank an anonymous referee for this suggestion.

[12] As mean values are affected by outliers, we compute the median MES for each year and employ it in the empirical analysis described in Section 3.4. The findings remain consistent.

among others, by Doumpos et al. (2015), Mourouzidou-Damtsa et al. (2019), and Andrieș et al. (2022). In multilevel models, homogeneity is not necessary because they separate the variances attributable to all levels of aggregation. Moreover, they consider the cross-level interaction effects between bank- and country-level variables and do not require errors to be independent (Mourouzidou-Damtsa et al., 2019). Raudenbush and Bryk (2002) argued that the standard errors of fixed effects are generally underestimated in an ordinary least-squares (OLS) framework when dealing with multilevel data.

An important advantage of the HLM over other models is that it considers that banks within a country manifest similar behavior to banks in different countries (Doumpos et al., 2015). For instance, Islamic banks governed by the Sharia Law are less risky than their conventional counterparts (Sorwar et al., 2016). Additionally, bank-based financial structures, such as those in Europe, are more prone to systemic fragility than market-based financial structures, given their dependence on bank funding and, thus, a larger asset-liability mismatch and more leveraged nature (Langfield and Pagano, 2016; Bats and Houben, 2020).

Following Binici and Ganioglu (2021) and Karolyi et al. (2023), we specify the estimated model as follows:

$$MES_{ij,t} = \underbrace{\beta_0 + \beta_1 \times \Delta NIIP\ \ GDP_{j,t} + \delta \times \Phi_{ij,t-1} + \lambda \times \Psi_{j,t-1}}_{fixed\ \ components} + \underbrace{u_{ij} + \zeta_j + \varepsilon_{ij,t}}_{random\ \ components} \tag{7}$$

will affect all control variables, the explanatory control variables were lagged by one year (Anginer et al., 2014; Binici and Ganioglu, 2021). All continuous variables were winsorized within the 1st and 99th percentiles to address outliers.

In addition to the specifications given in Eq. (7), we included a dummy variable that takes the value of one if the NIIP of country j in year t is higher than zero; the country is a creditor vis-à-vis the rest of the world, and zero otherwise. The fit model has the following form:

$$MES_{ij,t} = \underbrace{\beta_0 + \beta_1 \times NIIP\ \ Dummy_{j,t} + \delta \times \Phi_{ij,t-1} + \lambda \times \Psi_{j,t-1}}_{fixed\ \ components} + \underbrace{u_{ij} + \zeta_j + \varepsilon_{ij,t}}_{random\ \ components} \tag{8}$$

where $NIIP\ Dummy_{j,t}$ is a dummy variable capturing the creditor status of country j in year t.

Finally, we study the asymmetric impact of the global financial crisis, banking crisis episodes, and specific macroeconomic variables, that is, the fiscal stance proxied by the fiscal balance adjusted for business cycle fluctuations (cyclically adjusted fiscal balance), fiscal fragility measured by the change in debt-to-GDP ratio, country risk quantified through the 5 y sovereign CDS spreads, and financial system development with its two components (financial institutions and markets). We included these variables and their interactions with $NIIP\ Dummy_{j,t}$ in the benchmark regression.[15]

$$MES_{ij,t} = \underbrace{\beta_0 + \beta_1 \times NIIP\ \ Dummy_{j,t} + \vartheta \times \Theta_{j,t-1} + \nu \times NIIP\ \ Dummy_{j,t} \times \Theta_{j,t-1}}_{fixed\ \ components} + \underbrace{\delta \times \Phi_{ij,t-1} + \lambda \times \Psi_{j,t-1}}_{fixed\ \ components} + \underbrace{u_{ij} + \zeta_j + \varepsilon_{ij,t}}_{random\ \ components} \tag{9}$$

where $MES_{ij,t}$ is the yearly marginal expected shortfall for bank i from country j during year t, $\Delta NIIP/GDP_{j,t}$ is our regressor of interest, that is, the change in NIIP excluding gold as a share of the GDP of country j in year t (excluding gold holdings because they are not financial claims in other countries),[13] similar to Lane and Milesi-Ferretti (2004). $\Phi_{ij,t-1}$ is a lagged vector of bank-level observable characteristics that are discussed in literature to influence systemic risk (size, capitalization, lending activities, funding structure, income diversification, credit risk ratio, and profitability), and $\Psi_{j,t-1}$ is a lagged vector of the banking system and macroeconomic controls (bank concentration, real GDP growth, inflation and financial institutions index).[14] Additionally, we included year dummies to account for aggregate time shocks affecting all banks. Table A2 in the Appendix describes all variables used in the empirical setting and presents their sources. Table A3 shows the correlation matrix, and Table A4 provides summary statistics.

We are interested in mean differences and not the slope variation due to the multilevel structure; therefore, we include the variables as fixed factors (Raudenbush and Bryk, 2002). However, the random variables u_{ij} and ζ_j alow the intercept ($\beta_0 + u_{ij} + \zeta_j$) to be random and unique at the country and bank levels. Thus, the HLM is estimated with random intercepts and fixed slopes and is fitted using the maximum likelihood (ML) estimation technique.

To account for potential endogeneity issues related to changes in NIIP and systemic distress and the fact that an increase in systemic risk

where $\Theta_{ij,t-1}$ is the vector of selected variables in year t-1(except two dummy-type variables capturing crises episodes that are added with a contemporary effect).

4. Estimation Results

4.1. Baseline Results

We considered the benchmark specification of the model in Eq. (7), which captures the main purpose of this study. The dependent variable is the marginal expected shortfall of Acharya et al. (2017), which quantifies banks' exposure to the financial system's tail shocks, whereas the main regressor of interest is $\Delta NIIP/GDP_{j,t}$ based on Lane and Milesi-Ferretti (2018) updated dataset. We focus on the NIIP as a share of GDP, excluding gold holdings, because they are not financial claims in other countries, similar to Lane and Milesi-Ferretti (2018). The findings are summarized in Table 1. Model (1) reports the results using $\Delta NIIP/GDP_{j,t}$Model (2) shows the output by employing the NIIP Dummy excluding gold, whereas Model (3) displays the findings using $\Delta NIIP/GDP_{j,t}$ and $NIIP\ Dummy_{j,t}$. The estimated coefficient of $\Delta NIIP/GDP_{j,t}$ in Model (1) is negative and statistically significant at the 1% level, implying that banks can reduce their exposure to system-wide distress when the countries where they are incorporated increase their net foreign assets, when they are net global creditors shown by Model (2), or in both cases as shown by Model (3), consistent with Binici and Ganioglu's (2021) conclusion in systemic banking crises. The effect is also economically sizeable; a one standard deviation increase in ΔNIIP/GDP is associated with a 5.18% decline in banks' systemic risk exposure. The possible transmission channels from the NIIP to systemic

[13] We also run Eq. (7) with $\Delta NIIP/GDP_{j,t}$ constructed by including gold holdings that are used in official international investment position statistics, and the findings yield the same conclusion. The results are available upon request.

[14] Catão and Milesi-Ferretti (2014) include in their specifications current account/GDP as additional regressor. We followed their strategy and included $\Delta Current\ Account/GDP_{j,t}$ as an additional regressor and documented its statistical insignificance, in line with Binici and Ganioglu (2021) who found that current account/GDP is not a significant predictor of banking crises.

[15] To facilitate the interpretation of interaction coefficients, we employ the $NIIP\ Dummy_{j,t}$ (dummy variable) instead of $\Delta NIIP/GDP_{j,t}$ (continous variable).

Table 1
Baseline model results.

Dependent: MES	(1)	(2)	(3)
Fixed effects parameters			
ΔNIIP/GDP	-0.0071 * **		-0.0070 * **
	(0.0005)		(0.0005)
NIIP Dummy		-0.1011 * **	-0.0605 * *
		(0.0257)	(0.0256)
Size (t-1)	0.0981 * **	0.0981 * **	0.0975 * **
	(0.0093)	(0.0093)	(0.0093)
Capitalization (t-1)	0.0004	0.0011	0.0003
	(0.0022)	(0.0022)	(0.0022)
Lending Activities (t-1)	-0.0003	-0.0003	-0.0003
	(0.0006)	(0.0006)	(0.0006)
Funding Structure (t-1)	-0.0015 * *	-0.0015 * *	-0.0015 * *
	(0.0007)	(0.0007)	(0.0007)
Income Diversification (t-1)	-0.0024 * **	-0.0024 * **	-0.0024 * **
	(0.0006)	(0.0007)	(0.0006)
Credit Risk (t-1)	0.0059 * **	0.0052 * **	0.0060 * **
	(0.0017)	(0.0018)	(0.0017)
Profitability (t-1)	-0.0013 *	-0.0011	-0.0012 *
	(0.0007)	(0.0007)	(0.0007)
Bank Concentration (t-1)	0.0067 * *	0.0060 *	0.0066 * *
	(0.0031)	(0.0031)	(0.0031)
Real GDP Growth (t-1)	-0.0127 * **	-0.0115 * **	-0.0125 * **
	(0.0018)	(0.0018)	(0.0018)
Inflation (t-1)	-0.0007	-0.0004	-0.0007
	(0.0005)	(0.0005)	(0.0005)
Financial Institution Index (t-1)	0.4797 * **	0.4599 * **	0.4943 * **
	(0.1384)	(0.1400)	(0.1385)
Constant	-1.4473 * **	-1.4424 * **	-1.4243 * **
	(0.2692)	(0.2712)	(0.2693)
Random effects parameters			
Country-level variance	-0.5490 * **	-0.5465 * **	-0.5514 * **
	(0.1106)	(0.1108)	(0.1108)
Bank-level variance	-1.1520 * **	-1.1524 * **	-1.1515 * **
	(0.0413)	(0.0414)	(0.0413)
Residual variance	-1.0440 * **	-1.0323 * **	-1.0444 * **
	(0.0087)	(0.0087)	(0.0087)
Observations	7132	7132	7132
Banks	470	470	470
Countries	49	49	49
Likelihood ratio test	7593.6615 * **	6837.9714 * **	6906.9611 * **
Year FE	Yes	Yes	Yes

Note: This table displays the results of the base model described in Eq. (7). The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

risk can be summarized as follows. Literature suggests that banks can mitigate risks and reduce the likelihood of bank failures during financial crises by diversifying their sources of income through non-interest income (Baele et al., 2007; DeYoung and Torna, 2013). Looking at the Income Diversification variable in Table 1, we note a negative and highly significant impact on the MES in all three models, confirming this channel. Furthermore, a higher NIIP improves a country's financial stability and lowers the sovereign premium, decreasing funding costs for private sector residents, including banks (Lane, 2015) (Section 3.3). Moreover, banks typically hold significant amounts of sovereign debt, including cross-border debt, in their balance sheets (Al-Saffar et al., 2013). Therefore, an improvement in sovereign risk can increase the value of these bonds, enabling them to be used as collateral in inter-bank lending and repo transactions. This enhances the banks' financial positions and liquidity. Lastly, reducing country risk benefits banks through improved funding conditions and increases the advantages they receive from implicit and explicit government guarantees (BIS, 2011). It also enhances the overall capacity of countries to support their financial sectors when necessary. As Obstfeld (2012a) states, if current account deficits put pressure on NIIP positions, without a windfall of capital gains on national foreign positions, expenditures have to be cut or output increased to maintain the solvency of public and private agents, which limits the government's capacity to be involved. Thus, the NIIP reasonably shows a country's consumption possibilities, is an important predictor of banks' systemic behavior, and provides insurance against shocks (Forbes et al., 2017).

