# Sovereign Stress and Global Credit Reallocation

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**Abstract**

We examine how sovereign stress in third countries propagates through international banks and affects the allocation of credit across borders. Using bilateral international banking claims, we compare creditors that lend to the same recipient in the same quarter but differ in their exposure to sovereign stress abroad. We find that more exposed banking systems reduce lending relative to other creditors, with the response driven by exposure to the euro area periphery. The decline extends to cross-border interbank credit and worldwide consolidated claims. The lending gap widens over time and persists beyond the initial change in sovereign-stress exposure. Less exposed creditors expand their lending, which leads to a lasting shift in the composition of emerging markets' foreign creditors. Our findings show that the geographical composition of international banks' portfolios shapes both the transmission of financial shocks and the persistent reallocation of international credit.

*Keywords*: Sovereign stress, International banking, Financial spillovers, Cross-border credit.

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# 1 Introduction

Rising geopolitical tensions, geoeconomic fragmentation, and the 2026 energy crisis have heightened risks to international financial stability and cross-border shock transmission (International Monetary Fund, 2026). International banking networks connect economies beyond direct trade and investment and can amplify shocks across countries (Shen and Zhang, 2024). These linkages create vulnerabilities for emerging market economies (EMEs), where foreign bank credit affects domestic financial conditions and economic activity (Aldasoro et al., 2023). Yet the transmission of financial stress depends not only on global conditions but also on the geographical exposures of individual banking systems. Sovereign stress in one country can therefore affect credit in distant economies, even when their domestic conditions remain unchanged. We ask how sovereign stress in third countries affects international bank lending to emerging markets and whether its effects persist beyond the initial shock.

We examine this question with bilateral banking statistics from the Bank for International Settlements (BIS), which cover claims of banking systems in 17 advanced economies on 152 emerging and developing economies from 2000 to 2025. We construct an exposure index that combines each creditor's foreign portfolio with sovereign stress in third countries. Creditor–recipient pair fixed effects and recipient × quarter fixed effects allow us to compare creditors that lend to the same emerging market in the same quarter but differ in their exposure to sovereign stress abroad. This design isolates differences in lending associated with creditors' foreign exposures from shocks common to the recipient economy.

We find that sovereign stress in third countries reduces the relative lending growth of exposed banking systems. During the euro area sovereign debt crisis, a one-standard-deviation difference in exposure implied 0.66 percentage points lower quarterly claims growth for the more exposed creditor. The response originates almost entirely from exposure to Greece, Ireland, Italy, Portugal, and Spain. Relative to average exposure, the estimates imply a lending shortfall of $159 billion among creditors with above-average exposure during 2010–2013, equivalent to 14 percent of their claims on emerging markets at the end of 2009. This magnitude captures differences across creditors rather than a change in aggregate credit to recipient economies.

The lending response persists beyond the initial change in exposure. Local projections show that the cumulative lending gap widens over three years, after the change in sovereign-stress exposure has largely dissipated. The coefficient remains negative at a four-year horizon. The euro area crisis also produced a lasting shift in the composition of foreign creditors. More and less exposed banking systems followed similar lending paths before the crisis, but less exposed creditors expanded their claims substantially during and after it. The gap persisted after sovereign stress subsided.

The response extends across different categories of international bank claims. Exposed banking systems reduce cross-border claims on banks in recipient economies, a source of external funding for domestic banking sectors (Cetorelli and Goldberg, 2011; Schnabl, 2012). The neg-

ative response also appears in banking groups' worldwide consolidated claims, which include claims booked through foreign affiliates. The evidence is consistent with a contraction in credit supplied by exposed lenders. We find a similar response for advanced-economy recipients and no systematic differences across emerging markets according to their measured pre-crisis fundamentals.

The geographical composition of creditors' portfolios is central to the transmission of sovereign stress. Broad measures of systemic financial stress move closely together across countries and provide little cross-creditor variation once common shocks are absorbed. Sovereign stress, by contrast, differed sharply across European countries during the euro area crisis. These differences, combined with creditors' pre-existing foreign portfolios, explain variation in lending to the same recipient beyond common global financial conditions (Rey, 2013; Miranda-Agrippino and Rey, 2020). The results remain robust to controls for creditors' own sovereign risk, pre-crisis banking conditions, common European shocks, and differential sensitivity to global financial factors.

Our findings highlight a source of international financial vulnerability that depends on the geographical exposures of foreign lenders. A country's access to international bank credit depends not only on its own economic conditions but also on where its creditors lend elsewhere. Sovereign stress can propagate across borders through these exposures and leave persistent differences in the allocation of international credit. The composition of foreign creditors is therefore an important dimension of external financial vulnerability, particularly when geopolitical and geoeconomic shocks affect countries unevenly.

### Related Literature and Contribution

The closest paper to ours is Hale et al. (2020), who show that banks exposed to banking crises abroad reduce lending, particularly to foreign borrowers. We examine the transmission of third-country sovereign stress through international banking systems and its effects on credit to emerging markets. Our bilateral data cover claims beyond syndicated loans and allow us to compare creditors that lend to the same recipient. More importantly, we show that differences in creditors' foreign portfolios predict relative lending growth and that the resulting gap persists beyond the initial stress episode. These findings extend evidence on the common lender channel and the international transmission of banking shocks (van Rijckeghem and Weder, 2003; Peek and Rosengren, 1997; De Haas and van Horen, 2012; Popov and Udell, 2012; Giannetti and Laeven, 2012).

Gilchrist et al. (2022) show that global financial risk generates large and persistent movements in sovereign spreads. We examine the transmission in the other direction: how sovereign stress propagates through international banks to borrowers in third countries. Sovereign-bank linkages can amplify financial stress through bank balance sheets and funding conditions (Bocola, 2016; Acharya et al., 2018; Altavilla et al., 2017). Popov and van Horen (2015) document

the withdrawal of European banks exposed to distressed sovereign debt from foreign syndicated lending, while De Marco (2019) identifies spillovers to foreign firms and subsidiaries. We complement these studies by documenting a persistent lending gap across exposed and less exposed banking systems and a lasting shift in the composition of emerging markets' foreign creditors.

International bank lending responds to global financial conditions, risk appetite, and exchange rate movements (Rey, 2013; Bruno and Shin, 2015; Cerutti et al., 2017; Avdjiev et al., 2020; Miranda-Agrippino and Rey, 2020). Global banks transmit shocks through funding markets and internal capital allocation (Cetorelli and Goldberg, 2012; Ivashina et al., 2015; Cerutti and Claessens, 2017; Morais et al., 2019). Shen and Zhang (2024) examine risk sharing and shock amplification through the global banking network, while Fabiani and Neanidis (2025) document the transmission of foreign macroprudential policy through cross-border bank flows. We identify the geographical composition of creditors' portfolios as a source of international financial spillovers. Creditors with different exposures adjust their lending to the same recipient differently, even after common global and recipient-specific shocks are absorbed. These differences lead to persistent changes in the composition of emerging markets' foreign lenders.

Our empirical approach also informs the measurement of international financial spillovers. Exposure-based designs combine creditors' portfolio weights with shocks in foreign economies (Goldsmith-Pinkham et al., 2020; Borusyak et al., 2022). We show that sovereign stress retains cross-country variation that identifies differences in lending across creditors, whereas broad measures of systemic financial stress are largely synchronized. The distinction matters when common time shocks are absorbed and identification rests on differences in creditors' exposure to geographically concentrated stress.

Section 2 describes cross-border bank lending to emerging markets during the euro area crisis and the channels through which stress travels within multinational banks. Section 3 presents the data, the exposure index, and the empirical strategy, and Section 4 the main results, their magnitude, and their dynamics. Section 5 addresses identification and robustness, Section 6 examines which claims and which recipients are affected, and Section 7 concludes.

## 2 International Banks and the Euro Area Crisis

### 2.1 Cross-Border Bank Claims on Emerging Markets

Figure 1 shows the cross-border claims of banks in 21 advanced economies on emerging market and developing economies, based on the BIS locational banking statistics. These claims increased by a factor of 3.5 between 2002Q2 and 2008Q2. European banking systems accounted for 80 percent of this expansion, with emerging Europe as their main destination. In 2008Q2, emerging Europe accounted for 37 percent of the claims of banks in European Union countries on emerging and developing economies.

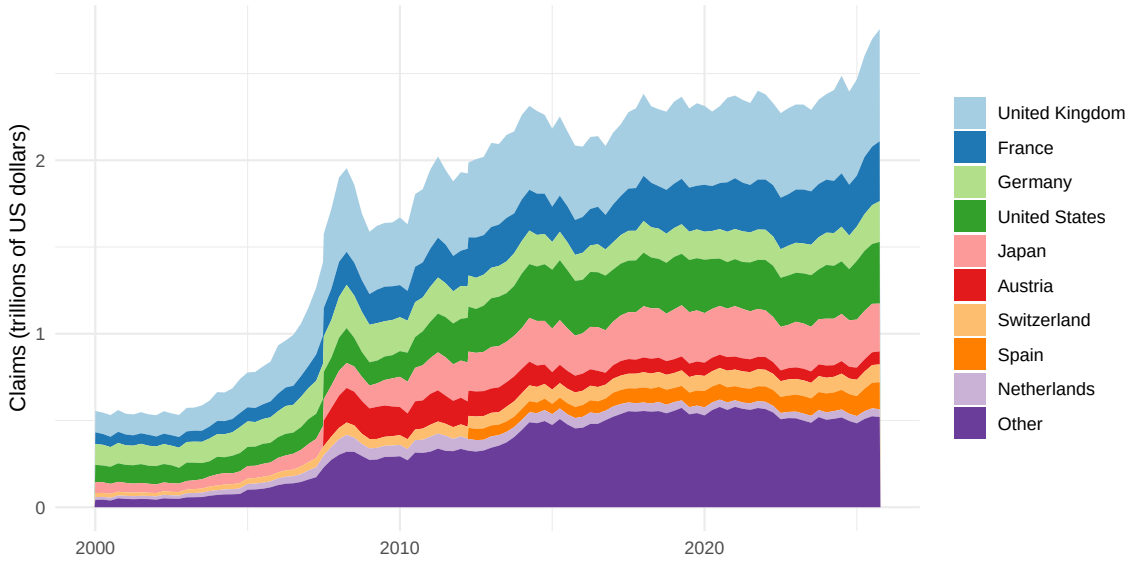



Figure 1: Cross-border claims of banks in advanced economies on emerging market and developing economies, by creditor country

*Notes:* Outstanding cross-border claims (all instruments, all counterparty sectors) of banks located in 21 advanced economies on emerging market and developing economies, grouped as in Table A2, in trillions of US dollars. Nine creditor countries are shown separately; "Other" comprises the remaining 12. The distribution across recipient regions is shown in Figure A2. Source: BIS locational banking statistics.

The global financial crisis interrupted this expansion.[1] The euro area sovereign debt crisis that followed did not originate in emerging markets and exposed their foreign lenders to different degrees of stress. Sovereign stress rose most in Greece, Ireland, and Portugal and then in Spain and Italy, while it remained considerably lower in the core of the euro area and in other European countries (Lane, 2012, and Figure A3). The composition of creditors' foreign portfolios determined their exposure to this stress and created different pressures across banking systems that lent to the same recipient economy.

## 2.2 Sovereign Stress Exposure and Bank Lending

Figure 2 shows how the claims of more and less exposed creditors evolved around the euro area crisis. It splits the 17 creditor countries according to whether their average exposure to third-country sovereign stress during 2010–2013 was above or below the cross-creditor mean (Section 3.2 defines the measure). The exposure weights are fixed at average claims over the four quarters of 2009, so portfolio adjustments during the crisis do not enter the grouping. Group membership nevertheless uses realized stress during 2010–2013. The more exposed group

[1] Consolidated claims of banks headquartered in euro area countries on emerging market and developing economies, measured on an ultimate risk basis, fell by 13 percent in US dollar terms from about $2.0 trillion in 2008Q2 over the following six months. Part of this decline reflects dollar appreciation (McCauley and McGuire, 2009). Locational claims adjusted for exchange rate movements fell by about 2 percent over the same period; the two statistics also differ in coverage.

consists of seven euro area creditors, the United Kingdom, and Canada; the less exposed group consists of Denmark, Sweden, Switzerland, and the non-European creditors other than Canada. For each group, the figure plots the cumulative exchange rate- and break-adjusted change in claims on the sample recipients, relative to the stock at the end of 2009.