The likelihood ratio test, which follows a chi-squared distribution, strongly rejects the null hypothesis of no differences between the estimated model and linear regression, favoring a multilevel specification.

The control variable signs are consistent with empirical literature. Size, proxied by the natural logarithm of total assets denominated in US dollars, amplifies systemic vulnerabilities consistent with Laeven et al. (2016), Varotto and Zhao (2018) and Andrieș and Sprincean (2022). Large and complex financial institutions, often deemed as "too-big-to-fail," are more susceptible to being bailed out in case of distress, being an incentive for moral hazard and excessive risk-taking. Reliance on deposits as a funding source is considered more stable than non-deposit liabilities, such as inter-bank loans, certificates of deposit, or short-term bonds (Bertay et al., 2015). Thus, they have a beneficial effect on bank MES. In many countries, customer deposits are covered by deposit insurance schemes to prevent bank runs (Demirgüç-Kunt and Huizinga, 2010). Income diversification, computed as non-interest income divided by revenue, such as service or loan origination fees, trading income, or commissions; income from non-traditional activities, which are more volatile than lending activities but simultaneously more profitable (Stiroh and Rumble, 2006), decreases banks' riskiness. Thus, a

Table 2
Results for decomposition in net equity and net debt positions.

Dependent: MES	(1)	(2)	(3)	(4)
Fixed effects parameters				
ΔNet Foreign Equity/GDP	-0.0082 * **			
	(0.0006)			
ΔNet Foreign Debt/GDP		-0.0013		
		(0.0009)		
Current Account/GDP			0.0007	
			(0.0017)	
Valuation Changes/GDP				-0.0072 * **
				(0.0006)
Size (t-1)	0.0945 * **	0.0996 * **	0.0993 * **	0.0976 * **
	(0.0093)	(0.0093)	(0.0093)	(0.0093)
Capitalization (t-1)	0.0001	0.0014	0.0012	0.0010
	(0.0022)	(0.0022)	(0.0022)	(0.0022)
Lending Activities (t-1)	-0.0003	-0.0003	-0.0003	-0.0002
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Funding Structure (t-1)	-0.0017 * *	-0.0015 * *	-0.0015 * *	-0.0017 * **
	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Income Diversification (t-1)	-0.0023 * **	-0.0024 * **	-0.0024 * **	-0.0024 * **
	(0.0006)	(0.0007)	(0.0007)	(0.0006)
Credit Risk (t-1)	0.0050 * **	0.0053 * **	0.0051 * **	0.0058 * **
	(0.0017)	(0.0018)	(0.0018)	(0.0017)
Profitability (t-1)	-0.0011	-0.0012 *	-0.0012 *	-0.0013 *
	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Bank Concentration (t-1)	0.0066 * *	0.0058 *	0.0060 *	0.0045
	(0.0031)	(0.0031)	(0.0031)	(0.0031)
Real GDP Growth (t-1)	-0.0131 * **	-0.0118 * **	-0.0119 * **	-0.0130 * **
	(0.0018)	(0.0018)	(0.0018)	(0.0018)
Inflation (t-1)	-0.0009 *	-0.0005	-0.0005	-0.0012 * *
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Financial Institution Index (t-1)	0.6195 * **	0.4192 * **	0.4408 * **	0.6266 * **
	(0.1388)	(0.1404)	(0.1411)	(0.1393)
Constant	-1.4115 * **	-1.4858 * **	-1.4852 * **	-1.4827 * **
	(0.2693)	(0.2713)	(0.2714)	(0.2694)
Random effects parameters				
Country-level variance	-0.5467 * **	-0.5414 * **	-0.5401 * **	-0.5501 * **
	(0.1106)	(0.1105)	(0.1104)	(0.1106)
Bank-level variance	-1.1486 * **	-1.1532 * **	-1.1535 * **	-1.1511 * **
	(0.0413)	(0.0414)	(0.0414)	(0.0412)
Residual variance	-1.0461 * **	-1.0313 * **	-1.0311 * **	-1.0431 * **
	(0.0087)	(0.0087)	(0.0087)	(0.0087)
Observations	7131	7132	7132	7132
Banks	470	470	470	470
Countries	49	49	49	49
Likelihood ratio test	7679.4894 * **	7658.6584 * **	7405.2159	7721.2210
Year FE	Yes	Yes	Yes	Yes

Note: This table displays the results disaggregated for net foreign equity, net foreign debt positions, and current account and valuation changes. The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

combination of non-interest income and interest-earning activities can increase returns and diversify risk (Demirgüç-Kunt and Huizinga, 2010). Our findings support the evidence of Andrieş and Sprincean (2021) but contradict that of Brunnermeier et al. (2020). Credit risk, defined as the proportion of non-performing loans in total loans, which reflects the quality of banks' portfolios, is positively associated with banks' marginal expected shortfall, consistent with Bostandzic and Weiß (2018), Andrieş and Sprincean (2021) and Andrieş et al. (2022). Banks' profitability mitigates their risk-taking behavior (Xu et al., 2019). This is because of the ability of higher profits to create equity buffers, which can be funded through retained earnings, a more cost-effective source than external financing. Bank concentration contributes to the accumulation of systemic risk in the banking sector, supporting the concentration-fragility hypothesis. Increased concentration in the banking sector has resulted in greater market power, enabling banks to charge higher interest rates. This raises their credit risk, contributing to higher loan defaults and the probability of bank failure (Boyd and De Nicoló, 2005). Enhanced levels of economic growth play a mitigating role in banks' systemic distress, as documented by Andrieş et al. (2022). Finally, more developed financial institutions encompassing depth, efficiency, and access boost systemic risk exposure, complementing earlier evidence that bank financing contributes more to systemic risk than market-based financial structures (Langfield and Pagano, 2016; Bats and Houben, 2020).

Ahrend and Goujard (2014) and Joyce (2018) argued that a country's vulnerability to cross-border shocks depends, in part, on the composition of its international portfolios. Following Vermeulen and de Haan (2014), we decompose countries' NIIPs into net foreign equity positions, computed as portfolio equity assets + FDI assets – portfolio equity liabilities – FDI liabilities, and net foreign debt positions given by total debt assets – total debt liabilities. Table 2 shows that only net foreign equity change is negatively and significantly related to banks' expected marginal shortfall, whereas net foreign debt, although having a negative coefficient, lacks statistical significance. This finding can be considered strikingly against the backdrop of literature, which finds that FDI is highly illiquid and difficult to liquidate during periods of uncertainty (Sula and Willett, 2009).[16] However, FDI flows are driven by

[16] We thank an anonymous referee for pointing-out this issue.

Table 3
Robustness checks using additional measures of external imbalances.

Dependent: MES	(1)	(2)	(3)
Fixed effects parameters			
ΔTotal Liabilities/GDP	0.0012 * **		
	(0.0003)		
ΔTotal Assets excluding gold/GDP		-0.0006 * *	
		(0.0003)	
Current Account Dummy			-0.0642 * **
			(0.0194)
Size (t-1)	0.0978 * **	0.0998 * **	0.0972 * **
	(0.0093)	(0.0093)	(0.0093)
Capitalization (t-1)	0.0016	0.0011	0.0012
	(0.0022)	(0.0022)	(0.0022)
Lending Activities (t-1)	-0.0003	-0.0003	-0.0004
	(0.0006)	(0.0006)	(0.0006)
Funding Structure (t-1)	-0.0015 * *	-0.0015 * *	-0.0014 * *
	(0.0007)	(0.0007)	(0.0007)
Income Diversification (t-1)	-0.0023 * **	-0.0024 * **	-0.0023 * **
	(0.0007)	(0.0007)	(0.0007)
Credit Risk (t-1)	0.0055 * **	0.0051 * **	0.0058 * **
	(0.0018)	(0.0018)	(0.0018)
Profitability (t-1)	-0.0012 *	-0.0012 *	-0.0013 *
	(0.0007)	(0.0007)	(0.0007)
Bank Concentration (t-1)	0.0062 * *	0.0061 *	0.0057 *
	(0.0031)	(0.0031)	(0.0031)
Real GDP Growth (t-1)	-0.0117 * **	-0.0118 * **	-0.0111 * **
	(0.0018)	(0.0018)	(0.0018)
Inflation (t-1)	-0.0005	-0.0005	-0.0005
	(0.0005)	(0.0005)	(0.0005)
Financial Institution Index (t-1)	0.4337 * **	0.4396 * **	0.3610 * *
	(0.1399)	(0.1401)	(0.1417)
Constant	-1.4491 * **	-1.4976 * **	-1.3574 * **
	(0.2715)	(0.2712)	(0.2737)
Random effects parameters			
Country-level variance	-0.5400 * **	-0.5423 * **	-0.5423 * **
	(0.1105)	(0.1105)	(0.1107)
Bank-level variance	-1.1504 * **	-1.1545 * **	-1.1504 * **
	(0.0414)	(0.0413)	(0.0415)
Residual variance	-1.0325 * **	-1.0314 * **	-1.0321 * **
	(0.0087)	(0.0087)	(0.0087)
Observations	7132	7132	7132
Banks	470	470	470
Countries	49	49	49
Likelihood ratio test	7686.4148 * **	7604.4239 * **	7002.8732 * **
Year FE	Yes	Yes	Yes

Note: This table displays the results using additional measures of external imbalances. The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

long-term returns and a country's fundamentals rather than speculative aspects and interest rate differentials (Sula and Willett, 2009; Baskaya et al., 2017). Moreover, as Sula and Willett (2009) argued, a decrease in the market value of companies due to a crisis can attract more inflows to leverage perceived bargains. This explains the results of Kellard et al. (2022), who find that bank stress in the host country has no impact on inward FDI. Further, we decompose ΔNIIP/GDP into current account balance and valuation changes, computed as the difference between the change in net foreign assets and the current account, and find that the mitigating effect of the external balance sheet on MES derives from valuation gains rather than the incremental net acquisition of assets or liabilities represented by the current account. These fluctuations in the market value of assets and liabilities directly influence a country's cost of capital and borrowing capacity, resulting in indirect and lasting consequences for the real economy, primarily through their impact on investment (Hale and Juvenal, 2023).