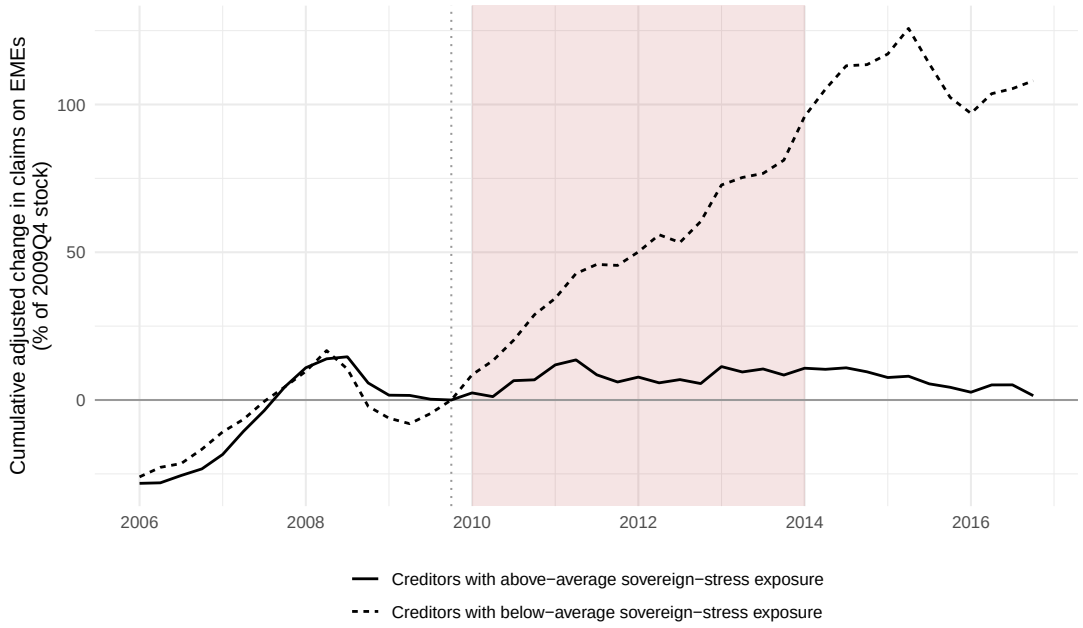



Figure 2: Lending to emerging markets by creditors with high and low exposure to sovereign stress

*Notes:* Creditor countries are split according to whether their average exposure to third-country sovereign stress in 2010–2013, computed using average claims over the four quarters of 2009 as fixed exposure weights, is above or below the cross-creditor mean. Above-average exposure: Austria, Belgium, Canada, Finland, France, Germany, Luxembourg, the Netherlands, and the United Kingdom. Below-average exposure: Australia, Denmark, Japan, Korea, Sweden, Switzerland, Taiwan, and the United States. Each line shows the cumulative exchange rate- and break-adjusted change in the group's claims on the 152 sample recipients relative to 2009Q4, in percent of the group's 2009Q4 stock; values before 2009Q4 are the negative of the change between the quarter shown and 2009Q4. The shaded area marks 2010–2013. Source: BIS locational banking statistics.

Before the euro area crisis, the two groups followed similar lending paths. Their claims grew at comparable rates between 2006 and 2008, and both contracted during the global financial crisis. From 2010 onwards, their paths diverged sharply. By the end of 2013, less exposed creditors had increased their claims by 81 percent of their end-2009 stock, compared with 8.5 percent for more exposed creditors. The gap persisted after sovereign stress subsided. This divergence reflects differences in relative lending growth, not necessarily an absolute contraction by more exposed creditors. It also remains when China or the Asia-Pacific creditors are excluded.[2] The regressions below assess whether the relationship survives controls for creditor characteristics and recipient-specific conditions.

[2]Excluding China as a recipient, the cumulative changes by 2013Q4 are 56 and 1 percent for the less and more exposed groups, respectively. Excluding Japan, Korea, Taiwan, and Australia as creditors, they are 81 and 8.5 percent.

## 2.3 Channels of International Risk Transmission

Multinational banks transmit financial shocks across borders through their balance sheets and internal capital markets (Sbracia and Zaghini, 2003; Cetorelli and Goldberg, 2011). Figure 3 illustrates the channels through which sovereign stress in a third country $k$ can affect credit to recipient country $j$. Stress can reduce the value of a parent bank's claims on the sovereign and on domestic banks and firms, while also raising its wholesale funding costs (Acharya et al., 2018; De Marco, 2019). The parent bank may respond by reducing direct cross-border lending to country $j$, cutting funding to its foreign affiliates, or withdrawing liquidity through internal capital markets (Cetorelli and Goldberg, 2012). Affiliates may, in turn, reduce local lending as internal funding declines (De Haas and van Lelyveld, 2014). Access to alternative funding, including central bank liquidity facilities, can mitigate these adjustments (Andrade et al., 2019). Our data capture cross-border and locally booked claims but not funding flows within banking groups.

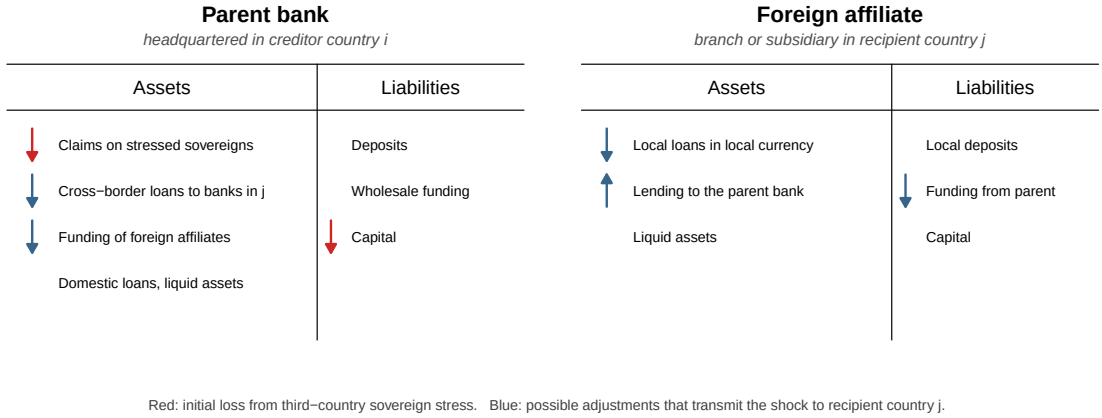



Figure 3: Illustrative channels of transmission of third-country sovereign stress through a multinational bank

*Notes:* The figure illustrates adjustments following a capital loss; sovereign stress may also transmit through funding pressures, as discussed in the text. The red arrows show the initial shock: losses on claims on stressed sovereigns reduce the parent bank's capital. The blue arrows show possible subsequent adjustments: the parent bank reduces its cross-border loans and its funding of foreign affiliates, and the affiliates reduce their local lending in the recipient country and lend to the parent bank. Flows within the banking group are not observed in our data.

The framework predicts that banking systems with greater exposure to third-country sovereign stress reduce lending relative to less exposed creditors. The response can affect both cross-border and locally booked claims and extend to recipients outside the stressed economies. Its magnitude may depend on recipient characteristics and access to alternative sources of finance.

# 3 Data and Empirical Strategy

## 3.1 International Banking Data

Our main data source is the BIS locational banking statistics (Bank for International Settlements, 2019b), which report the claims of banks located in a reporting country on residents of each counterparty country. Of the 31 reporting countries that publish bilateral positions, we select 17 advanced economies outside the five euro area periphery countries (Table 1). We exclude Greece, Ireland, Italy, Portugal, and Spain as creditors to distinguish exposure to third-country sovereign stress from direct stress in the creditor's own country. These five countries remain in the set of sovereigns used to construct our exposure index. The recipient sample covers 152 emerging market and developing economies across six regions: emerging Europe, emerging Asia, Latin America, the Middle East and Central Asia, Sub-Saharan Africa, and other developing economies (Table A2). We refer to these economies as emerging markets throughout the paper.

The BIS locational statistics provide changes in bilateral claims adjusted for exchange rate movements and breaks in reporting. We measure quarterly claims growth as the adjusted change in claims of banks in creditor country $i$ on recipient country $j$, divided by the previous quarter's stock:

$$y_{ijt} = \frac{\Delta X^{adj}_{ijt}}{X_{ij,t-1}}, \tag{3.1}$$

where $X_{ijt}$ covers all instruments and all counterparty sectors. We drop observations in which the adjusted change exceeds, in absolute value, the stock of the previous quarter or of four quarters earlier. Section 5.4 examines alternative trimming thresholds and definitions of growth.

We complement the locational data with the BIS consolidated banking statistics (Bank for International Settlements, 2017, 2019a), which report the worldwide consolidated claims of banking groups headquartered in a reporting country. We use claims on an immediate counterparty basis to study total consolidated claims and foreign affiliates' local claims in local currency. We separately use the ultimate risk basis, which reallocates claims following risk transfers, to examine the sectors of ultimate obligors (Section 6). These statistics group banks by headquarters rather than residence and therefore provide complementary evidence from a different reporting population. They report stocks only, so the growth rates computed from them include valuation effects. Throughout the paper, a creditor banking system refers to banks located in a reporting country in the locational data and to banking groups headquartered there in the consolidated data.

The estimation sample spans 2000Q3–2025Q2 and contains 120,031 creditor–recipient–quarter observations across 1,997 creditor–recipient pairs. Table 2 reports summary statistics. Average quarterly bilateral claims growth is close to zero, with a standard deviation of 24 percentage

points. Table A1 lists the data sources.

Table 1: Creditor countries and stress countries

| Group | Count | Countries |
|---|---|---|
| European creditors | 11 | Austria, Belgium, Denmark, Finland, France, Germany, Luxembourg, Netherlands, Sweden, Switzerland, United Kingdom |
| Non-European creditors | 6 | Australia, Canada, Japan, Korea, Taiwan, United States |
| Stress countries in $CXI^{sov}$ | 17 | Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom |

*Notes:* Creditor countries are the BIS reporting countries with bilateral locational statistics that are advanced economies outside Greece, Ireland, Italy, Portugal, and Spain. Stress countries are the countries for which the ECB publishes the Composite Indicator of Sovereign Stress (SovCISS); they enter $CXI^{sov}_{ijt}$ as third countries $k$ and are excluded when $k$ is the creditor or the recipient.

Table 2: Summary statistics

| *Panel A: Regression variables* | | | | | | |
|---|---|---|---|---|---|---|
| | *N* | Mean | SD | P10 | Median | P90 |
| Growth of bilateral claims, $y_{ijt}$ | 120,031 | −0.005 | 0.238 | −0.248 | −0.004 | 0.236 |
| Lagged exposure to recipient (% of creditor's total claims) | 120,031 | 0.142 | 0.759 | 0.000 | 0.010 | 0.265 |
| Third-country sovereign-stress exposure, $CXI^{sov}_{ijt}$ | 120,031 | 0.160 | 0.149 | 0.044 | 0.085 | 0.418 |
| Quarterly change in $CXI^{sov}_{ijt}$ | 109,934 | 0.000 | 0.054 | −0.057 | −0.004 | 0.059 |
| Third-country systemic-stress exposure, $CXI^{sys}_{ijt}$ | 120,031 | 0.117 | 0.141 | 0.014 | 0.067 | 0.309 |
| *Panel B: Sample composition* | | | | | | |
| Creditor countries | 17 (AT, AU, BE, CA, CH, DE, DK, FI, FR, GB, JP, KR, LU, NL, SE, TW, US) | | | | | |
| Recipient countries | 152 | | | | | |
| Middle East and Central Asia | 33 recipients, 29,700 observations | | | | | |
| Sub-Saharan Africa | 46 recipients, 26,582 observations | | | | | |
| Latin America | 21 recipients, 22,204 observations | | | | | |
| Emerging Asia | 17 recipients, 16,585 observations | | | | | |
| Emerging Europe | 13 recipients, 13,890 observations | | | | | |
| Other developing | 22 recipients, 11,070 observations | | | | | |
| Creditor–recipient pairs | 1,997 | | | | | |
| Sample period | 2000Q3–2025Q2 | | | | | |

*Notes:* Statistics are computed on the estimation sample of the baseline specification (Table 4, column 3). $y_{ijt}$ is the exchange-rate- and break-adjusted change in claims of banks in creditor $i$ on recipient $j$, divided by the previous quarter's stock (BIS locational banking statistics). Growth rates and exposure indices are in decimal units; the lagged exposure to the recipient is reported in percent, whereas the regressions use the share. $CXI^{sov}$ and $CXI^{sys}$ weight the sovereign stress indicators (SovCISS) and the systemic stress indicators (CISS) of third countries by the creditor's lagged claims on them.

### 3.2 Third-Country Sovereign Stress Exposure

We measure sovereign stress with the Composite Indicator of Sovereign Stress (SovCISS) developed by de Andoain and Kremer (2017). The indicator combines credit risk, volatility, and liquidity measures from government bond markets at short and long maturities. It covers 17 European countries, including the five euro area periphery countries. As an alternative, we use the Composite Indicator of Systemic Stress (CISS), which captures stress in money, bond, equity, financial intermediary, and foreign exchange markets (Holló et al., 2012; Chavleishvili and Kremer, 2023). The country-level CISS covers 13 countries. Both indicators range from zero to one. We average their monthly observations within each quarter.

For each creditor–recipient pair, we define the exposure of creditor $i$ to stress in third countries as the average stress across the countries on which it holds claims, weighted by these claims:

$$CXI_{ijt} = \frac{\sum_{k \in K,\, k \neq i,j} X_{ik,t-1}\, s_{kt}}{\sum_{k \in K,\, k \neq i,j} X_{ik,t-1}}, \tag{3.2}$$

where $K$ is the set of countries covered by the stress indicator, $s_{kt}$ is the stress indicator of country $k$ in quarter $t$, and $X_{ik,t-1}$ is the locational claim of banks in creditor country $i$ on country $k$ at the end of the previous quarter.[3] We denote the index by $CXI^{sov}_{ijt}$ when $s_{kt}$ is the SovCISS and by $CXI^{sys}_{ijt}$ when it is the CISS. Two features of the index support identification. First, lagged portfolio weights exclude contemporaneous adjustments in creditors' foreign claims. Second, we exclude the creditor and recipient countries from the index, so sovereign stress in either country does not enter the measured third-country exposure directly.[4]

The index measures how far a creditor's claims on the countries in $K$ are tilted toward the countries whose sovereigns are under stress in a given quarter. The weights are the creditor's claims on all sectors of each country, not its holdings of government debt, and the index is not a measure of the share of stressed assets in the creditor's total balance sheet.[5] Two creditors with the same total exposure to Europe can have very different values of the index: during the euro area crisis, a banking system whose European claims were concentrated on Italy and Spain had a much higher value than one whose European claims were concentrated on Germany and the Nordic countries.

### 3.3 Cross-Country Variation in Financial Stress

Identification requires differences in stress exposure across creditors that lend to the same recipient in the same quarter. Table 3 and Figure 4 compare the variation generated by alternative stress indicators. Systemic financial stress is highly synchronized across countries: quarter fixed effects explain 98 percent of the variation in the CISS-based exposure index. The country-level financial stress indicator (CLIFS) of Duprey et al. (2017) also exhibits strong common movements.

[3] In a given quarter, the sums run over the countries in $K$ for which both the stress indicator and the creditor's claims are available.

[4] For example, the index for the claims of banks in Germany on Poland is the average sovereign stress in the 15 remaining countries of $K$, weighted by the claims of banks in Germany on each of them.

[5] An alternative index that divides stress-weighted claims on these countries by the creditor's total foreign claims measures the size rather than the composition of exposure. When both indices enter the baseline specification, the lending response is associated with the composition of exposure: per standard deviation, the coefficient is $-0.019$ ($p = 0.006$) on the composition index and 0.008 ($p = 0.007$) on the size index, and $-0.018$ ($p = 0.005$) and 0.006 ($p = 0.025$) when portfolio weights are fixed at their 2007 averages. The size index equals the composition index times the share of these countries in the creditor's total foreign claims, so its positive coefficient indicates a smaller response to a given composition when that share is larger. In a specification with the composition index, the share, and their interaction, the response to a one-standard-deviation increase in the composition index is $-0.017$, $-0.013$, and $-0.011$ at the 10th, 50th, and 90th percentiles of the share. Section 5.2 also controls for the pre-crisis share of the stress countries in each creditor's claims.

Sovereign stress varies more across countries, particularly during the euro area crisis. Although quarter fixed effects explain 96 percent of the variation in the sovereign-stress index, its average within-quarter dispersion across creditors is 63 percent greater than that of the systemic-stress index. These comparisons use each indicator's available country coverage and estimation sample and remove quarter effects rather than the full set of baseline fixed effects. Figure 4 shows that cross-creditor dispersion in sovereign-stress exposure is concentrated in 2010–2013.

Table 3: Cross-creditor variation in third-country stress exposure

| Stress index used in $CXI$ | Stress countries | $R^2$ of quarter FE | Within-quarter SD across creditors | Overall SD | Corr. with creditor's own CISS | |
|---|---|---|---|---|---|---|
| | | | | | Raw | Net of quarter means |
| Systemic stress (CISS) | 13 | 0.976 | 0.0160 | 0.1267 | 0.90 | −0.49 |
| Financial stress (CLIFS) | 28 | 0.942 | 0.0160 | 0.0720 | 0.79 | −0.08 |
| Sovereign stress (SovCISS) | 17 | 0.957 | 0.0261 | 0.1491 | 0.73 | 0.08 |

*Notes:* Each row constructs the third-country stress exposure index with a different stress indicator, holding the formula fixed. $R^2$ of quarter FE is the share of the variance of the index explained by quarter fixed effects alone. For the within-quarter SD across creditors, the index is first averaged across each creditor's recipients; the standard deviation of these creditor-level values across creditors is then averaged over quarters. The last two columns report the correlation with the creditor's own systemic stress (CISS), raw and after removing quarter means. Each row uses the estimation sample available for that index; both coverage and samples differ across rows. These descriptive measures remove quarter effects only, rather than the full set of baseline fixed effects.

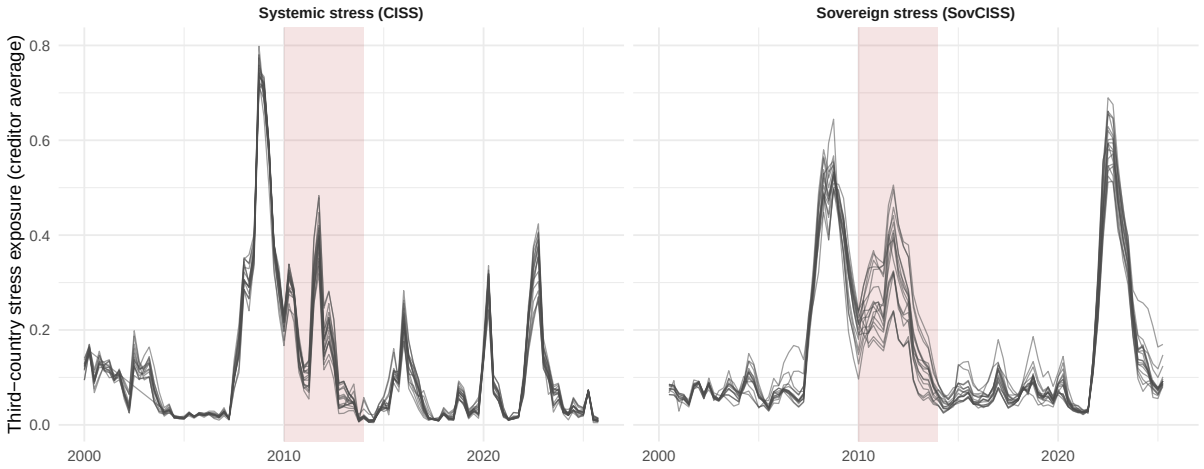



Figure 4: Third-country stress exposure of individual creditor countries: systemic versus sovereign stress

*Notes:* Each line shows the exposure index of one creditor country, averaged across its recipients, computed with the composite CISS (left panel) and with the sovereign stress indicator (right panel). The figure shows how far the creditor-level series spread apart; individual lines are not labeled. The shaded area marks 2010–2013.

The last two columns of Table 3 distinguish common movements from the correlation with a creditor's own systemic stress. The raw correlations are high for both the systemic and sovereign exposure indices (0.90 and 0.73). After quarter means are removed, they are −0.49 and 0.08, respectively, so in its estimation sample the cross-creditor differences in the sovereign index are nearly uncorrelated with creditors' own systemic stress. Section 5.1 separately examines creditors' own sovereign risk.

### 3.4 Empirical Specification and Identification

Our baseline specification is

$$y_{ijt} = \beta \frac{X_{ij,t-1}}{X_{i,t-1}} + \lambda CXI^{sov}_{ijt} + \alpha_{ij} + \delta_{jt} + \varepsilon_{ijt}, \tag{3.3}$$

where $X_{ij,t-1}/X_{i,t-1}$ is the share of recipient $j$ in creditor $i$'s total foreign claims at the end of the previous quarter, $\alpha_{ij}$ is a creditor–recipient pair fixed effect, and $\delta_{jt}$ is a recipient × quarter fixed effect. The recipient × quarter fixed effects compare lenders to the same country in the same quarter, following the logic of Khwaja and Mian (2008) at the level of banking systems (see also Degryse et al., 2019). They absorb all shocks that affect the recipient's borrowing from all of its lenders alike, including changes in its demand for credit, its macroeconomic conditions, and its exchange rate, as well as all shocks that are common to lenders worldwide, including the global component of financial stress. The pair fixed effects absorb time-invariant features of each lending relationship, such as geographic distance, common language, and historical ties. The coefficient $\lambda$ captures differences in lending growth associated with sovereign-stress exposure across creditors that lend to the same recipient in the same quarter, conditional on creditor–recipient pair fixed effects.

The exposure index has a shift-share structure: it combines creditor-specific foreign portfolio weights with country-specific sovereign stress (Goldsmith-Pinkham et al., 2020; Borusyak et al., 2022). Recipient × quarter fixed effects absorb common financial shocks, so identification rests on differences in creditors' pre-existing portfolio composition and the geographical distribution of sovereign stress. The identifying assumption is that these exposure differences are uncorrelated with other determinants of creditors' lending to a given recipient, conditional on the fixed effects and lagged recipient share. Potential confounding factors include creditors' own sovereign risk, pre-crisis banking conditions, and differential sensitivity to global financial shocks. Section 5 examines these alternative explanations.

### 3.5 Statistical Inference

We cluster standard errors by creditor country to account for correlation across recipients and over time within each banking system. With 17 creditor clusters, conventional cluster-robust inference may over-reject (Cameron et al., 2008; MacKinnon and Webb, 2017; MacKinnon et al., 2023). Our main inference uses the wild cluster restricted bootstrap with six-point Webb weights and 9,999 replications (Webb, 2023). Unless otherwise stated, reported $p$-values and significance stars for exposure coefficients follow this procedure. We also assess the baseline estimate with randomization inference (Young, 2019). Confidence intervals in figures use creditor-clustered standard errors; the text reports bootstrap $p$-values. Additional inference procedures appear in Section 5.4.

# 4 Sovereign Stress and International Bank Lending

## 4.1 Baseline Results

Table 4 reports the baseline estimates. Banking systems with greater exposure to third-country sovereign stress reduce lending relative to other creditors that lend to the same recipient in the same quarter. In column 3, the coefficient on sovereign-stress exposure is −0.084, with a bootstrap $p$-value of 0.020. The coefficient remains negative with creditor–recipient pair fixed effects alone and when quarter fixed effects replace recipient × quarter fixed effects (columns 1 and 2). All specifications use observations for which both stress indices are available. Differences in sample size reflect the removal of singleton observations, as explained in the table notes.

Table 4: Third-country stress exposure and cross-border bank lending

| | $CXI^{sov}$ | | | $CXI^{sys}$ | | | Both | By period |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Third-country sovereign-stress exposure, $CXI^{sov}_{ijt}$ | −0.019*** | −0.073** | −0.084** | | | | −0.091** | |
| | (0.006) | (0.033) | (0.033) | | | | (0.035) | |
| | [0.007] | [0.042] | [0.020] | | | | [0.018] | |
| $CXI^{sov}_{ijt}$ × 2010–2013 (euro area crisis) | | | | | | | | −0.134** |
| | | | | | | | | (0.038) |
| | | | | | | | | [0.016] |
| $CXI^{sov}_{ijt}$ × all other quarters | | | | | | | | −0.028 |
| | | | | | | | | (0.072) |
| | | | | | | | | [0.755] |
| Third-country systemic-stress exposure, $CXI^{sys}_{ijt}$ | | | | −0.036*** | 0.018 | 0.017 | 0.055 | |
| | | | | (0.008) | (0.043) | (0.045) | (0.053) | |
| | | | | [0.001] | [0.680] | [0.694] | [0.310] | |
| Lagged recipient share of total foreign claims | −1.163*** | −1.014*** | −1.021*** | −1.167*** | −1.008*** | −1.014*** | −1.021*** | −1.017*** |
| | (0.360) | (0.339) | (0.303) | (0.360) | (0.337) | (0.302) | (0.304) | (0.302) |
| Creditor–recipient pair FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter FE | No | Yes | No | No | Yes | No | No | No |
| Recipient × quarter FE | No | No | Yes | No | No | Yes | Yes | Yes |
| Observations | 120,938 | 120,938 | 120,031 | 120,938 | 120,938 | 120,031 | 120,031 | 120,031 |
| Creditor countries | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| Recipient countries | 153 | 153 | 152 | 153 | 153 | 152 | 152 | 152 |

*Notes:* The dependent variable is the quarterly growth of claims of banks in creditor country $i$ on recipient country $j$. $CXI_{ijt}$ is the average stress in third countries $k \neq i, j$ weighted by creditor $i$'s lagged claims on them, using the Composite Indicator of Sovereign Stress (SovCISS; $CXI^{sov}$) or the Composite Indicator of Systemic Stress (CISS; $CXI^{sys}$). All columns use the observations for which both indices are available. When recipient × quarter fixed effects are included, singleton observations (recipient–quarter cells with a single creditor) are dropped, which removes one recipient country. Column 3 is the baseline specification. Column 8 interacts $CXI^{sov}_{ijt}$ with an indicator for 2010Q1–2013Q4 and with its complement. Recipient × quarter fixed effects absorb time-varying recipient conditions that affect lending from all creditors alike, including common changes in credit demand and macroeconomic conditions. Standard errors clustered by creditor country in parentheses. Wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by creditor) in brackets. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Stars on the control variable refer to cluster-robust $p$-values.

Columns 4–6 replace sovereign stress with the systemic stress index. With pair fixed effects alone, the coefficient is negative and statistically significant (−0.036). Once quarter or recipient × quarter fixed effects are included, the coefficient becomes positive and statistically insignificant 0.017 ($p = 0.694$ in column 6). The negative association therefore reflects common time variation rather than differences across creditors. When both indices enter the regression (column 7), the sovereign-stress coefficient remains negative and significant −0.091 ($p = 0.018$), whereas the

systemic-stress coefficient is insignificant 0.055 ($p = 0.310$). Sovereign stress thus retains cross-creditor variation that predicts relative lending growth after common shocks are absorbed.