4.2. Robustness Tests

4.2.1. Alternative Measures of External Imbalances

Obstfeld (2012b) argued that gross foreign asset and liability positions provide the most comprehensive insight into potential stability risks and that hazardous gross positions could accumulate without net international capital flows. Thus, we conduct the analysis separately for gross foreign assets and liabilities. The empirical findings in Table 3 show that higher changes in gross foreign assets are associated with lower system-wide distress as shown by Model (1). However, heightened changes in the value of domestic assets owned by foreigners (gross foreign liabilities) threaten overall financial stability.

Although the current account balance per se is not a significant predictor of banks' exposure to system-wide distress, as shown in the previous section, we construct a dummy variable that takes the value of one when a country has a positive current account balance (creditor position) and zero otherwise. We find that a country's status matters more in terms of financial stability than its current account balance as shown by Model (3).

4.2.2. Alternative Estimation Models

We performed various robustness tests to examine the strengths of our findings. First, we employed alternate static models; the outputs are listed in Table 4. The ML estimation technique was used in the baseline specification to estimate the HLM. In Model (1), we employ restricted

Table 4
Robustness checks: estimation results using alternative static models.

Dependent: MES	HLM REML (1)	Bank FE (2)	Country FE (3)	Driscoll and Kraay (4)	LIML (5)
ΔNIIP/GDP	-0.0071 * **	-0.0071 * **	-0.0071 * **	-0.0071 * *	-0.0363 * **
	(0.0005)	(0.0007)	(0.0007)	(0.0031)	(0.0117)
Size (t-1)	0.0982 * **	0.0002	0.0977 * **	0.0002	0.0109
	(0.0093)	(0.0180)	(0.0118)	(0.0277)	(0.0252)
Capitalization (t-1)	0.0004	0.0008	0.0003	0.0008	-0.0027
	(0.0022)	(0.0027)	(0.0025)	(0.0026)	(0.0039)
Lending Activities (t-1)	-0.0003	0.0002	-0.0003	0.0002	-0.0001
	(0.0006)	(0.0007)	(0.0007)	(0.0010)	(0.0010)
Funding Structure (t-1)	-0.0015 * *	-0.0021 * *	-0.0013	-0.0021	-0.0033 * *
	(0.0007)	(0.0010)	(0.0009)	(0.0025)	(0.0014)
Income Diversification (t-1)	-0.0024 * **	-0.0042 * **	-0.0025 * **	-0.0042 * *	-0.0034 * **
	(0.0006)	(0.0008)	(0.0008)	(0.0019)	(0.0012)
Credit Risk (t-1)	0.0059 * **	0.0063 * **	0.0058 * **	0.0063	0.0108 * **
	(0.0018)	(0.0022)	(0.0022)	(0.0053)	(0.0035)
Profitability (t-1)	-0.0013 *	-0.0009	-0.0013	-0.0009	-0.0016
	(0.0007)	(0.0010)	(0.0010)	(0.0016)	(0.0012)
Bank Concentration (t-1)	0.0067 * *	0.0072 *	0.0074 *	0.0072	0.0077
	(0.0031)	(0.0039)	(0.0038)	(0.0088)	(0.0066)
Real GDP Growth (t-1)	-0.0127 * **	-0.0150 * **	-0.0128 * **	-0.0150 * *	-0.0166 * **
	(0.0018)	(0.0017)	(0.0017)	(0.0064)	(0.0025)
Inflation (t-1)	-0.0007	-0.0009	-0.0008	-0.0009	-0.0015 *
	(0.0005)	(0.0006)	(0.0006)	(0.0011)	(0.0009)
Financial InstitutionsIndex (t-1)	0.4791 * **	0.5634 * **	0.4515 * **	0.5634	1.0043 * **
	(0.1389)	(0.1664)	(0.1714)	(0.4755)	(0.2456)
Constant	-1.4482 * **	0.9134 * *	-0.4179	0.9134	
	(0.2701)	(0.4528)	(0.2938)	(0.6137)	
Observations	7132	7132	7132	7132	6672
Banks	470	470	470	470	458
Countries	49	49	49	49	49
Likelihood ratio test	7575.1035 * **				
R-squared	0.7106	0.7085			
F-test (first stage)					19.2104 * **
Underidentification - Kleibergen-Paap rk LM statistic					18.7026 * **
GMM distance test statistic of endogeneity					15.7035 * **
Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table displays the results for the alternative static models. The dependent variable is MES, as defined in Table A2 in the Appendix. The HML REML model is estimated using the restricted maximum likelihood estimation. Model (2) and Model (3) are estimated using the fixed effect estimator with bank and year and country and year fixed effects, respectively. Model (4) is estimated using Driscoll and Kraay standard errors (Driscoll and Kraay, 1998) to account for heteroskedasticity, serial correlation and cross-sectional dependence across panels. In Model (5), we use instrumental variables regression and estimate it using limited-information maximum likelihood (LIML) estimator that is robust to weak instruments. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. The F-test tests the excluded exogenous variable in the first-stage regression, with the null hypothesis that the instrument does not explain the variation in ΔNIIP/GDP. The Kleibergen-Paap rk LM statistic is the underidentification test of whether the equation is identified (i.e., excluded instruments are correlated with the endogenous regressors) with the null hypothesis that the model is underidentified. The GMM distance test statistic of endogeneity has the null hypothesis that endogenous regressors can be treated as exogenous. All three latter tests refer to LIML estimation. Standard errors in parentheses for HLM REML. Clustered-robust standard errors in parentheses for FE and cluster-robust standard errors in parentheses for LIML. Driscol and Kraay standard errors in parentheses for Model (4). * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. To conserve space, the output for random-effects parameters is not shown for the HLM REML.

maximum likelihood estimation (REML), a special case of ML in which random components are estimated to explain the remaining variance for the part free of fixed components. Maximizing this part yields the REML estimates, which are less biased than the ML estimates, especially when the number of groups is reduced (Boedeker, 2019). The results remain unchanged, and the likelihood ratio test rejects the null hypothesis. Thus, the estimations from the HLM model are different and preferred compared to those from a linear regression. Furthermore, in Models (2) and (3), we apply a fixed effects (FE) estimator to capture any time-invariant unobserved heterogeneity across banks, countries, and common shocks across banks. While Model (2) is estimated using bank- and year-fixed effects, Model (3) incorporates country- and year-fixed effects with standard errors clustered at the bank level. Again, the conclusion drawn from the baseline specifications holds.

To account for possible heteroskedasticity, serial correlation, and cross-sectional dependence across the panels in Model (4), we estimate a regression using Driscoll and Kraay standard errors (Driscoll and Kraay, 1998). Common sources of cross-sectional dependence can be unobserved common shocks, spillover effects, or omitted variables (Andrieș and Sprincean, 2021). As we have yearly data, we assume that the disturbances are autocorrelated up to the first lag. Findings remain robust.

Finally, to specifically address endogeneity concerns related to the NIIP that may arise from reverse causality or omitted variable bias, we instrument the ΔNIIP/GDP using an instrumental variable (IV) approach and a limited-information maximum likelihood (LIML) estimator that is robust to weak instruments. A valid instrument should satisfy two criteria: (i) relevance and (ii) exogeneity; it must correlate with the ΔNIIP/GDP but not be a direct cause of systemic risk exposure. We employ the change in the *de jure* KOF Financial Globalization Index (Gygli et al., 2019) as an instrument. This index should correlate with ΔNIIP/GDP but is less likely to directly impact MES, as it encompasses information related to investment restrictions, capital account openness, and international investment agreements. This was identified because only one instrument was included. We evaluated the suitability of our instrument using two tests: the first-stage F-test with the null hypothesis that the instrument does not explain the variation in ΔNIIP/GDP and the Kleibergen-Paap rk LM statistic that tests whether the excluded instrument is correlated with the endogenous regressor, with the null hypothesis that the model is under-identified. Both tests reject the null

Table 5
Robustness checks: estimation results using dynamic models.

Dependent: MES	System GMM (1)	LSDVC (2)
ΔNIIP/GDP	-0.0097 * **	-0.0085 * **
	(0.0010)	(0.0007)
Size (t-1)	0.1265 *	0.0237
	(0.0729)	(0.0156)
Capitalization (t-1)	0.0333 * **	0.0000
	(0.0116)	(0.0034)
Lending Activities (t-1)	0.0050 * *	0.0008
	(0.0023)	(0.0007)
Funding Structure (t-1)	0.0029	-0.0001
	(0.0025)	(0.0009)
Income Diversification (t-1)	-0.0037 * *	-0.0037 * **
	(0.0017)	(0.0009)
Credit Risk (t-1)	-0.0117	0.0031
	(0.0083)	(0.0021)
Profitability (t-1)	-0.0008	0.0003
	(0.0018)	(0.0008)
Bank Concentration (t-1)	-0.0021	0.0155 * **
	(0.0019)	(0.0033)
Real GDP Growth (t-1)	-0.0306 * **	-0.0076 * **
	(0.0096)	(0.0021)
Inflation (t-1)	0.0071 * *	-0.0005
	(0.0035)	(0.0006)
Financial Institution Index (t-1)	0.4400 * **	0.1858
	(0.1341)	(0.2034)
Constant	0.6572 * **	0.5947 * **
	(0.0256)	(0.0123)
Constant	-3.1770 *	
	(1.7110)	
Observations	6873	6873
Banks	468	468
Countries	49	49
Instruments	34	
Hansen J statistic	0.7347	
AR(1) test	-12.9123 * **	
AR(2) test	-1.1659	
Year FE	Yes	Yes

Note: This table displays the results of the dynamic models. The dependent variable is MES, as defined in Table A2 in the Appendix. The System GMM model follows the approach of Blundell and Bond (1998), and is estimated using the doubly-corrected misspecification-robust standard errors of Hwang et al. (2022). The LSDVC is the bias-corrected least squares dummy variable estimator developed by Kiviet (1995), adopted for unbalanced panels by Bruno (2005), being initialized by the Blundell-Bond estimator. The Hansen J statistic tests the overidentifying restrictions with the null hypothesis that the overidentifying restrictions are valid. AR(1) test is the Arellano-Bond test for autocorrelation of the first-differenced residuals with the null hypothesis that there is no autocorrelation of order one, whereas the AR(2) test is the Arellano-Bond test for autocorrelation of the first-differenced residuals with the null hypothesis that there is no autocorrelation of order two. Doubly-corrected misspecification-robust standard errors in parentheses for System GMM, and bootstrap standard errors based on 50 repetitions in parentheses for LSDVC.

hypothesis and confirm that our instrument satisfies the relevance and exogeneity requirements. Additionally, the GMM distance test statistic of endogeneity indicates the adequate treatment of ΔNIIP/GDP as endogenous.