The response is concentrated in the euro area crisis. Column 8 estimates separate coefficients for 2010Q1–2013Q4 and all other quarters. The crisis-period estimate is larger in absolute value and more precise: $-0.134$ ($p = 0.016$), compared with $-0.028$ ($p = 0.755$) outside the crisis, when sovereign stress varied much less across countries (Figure 4). To gauge the magnitude, we use the standard deviation of exposure after removing the baseline fixed effects: 0.028 in the full sample and 0.049 during the crisis. A one-standard-deviation difference in exposure implies 0.24 percentage points lower quarterly claims growth for the more exposed creditor in the full sample and 0.66 percentage points during the crisis. We next quantify the lending shortfall during the crisis and examine the persistence of the response.

A separate comparison within the euro area crisis distinguishes changes in the lending coefficient from changes in exposure itself. We divide 2010–2013 into the quarters before the ECB's two three-year LTROs (2010Q1–2011Q3), the period encompassing the operations (2011Q4–2012Q2), and the period following the OMT announcement (2012Q3–2013Q4). These interventions eased bank funding conditions and sovereign market stress (Andrade et al., 2019; Krishnamurthy et al., 2018; Acharya et al., 2019). The exposure coefficients are $-0.131$, $-0.156$, and $-0.108$ across the three phases; the differences are not statistically significant.[6] Exposure itself declined: its mean fell from 0.34 during the refinancing operations to 0.16 after the OMT announcement, and its average within-quarter dispersion across creditor–recipient pairs narrowed by about 40 percent. These comparisons describe the crisis phases and do not separately identify the effects of ECB interventions.

### 4.2 Economic Magnitude

We quantify the economic magnitude of the estimated response by comparing each creditor's lending during 2010–2013 with a counterfactual in which its exposure equals the cross-creditor average in each quarter. For each creditor and quarter, we multiply the crisis-period coefficient ($-0.134$; Table 4, column 8) by the deviation from average exposure and the creditor's lagged claims on emerging markets. We sum these differences over the crisis period, holding observed lagged claims fixed rather than simulating a counterfactual path of claims. The resulting magnitudes capture relative differences across creditors, not changes in aggregate credit to emerging markets. Table 5 reports the results.

The implied amounts are large. Banks located in the United Kingdom lent about $76 billion less to emerging markets over 2010–2013 than under this counterfactual, equal to 21 percent of their claims on these economies at the end of 2009. The corresponding figures are $41 billion (21 percent) for banks located in France and $30 billion (15 percent) for banks located in Germany.

[6] The three coefficients are estimated in a single regression that also includes a separate coefficient for all other quarters. Their bootstrap $p$-values are 0.098, 0.005, and 0.090, and the bootstrap $p$-values of the differences from the pre-LTRO period are 0.776 and 0.829.

Table 5: Economic magnitude during the euro area crisis

| Creditor | Average exposure gap (2010–2013) | Model-implied claims difference (billions of US dollars) | Share of 2009Q4 claims on sample EMEs (%) |
|---|---|---|---|
| United Kingdom | 0.080 | −75.9 | −20.7 |
| France | 0.089 | −40.8 | −21.1 |
| Germany | 0.074 | −30.1 | −14.9 |
| Belgium | 0.044 | −5.0 | −9.6 |
| Netherlands | 0.017 | −2.5 | −4.0 |
| Austria | 0.008 | −2.3 | −1.4 |
| Taiwan | 0.022 | −1.6 | −7.0 |
| Luxembourg | 0.008 | −0.7 | −1.3 |
| Denmark | 0.003 | 0.0 | −0.3 |
| Finland | −0.020 | 0.1 | 3.8 |
| Korea | −0.010 | 1.1 | 2.7 |
| Sweden | −0.034 | 1.7 | 7.7 |
| Australia | −0.073 | 3.5 | 42.3 |
| Canada | −0.071 | 4.6 | 18.7 |
| Switzerland | −0.040 | 5.8 | 11.0 |
| Japan | −0.031 | 13.9 | 8.6 |
| United States | −0.065 | 32.0 | 24.2 |
| Creditors with above-average exposure | | −159.0 | −14.0 |
| Creditors with below-average exposure | | 62.6 | |

*Notes:* Model-implied claims differences compare each creditor's lending with a counterfactual in which the same creditor, with the same claims, had the cross-creditor mean exposure in each quarter. They multiply the euro-crisis coefficient (−0.134; Table 4, column 8) by the quarterly exposure gap and by the creditor's lagged claims on sample emerging market economies, summed over 2010Q1–2013Q4. The exposure gap is the creditor's $CXI^{sov}$ minus the cross-creditor mean in the same quarter; the first column reports its average over 2010–2013. Observed lagged claims are held fixed quarter by quarter; no counterfactual stock path is simulated. Amounts are rounded to one decimal place, so Denmark's negative dollar difference appears as zero. These are relative effects and do not measure changes in total lending to emerging markets. A regression of the actual change in excess lending growth during 2010–2013 on the predicted change across the 17 creditors has a slope of 0.93 and an $R^2$ of 0.25.

In total, creditors with above-average exposure lent about $159 billion less than under the counterfactual,[7] or 14 percent of their end-2009 claims on emerging markets. Creditors with below-average exposure, led by the United States and Japan, lent about $63 billion more. For scale, the claims of all 17 creditors on the sample recipients amounted to about $1.6 trillion at the end of 2009.

Appendix Figure A4 compares the exposure-related predictions with observed differences in creditors' lending growth during 2010–2013. Across the 17 creditors, the fitted slope is 0.93 and the $R^2$ is 0.25. In this in-sample comparison, the predicted differences account for about a quarter of the cross-creditor variation in excess lending growth, measured relative to the baseline fixed effects and control.

### 4.3 Dynamics and Persistence

We examine how the lending response evolves after a change in sovereign-stress exposure. Using the full sample, we estimate local projections of cumulative claims growth at horizons of up to 16 quarters (Jordà, 2005):

[7]The grouping in Table 5 is based on the time-varying exposure index. It differs from the grouping in Figure 2, which holds exposure weights at their 2009 average, for Canada, Denmark, Finland, and Taiwan.

$$\sum_{s=0}^{h} y_{ij,t+s} = \lambda_h \, \Delta CXI^{sov}_{ijt} + \gamma_h \, CXI^{sov}_{ij,t-1} + \alpha^h_{ij} + \delta^h_{jt} + \varepsilon^h_{ijt}, \qquad h = 0, \ldots, 16, \tag{4.1}$$

where the left-hand side is cumulative claims growth from quarter $t$ to quarter $t+h$, measured as the sum of quarterly growth rates, and the explanatory variable of interest is the quarterly change in exposure. Controlling for the lagged level of the index accounts for its persistence. For $h = -4, \ldots, -1$, we replace the left-hand side with cumulative growth over the $|h|$ quarters before $t$ to check for differential lending changes preceding the change in exposure.

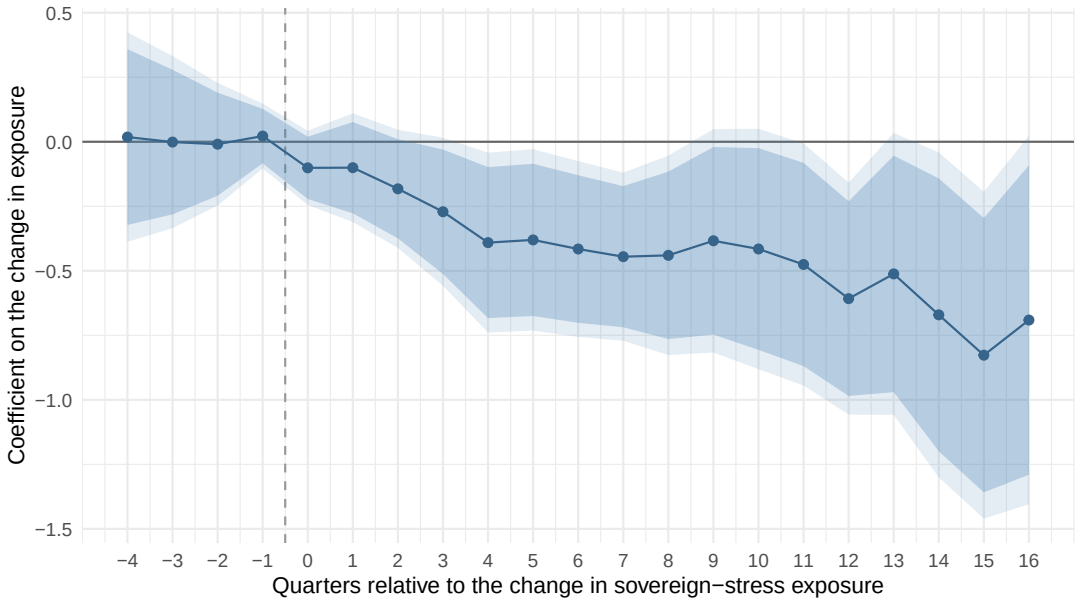



Figure 5: Dynamic response of cross-border claims to third-country sovereign-stress exposure

*Notes:* Estimates of $\lambda_h$ from equation (4.1), the coefficient on the quarterly change in the index. For $h \geq 0$, the dependent variable is the cumulative growth of claims from quarter $t$ to $t+h$, measured as the sum of quarterly growth rates; for $h < 0$, it is the cumulative growth over the $|h|$ quarters before $t$. Multiplying the coefficients by 0.054, the standard deviation of the quarterly change in the index, gives the response to a one-standard-deviation change. All regressions include creditor–recipient pair and recipient × quarter fixed effects and control for the lagged level of the index. Dark and light bands are 90 and 95 percent confidence intervals based on standard errors clustered by creditor country; the text reports bootstrap $p$-values.

Figure 5 shows no detectable differential lending changes before an increase in sovereign-stress exposure. The pre-change coefficients range from −0.01 to 0.02, with bootstrap $p$-values above 0.72. The contemporaneous response is small and imprecisely estimated (−0.10, $p = 0.188$), but the cumulative lending gap widens over time. The coefficient reaches −0.39 after one year ($p = 0.039$) and −0.61 after three years ($p = 0.007$). For a one-standard-deviation increase in exposure (0.054), these estimates imply cumulative reductions in claims growth of 2.1 and 3.3 percentage points, respectively. At four years, the coefficient remains negative at −0.69 ($p = 0.067$). The lending gap outlasts the change in exposure, which has largely dissipated after

three years. Controlling for subsequent changes in exposure does not reduce the cumulative response.[8]

The crisis-period evidence reinforces this pattern. By 2016, less exposed creditors had increased their claims by approximately their entire end-2009 stock, whereas claims of more exposed creditors remained close to their end-2009 level (Figure 2). The resulting shift in the composition of emerging markets' foreign lenders persisted after sovereign stress subsided. The evidence identifies relative changes across creditors but does not measure the extent to which borrowers replaced funding from exposed lenders. Firm-level studies show that such substitution can be costly and incomplete, particularly for smaller borrowers (Khwaja and Mian, 2008; Chodorow-Reich, 2014).

# 5 Identification and Robustness

Creditors with greater exposure to third-country sovereign stress were predominantly European banking systems during the euro area crisis. The estimated response could therefore reflect creditors' own financial conditions, shocks common to European banks, or differences in their sensitivity to global financial factors. Table 6 examines these explanations. We then identify the sovereigns that account for the estimated response and assess its robustness to alternative measures, samples, and inference procedures.

## 5.1 Creditor-Specific Conditions

A creditor's own sovereign stress can weaken its banks and reduce foreign lending (Altavilla et al., 2017; Bofondi et al., 2018). Although our exposure index excludes the creditor's own country, third-country stress may still correlate with domestic sovereign risk. After removing quarter means, the correlation between the exposure index and the creditor's 10-year sovereign spread over Germany is $-0.006$, and its correlation with the quarterly change in that spread is $-0.025$ (Table 6). Controlling for both variables leaves the exposure coefficient unchanged at $-0.084$ ($p = 0.026$). The coefficient on the creditor's own sovereign spread is small and statistically insignificant. Adding creditor-level macroeconomic controls yields a coefficient of $-0.075$ ($p = 0.057$) in a smaller sample.

More exposed creditors may have entered the crisis with weaker banking systems or different international lending strategies. We interact standardized pre-crisis creditor characteristics with quarter indicators to allow their effects on lending to vary over time. These characteristics include banking-system size in 2007, non-performing loan and capital-to-assets ratios in 2005–2007, and real GDP growth in 2003–2007. Across these specifications, the exposure coefficient

[8] Regressing the change in the index between $t-1$ and $t+h$ on its change in quarter $t$, with the controls and fixed effects of equation (4.1), yields coefficients of 0.58, 0.46, and 0.06 for $h = 4$, 8, and 12. Adding the change in the index between $t$ and $t+h$ to equation (4.1) yields $\lambda_h$ of $-0.46$, $-0.57$, and $-0.92$ at these horizons (bootstrap $p$-values 0.041, 0.041, and 0.037), estimated on the observations for which the index in quarter $t+h$ is available.