Second, we employed two linear dynamic panel data models to capture systemic risk persistence over time (Table 5). The first model is the System GMM, which follows the approach of Blundell and Bond (1998) and is estimated using the doubly corrected misspecification-robust standard errors of Hwang et al. (2022). The consistency of the System GMM estimation is verified with two diagnostic tests: the Hansen J statistic of the overidentifying restrictions with the null hypothesis that the overidentifying restrictions are valid, and the Arellano-Bond test for autocorrelation of the first-differenced residuals with the null hypothesis that there is no autocorrelation of order 1 and 2. We note the same negative and statistically significant impact of the ΔNIIP/GDP ratio on banks' expected marginal shortfalls. The Hansen J statistic rejects the null hypothesis of the validity of over-identifying restrictions, showing that instruments are uncorrelated with the error term. However, the Arellano-Bond test reveals a lack of AR(2) serial correlation in the first-differenced residuals.

Bruno (2005b) argued that the bias-corrected least squares dummy variable (LSDVC) estimator, developed by Kiviet (1995) and subsequently by Bun and Kiviet (2003) and adopted for unbalanced panels by Bruno (2005a), outperforms the IV-GMM estimators in terms of bias and root mean squared error when the number of cross-sectional units is small. Bias correction was initialized using the Blundell-Bond consistent estimator-based bootstrap procedure with 50 repetitions. ΔNIIP/GDP remained significantly associated with reducing systemic risk exposure, as shown in Model (2) in Table 5.

4.2.3. Alternative Systemic Risk Measures

As the MSCI World Index could be more correlated with developed countries and less correlated with emerging markets and developing economies, we employed national stock market indices to compute the MES,[17] as in Benoit (2014). Model (1) in Table 6 shows that our findings remain qualitatively unaffected.

Kleinow et al. (2017) suggested that different systemic risk metrics may lead to contradictory assessments of the riskiness of various financial institutions. Against this backdrop, we estimate three other indicators widely used in literature to evaluate the robustness of our MES findings.

The first is the Exposure-ΔCoVaR (eΔCoVaR), based on the Δ CoVaR proposed by Adrian and Brunnermeier (2016). It works in the opposite direction with ΔCoVaR, denoting banks' exposure to system-wide fragility. Thus, it can be seen as an alternative indicator of the marginal expected shortfall. Furthermore, eΔCoVaR is estimated using the quantile regression technique and measures the sensitivity of the value-at-risk (VaR) of a bank's stock returns to fluctuations in the VaR of the financial system's returns defined as the MSCI World Financials Index. The second metric is ΔCoVaR, reflecting banks' systemic risk contribution and the systemic risk transmission from banks to the financial system. This involves the same methodological approach as eΔCoVaR, as shown in Table A2 in the Appendix. Finally, following Brownlees and Engle (2017), we focus on SRISK, a bank's expected capital shortage conditional on a substantial market decline, usually set at 40%. It shows how much capital a bank needs to maintain when the market is distressed relative to a statutory minimum capital-to-assets ratio of 8%. Following Acharya et al. (2012), we set negative SRISK values to zero because they imply capital surplus and do not contribute to systemic risk. As shown in Table 6, only eΔCoVaR and ΔCoVaR deliver similar inferences, whereas the estimated coefficient for SRISK is not statistically different from zero. While ΔCoVaR is closer to capturing contagion risks, SRISK is closer to capturing the exposure to common shocks affecting the financial sector (Andrieş et al., 2022). Thus, banks in countries with sustainable external balance sheets experience less exposure, contributing to systemic instability.

4.2.4. Additional Robustness Tests

Table A5 of the Appendix presents the results obtained by applying a stepwise procedure to select the control variables. Model (1) includes the ΔNIIP/GDP with no control variables. Model (2) shows the findings by controlling only for bank-level characteristics, whereas Model (3) includes only the banking system and macroeconomic factors. Model (4) presents the benchmark findings for comparison. In all specifications, our variable of interest, ΔNIIP/GDP, and all control variables maintain their signs and significance. Furthermore, we included three additional variables to control for bank regulatory and supervisory requirements. The first variable is the Supervision Index obtained from Kladakis et al. (2022), which measures the official power of supervisory authorities and

[17] We thank an anonymous referee for this suggestion.

Table 6
Robustness checks: estimation results for alternative systemic risk measures.

Fixed effects parameters	MES-NI (1)	eΔCoVaR (2)	ΔCoVaR (3)	SRISK (4)
ΔNIIP/GDP	-0.0032 * **	-0.0059 * **	-0.0028 * **	0.0075
	(0.0006)	(0.0005)	(0.0002)	(0.0116)
Size (t-1)	0.1051 * **	0.0513 * **	0.0395 * **	2.2330 * **
	(0.0102)	(0.0080)	(0.0037)	(0.2301)
Capitalization (t-1)	-0.0060 * *	-0.0048 * **	-0.0017 * *	0.0175
	(0.0024)	(0.0019)	(0.0009)	(0.0485)
Lending Activities (t-1)	0.0000	-0.0016 * **	-0.0008 * **	-0.1043 * **
	(0.0007)	(0.0005)	(0.0002)	(0.0134)
Funding Structure (t-1)	0.0004	-0.0015 * **	-0.0009 * **	-0.1073 * **
	(0.0007)	(0.0006)	(0.0003)	(0.0145)
Income Diversification (t-1)	0.0002	-0.0016 * **	-0.0006 * *	0.0554 * **
	(0.0007)	(0.0005)	(0.0003)	(0.0143)
Credit Risk (t-1)	0.0101 * **	0.0004	0.0024 * **	0.1044 * **
	(0.0019)	(0.0015)	(0.0007)	(0.0378)
Profitability (t-1)	0.0004	-0.0007	-0.0006 * *	-0.1122 * **
	(0.0007)	(0.0006)	(0.0003)	(0.0148)
Bank Concentration (t-1)	-0.0098 * **	0.0040	0.0007	-0.2409 * **
	(0.0034)	(0.0026)	(0.0012)	(0.0661)
Real GDP Growth (t-1)	0.0090 * **	-0.0088 * **	-0.0035 * **	0.0709 *
	(0.0019)	(0.0015)	(0.0007)	(0.0383)
Inflation (t-1)	-0.0016 * **	-0.0022 * **	-0.0006 * **	-0.0169
	(0.0005)	(0.0004)	(0.0002)	(0.0106)
Financial Institution Index (t-1)	-1.4134 * **	0.5697 * **	0.2425 * **	22.5527 * **
	(0.1535)	(0.1167)	(0.0547)	(2.9942)
Constant	1.1909 * **	0.7426 * **	-0.1193	-45.1804 * **
	(0.3047)	(0.2322)	(0.1059)	(6.4023)
Random effects parameters				
Country-level variance	-0.2480 * *	-0.6611 * **	-1.5364 * **	2.5254 * **
	(0.1080)	(0.1114)	(0.1126)	(0.1164)
Bank-level variance	-1.0370 * **	-1.2571 * **	-2.0837 * **	2.2578 * **
	(0.0403)	(0.0393)	(0.0419)	(0.0378)
Residual variance	-0.9588 * **	-1.2080 * **	-1.9517 * **	2.0219 * **
	(0.0087)	(0.0086)	(0.0086)	(0.0087)
Observations	7129	7257	7257	7132
Banks	470	470	470	470
Countries	49	49	49	49
Likelihood ratio test	5908.4129 * **	8473.1483 * **	7731.0538 * **	7378.2542 * **
Year FE	Yes	Yes	Yes	Yes

Note: This table displays the results of the alternative systemic risk measures. The dependent variables are MES-NI (MES computed using national stock market indices), eΔCoVaR, ΔCoVaR, and SRISK, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

actions taken against moral hazard. Banks operating in countries with greater supervision have enhanced systemic risk exposure. Supervisors can use this authority to encourage or compel banks to allocate credit in a manner that generates private or political advantages, leading to corruption and harm to bank performance and stability (Hoque et al., 2015). Regarding regulatory requirements, we used two variables: the Regulation Index (Kladakis et al., 2022) and the Macroprudential Index (Alam et al., 2019). The Regulation Index is based on activity restrictions and capital regulations, whereas the Macroprudential Index includes country-level macroprudential policies. In both cases, stricter regulations benefit banks' systemic behavior, lowering their systemic risk exposure, which aligns with Hoque et al. (2015).

Finally, we include the ΔNIIP/GDP and NIIP dummies in a dynamic model by controlling for banking crises and the type of economy. As illustrated in Table A6 in the Appendix, our findings remain unchanged compared with the benchmark results displayed in Table 1. Banks' systemic risk exposure is amplified when a country experiences a banking crisis. In contrast, banks from advanced economies are more exposed to systemic distress given their complex, large, and highly interconnected financial systems (Binici and Ganioglu, 2021).

4.3. Further Analysis

This section provides further analyses based on different sample structures and considers the asymmetric impact of specific macroeconomic variables on marginal expected shortfall in interaction with countries' ΔNIIP/GDP.

As 30% of our sample comprises US banks (Table A1 in the Appendix), we re-estimate Eq. (7), excluding institutions incorporated in the US Model (1) in Table 7 shows that the negative and significant association between the ΔNIIP/GDP and bank MES is preserved. Further, we eliminate countries with fewer than three banks as shown by Model (2) and combine the two abovementioned strategies as shown by Model (3); the findings still hold. In addition, following Lane and Milesi-Ferretti (2018), we eliminate banks from countries deemed financial centers, such as Belgium, Hong Kong, Ireland, the Netherlands, Singapore, Switzerland, and the United Kingdom, because they have the largest net foreign asset portfolios. Model (4) shows that the results remain unchanged. Further, we evaluate the impact of the NIIP on systemic fragility before and during/after the 2008 global financial crisis and find a more pronounced stabilizing effect in terms of magnitude for the latter period.

Ahrend and Goujard (2014) show in their empirical setting that heterogeneity is sizable across advanced, developing, and emerging countries; while credit expansion and debt are found to drive systemic banking crises in developed countries, foreign currency reserves are important in emerging and developing economies. We split our sample into AEs and EMDEs according to the IMF classification. The findings in Table 8 indicate that banks in AEs and EMDEs benefit from greater changes in the NIIP position of their countries of incorporation

Table 7
Further analysis using different sample structures.

Dependent: MES	No U.S. (1)	No countries with fewer than 3 banks (2)	(1) + (2) (3)	No financial centers (4)	Pre-crisis (5)	Crisis/Post-crisis (6)
Fixed effects parameters						
ΔNIIP/GDP	-0.0026 * **	-0.0096 * **	-0.0041 * **	-0.0082 * **	-0.0056 * **	-0.0066 * **
	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0010)	(0.0006)
Size (t-1)	0.1055 * **	0.0922 * **	0.1018 * **	0.0929 * **	0.1292 * **	0.1447 * **
	(0.0119)	(0.0095)	(0.0123)	(0.0091)	(0.0116)	(0.0108)
Capitalization (t-1)	0.0045	0.0019	0.0087 * **	-0.0013	-0.0009	-0.0026
	(0.0028)	(0.0023)	(0.0031)	(0.0021)	(0.0033)	(0.0030)
Lending Activities (t-1)	-0.0021 * **	-0.0001	-0.0020 * **	-0.0003	-0.0009	-0.0003
	(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0009)	(0.0008)
Funding Structure (t-1)	-0.0000	-0.0020 * **	-0.0002	-0.0016 * *	0.0023 * *	-0.0031 * **
	(0.0007)	(0.0007)	(0.0007)	(0.0006)	(0.0009)	(0.0008)
Income Diversification (t-1)	-0.0036 * **	-0.0023 * **	-0.0035 * **	-0.0023 * **	-0.0000	-0.0041 * **
	(0.0007)	(0.0007)	(0.0008)	(0.0006)	(0.0010)	(0.0008)
Credit Risk (t-1)	0.0006	0.0063 * **	0.0009	0.0068 * **	0.0060 * *	-0.0030
	(0.0017)	(0.0018)	(0.0018)	(0.0017)	(0.0030)	(0.0025)
Profitability (t-1)	0.0017 * *	-0.0014 * *	0.0018 * *	-0.0011 *	0.0023 * *	-0.0026 * **
	(0.0008)	(0.0007)	(0.0008)	(0.0007)	(0.0009)	(0.0009)
Bank Concentration (t-1)	0.0180 * **	0.0074 * *	0.0217 * **	0.0066 * *	-0.0086	0.0147 * **
	(0.0030)	(0.0035)	(0.0034)	(0.0031)	(0.0056)	(0.0036)
Real GDP Growth (t-1)	-0.0062 * **	-0.0143 * **	-0.0067 * **	-0.0134 * **	-0.0030	-0.0143 * **
	(0.0017)	(0.0020)	(0.0020)	(0.0017)	(0.0034)	(0.0021)
Inflation (t-1)	-0.0010 * *	-0.0012 * *	-0.0014 * **	-0.0008 *	0.0001	-0.0031 * **
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0007)	(0.0007)
Financial Institution Index (t-1)	0.2651 *	0.5382 * **	0.2702 *	0.5868 * **	0.6136 * **	1.3295 * **
	(0.1433)	(0.1458)	(0.1535)	(0.1395)	(0.2267)	(0.2067)
Constant	-1.6467 * **	-1.3027 * **	-1.5820 * **	-1.3366 * **	-2.4774 * **	-1.3540 * **
	(0.3274)	(0.2815)	(0.3461)	(0.2646)	(0.3524)	(0.3364)
Random effects parameters						
Country-level variance	-0.4734 * **	-0.5251 * **	-0.4373 * **	-0.6198 * **	-0.8146 * **	-0.4406 * **
	(0.1110)	(0.1229)	(0.1238)	(0.1186)	(0.1234)	(0.1099)
Bank-level variance	-1.1901 * **	-1.1301 * **	-1.1647 * **	-1.2042 * **	-1.3517 * **	-1.1851 * **
	(0.0498)	(0.0424)	(0.0518)	(0.0414)	(0.0491)	(0.0415)
Residual variance	-1.0921 * **	-1.0515 * **	-1.0937 * **	-1.0906 * **	-1.4930 * **	-0.9945 * **
	(0.0106)	(0.0089)	(0.0111)	(0.0090)	(0.0178)	(0.0103)
Observations	4795	6772	4435	6704	1941	5191
Banks	334	439	303	442	344	470
Countries	48	38	37	42	44	49
Likelihood ratio test	4305.2661 * **	7146.2551 * **	3918.7501 * **	7116.9377 * **	2169.8411 * **	5458.3981 * **
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table displays the results using different sample structures. The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

regarding their exposure to financial vulnerability. Additionally, we divide banks into small and large groups when the value of a bank's total assets is smaller and larger than the sample median value in a given year, respectively. The results in Table 8, Models (3) and (4), show that both types of banks benefit from higher NIIP levels.

Finally, in Tables 9 and 10, we interact the NIIP Dummy with specific (macroeconomic) variables to gain further insight into their asymmetric impact on banks' marginal expected shortfalls. During periods of global and country-specific financial turbulence as shown by Models (1) and (2), respectively, banks' exposure to systemic risk is enhanced, but the effect is reduced if countries preserve their net creditor positions vis-à-vis the world, consistent with a large strand of literature. As the government budget balance,[18] adjusted for business cycle conditions, improves, capturing the fiscal policy stance, banks act less systemically.[19] However, the outcome diminishes in the interaction with countries' net creditor status, as indicated in Model (3). When countries borrow to cover previous deficits, the result is an increase in gross debt/GDP and, thus, fiscal fragility. However, maintaining a positive NIIP is a channel for systemic risk reduction. Higher levels of sovereign credit risk, measured by changes in the log of sovereign credit default swap (CDS) spreads, are linked to heightened systemic distress in the banking sector. However, this effect diminishes when countries where banks are incorporated maintain a sustainable status.

Banks located in countries with more developed and complex financial systems that are creditors to the world are more prone to systemic distress exposure (Table 10, Model (1)) because financial development provides insurance against risk (Mendoza et al., 2009). Financial institution development amplifies systemic risk, both stand-alone and in interaction with the NIIP Dummy (Model (2)), supporting the conclusion that bank-based financial structures are linked to more systemic risk (Langfield and Pagano, 2016; Bats and Houben, 2020), and that financial institution development is a more important predictor of banking crises than financial market development (Naceur et al., 2019).

5. Conclusions

Widening external imbalances played a pivotal role before the global financial crisis and were an important underlying cause of the ensuing turmoil. While current account (flow) imbalances were corrected to a great extent in the aftermath of the crisis, net international investment position (stock) imbalances persisted. Literature devotes significant

[18] Afonso and Coelho (2022) found that a deterioration in general government balance is associated with larger current account deficits for 28 European Union Member States.

[19] We employ cyclically-adjusted fiscal balance to control for procyclical nature of fiscal policy as documented recently by Gootjes and de Haan (2022).

Table 8
Further analysis: advanced markets vs. emerging markets; large banks vs. small banks.

Dependent: MES	AE (1)	EMDE (2)	Large banks (3)	Small banks (4)
Fixed effectc parameters				
ΔNIIP/GDP	-0.0080 * **	-0.0014 * *	-0.0049 * **	-0.0118 * **
	(0.0007)	(0.0007)	(0.0008)	(0.0008)
Size (t-1)	0.1057 * **	0.1103 * **	0.1503 * **	0.0578 * **
	(0.0104)	(0.0181)	(0.0176)	(0.0157)
Capitalization (t-1)	0.0014	0.0026	0.0043	-0.0004
	(0.0029)	(0.0027)	(0.0049)	(0.0025)
Lending Activities (t-1)	0.0006	-0.0013	-0.0009	0.0004
	(0.0007)	(0.0008)	(0.0011)	(0.0007)
Funding Structure (t-1)	-0.0009	0.0006	-0.0004	-0.0020 * *
	(0.0008)	(0.0008)	(0.0011)	(0.0008)
Income Diversification (t-1)	-0.0010	-0.0019 *	-0.0039 * **	-0.0030 * **
	(0.0007)	(0.0010)	(0.0009)	(0.0009)
Credit Risk (t-1)	0.0049 * *	0.0002	0.0014	0.0120 * **
	(0.0023)	(0.0021)	(0.0026)	(0.0024)
Profitability (t-1)	-0.0015 *	0.0005	-0.0013	-0.0010
	(0.0008)	(0.0010)	(0.0010)	(0.0009)
Bank Concentration (t-1)	-0.0016	0.0131 * **	0.0170 * **	-0.0062
	(0.0050)	(0.0031)	(0.0042)	(0.0048)
Real GDP Growth (t-1)	-0.0197 * **	-0.0058 * **	-0.0062 * *	-0.0167 * **
	(0.0048)	(0.0017)	(0.0026)	(0.0024)
Inflation (t-1)	-0.0007	-0.0014 * **	-0.0001	-0.0024 * **
	(0.0007)	(0.0005)	(0.0007)	(0.0008)
Financial Institution Index (t-1)	1.2132 * **	-0.1694	0.4692 * *	0.4419 * *
	(0.1982)	(0.1870)	(0.1822)	(0.2201)
Constant	-2.0955 * **	-1.7226 * **	-2.8076 * **	-0.5606
	(0.3618)	(0.4430)	(0.4943)	(0.3953)
Random effects parameters				
Country-level variance	-0.3932 * **	-0.8622 * **	-0.4887 * **	-0.8022 * **
	(0.1509)	(0.1733)	(0.1149)	(0.1423)
Bank-level variance	-1.1888 * **	-1.0592 * **	-1.2671 * **	-1.1169 * **
	(0.0499)	(0.0671)	(0.0600)	(0.0525)
Residual variance	-1.1150 * **	-1.3078 * **	-1.0028 * **	-1.1226 * **
	(0.0104)	(0.0161)	(0.0123)	(0.0124)
Observations	5028	2104	3613	3517
Banks	323	157	271	277
Countries	25	24	45	37
Likelihood ratio test	5264.2494 * **	2210.2165 * **	3630.4577 * **	3379.7704 * **
Year FE	Yes	Yes	Yes	Yes

Note: This table displays the results using different sample structures. The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 9
Estimation results for interaction regression.

Dependent: MES	(1)	(2)	(3)	(4)	(5)
NIIP Dummy	-0.0376	-0.0580 * *	-0.0578 * *	-0.1115 * **	-0.1734 * **
	(0.0313)	(0.0239)	(0.0274)	(0.0268)	(0.0303)
GFC	0.9243 * **				
	(0.0382)				
NIIP Dummy × GFC	-0.0845 * **				
	(0.0238)				
Banking Crisis		0.6381 * **			
		(0.0191)			
NIIP Dummy × Banking Crisis		-0.7849 * **			
		(0.0458)			
CAB (t-1)			-0.0471 * **		
			(0.0036)		
NIIP Dummy × CAB (t-1)			0.0403 * **		
			(0.0058)		
ΔGross Debt/GDP (t-1)				0.0024	
				(0.0020)	
NIIP Dummy × ΔGross Debt/GDP (t-1)				-0.0141 * **	
				(0.0023)	
ΔLog(Sovereign CDS)					0.1183 * **
					(0.0148)
NIIP Dummy × ΔLog(Sovereign CDS)					-0.1810 * **
					(0.0175)
Size (t-1)	0.0910 * **	0.1083 * **	0.0985 * **	0.1152 * **	0.1228 * **
	(0.0095)	(0.0091)	(0.0098)	(0.0096)	(0.0098)
Capitalization (t-1)	0.0003	0.0026	0.0026	0.0009	0.0030
	(0.0022)	(0.0021)	(0.0025)	(0.0024)	(0.0025)
Lending Activities (t-1)	-0.0005	-0.0006	0.0009	0.0001	-0.0013 *
	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0007)
Funding Structure (t-1)	-0.0017 * **	0.0007	-0.0014 * *	-0.0014 * *	0.0013 *
	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0007)
Income Diversification (t-1)	-0.0023 * **	-0.0025 * **	-0.0025 * **	-0.0030 * **	-0.0007
	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0007)
Credit Risk (t-1)	0.0041 * *	0.0032 *	0.0016	0.0041 * *	-0.0004
	(0.0018)	(0.0016)	(0.0019)	(0.0018)	(0.0017)
Profitability (t-1)	-0.0010	0.0009	-0.0018 * *	-0.0016 * *	-0.0008
	(0.0007)	(0.0006)	(0.0007)	(0.0007)	(0.0007)
Bank Concentration (t-1)	-0.0005	-0.0002	0.0005	-0.0003	0.0009
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0031)
Real GDP Growth (t-1)	0.0055 *	0.0235 * **	0.0112 * **	0.0060 *	-0.0011
	(0.0031)	(0.0029)	(0.0036)	(0.0035)	(0.0020)
Inflation (t-1)	-0.0111 * **	-0.0074 * **	-0.0135 * **	-0.0149 * **	0.0001
	(0.0018)	(0.0017)	(0.0027)	(0.0020)	(0.0005)
Financial Institution Index (t-1)	0.4742 * **	0.3247 * *	0.4117 * **	0.3032 * *	0.5977 * **
	(0.1399)	(0.1309)	(0.1453)	(0.1488)	(0.1519)
Constant	-1.2544 * **	-1.8429 * **	-1.6914 * **	-1.6018 * **	-2.2001 * **
	(0.2760)	(0.2623)	(0.2942)	(0.2808)	(0.2928)
Observations	7132	7132	6402	6677	4442
Banks	470	470	429	470	426
Countries	49	49	44	49	45
Likelihood ratio test	6850.4068 * **	7198.3451 * **	6345.5679 * **	6191.5045 * **	4794.2018 * **
Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table displays the results for the model described in Eq. (9). The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. To conserve space, the output for random effects parameters is not shown.