Table 6: Third-country exposure versus alternative explanations

| | Coefficient | SE | Bootstrap $p$ | Observations | Creditors |
|---|---|---|---|---|---|
| Baseline | $-0.084^{**}$ | (0.033) | [0.020] | 120,031 | 17 |
| *Panel A: The creditor's own condition* | | | | | |
| Own 10-year sovereign spread over Germany and its quarterly change | $-0.084^{**}$ | (0.035) | [0.026] | 112,441 | 16 |
| Creditor macroeconomic controls | $-0.075^{*}$ | (0.039) | [0.057] | 98,174 | 16 |
| Pre-crisis size (log total claims, 2007) × quarter | $-0.079^{*}$ | (0.039) | [0.088] | 120,031 | 17 |
| Pre-crisis banking-sector NPL ratio (2005–07) × quarter | $-0.075^{*}$ | (0.043) | [0.080] | 110,079 | 15 |
| Pre-crisis banking-sector capital-to-assets ratio (2005–07) × quarter | $-0.079^{**}$ | (0.033) | [0.028] | 112,441 | 16 |
| Pre-crisis real GDP growth (2003–07) × quarter | $-0.070^{*}$ | (0.036) | [0.056] | 112,441 | 16 |
| *Panel B: Common shocks and global factors* | | | | | |
| Euro area group × quarter FE | $-0.069^{**}$ | (0.030) | [0.034] | 120,031 | 17 |
| European group × quarter FE | $-0.090^{**}$ | (0.035) | [0.023] | 120,031 | 17 |
| Pre-crisis exposure share to the stress countries × quarter | $-0.096^{***}$ | (0.032) | [0.007] | 120,031 | 17 |
| European creditors only | $-0.104^{**}$ | (0.038) | [0.020] | 86,982 | 11 |
| Creditor-specific slopes on the VIX | $-0.078^{**}$ | (0.031) | [0.023] | 120,031 | 17 |
| Creditor-specific slopes on the US dollar | $-0.090^{**}$ | (0.032) | [0.012] | 120,031 | 17 |
| Creditor-specific slopes on euro area systemic stress | $-0.074^{**}$ | (0.031) | [0.030] | 120,031 | 17 |
| All three sets of creditor-specific slopes | $-0.077^{**}$ | (0.029) | [0.021] | 120,031 | 17 |
| Creditor-specific linear trends | $-0.104^{**}$ | (0.036) | [0.011] | 120,031 | 17 |
| *Correlation of $CXI_{ijt}^{sov}$ with the creditor's own sovereign risk, net of quarter means:* | | | | | |
| own sovereign spread: $-0.006$; its quarterly change: $-0.025$; own sovereign stress (SovCISS, 9 creditors): $-0.200$ | | | | | |

*Notes:* Each row is a separate regression that adds the listed controls to the baseline specification (Table 4, column 3) and uses the largest sample for which they are available; Taiwan has no sovereign-yield or macroeconomic data. The own sovereign spread is the creditor's 10-year government bond yield minus the German yield; its coefficient is 0.0012 (SE 0.0023). Creditor macroeconomic controls are real GDP growth, inflation, the current account to GDP ratio, the banking-sector non-performing loan ratio, and the quarterly change in the real effective exchange rate. Pre-crisis characteristics are standardized and interacted with a full set of quarter indicators; banking-sector ratios are from the World Bank Global Financial Development Database. The pre-crisis exposure share is the creditor's 2005–2007 claims on the seventeen stress countries relative to its total claims. Group × quarter fixed effects interact an indicator for euro area (European) creditors with quarter indicators. Euro area creditors are Austria, Belgium, Finland, France, Germany, Luxembourg, and the Netherlands; European creditors are these and Denmark, Sweden, Switzerland, and the United Kingdom. Creditor-specific slopes interact creditor indicators with the quarterly average of the VIX, the quarterly log change of the Federal Reserve's broad trade-weighted US dollar index, and the euro area composite indicator of systemic stress (CISS), respectively; the common component of each factor is absorbed by the recipient × quarter fixed effects. Standard errors clustered by creditor country in parentheses. Wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by creditor) in brackets. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

remains between $-0.070$ and $-0.079$, with bootstrap $p$-values between 0.028 and 0.088.

## 5.2 Common Shocks and Global Financial Conditions

European banks faced common pressures during the euro area crisis, including tighter dollar funding conditions and higher capital requirements (Ivashina et al., 2015; Gropp et al., 2019). Panel B of Table 6 controls for these common shocks through euro area and European creditor group × quarter fixed effects. The exposure coefficients remain negative at $-0.069$ and $-0.090$, respectively. Interacting each creditor's pre-crisis share of claims on the 17 stress countries with quarter indicators also leaves the estimate unchanged. Among the 11 European creditors alone, the coefficient is $-0.104$ ($p = 0.020$). The estimated response therefore does not depend on differences between European and non-European banking systems.

Global financial conditions can affect international banking systems differently (Rey, 2013; Cerutti et al., 2017; Avdjiev et al., 2019). Although recipient × quarter fixed effects absorb

common shocks, creditors may differ in their sensitivity to global risk appetite, dollar movements, and systemic stress. We allow each creditor a separate slope on the VIX, the quarterly change in the broad trade-weighted US dollar index, and euro area systemic stress. The exposure coefficient remains close to the baseline in each specification and equals $-0.077$ ($p = 0.021$) when all three sets of creditor-specific slopes enter together. Pre-crisis VIX sensitivity and average sovereign-stress exposure during 2010–2013 are weakly correlated ($-0.08$).

A further possibility is that more exposed creditors were on a gradual path of retrenchment from international lending. Such trends could accompany the shift toward local funding and lending models after the global financial crisis (McCauley et al., 2012). Allowing each creditor its own linear trend yields a coefficient of $-0.104$ ($p = 0.011$).

Apart from the exclusion of the recipient itself, exposure varies across creditors and over time but not across the recipients of a given creditor, so creditor $\times$ quarter fixed effects would absorb it. Creditor-specific shocks that coincide with exposure cannot be ruled out entirely.

### 5.3 Sources of Identifying Variation

Exposure to the five euro area periphery countries accounts for almost the entire estimated lending response. The shift-share decomposition (Goldsmith-Pinkham et al., 2020) attributes $-0.082$ of the baseline coefficient of $-0.084$ to Greece, Ireland, Italy, Portugal, and Spain, compared with $-0.002$ for the other twelve stress countries (Appendix Table A6). The two groups account for 51 and 49 percent of the identifying variation, respectively. Their group-specific coefficients are $-0.161$ and $-0.005$. Thus, the negative lending response is concentrated in exposure to the sovereigns at the center of the euro area crisis.

No single stress country is essential to the negative estimate. Removing one country at a time and rebuilding the index yields coefficients between $-0.061$ (without Denmark) and $-0.102$ (without Sweden), all with bootstrap $p$-values below 0.04.

### 5.4 Robustness Checks

Table 7 and Appendix Table A5 assess alternative exposure measures, outcome definitions, samples, and inference procedures. Fixing portfolio weights at their 2007 or 2009 averages yields coefficients of $-0.092$ ($p = 0.009$) and $-0.085$ ($p = 0.013$), respectively. Using 2009 weights and restricting the sample to 2010 onwards gives $-0.107$ ($p = 0.010$). The estimates remain negative across alternative sets of stress countries.

The negative response is robust to alternative measures of claims growth. A stricter trimming threshold of 0.5 reduces the coefficient to $-0.046$ ($p = 0.065$), while less restrictive thresholds yield estimates of $-0.094$ and $-0.107$. The difference indicates that large adjustments in individual lending relationships contribute to the estimated response.[9] Weighting observations by

[9] During 2010–2013, the baseline rule removes 7.2 percent of observations for above-average exposure creditors and 7.8 percent for below-average exposure creditors. These observations account for 0.7 percent of lagged claims,

lagged claims yields −0.091 ($p = 0.079$). A symmetric growth measure (Davis and Haltiwanger, 1992) gives −0.112 ($p = 0.015$). Using consolidated claims growth yields −0.110 ($p = 0.001$). Section 6.1 examines the composition of consolidated claims.

The estimates remain stable across alternative samples. Excluding offshore financial centers, the global financial crisis, the period since 2020, or recipients in the stress-country set yields coefficients between −0.074 and −0.083. The coefficient remains negative when individual creditors are excluded. Across all 136 specifications that exclude two creditors at a time, the estimates range from −0.116 to −0.045; 99 have bootstrap $p$-values below 0.05 and 130 below 0.10 (Appendix Figure A5). [10]

Replacing the SovCISS with a claims-weighted index of euro area countries' 10-year government bond spreads over Germany, available since 1999, yields a negative coefficient ($p = 0.049$). Its standardized magnitude is about one third of the baseline's. This comparison uses each index's raw standard deviation in its own sample, rather than the residual standard deviations used for the baseline magnitudes in Section 4.1.

Alternative inference procedures support the baseline result (Table 7, Panel B). The corresponding $p$-values range from 0.017 to 0.059, with the largest obtained from two-way clustering by creditor and quarter. Randomization inference yields $p$-values of 0.026 when exposure series are reassigned across creditors and 0.017 when reassignment is restricted within European and non-European groups. Reassigning sovereign-stress series across stress countries, with creditor portfolios held fixed, yields a $p$-value of 0.042.

# 6 Transmission Across Claims and Recipients

We examine how sovereign stress affects different categories of bank claims and whether the response varies across recipient economies. The BIS locational statistics distinguish cross-border claims by counterparty sector, while the consolidated statistics capture worldwide claims of banking groups, including those booked through foreign affiliates. We also compare emerging and advanced-economy recipients and examine differences across emerging markets. All regressions follow the baseline specification, with the relevant claims growth as the dependent variable. Samples and reporting populations differ across categories, so the coefficients do not provide formal tests of differences in responses.

## 6.1 Transmission Across Bank Claims

The lending response is particularly strong for cross-border claims on banks in recipient economies. Panel A of Table 8 reports a coefficient of −0.174 ($p = 0.003$) for claims on banks, compared with −0.059 ($p = 0.097$) for claims on non-banks. Restricting claims on banks to loans yields

and about two-thirds represent large increases. Exposure does not predict exclusion ($p = 0.83$).

[10] In a regression with creditor-specific exposure coefficients, 16 of the 17 estimates are negative. The exception, Finland, has a coefficient close to zero.

Table 7: Robustness of the effect of third-country sovereign-stress exposure

| | Coefficient | SE | Bootstrap $p$ | Observations | Creditors |
|---|---|---|---|---|---|
| *Panel A: Alternative samples, exposure weights, and stress-country sets* | | | | | |
| Baseline (full $CXI^{sov}$ sample) | $-0.084^{**}$ | (0.033) | [0.020] | 120,031 | 17 |
| Excluding Korea, Luxembourg, and Taiwan (14 creditors) | $-0.097^{**}$ | (0.037) | [0.017] | 97,086 | 14 |
| Exposure weights fixed at their 2007 average | $-0.092^{***}$ | (0.028) | [0.009] | 120,031 | 17 |
| Exposure weights fixed at their 2009 average | $-0.085^{**}$ | (0.028) | [0.013] | 120,031 | 17 |
| Weights fixed at their 2009 average, sample from 2010Q1 | $-0.107^{***}$ | (0.036) | [0.010] | 83,163 | 17 |
| Stress countries: 11 covered by both CISS indices | $-0.065^{**}$ | (0.030) | [0.042] | 120,031 | 17 |
| Stress countries: excluding Greece | $-0.086^{**}$ | (0.034) | [0.019] | 120,031 | 17 |
| Stress countries: excluding Czechia, Hungary, Poland | $-0.088^{**}$ | (0.034) | [0.019] | 120,031 | 17 |
| Dropping one creditor at a time (range across 17 samples) | $[-0.097, -0.061]$ | | $\leq 0.061$ | | 16 |
| *Panel B: Alternative inference for the baseline estimate* | | | | | |
| Cluster-robust, by creditor | $p = 0.022$ | | | | |
| Two-way cluster-robust, by creditor and recipient | $p = 0.018$ | | | | |
| Two-way cluster-robust, by creditor and quarter | $p = 0.059$ | | | | |
| Wild cluster restricted bootstrap, Webb weights | $p = 0.020$ | | | | |
| Wild cluster restricted bootstrap, Rademacher weights | $p = 0.020$ | | | | |
| Randomization inference: permuting creditors' exposure series | $p = 0.026$ | | | | |
| Randomization inference: permuting within European / non-European creditors | $p = 0.017$ | | | | |
| Randomization inference: permuting sovereign-stress series across stress countries | $p = 0.042$ | | | | |

*Notes:* Each row of Panel A reports the coefficient on third-country sovereign-stress exposure from the baseline specification (creditor–recipient pair and recipient × quarter fixed effects), changing one element at a time. Fixed weights replace the creditor's lagged claims on each stress country with its average claims over the four quarters of the stated year. Controls for the creditor's own sovereign risk and other alternative explanations are reported in Table 6. In Panel B, randomization inference uses 2,000 permutations each; the first two reassign entire creditor-level exposure series across creditors, the third reassigns the sovereign-stress series across stress countries and rebuilds the index, keeping exposures fixed. Standard errors clustered by creditor country in parentheses. Wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by creditor) in brackets. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 8: Third-country sovereign-stress exposure and the composition of claims

| | Coefficient | SE | Bootstrap $p$ | Observations | Creditors |
|---|---|---|---|---|---|
| *Panel A: Cross-border claims by immediate counterparty (locational statistics)* | | | | | |
| All claims (baseline) | $-0.084^{**}$ | (0.033) | [0.020] | 120,031 | 17 |
| Claims on banks | $-0.174^{***}$ | (0.052) | [0.003] | 67,238 | 16 |
| Claims on non-banks | $-0.059^{*}$ | (0.037) | [0.097] | 102,634 | 16 |
| Loans to banks | $-0.152^{***}$ | (0.053) | [0.006] | 56,269 | 15 |
| *Panel B: Consolidated claims of domestic banks (consolidated statistics)* | | | | | |
| All claims, immediate counterparty basis | $-0.110^{***}$ | (0.026) | [0.001] | 82,007 | 16 |
| Local claims of foreign affiliates in local currency | $-0.173^{**}$ | (0.086) | [0.016] | 13,688 | 14 |
| Claims on banks, ultimate risk basis | $-0.125^{*}$ | (0.067) | [0.097] | 29,245 | 14 |
| Claims on the non-bank private sector, ultimate risk basis | $-0.129^{***}$ | (0.043) | [0.001] | 45,156 | 14 |
| Claims on the official sector, ultimate risk basis | 0.023 | (0.044) | [0.590] | 26,057 | 13 |