Table 10
Estimation results for interaction regression (continued).

Dependent: MES	(1)	(2)	(3)
NIIP Dummy	-0.3202 * **	-0.5542 * **	-0.1672 * *
	(0.1102)	(0.1257)	(0.0769)
Financial Development Index (t-1)	-0.2042		
	(0.1527)		
NIIP Dummy × Financial Development Index (t-1)	0.3252 * *		
	(0.1556)		
Financial Institution Index (t-1)		0.2748 *	
		(0.1488)	
NIIP Dummy × Financial Institution Index (t-1)		0.6151 * **	
		(0.1670)	
Financial Market Index (t-1)			-0.2852 * **
			(0.1033)
NIIP Dummy × Financial Market Index (t-1)			0.1220
			(0.1175)
Size (t-1)	0.1019 * **	0.1024 * **	0.0980 * **
	(0.0094)	(0.0094)	(0.0094)
Capitalization (t-1)	0.0008	0.0015	0.0008
	(0.0022)	(0.0022)	(0.0022)
Lending Activities (t-1)	-0.0000	-0.0002	-0.0002
	(0.0006)	(0.0006)	(0.0006)
Funding Structure (t-1)	-0.0019 * **	-0.0013 * *	-0.0020 * **
	(0.0007)	(0.0007)	(0.0006)
Income Diversification (t-1)	-0.0023 * **	-0.0025 * **	-0.0021 * **
	(0.0007)	(0.0007)	(0.0007)
Credit Risk (t-1)	0.0035 * *	0.0052 * **	0.0032 *
	(0.0017)	(0.0018)	(0.0017)
Profitability (t-1)	-0.0010	-0.0011 *	-0.0009
	(0.0007)	(0.0007)	(0.0007)
Bank Concentration (t-1)	-0.0006	-0.0001	-0.0007
	(0.0005)	(0.0005)	(0.0005)
Real GDP Growth (t-1)	0.0050	0.0076 * *	0.0052 *
	(0.0031)	(0.0031)	(0.0031)
Inflation (t-1)	-0.0121 * **	-0.0117 * **	-0.0119 * **
	(0.0018)	(0.0018)	(0.0018)
Constant	-1.1187 * **	-1.4557 * **	-0.9804 * **
	(0.2758)	(0.2716)	(0.2684)
Observations	7132	7132	7132
Banks	470	470	470
Countries	49	49	49
Likelihood ratio test	6010.5585 * **	6161.4292 * **	6089.0018 * **
Year FE	Yes	Yes	Yes

Note: This table displays the results of the model described in Eq. (9). The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. To conserve space, the output for the random effects parameters is not shown. The Financial Institution Index is eliminated from the model as a control variable because it is highly correlated with Financial Development and Financial Market Indices.

attention to the nexus between (systemic banking) crises and countries' net foreign assets. However, little is known about the impact of a country's external wealth on its systemic risk.

This study fills this gap in the literature and explores the financial stability implications of the balance sheet of a country's external assets and liabilities on banks' systemic resilience. Employing a large dataset of 470 banks located in 49 advanced, emerging, and developing economies over 2000–2020, we document the beneficial impact of NIIP on banks' exposure to system-wide financial market instability. Overall, the findings imply that banks can reduce their exposure to system-wide distress when the countries where they are incorporated increase their net foreign assets and when they are net creditors for the rest of the world, or in both cases, thus providing insurance against shocks. Moreover, countries with sustainable external balance sheets are more likely to bail out distressed banks during turbulence. However, only the net foreign equity position is responsible for this outcome, and net foreign debt does not play an important role. Similarly, we find that the mitigating effect of an external balance sheet on systemic risk is derived from valuation gains rather than from the incremental net acquisition of assets or liabilities represented by the current account. These results are consistent across various robustness checks, including alternative measures of external imbalances, various static and dynamic estimation models in which we control for the potential endogeneity of the NIIP, different systemic risk measures capturing exposure and contribution and multiple sample structures. Additionally, we find that banks in advanced economies, emerging markets, and developing economies benefit from higher changes in the NIIP of their countries of incorporation, improving their resilience to system-wide shocks and to small and large banks.

Furthermore, we interact with the creditor status variable with specific (macroeconomic) indicators to gain further insights. We conclude the following: (i) During periods of systemic banking crises, banks' exposure to the system's tail risk is amplified, but the effect is diminished if countries are net creditors; (ii) fiscal policy stance, fiscal fragility, and sovereign risk matter for banks' systemic behavior, with their influence being tamed when they interact with countries' net creditor status; and (iii) financial institution development amplifies systemic risk, standalone and in interaction with creditor variables, lending more support to the evidence that bank-based financial structures are associated with more systemic risk.

These results have important policy implications; authorities must maintain sustainable external status by accumulating gross foreign asset portfolios and decreasing gross foreign liability positions, thus mitigating systemic risk and strengthening banks' resilience to adverse shocks to preserve financial stability.

Avenues for further research could include the decomposition of foreign assets and liabilities by currency and assessing their impact on systemic risk.

Data Availability

Data will be made available on request.

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APPENDIX

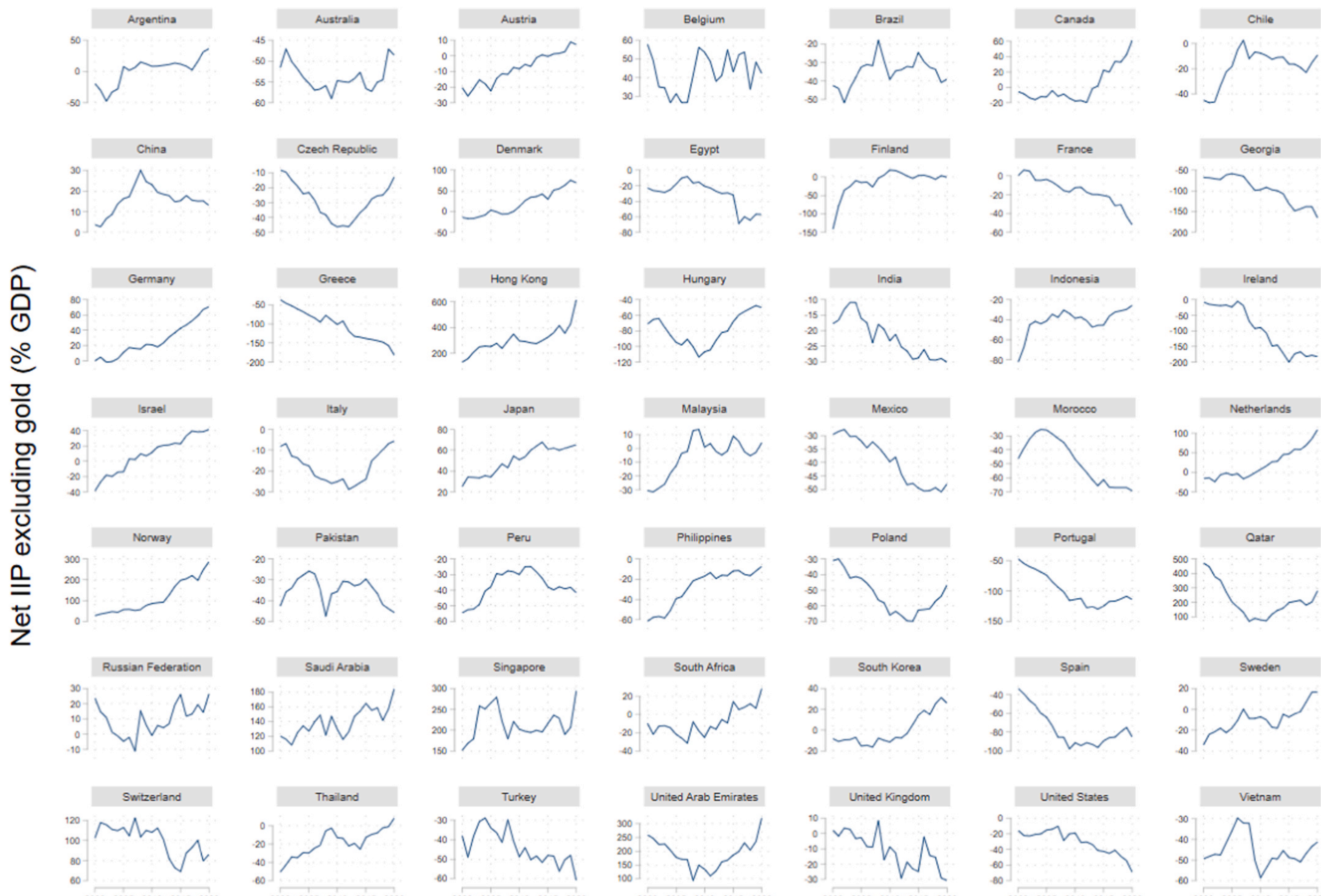

Fig. A1. Evolution of net international investment position excluding gold as percent of GDP by year and by country.

Table A1
Distribution of the banks by country.

Country	Number of banks	Type of economy	Average MES (%)	Average NIIP excluding gold/GDP (%)
Argentina	4	EMDE	1.5889	2.1625
Australia	7	AE	0.3736	-53.7624
Austria	3	AE	2.1926	-7.9438
Belgium	1	AE	2.4888	42.6334
Brazil	9	EMDE	1.3774	-34.9821
Canada	9	AE	1.1854	2.4384
Chile	4	EMDE	0.7677	-18.2606

(*continued on next page*)

Table A1 (*continued*)

Country	Number of banks	Type of economy	Average MES (%)	Average NIIP excluding gold/GDP (%)
China	12	EMDE	0.6388	15.8798
Czech Republic	2	AE	0.8978	-28.9143
Denmark	6	AE	1.0922	20.0239
Egypt	3	EMDE	0.3240	-31.7560
Finland	2	AE	1.4685	-14.1698
France	3	AE	2.5761	-15.9173
Georgia	1	EMDE	0.7710	-98.3455
Germany	4	AE	2.6712	26.5103
Greece	4	AE	2.1786	-103.7167
Hong Kong	5	AE	-0.1464	302.7397
Hungary	1	EMDE	1.6836	-78.8878
India	23	EMDE	0.0492	-22.0025
Indonesia	6	EMDE	0.6464	-41.2565
Ireland	2	AE	0.5232	-96.7018
Israel	6	AE	0.9105	9.4755
Italy	12	AE	1.8663	-17.9227
Japan	65	AE	0.8250	50.0219
Malaysia	9	EMDE	0.3666	-5.9391
Mexico	4	EMDE	1.1525	-39.6603
Morocco	3	EMDE	0.2023	-48.1650
Netherlands	3	AE	2.2682	21.2990
Norway	5	AE	1.2606	114.7382
Pakistan	12	EMDE	0.1192	-35.0219
Peru	1	EMDE	1.3746	-37.0153
Philippines	6	EMDE	0.3232	-28.0475
Poland	8	EMDE	1.2039	-52.9593
Portugal	1	AE	1.8066	-98.3304
Qatar	7	EMDE	0.3453	211.2445
Russian Federation	4	EMDE	1.4183	9.5480
Saudi Arabia	9	EMDE	0.5958	139.0390
Singapore	3	AE	0.7482	215.9214
South Africa	5	EMDE	0.3567	-8.2282
South Korea	7	AE	0.7108	-0.0213
Spain	7	AE	1.9788	-76.2984
Sweden	6	AE	1.7787	-9.4361
Switzerland	7	AE	0.7882	100.0293
Thailand	6	EMDE	0.6918	-18.7725
Turkey	7	EMDE	1.1042	-43.9277
United Arab Emirates	5	EMDE	0.6087	190.2047
United Kingdom	7	AE	1.4892	-11.2253
United States	136	AE	1.8504	-30.8545
Vietnam	8	EMDE	0.3457	-45.2837
Total	470			

Table A2
Description of variables.

Variable name	**Definition**	**Source**
Dependent variables (bank-level)		
Marginal Expected Shortfall (MES) (%)	Yearly marginal expected shortfall as defined by Acharya et al. (2017), i.e., average bank stock log-return conditional on the whole market (MSCI World Financials Index) experiencing losses greater than 5%. Conditional volatilities of the equity returns are modeled using the asymmetric GJR-GARCH model, whereas time-varying conditional correlations are estimated using the asymmetric Dynamic Conditional Correlation (DCC) framework of Capiello et al. (2006) with a Quasi Maximum Likelihood (QML) estimator. The indicator is expressed as a positive number, higher values being associated with greater systemic exposure	Own calculation; Data from Thomson Reuters Eikon
Exposure-ΔCoVaR (eΔCoVaR) (%)	Yearly exposure to systemic risk as defined by Adrian and Brunnermeier (2016). ΔCoVaR is computed as the difference between the Value at Risk of the bank *i* log-return conditional on the tail event of the financial system (5% worst log-returns) and the VaR of bank *i* log-return conditional on the median state of the financial system (50% outcomes). Exposure-ΔCoVaR is estimated using the Quantile Regression method with the following common factors: (1) the daily return of MSCI World index; (2) the volatility index (VIX); (3) the daily real estate sector return (MSCI World Real Estate) in excess of the financial sector return (MSCI World Financials); (4) the change in the three-month T-bill rate; (5) the spread between three-month repo rate and three-month T-bill rate; (6) the spread of change in 10-year bond yield and three-month T-bill rate; and (7) the change in the spread of Moody's Baa corporate bond yield and 10-year bond yield. Market is defined as the MSCI World Financials Index. The indicator is expressed as a positive number, higher values indicating greater systemic exposure	Own calculation; Data from Thomson Reuters Eikon and Federal Reserve Board's H.15
Delta-CoVaR (ΔCoVaR) (%)	Yearly contribution to systemic risk as defined by Adrian and Brunnermeier (2016). ΔCoVaR is measured as the difference between the Value at Risk of the financial system's log-return conditional on the tail event of a particular bank (5% worst log-returns) and the VaR of the financial system's log-return conditional on the median state of the bank (50% outcomes). ΔCoVaR is estimated using the Quantile Regression method with the following common factors: (1) the daily return of MSCI World index; (2) the volatility index (VIX); (3) the daily real estate sector return (MSCI World Real Estate) in excess of the financial sector return (MSCI World Financials); (4) the change in the three-month T-bill rate; (5) the spread between three-month repo rate and three-month T-bill rate; (6)	Own calculation; Data from Thomson Reuters Eikon and Federal Reserve Board's H.15

(continued on next page)

Table A2 (*continued*)

Variable name	Definition	Source
	the spread of change in 10-year bond yield and three-month T-bill rate; and (7) the change in the spread of Moody's Baa corporate bond yield and 10-year bond yield. System is defined as the MSCI World Financials Index. The indicator is expressed as a positive number, higher values indicating with greater systemic importance	
SRISK (USD)	Yearly SRISK defined as the loss of the bank *i* conditional by the market being in distress (5% worst log-returns) given by $SRISK_{i,t} = k \times Liabilities_{i,t} - (1-k) \times Equity_{i,t} \times (1 - LRMES_{i,t})$, where *k* is set at 8% and denotes regulatory capital ratio, $Liabilities_{i,t}$ is the book value of total liabilities, $Equity_{i,t}$ is the market capitalization of the bank, and $LRMES_{i,t}$ is the long-run marginal expected shortfall computed as $1 - \exp(\log(1-d) \times beta)$, where *d* is the six-month crisis threshold for the market decline set at 40% and *beta* is the bank's beta coefficient. SRISK is determined using the GJR-GARCH method with Quasi Maximum Likelihood (QML) estimator as in Brownlees and Engle (2017). SRISK is expressed in USD. Market is defined by the MSCI World Financials Index. Positive values denote capital shorfall, whereas negative values indicate capital surplus	Own calculation; Data from Thomson Reuters Eikon and Worldscope
Independent variables (country-level)		
ΔNIIP/GDP excluding gold	Yearly change in net international investment position excluding gold holdings/GDP	Own calculations based on Lane and Milesi-Ferretti (2018)
NIIP Dummy	Dummy variable that takes the value of one if a country has a positive net international investment position excluding gold holdings, and zero otherwise	Own calculations based on Lane and Milesi-Ferretti (2018)
ΔNet Foreign Equity Position	Yearly change in net foreign equity position/GDP. The net foreign equity position is computed as portfolio equity assets + FDI assets – portfolio equity liabilities – FDI liabilities	Own calculations based on Lane and Milesi-Ferretti (2018)
ΔNet Foreign Debt Position	Yearly change in net foreign debt position/GDP. The net foreign debt position is computed as total debt assets – total debt liabilities	Own calculations based on Lane and Milesi-Ferretti (2018)
ΔGross Foreign Assets/GDP	Yearly change in gross foreign assets/GDP	Own calculations based on Lane and Milesi-Ferretti (2018)
ΔGross Foreign Liabilities/GDP	Yearly change in gross foreign liabilities/GDP	Own calculations based on Lane and Milesi-Ferretti (2018)
Current Account/GDP	Current account balance/GDP	Lane and Milesi-Ferretti (2018)
Valuation Changes/GDP	The difference between the change in net foreign assets and the current account balance as a share of GDP	Own calculations based on Lane and Milesi-Ferretti (2018)
Independent variables (bank-level)		
Size	Natural logarithm of Total Assets expressed in USD	Worldscope
Capitalization (%)	Common Equity/Total Assets	Worldscope
Profitability (%)	Net Income/Common Equity, i.e., Return on Assets (ROE)	Worldscope
Lending Activities (%)	Total Loans/Total Assets	Worldscope
Credit Risk (%)	Non-performing Loans/Total Loans	Worldscope
Funding Structure (%)	Total Deposits/Total Liabilities	Worldscope
Income Diversification (%)	Non-interest Income/Revenue	Worldscope
Banking system/macroeconomic variables		
Bank Concentration (%)	Assets of three largest banks as a share of total commercial banking assets	Global Financial Development Database – World Bank
Real GDP Growth (%)	Annual percentage growth rate of GDP based on constant local currency. Aggregates are based on constant 2010 U.S. dollars	World Development Indicators – World Bank
Inflation (%)	Annual growth rate of the GDP implicit deflator	World Development Indicators – World Bank
Financial Institutions Index	Index developed by Sahay et al. (2015) based on financial institutions depth, access, and efficiency. The index takes values from 0 to 1, higher values being associated with more developed financial institutions	Sahay et al. (2015)
Other control variables		
Supervision Index	Index that measures the strictness of bank supervision, being constructed as the sum of the activity restrictions and capital regulations indices, and takes values from 0 to 17, with higher values associated with stricter supervision.	Kladakis et al. (2022)
Regulation Index	Index that measures the strictness of bank regulation, being constructed as the sum of the official supervisory power and actions taken against moral hazard indices. The index takes values from 3 to 22, with higher values associated with stricter regulations	Kladakis et al. (2022)
Macroprudential Index	Index that measures the number of macroprudential policies adopted at the country level. The index takes values from 0 to 17, with higher values associated with a higher number of macroprudential policies	Alam et al. (2019)
Interaction variables		
Global Financial Crisis (GFC)	Dummy variable that takes the value of one for years from 2008 onwards, and zero otherwise	Own calculations
Banking Crisis	Dummy variable that takes the value of one if a country experienced a banking crisis in year *t*, and zero otherwise as defined by Laeven and Valencia (2020)	Laeven and Valencia (2020)
Cyclically-Adjusted Balance (CAB)	Difference between government revenues and expenses adjusted for cyclical components (automatic stabilizers) as a share of potential GDP	International Monetary Fund
Gross Debt/GDP	General government gross debt as share of GDP	International Monetary Fund
ΔLog(Sovereign CDS)	Change in the log of 5 y sovereign CDS spreads	Own calculations based on Kose et al. (2022)
Financial Development Index	Index based on financial institutions and financial market indices developed by Sahay et al. (2015)	Sahay et al. (2015)
Financial Institution Index	See above	Sahay et al. (2015)
Financial Market Index	Index based on financial markets depth, access and efficiency developed by Sahay et al. (2015)	Sahay et al. (2015)

Table A3
Summary statistics.