*Notes:* Each row estimates the baseline specification (creditor–recipient pair and recipient × quarter fixed effects, lagged recipient share) with the growth of the listed claims as the dependent variable. In Panel A, claims on banks equal claims on all sectors minus claims on non-banks; Germany does not report the sectoral breakdown. Growth rates are computed from exchange rate- and break-adjusted changes. Panel B groups banks by headquarters rather than residence. Total and local-currency claims use the immediate counterparty basis, and the sectoral rows use the ultimate risk basis. The consolidated statistics report stocks only; growth rates are quarterly changes in stocks, and valuation effects common to all creditors lending to the same recipient are absorbed by the recipient × quarter fixed effects. Local claims in local currency are claims of the creditor banks' affiliates located in the recipient country, booked locally and denominated in the recipient's currency. Ultimate risk claims reallocate claims to the country and sector of the ultimate obligor (guarantor). Samples differ across rows, so differences between coefficients are not formal tests of differences between categories of claims. Standard errors clustered by creditor country in parentheses. Wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by creditor) in brackets. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

a coefficient of −0.152 ($p = 0.006$). These results identify a reduction in cross-border funding from exposed creditors to recipient banking systems. Such funding provides a channel through which external financial shocks can reach domestic credit markets. Schnabl (2012) documents the effects of a contraction in international bank funding on Peruvian firms, while Cetorelli and Goldberg (2011) examine transmission through interbank funding during the global financial crisis. Our data capture the decline in external bank funding rather than its subsequent allocation to domestic borrowers.

The negative response also appears in the worldwide claims of internationally active banking groups. Panel B of Table 8 reports a coefficient of −0.110 ($p = 0.001$) for total consolidated claims, which include cross-border claims and those booked through foreign affiliates. The coefficient for affiliates' local claims in local currency is −0.173 ($p = 0.016$).[11] The consolidated-claims response remains negative after controlling for shocks common to euro area creditors (−0.084, $p = 0.050$) or European creditors (−0.115, $p = 0.025$; Appendix Table A8). The local-currency estimate is based on a smaller sample of 13,688 observations for 14 creditors and loses statistical significance under these additional controls. The evidence for locally booked lending is therefore suggestive. These findings complement evidence on the adjustment of global banks' cross-border and affiliate lending after financial shocks (Cetorelli and Goldberg, 2011; De Haas and van Lelyveld, 2014; Cerutti and Claessens, 2017). The data do not separately identify internal funding adjustments within banking groups.

Claims measured on an ultimate-risk basis show a negative response in the non-bank private sector. After accounting for risk transfers such as guarantees (Bank for International Settlements, 2017), the coefficient is −0.129 ($p = 0.001$) for the non-bank private sector and −0.125 ($p = 0.097$) for banks. The response is more precisely estimated for the non-bank private sector. Both coefficients remain negative but lose statistical significance when euro area or European group × quarter fixed effects are included. We find no statistically significant response for claims on the official sector (0.023, $p = 0.590$), which includes general government, central banks, and international organizations.

### 6.2 Heterogeneity Across Recipients

The lending response extends beyond emerging markets. Panel A of Table 9 estimates the baseline specification for claims of the same 17 creditors on 20 advanced economies outside the stress-country set. The coefficient is −0.105 ($p = 0.034$), close to the estimate for emerging markets. A pooled regression does not reject equality between the two groups: the coefficient difference is −0.021 ($p = 0.594$). The similar responses across recipient groups are consistent with transmission through exposed banking systems rather than shocks specific to emerging markets.

[11] Recipient × quarter fixed effects absorb the common currency-conversion component of growth in claims denominated in the recipient's currency. For these claims, this is equivalent, up to a second-order term, to converting each creditor's claims at the bilateral US dollar exchange rate, as in Cerutti and Claessens (2017).

This finding complements evidence that European banks exposed to distressed sovereign debt withdrew from foreign syndicated lending markets (Popov and van Horen, 2015).

Table 9: Third-country sovereign-stress exposure across recipient groups

| | Coefficient | SE | Bootstrap $p$ | Observations | Recipients |
|---|---|---|---|---|---|
| *Panel A: Emerging market versus advanced economies* | | | | | |
| Emerging market economies (baseline) | $-0.084^{**}$ | (0.033) | [0.020] | 120,031 | 152 |
| Advanced economies | $-0.105^{**}$ | (0.043) | [0.034] | 25,812 | 20 |
| Difference, advanced minus emerging (pooled regression) | $-0.021$ | | [0.594] | 145,843 | |
| *Panel B: Emerging market regions* (one regression, $N$ = 120,031) | | | | | |
| Emerging Europe | $-0.107^{*}$ | (0.059) | [0.090] | | 13 |
| Emerging Asia | $-0.126^{***}$ | (0.039) | [0.005] | | 17 |
| Latin America | $-0.115^{*}$ | (0.055) | [0.051] | | 21 |
| Sub-Saharan Africa | $-0.113^{*}$ | (0.062) | [0.086] | | 46 |
| Middle East and Central Asia | 0.026 | (0.075) | [0.739] | | 33 |
| Other developing | $-0.147^{*}$ | (0.065) | [0.050] | | 22 |

*Notes:* All regressions include creditor–recipient pair and recipient × quarter fixed effects and the lagged exposure share; the seventeen creditor countries are the same in all rows. In Panel A, advanced economies are Australia, Canada, Cyprus, Estonia, Hong Kong SAR, Iceland, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, New Zealand, Norway, Singapore, Slovakia, Slovenia, Switzerland, Taiwan, and the United States; the stress countries are excluded because their stress enters the index directly. The difference is the coefficient on the interaction of $CXI_{ijt}^{sov}$ with an advanced-economy indicator in a pooled regression of both groups of recipients. Panel B interacts $CXI_{ijt}^{sov}$ with recipient-region indicators in a single regression; the regional classification is listed in Table A2. Standard errors clustered by creditor country in parentheses. Wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by creditor) in brackets. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Within emerging markets, we examine whether the response varies with recipients' pre-crisis fundamentals. Appendix Table A7 interacts sovereign-stress exposure with standardized measures of the current account balance, government debt, banking-sector non-performing loans, trade openness, inflation, cross-border bank claims relative to GDP, and the share of claims held by European banks. None of these interactions is statistically significant. The exposure coefficient remains between $-0.057$ and $-0.090$ across specifications, with coverage ranging from 72 recipients for banking-sector non-performing loans to all 152 for the European creditor share. The results indicate no systematic heterogeneity across the measured pre-crisis fundamentals.

Panel B of Table 9 compares the response across six emerging market regions. The coefficients range from $-0.107$ to $-0.147$ in emerging Asia, emerging Europe, Latin America, Sub-Saharan Africa, and other developing economies. The estimate is most precise in emerging Asia and significant at the 10 percent level in the other four groups. The coefficient for the Middle East and Central Asia is 0.026 ($p = 0.739$). Claims on this region are concentrated in a few economies: in 2008Q2, the Gulf Cooperation Council countries and Russia each accounted for approximately 40 percent of the sample creditors' claims on the region. Separate estimates for the Gulf economies, Russia, and the remaining countries are statistically insignificant.

# 7 Conclusion

Sovereign stress propagates across borders through international banks' foreign portfolios, with persistent effects on the allocation of international credit. We show that banking systems with greater exposure to stressed sovereigns reduce lending relative to other creditors serving the same emerging market. The response originates from exposure to the euro area periphery, extends to cross-border interbank credit and worldwide consolidated claims, and persists beyond the initial stress episode. Less exposed creditors expand their lending, which leads to a lasting shift in the composition of foreign creditors. Our findings reveal a channel of international financial spillovers through which geographically concentrated shocks reshape global credit allocation. Amid rising geopolitical tensions and geoeconomic fragmentation, financial vulnerability depends not only on domestic fundamentals but also on the geographical exposures of foreign lenders. Monitoring these exposures can strengthen the assessment of external financial risks and inform macroprudential surveillance.

An important question for future research is whether persistent changes in foreign creditor composition affect aggregate credit and real economic activity. Aldasoro et al. (2023) establish the macroeconomic effects of international bank lending on emerging markets, while Elliott et al. (2024) show how nonbank lenders can offset international credit contractions and mitigate their real effects. Extending this evidence to third-country sovereign stress would reveal whether substitution across lenders cushions recipient economies or whether persistent credit reallocation affects domestic lending, investment, and output.

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# A Data and sample

Table A1 lists the data sources. Table A2 lists the recipient countries in the estimation sample by region, and Tables A3 and A4 describe the coverage of the estimation sample by creditor country and by recipient region. The panel is unbalanced: the first quarter of observation differs across creditors, and not all creditors lend to all recipients.

The BIS locational banking statistics report both the stock of claims and the change in claims adjusted for exchange rate movements and breaks in series. Figure A1 illustrates the importance of the adjustment for the claims of banks in Germany on India. Changes in the unadjusted stocks, in either the locational or the consolidated statistics, also reflect exchange rate movements and breaks in reporting. In 2009, for example, the unadjusted change in the locational stock was several times larger than the adjusted change.

Figure A2 shows the cross-border claims of banks in advanced economies on emerging market and developing economies by recipient region. Figure A3 shows the sovereign stress indicators of selected euro area countries, the growth of claims of European and non-European creditors on emerging markets, and the difference between the two. Figure A4 relates the change in each creditor's excess lending growth during the euro area crisis to its exposure to third-country sovereign stress.

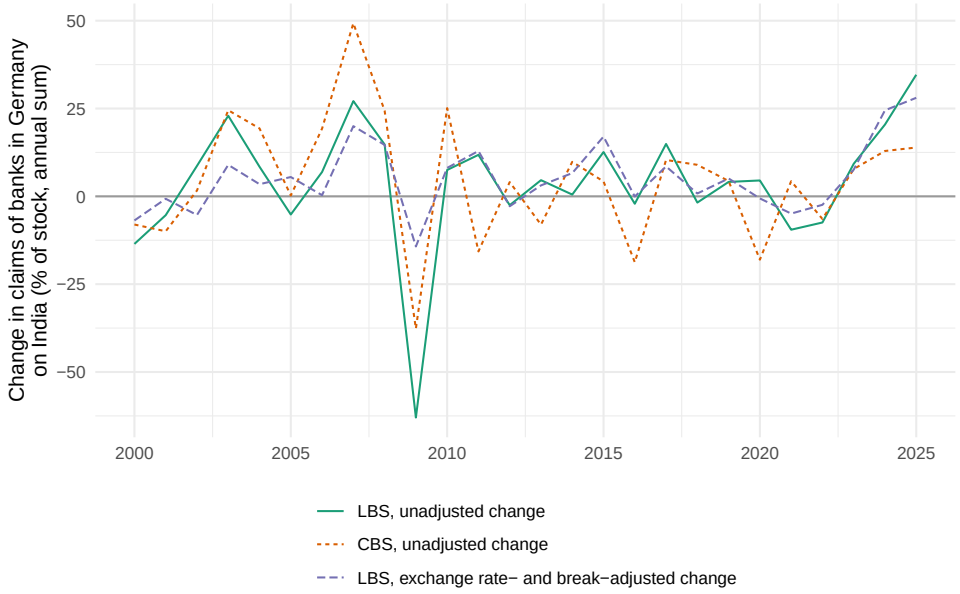



Figure A1: Growth of claims of banks in Germany on India: unadjusted and adjusted changes

*Notes:* Sum over each year of the quarterly change in the locational stock of claims (LBS, unadjusted change), in the consolidated stock of claims (CBS, unadjusted change), and of the exchange rate- and break-adjusted locational change (LBS, exchange rate- and break-adjusted change), each in percent of the outstanding stock. Sources: BIS locational and consolidated banking statistics.