Variables	Mean	St. dev.	p25	Median	p75	Min	Max	Obs.
MES	1.2077	0.9790	0.5297	1.0175	1.6625	-0.8815	4.5365	7132
ΔNIIP/GDP	0.1295	8.7968	-3.6736	0.5187	3.9255	-26.3222	35.9000	7132
NIIP Dummy	0.3273	0.4692	0.0000	0.0000	1.0000	0.0000	1.0000	7132
Size	24.1535	1.7733	22.8683	23.9958	25.1776	19.8402	28.4569	7130
Capitalization	8.7133	3.9230	5.8991	8.1982	10.7773	2.1130	35.3935	7130
Lending Activities	64.5254	13.0456	57.4265	65.9778	73.4733	21.6493	91.5913	7119
Funding Structure	77.1575	18.2124	68.0679	82.3968	91.3446	13.3864	98.7731	7130
Income Diversification	25.7240	12.8500	16.2235	24.1064	33.2258	2.2323	68.1073	7128
Credit Risk	3.0450	3.6910	0.8075	1.7895	3.7624	0.0235	24.0653	7064
Profitability	10.4191	8.8220	5.9600	10.3100	15.1300	-31.1800	36.6500	7119
Bank Concentration	50.0516	21.2019	34.8546	41.6036	64.8412	22.3073	99.9732	7097
Real GDP Growth	2.1942	3.0293	1.0076	2.1861	3.5132	-6.7345	11.2001	7132
Inflation	2.5195	3.6516	0.8422	1.8498	3.0531	-4.4559	22.9326	7132
Financial Institution Index	0.7325	0.2130	0.6090	0.8569	0.8901	0.2257	0.9595	7132

Note: This table exhibits the descriptive statistics of the winsorized variables used in the empirical analysis. All variables are defined in Table A2 in the Appendix.

Table A4
Correlation matrix of regressors.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) ΔNIIP/GDP	1.0000												
(2) NIIP Dummy	0.271 *	1.0000											
(3) Size	0.084 *	0.279 *	1.0000										
(4) Capitalization	-0.083 *	-0.272 *	-0.367 *	1.0000									
(5) Lending Activities	0.0070	0.0130	-0.236 *	0.089 *	1.0000								
(6) Finding Structure	-0.040 *	0.116 *	-0.454 *	0.135 *	0.186 *	1.0000							
(7) Income Diversification	0.045 *	0.206 *	0.369 *	-0.155 *	-0.340 *	-0.211 *	1.0000						
(8) Credit Risk	0.054 *	-0.0070	0.038 *	-0.085 *	-0.023 *	-0.074 *	0.020 *	1.0000					
(9) Profitability	0.0050	-0.133 *	-0.034 *	0.116 *	-0.085 *	-0.078 *	-0.0160	-0.234 *	1.0000				
(10) Bank Concentration	0.176 *	0.207 *	0.326 *	-0.155 *	0.029 *	-0.439 *	0.088 *	0.196 *	0.132 *	1.0000			
(11) Real GDP Growth	-0.053 *	-0.105 *	-0.043 *	0.106 *	-0.0160	0.028 *	-0.138 *	-0.046 *	0.381 *	0.069 *	1.0000		
(12) Inflation	-0.167 *	-0.194 *	-0.099 *	0.193 *	-0.078 *	-0.109 *	-0.163 *	0.078 *	0.358 *	0.145 *	0.289 *	1.0000	
(13) Financial Institution Index	-0.113 *	0.034 *	0.020 *	-0.151 *	0.073 *	0.082 *	0.174 *	-0.331 *	-0.325 *	-0.310 *	-0.394 *	-0.517 *	1.0000

Note: This table presents the correlation matrix of the winsorized independent variables. * shows statistical significance at the maximum level of 10%.

Table A5
Additional robustness checks: stepwise procedure.

Dependent: MES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fixed effect parameters							
ΔNIIP excluding gold/GDP	-0.0057 * **	-0.0064 * **	-0.0063 * **	-0.0071 * **	-0.0079 * **	-0.0079 * **	-0.0078 * **
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0006)	(0.0006)	(0.0006)
Size (t-1)		0.1075 * **		0.0981 * **	0.0970 * **	0.0981 * **	0.0930 * **
		(0.0090)		(0.0093)	(0.0093)	(0.0093)	(0.0094)
Capitalization (t-1)		-0.0002		0.0004	0.0005	0.0005	0.0024
		(0.0021)		(0.0022)	(0.0022)	(0.0022)	(0.0023)
Lending Activities (t-1)		-0.0002		-0.0003	-0.0003	-0.0003	-0.0003
		(0.0006)		(0.0006)	(0.0006)	(0.0006)	(0.0006)
Funding Structure (t-1)		-0.0020 * **		-0.0015 * *	-0.0016 * *	-0.0016 * *	-0.0016 * *
		(0.0006)		(0.0007)	(0.0007)	(0.0007)	(0.0007)
Income Diversification (t-1)		-0.0022 * **		-0.0024 * **	-0.0025 * **	-0.0025 * **	-0.0022 * **
		(0.0006)		(0.0006)	(0.0006)	(0.0006)	(0.0007)
Credit Risk (t-1)		0.0033 * *		0.0059 * **	0.0056 * **	0.0056 * **	0.0061 * **
		(0.0016)		(0.0017)	(0.0018)	(0.0018)	(0.0018)
Profitability (t-1)		-0.0011 *		-0.0013 *	-0.0013 *	-0.0013 *	-0.0013 *
		(0.0007)		(0.0007)	(0.0007)	(0.0007)	(0.0007)
Bank Concentration (t-1)			0.0018	0.0067 * *	0.0054 *	0.0054 *	0.0130 * **
			(0.0026)	(0.0031)	(0.0031)	(0.0031)	(0.0033)
Real GDP Growth (t-1)			-0.0147 * **	-0.0127 * **	-0.0125 * **	-0.0125 * **	-0.0146 * **
			(0.0016)	(0.0018)	(0.0019)	(0.0019)	(0.0019)
Inflation (t-1)			-0.0004	-0.0007	-0.0009 *	-0.0009 *	-0.0010 * *
			(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Financial Institutions Index (t-1)			0.4118 * **	0.4797 * **	0.4453 * **	0.4507 * **	0.4973 * **
			(0.1188)	(0.1384)	(0.1391)	(0.1398)	(0.1397)
Supervision Index (t-1)					0.0741 * **		
					(0.0254)		
Regulation Index (t-1)						-0.0698 * *	
						(0.0351)	
Macroprudential Index (t-1)							-0.0099 * **
							(0.0032)
Constant	0.8625 * **	-1.4513 * **	0.7294 * **	-1.4473 * **	-2.2525 * **	-0.4809	-1.3366 * **
	(0.0947)	(0.2472)	(0.1210)	(0.2692)	(0.3935)	(0.5418)	(0.2744)

(*continued on next page*)

Table A5 (*continued*)

Dependent: MES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Random effects parameters							
Country-level variance	-0.4772 * **	-0.5460 * **	-0.5280 * **	-0.5490 * **	-0.6237 * **	-0.5770 * **	-0.5218 * **
	(0.1111)	(0.1086)	(0.1147)	(0.1106)	(0.1139)	(0.1132)	(0.1128)
Bank-level variance	-0.9335 * **	-1.1819 * **	-0.9151 * **	-1.1520 * **	-1.1439 * **	-1.1450 * **	-1.1324 * **
	(0.0353)	(0.0401)	(0.0358)	(0.0413)	(0.0416)	(0.0415)	(0.0418)
Residual variance	-1.0283 * **	-1.0391 * **	-1.0369 * **	-1.0440 * **	-1.0426 * **	-1.0426 * **	-1.0487 * **
	(0.0080)	(0.0085)	(0.0082)	(0.0087)	(0.0088)	(0.0088)	(0.0088)
Observations	8350	7451	7967	7132	6900	7031	7004
Banks	512	485	497	470	462	462	460
Countries	50	50	49	49	47	47	47
Likelihood ratio test	12165.0659 * **	10037.5377 * **	9657.9029 * **	7593.6615 * **	6841.6656 * **	7436.7198 * **	7544.8546 * **
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table displays the results obtained using a stepwise procedure. The dependent variable is MES, as defined in Table A2 in the Appendix. The HML model is estimated using the maximum likelihood estimation. The likelihood ratio test compares the mixed model with OLS regression with the null hypothesis that there are no significant differences between the two models. Standard errors in parentheses. * ** , * *, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table A6
Additional robustness checks by including ΔNIIP/GDP, NIIP Dummy, banking crises, and type of economy.

Dependent: MES	(1)
ΔNIIP excluding gold/GDP	-0.0088 * **
	(0.0010)
NIIP Dummy excluding gold	-0.2537 * **
	(0.0629)
Banking Crisis	0.6354 * **
	(0.0874)
Advanced Economy	0.3829 * **
	(0.0795)
Size (t-1)	0.1673 * **
	(0.0603)
Capitalization (t-1)	-0.0146
	(0.0175)
Lending Activities (t-1)	0.0063 * *
	(0.0026)
Funding Structure (t-1)	0.0069 * *
	(0.0035)
Income Diversification (t-1)	-0.0031 *
	(0.0018)
Credit Risk (t-1)	-0.0187 * *
	(0.0079)
Profitability (t-1)	0.0031 *
	(0.0018)
Bank Concentration (t-1)	-0.0021
	(0.0021)
Real GDP Growth (t-1)	-0.0284 * **
	(0.0082)
Inflation (t-1)	0.0162 * **
	(0.0045)
Financial Institution Index (t-1)	-0.2860
	(0.2182)
MES (t-1)	0.5669 * **
	(0.0358)
MES (t-2)	-0.0570 * **
	(0.0177)
Constant	-3.0406 * *
	(1.4910)
Observations	6476
Banks	465
Countries	49
Instruments	37
Hansen J statistic	0.0006
AR(1) test	-12.2931 * **
AR(2) test	-1.5054
Year FE	Yes

Note: This table displays the results using the System GMM approach by controlling for the endogeneity of the lagged dependent variable, ΔNIIP/GDP, NIIP Dummy, banking crises, and type of economy. The dependent variable is MES, as defined in Table A2 in the Appendix. The System GMM model follows the approach of Blundell and Bond (1998), and is estimated using the doubly-corrected misspecification-robust standard errors of Hwang et al. (2022). To deal with serial correlation, we added the second lag of the dependent variable. Hansen J statistic tests the overidentifying restrictions with the null hypothesis that the overidentifying restrictions are valid. The AR(1) test is the Arellano-Bond test for autocorrelation of the first-differenced residuals with the null hypothesis that there is no autocorrelation of order one, whereas the AR(2) test is the Arellano-Bond test for autocorrelation of the first-differenced residuals with the null hypothesis that there is no autocorrelation of order two. Doubly-corrected mis-specification-robust standard errors in parentheses.

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