Table A1: Data sources

| Variable | Source | Coverage | Period covered | Use |
|---|---|---|---|---|
| Bilateral cross-border claims: stocks and exchange-rate- and break-adjusted changes; all sectors and non-bank sector | BIS locational banking statistics | 17 creditors and 152 recipients in the estimation sample (of 31 reporting countries publishing bilateral data) | 2000Q3–2025Q2 | Outcome; exposure weights |
| Consolidated claims of domestic banks: total claims; local claims in local currency; claims by sector of the ultimate obligor | BIS consolidated banking statistics | 16 creditors | 2000Q3–2025Q2 | Alternative outcome; composition of claims |
| Sovereign stress | ECB, Composite Indicator of Sovereign Stress (SovCISS) | 17 countries | 2000-09–2025-04 | $CXI^{sov}$ |
| Systemic stress | ECB, Composite Indicator of Systemic Stress (CISS) | 13 countries | 1980-01–2026-07 | $CXI^{sys}$ |
| 10-year government bond yields | OECD (via FRED); ECB | 24 countries | 1999-01–2026-08 | Own sovereign spread; spread-based index |
| Macroeconomic variables | World Bank WDI; IMF World Economic Outlook (general government gross debt); BIS effective exchange rates | Creditors and recipients | Annual / quarterly | Controls; recipient characteristics |
| Banking-sector non-performing loan and capital-to-assets ratios | World Bank Global Financial Development Database | Creditors | Annual | Pre-crisis creditor characteristics |
| Global factors: VIX; broad trade-weighted US dollar index | Federal Reserve Bank of St. Louis (FRED) | Global | 1990Q1–2026Q3 | Creditor-specific slopes on global factors |

*Notes:* For the BIS statistics, periods refer to the estimation samples; for the other series, they refer to the data as downloaded. The baseline estimation sample covers 2000Q3–2025Q2. Monthly series are averaged to quarterly frequency, and bond yields are used from 1999 onwards.

Table A2: Recipient countries by region

| Region | Count | Countries |
|---|---|---|
| Emerging Europe | 13 | Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Hungary, Montenegro, North Macedonia, Poland, Romania, Serbia, Turkey, Ukraine |
| Emerging Asia | 17 | Bangladesh, Brunei, Cambodia, China, India, Indonesia, Laos, Malaysia, Mongolia, Myanmar, Nepal, North Korea, Philippines, Sri Lanka, Thailand, Timor-Leste, Vietnam |
| Latin America | 21 | Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela |
| Middle East and Central Asia | 33 | Afghanistan, Algeria, Armenia, Azerbaijan, Bahrain, Belarus, Djibouti, Egypt, Georgia, Iran, Iraq, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon, Libya, Mauritania, Moldova, Morocco, Oman, Pakistan, Qatar, Russia, Saudi Arabia, Syria, Tajikistan, Tunisia, Turkmenistan, United Arab Emirates, Uzbekistan, West Bank and Gaza, Yemen |
| Sub-Saharan Africa | 46 | Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Cote d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of the Congo, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe |
| Other developing | 22 | Aruba, Barbados, Belize, Bermuda, Bhutan, Dominica, Fiji, Gibraltar, Grenada, Guyana, Israel, Jamaica, Maldives, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands, Suriname, Tonga, Tuvalu, Vanuatu |

*Notes:* Recipient countries included in the estimation sample (152 countries). Advanced economies and financial centers classified as advanced (for example, Hong Kong SAR, Singapore, Korea, Taiwan, Cyprus, and the Baltic states) are not recipients.

Table A3: Estimation sample by creditor country

| Creditor | First quarter | Last quarter | Observations | Recipients | Mean $CXI^{sov}$ |
|---|---|---|---|---|---|
| AT | 2008Q3 | 2025Q2 | 5,579 | 128 | 0.163 |
| AU | 2000Q3 | 2025Q2 | 6,005 | 136 | 0.158 |
| BE | 2000Q3 | 2025Q2 | 10,034 | 144 | 0.156 |
| CA | 2008Q3 | 2025Q2 | 1,127 | 61 | 0.157 |
| CH | 2000Q3 | 2025Q2 | 11,427 | 149 | 0.149 |
| DE | 2000Q3 | 2025Q2 | 10,379 | 129 | 0.172 |
| DK | 2004Q1 | 2025Q2 | 6,820 | 137 | 0.149 |
| FI | 2000Q3 | 2025Q2 | 3,421 | 93 | 0.176 |
| FR | 2000Q3 | 2025Q2 | 12,300 | 146 | 0.171 |
| GB | 2000Q3 | 2025Q2 | 11,262 | 145 | 0.158 |
| JP | 2000Q3 | 2025Q2 | 6,453 | 79 | 0.148 |
| KR | 2006Q1 | 2025Q2 | 6,995 | 138 | 0.171 |
| LU | 2000Q3 | 2025Q2 | 8,244 | 133 | 0.148 |
| NL | 2000Q3 | 2025Q2 | 2,362 | 53 | 0.161 |
| SE | 2000Q3 | 2025Q2 | 5,472 | 119 | 0.165 |
| TW | 2001Q4 | 2025Q2 | 7,399 | 133 | 0.163 |
| US | 2000Q3 | 2025Q2 | 4,752 | 74 | 0.146 |

*Notes:* Estimation sample of the baseline specification (Table 4, column 3). Creditor countries are identified by ISO 3166 alpha-2 codes.

Table A4: Estimation sample by recipient region

| Region | Recipients | Pairs | Observations | Period | Share of claims (%) | |
|---|---|---|---|---|---|---|
| | | | | | 2008Q2 | 2024Q4 |
| Emerging Europe | 13 | 203 | 13,890 | 2000Q3–2025Q2 | 28.0 | 15.5 |
| Emerging Asia | 17 | 251 | 16,585 | 2000Q3–2025Q2 | 15.4 | 28.7 |
| Latin America | 21 | 312 | 22,204 | 2000Q3–2025Q2 | 17.8 | 19.5 |
| Middle East and Central Asia | 33 | 481 | 29,700 | 2000Q3–2025Q2 | 26.2 | 22.9 |
| Sub-Saharan Africa | 46 | 522 | 26,582 | 2000Q3–2025Q2 | 5.0 | 5.8 |
| Other developing | 22 | 228 | 11,070 | 2000Q3–2025Q2 | 7.7 | 7.5 |
| Total | 152 | 1,997 | 120,031 | 2000Q3–2025Q2 | 100.0 | 100.0 |

*Notes:* Estimation sample of the baseline specification (Table 4, column 3). Shares are the region's share in the sample creditors' locational claims on all sample recipients.

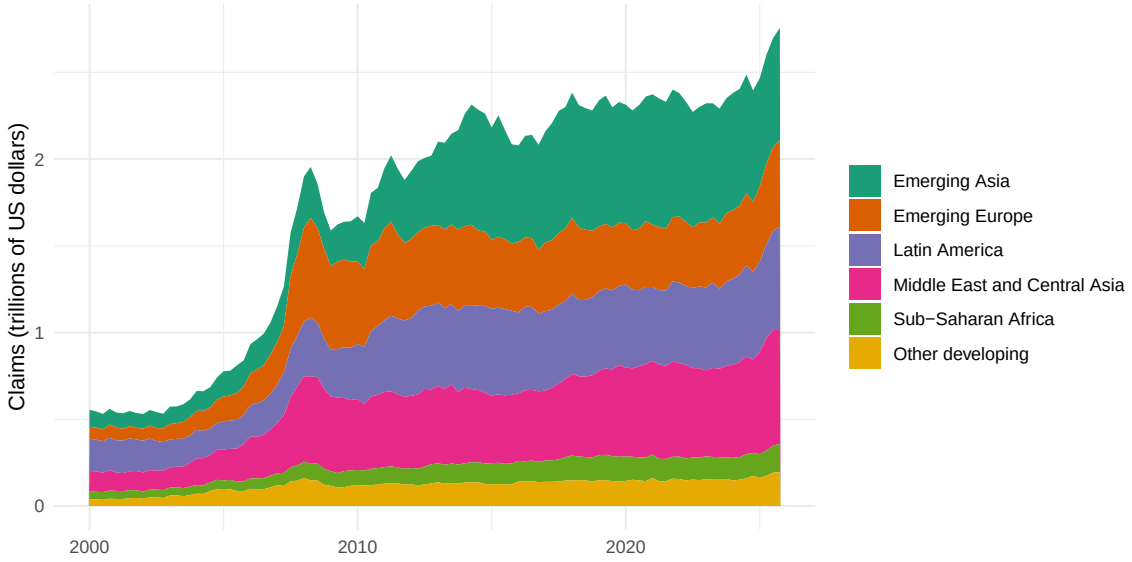



Figure A2: Cross-border claims of banks in advanced economies on emerging market and developing economies, by recipient region

*Notes:* Outstanding cross-border claims of banks located in the 21 advanced economies of Figure 1, in trillions of US dollars, by recipient region as defined in Table A2. Source: BIS locational banking statistics.

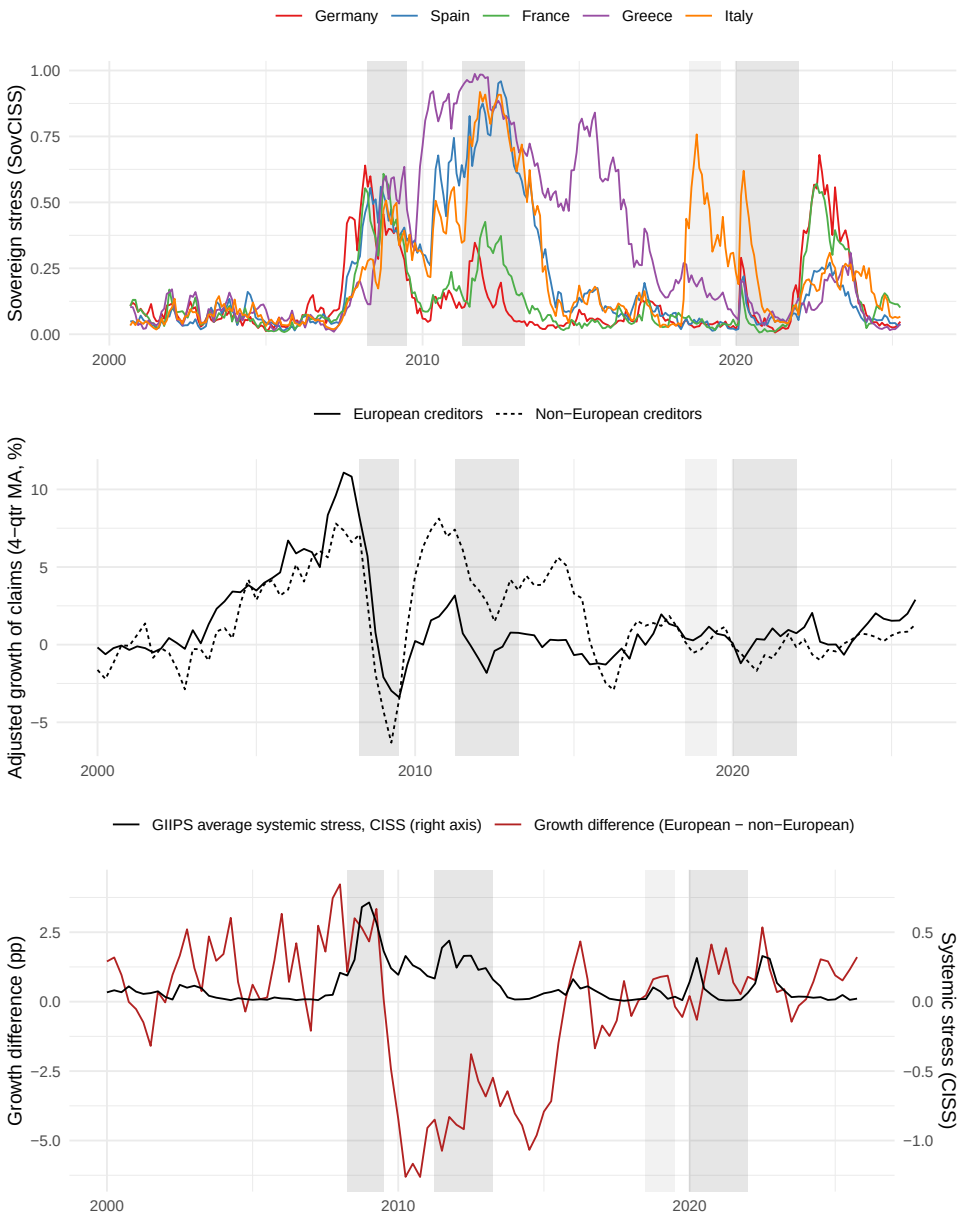



Figure A3: Sovereign stress and the growth of claims of European and non-European creditors

*Notes:* Top panel: sovereign stress indicator (SovCISS) of Germany, Spain, France, Greece, and Italy, monthly. Middle panel: exchange rate- and break-adjusted change in claims of European and non-European creditors (excluding Greece, Ireland, Italy, Portugal, and Spain) on emerging market and developing economies, in percent of the stock four quarters earlier, four-quarter moving average. Bottom panel: difference between the two growth rates in the middle panel and the average systemic stress indicator (CISS) of Greece, Ireland, Italy, Portugal, and Spain (right axis). Shaded areas mark the global financial crisis, the euro area crisis, the Italian stress episode of 2018, and the COVID-19 period.

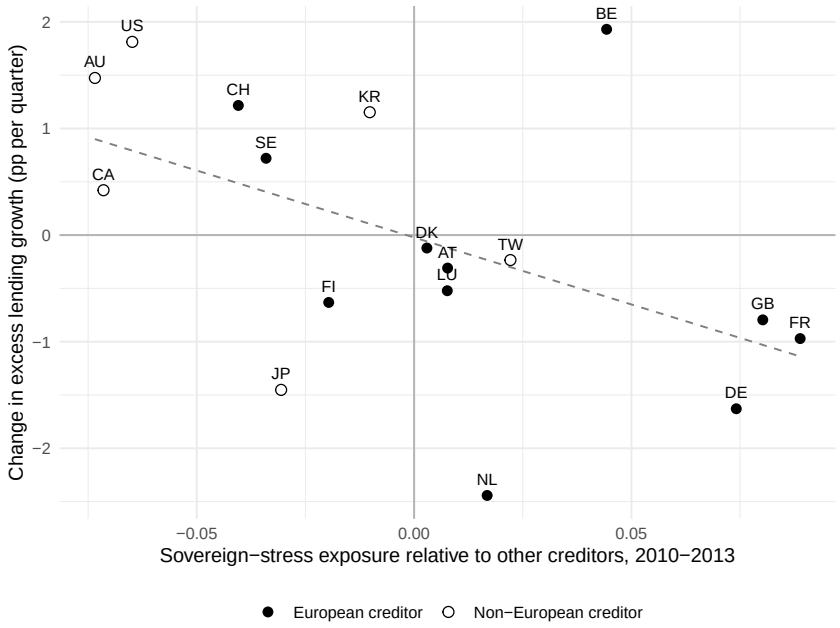



Figure A4: Exposure to third-country sovereign stress and lending during the euro area crisis, by creditor country

*Notes:* Horizontal axis: the creditor's average sovereign-stress exposure index in 2010–2013 minus the cross-creditor mean in each quarter. Vertical axis: the creditor's average residual lending growth in 2010–2013 minus its average in all other quarters, in percentage points per quarter, where residuals are from the baseline specification without the exposure index. Creditor countries are labeled by their ISO codes; the dashed line is the least-squares fit.

# B Additional results

Table A5 reports the robustness of the baseline estimate to the definition of the dependent variable, to the sample, and to an alternative measure of sovereign stress based on 10-year government bond spreads. Figure A5 shows the baseline estimates obtained when two creditors at a time are excluded. Table A6 decomposes the baseline estimate by stress country and reports the estimates obtained when one stress country at a time is removed from the index. Table A7 reports the interactions of the exposure index with pre-crisis characteristics of the recipient countries. Table A8 re-estimates the regressions for consolidated claims in Table 8, Panel B with euro area and European group × quarter fixed effects.

Table A5: Robustness to outcome definitions, samples, and the measurement of sovereign stress

| | Coefficient | SE | Bootstrap $p$ | Observations | Creditors |
|---|---|---|---|---|---|
| *Panel A: Outcome definitions* | | | | | |
| Trimming at 0.5 instead of 1 | $-0.046^{*}$ | (0.023) | [0.065] | 107,989 | 17 |
| Trimming at 2 instead of 1 | $-0.094^{**}$ | (0.042) | [0.018] | 125,431 | 17 |
| Trimming on quarterly growth only | $-0.107^{***}$ | (0.035) | [0.006] | 132,553 | 17 |
| Symmetric growth rate ($\lvert g\rvert \leq 2$) | $-0.112^{**}$ | (0.047) | [0.015] | 138,911 | 17 |
| Weighted by lagged pair stock | $-0.091^{*}$ | (0.050) | [0.079] | 120,031 | 17 |
| Consolidated (CBS) claims growth | $-0.110^{***}$ | (0.026) | [0.001] | 82,007 | 16 |
| *Panel B: Sample definitions* | | | | | |
| Excluding offshore financial centers | $-0.080^{**}$ | (0.035) | [0.034] | 109,448 | 17 |
| Excluding 2008Q3–2009Q2 | $-0.074^{**}$ | (0.033) | [0.031] | 115,238 | 17 |
| Excluding 2020 onwards | $-0.083^{**}$ | (0.032) | [0.021] | 89,089 | 17 |
| Excluding recipients in the stress-country set | $-0.081^{**}$ | (0.033) | [0.022] | 116,027 | 17 |
| *Panel C: Alternative sovereign-stress measure (coefficients per standard deviation)* | | | | | |
| SovCISS (baseline) | $-0.013^{**}$ | (0.005) | [0.020] | 120,031 | 17 |
| 10-year sovereign spreads over Germany, euro area, 1999– | $-0.004^{**}$ | (0.002) | [0.049] | 127,294 | 17 |

*Notes:* All rows use the baseline specification (creditor–recipient pair and recipient × quarter fixed effects). The symmetric growth rate divides the adjusted change by the average of the current and lagged stocks; observations in which it exceeds 2 in absolute value are dropped. Consolidated claims growth uses domestic banks' total claims on an immediate counterparty basis from the BIS consolidated banking statistics. Offshore financial centers follow the BIS classification. In Panel C, the spread-based index weights euro area countries' 10-year government bond spreads over Germany by the creditor's lagged claims, using the same formula as $CXI^{sov}$; the sample starts in 1999, when the spreads became measures of sovereign rather than currency risk. Each index in Panel C is divided by its standard deviation across all observations of its sample (for the spread-based index, from 1999 onwards). Standard errors clustered by creditor country in parentheses. Wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by creditor) in brackets. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

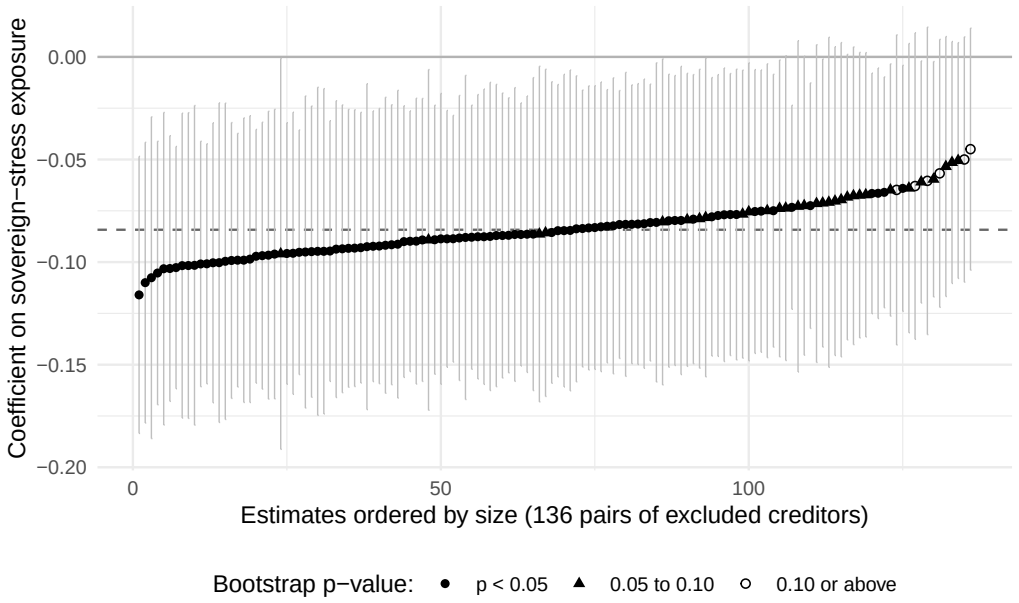



Figure A5: Baseline estimates excluding two creditors at a time

*Notes:* Each point is the coefficient on $CXI_{ijt}^{sov}$ from the baseline specification (Table 4, column 3) estimated without two of the 17 creditor countries; the 136 estimates are ordered by size. Vertical lines show 95 percent confidence intervals based on standard errors clustered by creditor country. Marker shapes indicate wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by the 15 remaining creditors). The dashed line is the full-sample estimate of $-0.084$.

Table A6: Decomposition of the baseline estimate by stress country

| *Panel A: Decomposition by stress-country group* | | | |
|---|---|---|---|
| | Decomposition weight | Group-specific coefficient | Contribution |
| Euro area periphery (Greece, Ireland, Italy, Portugal, Spain) | 0.507 | −0.161 | −0.082 |
| Other twelve stress countries | 0.493 | −0.005 | −0.002 |
| Total | 1.000 | | −0.084 |
| *Panel B: Excluding one stress country at a time* | | | |
| | Coefficient | Bootstrap $p$ | Observations |
| Excluding Austria | $-0.084^{**}$ | [0.013] | 120,031 |
| Excluding Belgium | $-0.079^{**}$ | [0.017] | 120,031 |
| Excluding Czechia | $-0.086^{**}$ | [0.014] | 120,031 |
| Excluding Germany | $-0.073^{**}$ | [0.011] | 120,031 |
| Excluding Denmark | $-0.061^{**}$ | [0.029] | 120,031 |
| Excluding Spain | $-0.083^{**}$ | [0.034] | 120,031 |
| Excluding Finland | $-0.083^{**}$ | [0.013] | 120,031 |
| Excluding France | $-0.073^{**}$ | [0.019] | 120,031 |
| Excluding United Kingdom | $-0.062^{**}$ | [0.036] | 120,031 |
| Excluding Greece | $-0.086^{**}$ | [0.013] | 120,031 |
| Excluding Hungary | $-0.089^{**}$ | [0.011] | 120,031 |
| Excluding Ireland | $-0.087^{**}$ | [0.014] | 120,031 |
| Excluding Italy | $-0.095^{**}$ | [0.029] | 120,031 |
| Excluding Netherlands | $-0.069^{**}$ | [0.021] | 120,023 |
| Excluding Poland | $-0.082^{**}$ | [0.016] | 120,031 |
| Excluding Portugal | $-0.086^{**}$ | [0.015] | 120,031 |
| Excluding Sweden | $-0.102^{**}$ | [0.012] | 120,031 |

*Notes:* Panel A decomposes the baseline coefficient into the contributions of the stress-country components of $CXI^{sov}_{ijt}$, $\hat{\lambda} = \sum_k c_k$ with $c_k = \sum \tilde{x}^k \tilde{y} / \sum \tilde{X}^2$, where $\tilde{x}^k$ is the component due to stress country $k$, $\tilde{X}$ denotes the full exposure index, and tildes denote residuals after removing the fixed effects and controls. The decomposition weight is $v_k = \sum \tilde{x}^k \tilde{X} / \sum \tilde{X}^2$; the weights sum to one across countries, and individual weights can be negative. Weights and contributions are summed within groups, and the group-specific coefficient is the ratio of the two. Panel B rebuilds $CXI^{sov}_{ijt}$ without the listed stress country and re-estimates the baseline specification; bootstrap $p$-values use 1,999 replications. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table A7: Recipient characteristics and the effect of third-country sovereign-stress exposure

| Recipient characteristic (2005–2007, standardized) | Recipients | $CXI^{sov}$ | Interaction | Bootstrap $p$ (interaction) |
|---|---|---|---|---|
| Current account / GDP | 131 | $-0.080^{**}$ | 0.0064 | [0.695] |
| Government debt / GDP | 139 | $-0.083^{**}$ | −0.0117 | [0.678] |
| Bank non-performing loan ratio | 72 | −0.057 | 0.0574 | [0.108] |
| Trade / GDP | 126 | $-0.090^{**}$ | 0.0049 | [0.869] |
| Inflation | 134 | $-0.079^{**}$ | −0.0048 | [0.869] |
| Cross-border bank claims / GDP | 146 | $-0.087^{**}$ | −0.0159 | [0.252] |
| Share of claims from European banks | 152 | $-0.083^{**}$ | 0.0088 | [0.683] |

*Notes:* Each row adds the interaction of $CXI^{sov}_{ijt}$ with one standardized pre-crisis recipient characteristic (winsorized at the 2nd and 98th percentiles) to the baseline specification. The characteristic itself is absorbed by the pair fixed effects. Stars on $CXI^{sov}$ refer to bootstrap $p$-values; the last column reports the bootstrap $p$-value of the interaction. Coverage differs across characteristics (second column). None of the interactions is statistically significant.

Table A8: Consolidated claims with group × quarter fixed effects

| | (1) Baseline | (2) Euro area group × quarter FE | (3) European group × quarter FE | Observations | Creditors |
|---|---|---|---|---|---|
| All claims, immediate counterparty basis | −0.110*** | −0.084* | −0.115** | 82,007 | 16 |
| | (0.026) [0.001] | (0.031) [0.050] | (0.051) [0.025] | | |
| Local claims of foreign affiliates in local currency | −0.173** | −0.100 | 0.114 | 13,688 | 14 |
| | (0.086) [0.016] | (0.099) [0.417] | (0.126) [0.317] | | |
| Claims on banks, ultimate risk basis | −0.125* | −0.080 | −0.139 | 29,245 | 14 |
| | (0.067) [0.097] | (0.059) [0.187] | (0.081) [0.151] | | |
| Claims on the non-bank private sector, ultimate risk basis | −0.129*** | −0.069 | −0.100 | 45,156 | 14 |
| | (0.043) [0.001] | (0.037) [0.147] | (0.080) [0.328] | | |
| Claims on the official sector, ultimate risk basis | 0.023 | 0.038 | −0.004 | 26,057 | 13 |
| | (0.044) [0.590] | (0.044) [0.402] | (0.083) [0.959] | | |

*Notes:* Each entry is the coefficient on $CXI_{ijt}^{sov}$ from a separate regression with the growth of the listed claims as the dependent variable. Column 1 reproduces Table 8, Panel B. Columns 2 and 3 add interactions of an indicator for euro area (European) creditors with quarter indicators, as in Table 6, Panel B. Euro area creditors are Austria, Belgium, Finland, France, Germany, Luxembourg, and the Netherlands; European creditors are these and Denmark, Sweden, Switzerland, and the United Kingdom. The sample of each row is the same across columns. Standard errors clustered by creditor country in parentheses. Wild cluster restricted bootstrap $p$-values (Webb weights, 9,999 replications; clustered by creditor) in brackets. Stars refer to the bootstrap $p$-values: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.